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HOUSEHOLDS MULTIPLE-USE WATER SERVICES AND LIVELIHOODS IN THE LAWRA DISTRICT IN THE UPPER WEST REGION OF GHANA

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SEPTEMBER, 2017

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DECLARATION

CANDIDATE

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

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I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

Signature……. Date……

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ABSTRACT

Historically, water delivery to communities has been designed for single use. Nevertheless, households have an integrated need for water. As a result, systems that were designed for single use either for domestic or irrigation were finally transformed into de facto multiple-use by community members. Therefore the purpose of the study was to explore households multiple use water services (MUS) and how it can be used to improve rural livelihoods in the Lawra District in the Upper West Region of Ghana. The study aimed to answer four major questions following the qualitative case study methodology which has been extensively used in multiple uses of water research. Non-probability sampling techniques were used to select five communities in the district. The findings revealed that the uses of water for the households were for both domestic and productive activities as opposed to how the water sector is organized. The research confirmed that MUS does positively impact health and economic productivity and that households need additional water facilities or the redesigning of old delivery systems for multiple uses. The study concluded that an integrated approach that supports both domestic and productive water uses will have a positive impact on its intended beneficiaries. It is recommended that provision of additional water facilities be prioritized because the current water supply systems are inadequate, partially functioning or non-functional. Also, there is need for adequate coordination between stakeholders in the implementation of MUS activities and the participatory level of beneficiary households must be increased through transformative representation.

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DEDICATION

To my family, **especially my dear wife**. Indeed blood is thicker than water. Thank you for the social, economic, and emotional support given me throughout my studies.

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ACRONYMS

AICD - Africa Infrastructure Country Diagnosis

AWDR - Africa Water Development Report

AWM – Agricultural Water Management

CAADP -Comprehensive Africa Agriculture Development Programme

CVM - Contingent Valuation Method

CWSA - Community Water and Sanitation Agency

CWSP – Community Water and Sanitation Program

COM - Community Ownership and Management

CBNRM - Community-Based Natural Resource Management

CFSVA – Comprehensive Food Security and Vulnerability Assessment

CPWF - Challenge Program on Water and Food

DRA- Demand Responsive Approach

DFID – Danish Federation for International Development

DWST - District Water and Sanitation Teams

DWD - District Works Departments

EHSD - Environmental Health and Sanitation Directorate

FAO – Food and Agriculture Organization

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FGD- Focus Group Discussions

GDP – Gross Domestic Product

GLSS- Ghana Living Standards Survey

GSS - Ghana Statistical Service

GWP - Global Water Project

GWI- Global Water Initiative

GSOP – Ghana Social Opportunities Program

HDW - Hand Dug Well

IFAD – International Fund for Agricultural Development

ILO – International Labour Organization

IRC - International Water and Sanitation Centre

IWMI - International Water Management Institute

IFPRI – International Food Policy Research Institute

JMP - Joint Monitoring Programme (for Water Supply and Sanitation)

MASSMUS - Mapping Systems and Services for Multiple Uses

MDG - Millennium Development Goals

MMDAs - Metropolitan, Municipal and District Assemblies

MOFA - Ministry of Food and Agriculture

MLGRD - Ministry of Local Government and Rural Development

MWRWH - Ministry of Water Resources, Works and Housing

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MTDP – Medium Term Development Plan

MICS- Multiple Indicator Cluster Survey

MUS - Multiple Use Water Services

NEPAD – New Economic Partnership for Africa's Development

NCWSP - National Community Water and Sanitation Programme

NGOs – Non Governmental Organizations

PBS – Population Baseline Survey

PHC – Population and Housing Census

RCC – Regional Coordinating Council

SADC - Southern Africa Development Community

SSA- Sub-Saharan Africa

UNDP – United Nations Development Programme

UWR - Upper West Region

VAM - Vulnerability Assessment Measurement

WASH - Water Supply, Sanitation and Hygiene

WSS- Water Supply Services

WATSAN - Water and Sanitation Committees

WHO - World Health Organization

WSDB - Water and Sanitation Development Boards

WUA - Water User Associations

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CHAPTER ONE

INTRODUCTION

1.1 Background

Traditionally, water delivery to communities have been designed for single use. Nevertheless, people's integrated need for and the use of water do not match the ways in which the water sector itself is organized Van Koppen et al., (2006). This is because the water sector has been strictly organized into sub sectors based on water usage such as for domestic uses, livestock, irrigation, and productive (income- generating). This implies that individuals and households are limited in the choice of water sources and the uses of water.

Also, the use of water systems for other purposes other than its original design causes pressure that can lead to water system breakages. Systems that were designed for single use, either for domestic or irrigation, were finally transformed into de facto multiple-use by community members Moriarty et al., (2010). The public sector was responsible for artificially creating these sub-sectors and categorizing water uses for single purposes (IRC and IWMI, 2009), when in practice communities naturally use water for a variety of purposes. This calls for the need to provide water for both domestic and productive purposes.

Globally, interest in the multiple uses of water services (MUS) is on the rise and there is increasing recognition of the relevance of the MUS approach to meet the challenges of feeding a rising global population. This approach seeks to open up the scope of water interventions, and in consequence, encourage changes in water regulations and policies so that these can genuinely meet all people's water needs, particularly around the household Smits et. al., (2010). Access to water for poor people is an important issue

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on the international agenda. In 2002, at the Johannesburg Declaration on Sustainable Development, participant countries agreed to speedily increase access to basic requirements including among others, clean water, sanitation, food security and protection of biodiversity (UN, 2002). After the Johannesburg Declaration, the concept of Multiple Uses of Water Services (MUS) emerged as a strategy to introduce water access that responds to the full range of people's needs, both domestic and productive, contributing to poverty alleviation and equity (MUS group, 2014).

The seventh Millennium Development Goal (MDGs) is to ensure environmental sustainability. The specific target is to half by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation. The above MDGs were developed in response to the fact that there are about 768 million people who still drew water from an unimproved source in 2011. Eighty-three per cent of the population (636 million) without access to an improved drinking water source live in rural areas. Furthermore, concerns about the quality and safety of many improved drinking water sources persist. As a result, the number of people without access to safe drinking water may be two to three times higher than official estimates (MDG Report, 2013).

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Most people around the world aspire to piped drinking water supplies on their premises. Yet 38 per cent of the 6.2 billion people globally using an improved drinking water source do not enjoy the convenience and associated health and economic benefits of piped drinking water at home (MDG Report, 2013). Instead, they spend valuable time and energy queuing up at public water points and carrying heavy loads of water home, often meeting only minimal drinking water needs. The most affected are the poorest

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and most marginalized people in society. Still, over 180 million people rely on rivers, streams, ponds or lakes to meet their daily drinking water needs (MDG Report, 2013).

It is important to emphasize that On 1 January 2016, the world officially began implementation of the 2030 Agenda for Sustainable Development. Sustainable Development is the transformative plan of action based on 17 Sustainable Development Goals (SDG Report, 2016). This is meant to address urgent global challenges over the next 15 years. This agenda is a road map for people and the planet that will build on the success of the Millennium Development Goals and ensure sustainable social and economic progress worldwide (SDG Report, 2016). As a result, the sixth SDG goal seeks to ensure availability and sustainable management of water and sanitation for all.

Also, Sub-Saharan Africa (SSA) is off track meeting the MDG on water with just 61% water coverage (UN Water, 2012). However, by the end of 2015, SSA water coverage had increased to 68% (SDG Report, 2016). Additionally, recent trends in SSA demand renewed efforts on water management. Socio-economically, continued growth in population and economic activities in the African continent are putting new pressures on water resources. It is time for efforts to be undertaken to support future investments in water development and management. Efforts have been put in place to improve water productivity in SSA. The Comprehensive Africa Agriculture Development Programme (CAADP) framework has established sustainable land and water management as its first pillar[1]. This prime position given to water management emphasizes the importance

[1] There are four key pillars, namely (1) Sustainable Land and Water Management, (2) Market Access, (3) Food Supply and Hunger, and (4) Agricultural Research.

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of effective water use. Furthermore, out of the estimated 800 million who live on the African continent, more than 300 million live in water-scarce environment (IFPRI, 2002; FAO, 2003, NEPAD 2007). This figure is expected to increase by 30 percent in the years ahead. Sub-Saharan Africa lacks water security despite having substantial natural resources such as large water bodies and areas of cultivable land (UNDP-Africa HDR, 2012).

In Ghana, water security is a major component of the principal development objectives being pursued by the Government of Ghana and its development partners. Rural water supply has been successfully extended to 65-76% of the rural population and Ghana is on track to achieve the MDG target for water (JMP, 2011). Statistics from the Upper West Regional office of the CWSA indicate that Regional coverage in water supply as at the end of 2014 stood at 76.13% (CWSA, 2010). But behind this successes are a complex set of challenges to turn newly provided water infrastructure into water services that people actually receive in terms of the quantity, quality, distance and reliability. At any given time, a substantial proportion of water supply infrastructure is either not functioning or functioning sub-optimally (Adank et al., 2013). This is a challenge across the developing world, and the pioneering work of the MUS Group is helping to provide solutions that can also benefit other countries.

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1.2 Statement of the Research Problem

The problem for this study is the inadequacy of an integrated approach that supports both domestic and productive water use in the Lawra District in the Upper West Region of Ghana. Specifically, we do not know whether the planned and completed water projects are able to meet rural households multiple needs for water. Most research have

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focused on water for single purpose uses. However, there is the need to establish the current water supply systems and ascertain the extent of the need for multiple uses.

Access to drinking water for the rural poor, along with water quality and safety, remain serious concerns. Freshwater is vital for socio-economic development but this resource is gradually becoming a scarce commodity in Ghana. Ghana's total actual renewable water resources are estimated to be 53.2 billion cubic meters per year, equivalent to availability per capita of about 2,500 cubic meters per year. Of this total, actual water withdrawals constitute only about 1.8% of total renewable water resources Namara et al., (2010), reflecting the limited level of water resources development in the country. There is a strong North/South rainfall gradient, with most major water infrastructure located in the south and southwest. According to the Africa Infrastructure Country Diagnosis, Ghana by African standards has quite extensive water resource infrastructure and some pockets of irrigation (AICD, 2010).

The Global Water Project (GWP) forecasts that six West African countries, including Ghana and Burkina Faso, may experience water scarcity by 2025 mainly due to the expected rate of growth in population. The annual population growth rate of 1.9 % (GSS, 2010) coupled with expansion in urbanisation suggests future increases in water demand. Another major issue is the non-functioning of rural point-systems. A research by the WASHCost project found that 29% of rural point-systems were non-functional at the time of visit. A point system is typically boreholes and covered wells for low density rural settlements. The same research found that only 23% of people relying on rural point-systems were accessing the nationally defined minimum level of service of

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20 litres per person per day (lpcd) of good quality water, although in small towns this rose to 59% Nyarko et al., (2011).

There is limited water available to be used for human needs. Forty percent (40%) of the 783 million people are without access to an improved source of drinking water in Africa (UN Water, 2012). Hence the need for solutions so as to ensure water and food security. The sources and uses of water by rural households amidst seasonal water insecurity still remains require further investigation. Adequate information and understanding is therefore needed on the nature of water accessibility in the rural communities such as in the Lawra District where this situation is very pronounced. In the Lawra District, some of the key water-related developmental problems include inadequate water for dry season and cultivation of vegetable crops in the field, inadequate potable water source, and erratic rainfall (Lawra DMTDP, 2013). Furthermore, some of the development objectives include to increase annual food crop production growth by 4%, to increase potable water supply coverage from 66.7% to 80% (District Annual Action Plan, 2013). These objectives indicate water availability and accessibility for various domestic and economic uses is a key problematic area in the District and hence there is the urgent need to seek answers to these developmental challenges.

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According to the Lawra DMTDP (2013), though the water coverage looks remarkable, much is still expected since people still scramble for water in most communities, especially in the dry season. Several other new settlements have no access to potable water. This emanates from the fact that, the settlement pattern is dispersed and the water facilities are over aged. Drying up of borehole, especially during the dry season also accounts for the inadequacy of potable water.

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For rural families, basic water uses should include human needs, cultivation of small plots and raising animals like poultry, pigs or cows, from which families obtain their income. Nevertheless, investments of the government are oriented towards the construction of water systems exclusively for domestic purposes. The lack of recognition of these uses is reflected in the design, management and operation of water systems. This situation limits people's access to water and makes it more difficult to ensure the improvement of quality of life. There are many water projects planned and some completed in Lawra, yet very little is documented about water use in rural communities. As a result, the concern of this study, therefore, is the inadequacy of an integrated approach that supports both domestic and productive water uses in the Lawra District in the Upper West Region of Ghana.

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1.3 Research questions

The main research question is how does the multiple uses of water affect the livelihoods of households in the Lawra District in the Upper West Region of Ghana?

The specific research questions are:

- What are the multiple uses of water practices in the study area?
- How do the various sources of water affect domestic and productive livelihood activities?
- How do the current water systems meet the needs of households?
- What are the challenges in accessing multiple water sources for domestic and productive livelihoods?

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This present study answers these questions.

1.4 Objective of the study

The main objective is to explore the multiple uses of water services (MUS) and its influence on the livelihoods of households in the Lawra District in the Upper West Region of Ghana.

The specific objectives are:

- To examine how MUS is practised in the study area.
- To explore how various sources of water affect domestic and productive livelihood activities.
- To ascertain households perception on how the existing water systems meet their needs.
- To explore the challenges faced by households in accessing multiple water sources for domestic and productive livelihoods.

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1.5 Significance of the study

A distinctive attribute of the District level analysis of water security in northern Ghana is that it provides details of household water use patterns, relative wealth of households and unique profiles of the Districts that are deemed to be worst off in terms of their varied water uses. This research gives a comprehensive picture of household water status in a rural setting. As a result, interventions can be better targeted to address the specific needs of the most vulnerable people.

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This study will add to the existing literature on the multiple uses of water services in northern Ghana. This is because the relevance of water to the socio-economic development of countries and communities are numerous. For instance, it provides food, supplies raw materials for industry, creates employment, provides income, and generates foreign exchange earnings. In addition, water used for agriculture helps to serve as a buffer during economic shocks, stabilizes the society and supports the environment. These go a long way to bridging the gaps for development.

Despite an overall increase in Ghana's wealth and development in recent years, the three northern regions have continued to record higher incidences of poverty, food insecurity and malnutrition(METSS-Ghana Survey, 2012). It is in this direction that, this research seeks to provide evidence-based answers using the MUS system in the study area.

This information contributes to improved understanding of relations between water usage in rural MUS systems and aspects of livelihoods and access to water. It provides evidence that highlights the need for mechanisms to incorporate the diverse needs of different categories of households in the design and operation of rural water systems. The justification for providing rural households with water supplies for both domestic and productive purposes lies behind the twin desires of reducing poverty, and developing and managing water resources to maximize the sustainable economic and social value.

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1.6 Scope of the Study

The study is focused on how the multiple-use water services can be used to enhance livelihoods at the household level. This is generally under the broader area of agricultural water management. Within the scope of this research, water use is restricted to domestic and productive areas in rural households. Domestic uses include washing, cooking, bathing, etc. These are traditionally studied by the domestic sector. The primary focus on productive uses comprises food crop production, gardening, livestock rearing amongst others. These are the most important in rural Upper West Region.

The major unit of analysis on which this research concentrates is the household. The water supply system is restricted here to point systems where households fetch water. Water supply systems for irrigation are also out of this research, because as discussed in the introductory chapter, in the District there are some areas under irrigation. Water quality issues have been deliberately taken out as well, to reduce complexity to the analysis.

This study is not an impact assessment with systematic water-use and water-productivity measurement. However, this is an analysis of the MUS implementation. It lends insight for scale up and anecdotal evidence of the potential impact MUS may have on rural households.

1.7 Limitation of the Study

A key limitation to this study was the language barrier. The researcher does not speak 'Dagaare' and as such had to rely on local translators. There was also the issue of adequate time needed throughout the observation period. A much longer time would

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have been preferred but there was the need to return from the field so as to be able to finalize the study on time for submission.

Though there were challenges and limitations as mentioned, they did not prevent the author from carrying out and achieving the objectives of this important study.

1.8 Operationalizing of Key Concepts

Van Koppen et al., (2006), defined **multiple use water services**, or "MUS" in short, as a participatory, integrated and poverty-reduction focused approach in poor rural and peri-urban areas, which takes people's multiple water needs as a starting point for providing integrated services (planning, financing) moving beyond the conventional sectoral barriers of the domestic and productive sectors.

Water Services refer to the water people actually receive. These services can be delivered with differing levels of quantity, quality, reliability, and distance (Renwick, 2007).

Water System is one or more physical systems that takes people's multiple water needs as starting point for providing water services (Smits, 2010).

Livelihoods refers to water related activities that contribute to people's livelihoods such as farming, livestock, or other trades, like brick-making. Renwick et al., (2007).

Household is defined as a person or a group of persons, who live together in the same house or compound and share the same catering arrangements. In general, a household consists of a man, his wife, children and some other relatives or a house help who may be living with them. However, it is important to remember that members of a household are not necessarily related (by blood or marriage) because nonrelatives (e.g. house helps) may form part of a household (GSS, 2010).

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1.9 Organization of the Study

This study is organized into five chapters. Chapter one is focused on the introduction; this gives a background of the study, problem statement, research objectives, research questions, limitation of the study and the justification for the study. Chapter two presents the literature, historical background and reviews both the theoretical and conceptual framework. Chapter three describes the research design, study profile, analysis, methods and techniques for the study. Chapter four presents the results and discussions of the study and finally Chapter five presents the recommendations and conclusions.

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CHAPTER TWO

LITERATURE REVIEW, THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

The literature review comprises theoretical and conceptual underpinnings of relevant themes of the study. It attempts to identify and leverage on distinctions and similarities forming the bases for a conceptual framework. Therefore, the literature review begins with the theoretical and conceptual frame followed by a discussion on water availability, water use and management in agriculture in Sub Saharan Africa (SSA). It proceeds to the main topic under study which is on the multiple use water services concepts and practices. The literature also discusses the potential impact of the MUS system on aspects such as poverty and access to water in rural areas. Also, the chapter presents and discusses the key concepts of the study.

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2.2 THEORETICAL FRAMEWORK

This section discusses theories that are relevant to the study under review. One major theory namely the Human Development (Capability) Approach was adopted. Also the Demand Responsive Approach (DRA) was used as a less dominant theory.

2.2.1 Human Development (Capability) Approach

The human development approach focuses on entitlements and capabilities. Human development is the expansion of capabilities: the freedoms that people have to lead lives they value such as the multiple uses of water services (MUS). Being well-nourished at

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all times without the threat of the scarcity of water is an important capability. Human development is 'both the process of widening people's choices and the level of their achieved well-being' (UNDP, 1990). The purpose of development is to enhance people's capabilities, in the present and in the future, in all areas of their life – economic, social, political and cultural. It is here that human development rests fully on Amartya Sen's core idea of capabilities and agency (Sen, 1981).

This approach is relevant to the multiple uses of water in that it provides many water system options for households to choose. This leads to water security, by preventing the ravages of hunger, fosters capabilities and the conditions for human development. Well-fed and well-nourished people are more likely to be educated, engage with society and realize their productive and human potential. In turn, higher human development leads to improved food security, creating a virtuous cycle. Conceptually, water security and human development are reinforcing (UNDP-Africa HDR, 2012).

MUS and the capability approach are linked in that multiple use of water can be leveraged by empowering people to make their own choices and by building resilience in the face of shocks. That means preserving people's water entitlements— the income, market structures, institutional rules and governance that enable the poor to have access to water (Sen, 1981). It also means reinforcing essential human capabilities in health, sanitation and education.

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2.2.2 Demand Responsive Approach (DRA)

Another essential theory needed for this study is the Demand Responsive Approach (DRA). It states that provision of a particular service in order to be sustainable should be an ―*informed expression of what people desire, together with the investments*

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people are prepared to make, over the lifetime of the service to sustain it Deverill et al., (2002). In water supply projects, adopting a DRA implies that engineers and technicians need to assess demand according to people livelihood strategies, which in most cases, for rural areas, comprises needs such as garden irrigation, livestock watering, building blocks manufacturing, etc. Therefore, a more flexible approach is required allowing for interventions to consider those needs in conjunction with domestic needs, as long as people are willing to assume the costs of increased levels of service Deverill et al., (2002); Moriarty and Butterworth, 2003). According to Deverill et al., (2002) figure 2.1 illustrates the main determinants of water demand.

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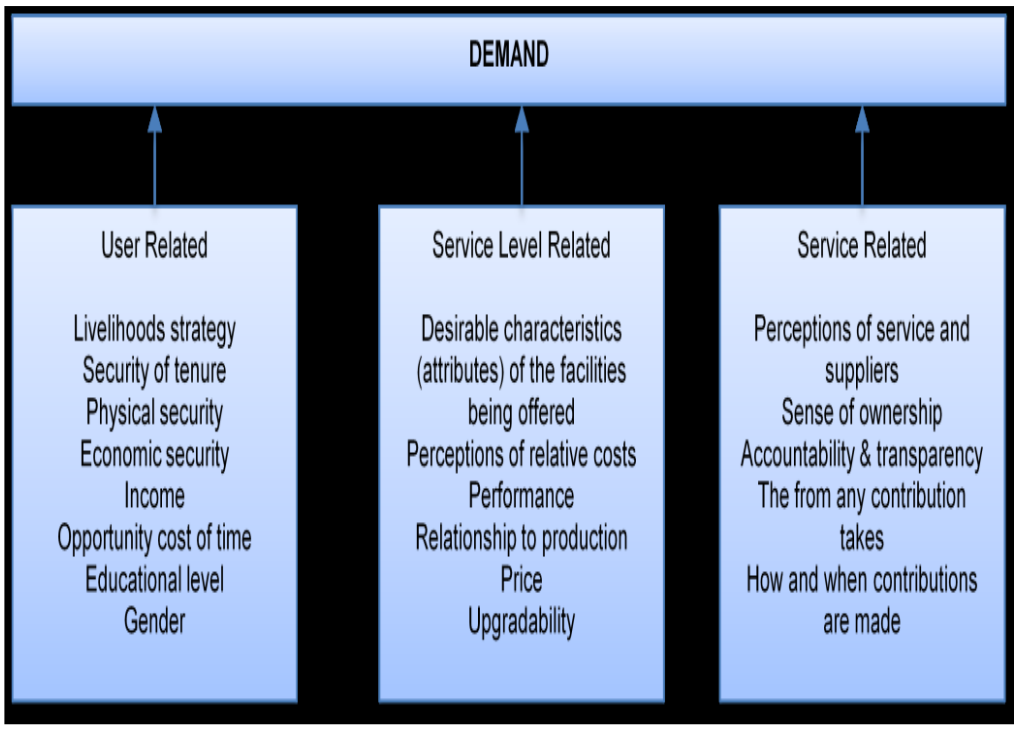

Figure 2.1 Main determinants of water demand

Source: Deverill et al., (2002)

The Demand Responsive Approach (DRA) can be applied in the discussion on service levels. Deverill et al., (2002) provides a useful framework to analyse the factors that

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affect demand at the user level, service level and the service related levels. Even though the DRA ignores hardware issues such as technology in the list of service related, it is worthwhile for the analysis.

2.3 CONCEPTUAL FRAMEWORK

This section is a discussion of the key concepts and variables used in this study. The diagram in figure 2.2 gives a pictorial view of the key issues under discussion. The key issue is the multiple uses of water services approach. The MUS approach as defined by Van Koppen et al., (2006) has three major components, namely, it must be participatory, integrated and a poverty reduction strategy. In this context, participation must take place at the community level. Community participation leads to the active engagement of individual needs and desires of water for multiple purpose. These individual needs then yield the required water services to be provided. Subsequently, the water services provided have the potential to meet people's drinking, hygiene and livelihood needs. They support programmes for hygiene, sanitation, or nutrition to deepen, health impacts. It enhances water and food security, income generation by adding, support for crops, livestock, and enterprises to expand livelihoods (Van Koppen et al., 2006).

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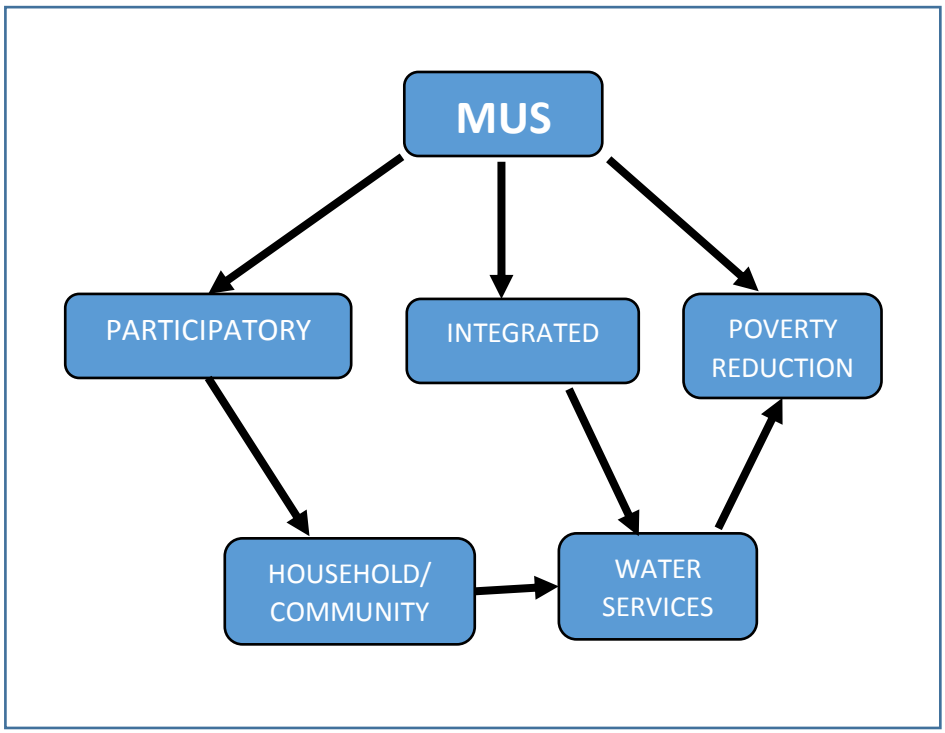

Figure 2.2 Conceptual Framework

Source: Authors Construct (2015)

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2.3.1 Community Participation

The World Bank says participatory development is a process through which stakeholders affect and share control over development initiatives, and the decisions and resources which affect them (World Bank, 1994). The human development Report defines participation in terms of people having constant "access to decision making and power, as well as in terms of economic participation" (UNDP, 1992). Also, participation can be described as 'consultation, as decision making, as partnerships for implementation, as capacity building, as expressing a need, as covering bases, as

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ownership, and as a mechanism of decentralization' (Lotz-Sisitka and Burt, 2006:70-82).

In the context of water service uses and delivery, participation is where control over the process and agenda of the process is handed over to the communities. This can be an empowering experience for community members as they become involved as partners in the process and their knowledge and capabilities are respected and valued. Local people involved in implementing a development strategy are often subordinate in their own social context, while outsiders are often perceived as experts who impose their views. Transforming these dynamics is achieved by enabling local people to articulate their views and express their knowledge through describing and analysing their own situation and problems.

However, Morua et al., (2007) stated that there is a growing recognition in developing countries that community participation in water projects is a necessary strategy in sustainable water supply. The main advantage of this approach is that participation can encourage a sense of ownership and the benefits of the projects are more likely to extend over the long term. This means that the community members have full control over the project and see to its logical conclusion.

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A number of scholars have formulated typologies which outline different levels of participation. Two well-known efforts are (Arnstein, 1969) ladder of citizen participation and (White, 1996) work on the forms and functions of participation. The ladder of citizen participation shows the range of participation from high to low for citizens. The first two (Manipulation, Therapy) fall under non-participation. The next three (Informing, consulting, Placation) fall under tokenism and the last three (partnership, delegation and citizen control) indicate citizen control. On the level of

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participation, local people experience different levels of participation in participatory project processes. In some, the local people set the agenda and objectives together with implementers, they are fully involved in the project, and can adjust the goals of the exercise and change research activities. It appears the MUS approach seeks to involve beneficiaries in all levels of participation. However, it remains to be seen as the exact balance often depends on how much power is retained by the organisation that has initiated the program.

Also, on representation who exactly are the 'local people' we refer to? In participation, it is crucial to understand the make-up of local communities and the power relations within them, and to include members of different social groups who have different perspectives on their circumstances (Galaa, 2012). Without due attention to difference, social inequalities can be reproduced in the research process and its outcomes. The MUS concept as advocated by Van Koppen et al., (2006) it is important to assess the needs of the households, the sources of water amongst others. This must be done in continuous consultation.

White (1996) distinguishes four forms of participation: nominal, instrumental, representative and transformative. She reasons that each form has different functions.

- **Nominal participation** is often used by more powerful actors to give legitimacy to development plans. Less powerful people become involved in it through a desire for inclusion. But it is little more than a display, and does not result in change.
- **Instrumental participation** sees community participation being used as a means towards a stated end – often the efficient use of the skills and knowledge of community members in project implementation.

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- **Representative participation** involves giving community members a voice in the decision-making and implementation process of projects or policies that affect them. For the more powerful, representative participation increases the chances of their intervention being sustainable; for the less powerful, it may offer a chance for leverage.
- **Transformative participation** results in the empowerment of those involved, and as a result alters the structures and institutions that lead to marginalization and exclusion.

Transformative participation appears to be lacking in the multiple uses of water services implementation and this needs to be improved. Representative participation resonates with the multiple uses of water services as both involves giving community members a voice in the decision making process from the point of accessing needs of the households.

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2.4 WATER AVAILABILITY AND OVERVIEW OF MANAGEMENT IN SSA

Globally, from the total precipitation over the continents only a third becomes runoff in rivers and recharge aquifers (blue water) and the remaining two thirds infiltrate into the soil (green water) to supply the plant cover and returns to the atmosphere as vapour flow (Falkenmark and Molden, 2008). Thus, blue water is the measured and managed freshwater resource, in its liquid form available to be withdrawn for different uses to satisfy the demands from the domestic, industrial, hydropower, livestock and irrigated-agriculture users, and also to sustain ecosystems in rivers and lakes (UN 2006b; Molden 2007; Rockström et al.,2003; Hoff et al.,2010).

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The understanding of the hydrologic cycle, with its different components and the balance of available water flows and the needs of agricultural, industrial and domestic sectors, contributes to the sustainability of the quantity and quality of water resources (DFID, 2001). However, people traditionally have had more interaction with the blue water, due to abstractions for different purposes through a wide variety of infrastructure, and in a less evident way, by modifying vegetation and causing alteration of soils and water flows (Falkenmark, 2003).

Because human interactions have been more related to blue water, it has been more widely studied. However, in recent years due to the increased pressure on this resource, much attention has turned to the green water, especially taking into account the need to feed a rapidly growing world population, considering that agriculture is the largest user of water at global scale. In the particular case of agriculture, irrigated areas use blue and green water, while rain fed areas receives only green water Hoff et al., (20010).

The motivation for increasing that proportion of productive green water flow for food production has generated a new paradigm, oriented to the management of precipitation as a key resource that enables food production allowing for less blue water abstractions Falkenmark et al., (2004). For this, some of the proposed alternatives are rainwater harvesting and supplementary irrigation. Clearly, those can be adopted in places where there is sufficient average rainfall during the crop season, so that farmers can collect and store surplus water and use it in critical periods (Molden and Fraiture, 2004; Hoff et.al. (2009); Rockström et al., (2003).

In order to evaluate water resource or to balance its availability against different demands, information regarding the components of the hydrological cycle and its associated human and natural ecosystems is required. Global Water Partnership (GWP,

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2006) highlights the importance to acquire knowledge about the water resources that integrate the occurrence on space and time of blue water, its quantities and qualities together with green water flows to estimate the water necessities for any proposed development. In order to do this, water balances and budgets are important tools to be explored. The sections below provide some specifics on water in SSA

2.4.1 Overview of Water Use and Management in SSA

Water is the foundation of life, for example, the water for agriculture in Africa is biased heavily towards rainfall sources. With annual precipitation values of 20,360 km^3, rainfall is the primary source of water for agriculture (Sirte Report, 2008). The continent would have little cause for alarm if all the rainfall resources were evenly distributed for the continent's citizens. While Northern and Southern Africa together receive 20% of the total rainfall, the Congo watershed with less than 10% of Africa's population receives over 35% of the rainfall due the continent (AWDR, 2006). Figure 2.3 shows more details about the continent's rainfall patterns. In addition to the heavy rain-zones of Central Africa, coastal areas of West Africa also have abundant rainfall. Agricultural land for the sub-continent, which is meant to tap into the rainfall resource, is over 44% of the landmass but remains underutilized with only 7% of Africa's land under irrigation facilities (AWDR, 2006).

This is low compared with 40% irrigated land in Asia. Additionally, water reserves remain untapped with only 4% of the continent's reserves in use compared with Asia's usage of 17% of its water resources (AWDR, 2006). The freshwater resources of Africa represent 10% of the global share of water resources. The result of these usage levels is a subsistent agriculture for the continent with low inputs, yields and is characterized by poor management of water resources. However, recent efforts to focus on blue and

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green water resources for agricultural water hold tremendous potential for farm output in the sub-region (Sirte Report, 2008).

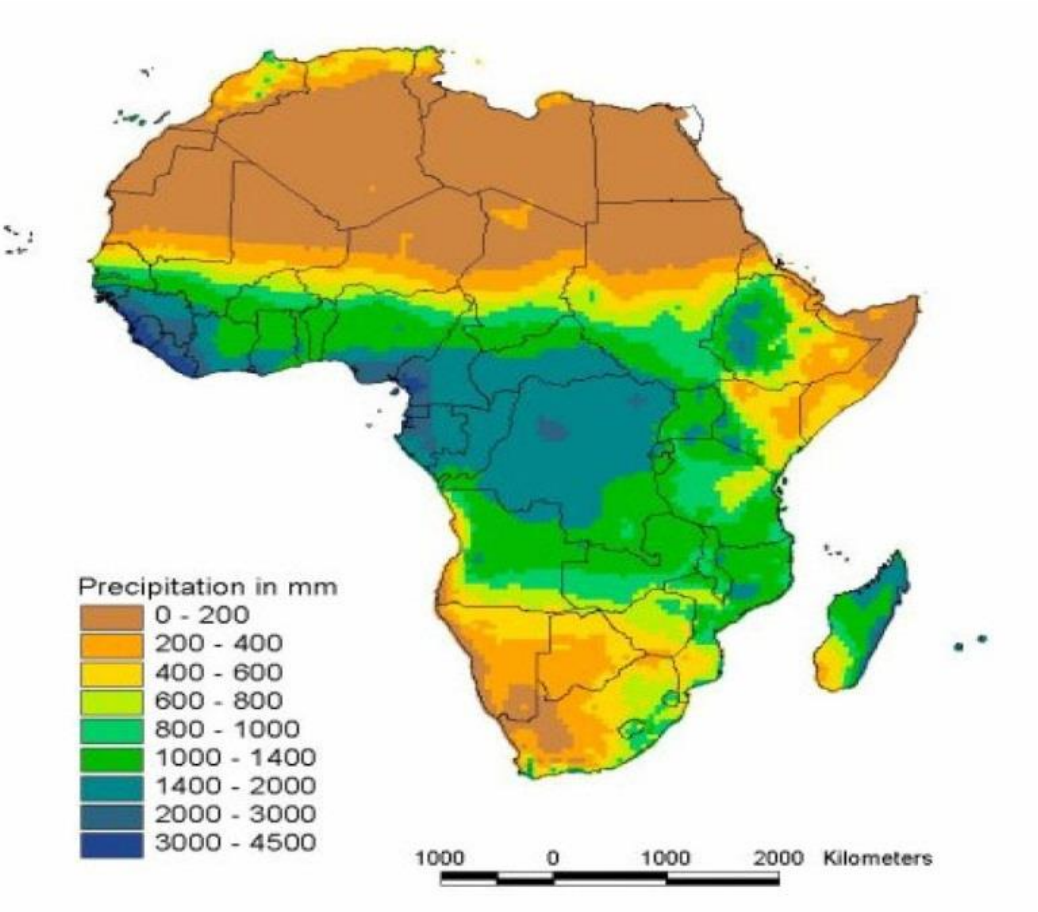

Figure 2.3: Average Annual Precipitation for Africa

Source: AWDR, 2006

To be able to tap into this potential of blue and green water for SSA's agriculture requires a full assessment of the current nature of water use in agriculture for SSA. Africa's agriculture is predominantly rain-fed and 70% of the population derives their livelihood from this source. For example, Rockstrom et al., (2003) noted that majority

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of countries in Western and Central Africa produce cereals with 80% of the water source coming from green water sources.

For the semi-arid and arid regions of the continent, cereal production, which is a natural economic strategy fitting the uni-modal rainfall supplies, is characterized by complete rainfall dependence with little investment in improving water use or water productivity Rockstrom et al., (2003). The West African region, which houses significant semi-arid areas of SSA, boasts of over 9 million ha of arable fit for irrigation purposes but less than 7% of this land is agriculturally water managed. This ranges from 28.8% of the cultivated area in Sierra Leone to less than 1% in Benin, Ghana and Togo (Sirte Report, 2008).

Central Africa is the region that shows the highest dependency on rain-fed agriculture in SSA. Due to rainfall amounts in this region irrigation potential is largely underexploited. Only 212,000 ha, or just over 2% of the 10 million ha of potentially irrigable land are under water management. East Africa has about 50% of the 11.3 million ha of irrigable land in the region equipped. However it ranges between the 77% of Egypt to only 2% in Rwanda and Eritrea. Only two countries, Egypt and Djibouti, completely rely on irrigated agriculture, while in other countries such as Uganda, Ethiopia and Kenya, water control is still not significantly developed (Africa Water Development Report, 2006).

Less than 7.5% of the Southern African region's vast irrigation potential has been equipped. Only in a few countries (Madagascar, Mauritius and Swaziland) has more than 20% of the cultivated area equipped for irrigation, while in countries with great potential such as Zambia or Mozambique less than 5% of the cultivated land is

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equipped. The regional analyses indicate the underutilized lands available at the regional level and the continual reliance on rain-fed systems (Sirte Report, 2008).

A fundamental feature which has central importance regarding issues of water use and management is rainfall variability. Weather variability issues continue to plague the continent and make rain-fed agriculture inherently risky (Africa Water Development Report, 2006). Intra-annual dry spells complicate seasonal food crop cultivation particularly when the dry spells occur during critical periods of the crop growth and impede the attainment of maximum yields. Hence even when average rainfall is obtained per annum but dry spells hit at critical stages optimal crop yields are missed. These spells together with droughts in prone areas give smallholders less incentive to invest in inputs to maximize the crop yields. Thus green water use is not optimized due to the unpredictable patterns of this water source.

On the other hand, in regions that have excess rainfall, drainage facilities are needed to curtail the devastating effects of soil erosion and nutrient runoff. In parts of Central and Western Africa, rainfall typically comes in high intensities and effective harnessing of the resource becomes challenging. This trend leaves soils overly drained and leads to soils having poor chemical properties for cultivation of certain key crops. Other factors accompanying water use in the sub-region that characterize rain-fed agriculture are marginal soils and the low input usage (Africa Water Development Report, 2006).

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2.5 MULTIPLE USES OF WATER

Traditionally, the water and sanitation sector have been responsible for needing water for activities described as domestic, aiming to provide people with clean, reliable and safe water to achieve health improvement. These two sectors have performed with the

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mandate of providing —*all with some high quality of wate*r (Moriarty and Butterworth, 2003; Van Koppen, et al., (2006). On the other hand, the agricultural sector has been in charge of water provision for food production. This approach has meant that activities such as backyard gardening, fishing and livestock keeping have been ignored by both sectors and in the end, in many cases, nobody is accountable for them (IWMI, 2006).

Contrary to this sub-sectoral approach; in rural households, water supply systems are used for both domestic and productive activities. Examples of productive activities are crop irrigation, horticulture, gardening, livestock, fisheries, food processing, brick making, weaving, pottery, handicrafts, and other small businesses; fuel wood and fodder production, etc. In those activities, water provision is an important enabling resource, significant to achieve well-being and reduce poverty Van Koppen et al., (2009); Moriarty et al., (2004).

Concerning the possibility of using water for income generating activities, Van Koppen et al., (2006) highlighted that it brings multiple benefits that mutually reinforced each other for the better: food production is essential for nutrition and health; health depends on access to and correct use of water and sanitation services; good health increases productivity, leading to more food and income, which allow paying for health services and adopting health prevention measures. Also, better nutrition decreases susceptibility to disease, reduces drudgery, frees up time for productive activities, domestic child care or schooling.

Despite the potential benefits of multiple uses of water, especially for poor people, these small-scale uses are normally ignored in formal planning process done by the different subsectors involved. In the domestic sector, the accepted definition of basic needs leads to design norms that frequently are insufficient to provide the quantities of water

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required to develop home-based activities, limiting the livelihood possibilities of poor people (Moriarty and Butterworth, 2003). In general, international, national norms and guidelines used for planning, account for basic needs or basic human rights taking into account quantities required only for drinking, cooking and personal hygiene, in a range of 25-40 lpcd (Van Koppen et al., 2006). In opposition to this paradigm conclusions, from the international symposium on productive uses of water at the household level in South Africa in 2003 indicated that quantities of water in the range of 50 - 200 lpcd were adequate for meeting multiple basic human needs (Butterworth et al.,2003). The latter range is similar to the quantities supplied exclusively for domestic uses to urban people in developed countries (Van Koppen et al., 2006).

Due to planning practices such as designing for a lifespan, allowance for losses and other engineering considerations, sometimes unplanned uses can be absorbed by the system Van Koppen et al., (2009), at least during the first years of infrastructure operation. Although, when the extra amount of water is required to support peoples' livelihoods is not provided, a variety of problems can threaten the sustainable provision of the services, resulting in interventions that are not sustainable or insufficient for real people needs. Generally, these failures have more impact on the poorest, which are less capable to cope with them (Butterworth, 2003).

Some of the Reported failures are damage to infrastructure, disruption of allocation schedules, deprivation of end-users and increase of conflict (Van Koppen et al., 2006); Moriarty et al., 2004). A widespread solution adopted to minimize these problems is the formulation of national and local regulations to ban productive uses in domestic schemes, although, these solutions usually fail and just contribute to exacerbate conflicts (Van Koppen et al., 2006). The MUS concept has emerged in response to these challenges.

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In relation to the environmental sustainability, the approach recognizes that for meeting their water demand, in most cases, people use multiple sources at homestead scale to augment the available water supply, allowing households to employ water of different qualities for different purposes (Scheelbeek, 2005). The extent to which multiple sources are used varies from case to case. Experiences in Thailand showed that people combine up to nine water sources to supply different needs as result of a National Policy that promotes intensive production and recycling of water and nutrients at the homestead level Van Koppen and Smits, 2010). In contrast, some regions in Colombia are at the other extreme, where piped systems are the main source of water for all uses Van Koppen et al., (2009).

The promotion of various water sources is considered within this concept as a promissory alternative to enhance the total quantities required, stimulate water reuse and increase the resilience to water availability (Renwick, 2001). The range of potential uses and sources that can be included under MUS requires for implementers to offer a variety of options to each community for their selection that has to be the result of an understanding of the local context in relation to water uses, water resources and available technology. To do this, a call is made to take into account that different communities have different priorities, preferences and availability of water resources and this situation is extended to the different households and population groups within communities (Mikhail, 2010).

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2.5.1 The Multiple-Use Water Services (MUS) Approach

The MUS Group was established in 2003 (then as PRODWAT). Its mission is "to be a platform of organizations, fulfilling resource centre functions, with the aim of

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improving delivery of multiple-use water services at different levels of scale, so as to better support poverty reduction."[2] The group involves a 15 core member organizations and Some 350 individual members. The Group targets funders, implementers and policy makers in its approach of practicing MUS projects in communities. The Group's MUS activities include, Information sharing and knowledge management, Synthesis and pilot testing, implementation, training and capacity development, carrying out innovation and research.

Access to water for poor people is an important issue on the international agenda. In 2002, at the Johannesburg Declaration on Sustainable Development, participant countries agreed to speedily increase access to basic requirements including among others, clean water, sanitation, food security and protection of biodiversity (UN, 2002). After the Johannesburg Declaration, the concept of Multiple Uses of Water Systems (MUS) emerged as a strategy to introduce water access that responds to the full range of people's needs: both domestic and productive, contributing to poverty alleviation and equity (MUS group, 2014). In Colombia, dialogue between academics and water sector professionals began around the topic in 2003 at the International Conference: ―Multiple uses of water for life and development Peña et al., (2006) and later in 2004 through the E – Conference on Multiple Uses of Water (IRC and Cinara, 2005). These spaces gave visibility to the issue of productive use of water, especially for rural water supply systems.

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[2] (www.musgroup.net/home/advocacy)

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Van Koppen et al., (2006) classify MUS designs into three broad categories in increasing order of cost and sophistication as:

1. Single access point systems;
2. Systems with distribution networks to common standpipes; and
3. Systems with distribution networks to individual homesteads.

Each of these categories can be further classified into sub-categories, depending on the extent to which storage and distribution infrastructure for domestic and productive water uses are separated. These different design sub-categories may arise from differences in the water source, quality of the water source, household settlement patterns, type of productive uses intended, system cost, and user ability to pay. The MUS facilities in the study area fit into the single access point category.

In less than a decade, the MUS approach has gained wide recognition among global and national policy makers, senior programme managers, development financiers, networks of water professionals, and academia. MUS started with the growing recognition in both the domestic and irrigation sectors that schemes designed for one single-use, whether domestic, irrigation, or livestock, are often used for additional purposes, and become *de facto* multiple-use schemes. Instead of ignoring or even declaring some returns as 'illegal', a MUS approach recognises these uses as returns on benefits from water investments and aims to plan and design for those multiple uses. This supports the capability approach in that the key idea of the capability approach is that social arrangements should aim to expand people's capabilities – their freedom to promote or achieve what they value doing and being. An essential test of development is whether people have greater freedoms today than they did in the past.

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Economic analysis found that relatively low incremental investments give disproportionately high benefits, with high benefit-cost ratios as an end result (WI, IRC, IWMI, 2007). Furthermore, providing multiple-use water services can lead to more sustainable service delivery as it avoids damage from unplanned uses, and better accommodates people's water needs and priorities, increasing their ability and interest in sustaining services and recovering costs. By using and re-using multiple water sources, both water resource efficiency and livelihood resilience can be enhanced. Last but not least, MUS matches the - often informal - realities on the ground, in which rural and peri-urban communities use and re-use a number of different sources for a variety of uses to concurrently meet a range of both domestic and productive water needs. MUS builds on these existing assets, skills, and investments. Adank et al., (2012).

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2.5.2 Types of MUS Service Modalities

There are five major types of MUS service modality. These are listed below

1. **Domestic--plus**

   The first modality is known as domestic-plus. Those who pursue these modalities work to scale up from within their own water sub-sector (a division of the water sector such as irrigation) by widening the scope of public investments for their mandated single use to encompass other uses. Subsectors often subsidize capital investments in infrastructure, while communities are usually responsible for operation and maintenance (Moriarty, 2007). In +plus modalities, the implicit priority for either water for domestic uses near households or crops in fields (or fisheries, or livestock watering) continues to be set by sub-sector professionals, not local users (Smits, 2007).

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2. Productive-plus modalities

In the plus modalities, the sub-sectors open up their mandate. This tends to happen in a step-wise fashion. The subsequent steps from single-use to multiple-use progress from ignoring or denying non-planned uses or declaring illegal to turning a blind eye on these uses ("not my job"), to implementing marginal practices on the ground to accommodate multiple uses, to accommodating *de facto* multiple uses at management level, to fully integrating multiple uses from multiple sources in planning, design and use (Renault, 2010). This happens especially in the Water Supply, Hygiene and Sanitation (WASH) and irrigation sub-sectors. As a result, these +plus modalities have developed into fairly robust scaling models.

These steps were supported by valuation studies that identified the range of *de facto* uses and calculated the returns (Meinzen-Dick, 1997; Bakker et al.,. (1999); Renwick (2001). In +plus approaches, the water sub-sectors are investors interested in all returns on their investments, instead of investors who may go so far as to criminalize livelihood returns only because they were not planned. A strong argument in favour of plus modalities is that relatively small incremental investment costs generate major livelihood benefits and avoid damage caused by unplanned uses.

3. Irrigation-plus

The **irrigation-plus modality** most frequently applied in India, Vietnam, and China, is the FAO's Mapping Systems and Services for Multiple Uses (MASSMUS) methodology for the modernization of large-scale irrigation systems. Relatively small

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incremental improvements are added on to existing irrigation infrastructure, which mostly improve access to surface water (cattle entry points, washing steps, small diversions for laundry, bridges, roads, etc.) (Butterworth, 2008).

In areas where canal water is the main source of water, water is supplied year-round and reservoirs are filled for residential areas. The Mapping Systems and Services for Multiple Uses (MASSMUS) is a methodology developed by the FAO to audit large irrigation systems. It has specific domestic water and gender modules (Butterworth, 2008).

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4. User-driven MUS

"Self-supply for multiple uses" is the one user-driven MUS modality. Here, users themselves invest in most infrastructure capital costs, often on an individual or household basis, although some communal arrangements may be included (Butterworth, 2008). Examples are self-financed wells, pumps, water harvesting techniques, gravity flows, drilling options, and water quality point-of-use treatment devices. Users decide on the purchase, installation and uses, which are often multiple. Scaling up self-supply is largely through market-led supply chains which are often highly effective and sustainable. Public sector support can focus on things like technological innovation, market development for supply chains, credit for purchase, and awareness raising (Butterworth, 2008).

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5. **"Community-based MUS"**

The second user-driven MUS modality is **"community-based MUS"**. In this modality, government or NGOs fund the bulk of mainly communal infrastructure construction or rehabilitation costs, but the choice of the technology, siting, and lay-out is in the hands of the community. Community members, including women and marginalized groups, are empowered to articulate their needs and demands, access information, and make choices regarding their assets and resources (Van Koppen et al., 2006). This MUS modality applies the general principles of community-based natural resource management (CBNRM) to water resources. Community-based MUS can be implemented on a project basis or aligned with the global trend toward decentralization of decision-making of public support through local government, or as a combination of both. An example of the latter is the SADC/Danida supported IWRM Demonstration Projects in five Southern Africa Development Community (SADC) countries (Van Koppen et al., 2006).

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2.6 WATER SERVICE PROVISION AND LEVELS

Water services can be defined as the supply of a certain quantity of water, of a certain quality, accessibility and reliability (Adank et al.,2013). Service should ideally be assessed and monitored from a user perspective: what is the level of service that people have access to (in terms of quantity, quality, reliability and accessibility) and what is the level of service that they are actually using (in terms of amount and quality of water)? For this study, the focus is on the level of service provided by facilities in terms of the quantity of water that they provide and the accessibility and reliability of the service provided, taking facilities as the starting point.

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As mentioned above, service levels can be assessed in terms of the quantity and quality of provided water, the reliability of the services and the accessibility, in terms of distance and crowding. In Ghana, it is the Community Water and Sanitation Agency, which is responsible for setting and regulating standards related to rural water service provision. The Community Water and Sanitation Agency (CWSA) Regulations Legislative Instrument (L.I. 2007) of 2011 sets out the following standards for the sub-sector:

- A person who designs a community water facility shall ensure that each person in a served community has access to not less than twenty litres of water per day.

- The walking distance to a water facility or delivery point in the case of a piped scheme does not exceed five hundred metres from the farthest house in the community or a section of the community.

- The facility provides safe water to the community throughout the year.

Further, CWSA's design guidelines for small communities and small towns (forthcoming) stipulate that the maximum number of people per borehole or standpipe should not exceed 300. For hand-dug wells, the maximum number of users should be 150.

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Table 2.1 is an overview of these standards set by CWSA related to the main service level indicators.

Table 2.1 Ghana Water Service Level Indicators

Service level sub-indicators	**Benchmark**
Quantity	20 litres per capita per day
Quality	Ghana Standards Board water quality standards
Crowding: maximum number of people per facility	Point source / standpipe: 300 Hand-dug well: 150
Distance to water point	Maximum of 500 metres
Reliability	The facility provides water for at least 95% of the year, interpreted as at least 347

Source: Adank et al., (2013).

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2.6.1 Service Levels and Functions

Renault et al., (forthcoming) identifies that multiple uses of water can take place at different levels:

The Household or Homestead Level

This is the lowest level, where people harvest water from several sources of water for different uses around or near the homestead, including domestic use, and for small-scale productive uses such as backyard gardens, livestock, micro-enterprises, etc.

The Water System Level

This is the level of a certain physical system such as a water distribution scheme or a water ecosystem. Such systems are often designed with a specific use in mind, for example, irrigation of field crops, or for domestic supply. Users may engage in multiple

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uses at household level, as seen above, but there may also be other uses and functions, which are built in at system level. For example, an irrigation canal may also fill village reservoirs for domestic supply, or provide water for fish. In large complex systems, such as some of the canal systems in South Asia, or paddy irrigation schemes in South East Asia, there may be a wide range of these uses and functions at system level.

Catchment or River Basin Level

Multiple uses of water occur from upper catchments down to estuaries and coastal wetlands, where different schemes and users take and discharge water for multiple purposes. Large dams have always typically been built to serve multiple functions such as flood protection, urban water supply, hydropower, irrigation, etc.

Besides these water user levels, where multiple uses of water take place, Smits and Lockwood (2011) define three groups of functions related to sustainable provision of (multiple-use) water services, which are linked to different levels. Table 2.2 illustrates the Ghana water service ladder from the high service to No service. A high service gives a score of one hundred (100) points and a no service scores zero (0) points.

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Table 2.2: Ghana Water Service Ladder

Service level	Score	Description of service level
High level service	100	The facility provides a minimum of 60 litres per capita per day (lpcd) of high quality water on demand.
Intermediate level service	75	The facility provides people with a minimum of 40 lpcd of reliable water services in line with the minimum criteria for water quantity, crowding and distance.
Basic level service (Benchmark)	50	The facility provides reliable water services (at least 347 days (95%) of the year) that are in line with the minimum criteria of providing 20 lpcd of acceptable quality water (GSB), at a distance no more than 500 m, with not more than 300 people using the hand pump, in the case of a bore hole, and 150 people, in the case of a hand-dug well.
Sub-standard level service	25	The facility provides water services which are an improvement on not having water services at all, but fails to meet the basic standards on one or more criteria (quantity, quality, reliability, distance, crowding).
No service	0	The facility is broken down or not used

Source: Adank et al., 2013

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2.6.2 Service Provision Functions

Service provider functions include functions of day-to-day management of a water service, which includes operation, preventative and corrective maintenance,

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bookkeeping, tariff collection, etc. In the case of rural water supply, domestic plus or community-driven MUS, the service provider functions are typically found at the level of a community or group of communities, depending on the size and scale of the water supply system(s) in question. This may be done directly by a committee acting on behalf of the community, or in cases where there is professionalization of community-based management, these tasks are increasingly delegated or sub-contracted to an individual (plumber or technician) or to a local company acting under a lease contract (Smits and Lockwood, 2011).

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2.6.3 Service Authority Functions

Smits and Lockwood (2011) define functions such as planning, coordination, regulation and oversight, and technical assistance, as service authority functions. Commonly, these functions take place at the intermediate level, described by Moriarty et al.,(2008) as the layer of governance (government, institutions and civil society bodies) that function below national level but above community level. In various countries, these intermediate levels are known as provinces, regions, Districts, municipalities or governorates. The authority functions may be split between different administrative levels, for example between provincial and District authorities, depending on the degree of decentralization or mix between decentralization and de-concentration of functions.

Enabling Environment

This refers to the overall enabling environment where sector policy, norms and regulatory frameworks are set, service levels are defined, and macro-level financial planning and development partner coordination takes place. It can also be the level at

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which learning; piloting and innovation are funded and promoted. Overall sector guidance and capacity building is set by this level. This is also the level where capacity support for the service authority takes place. Commonly this takes place at the national level, but institutional at intermediate level can be involved as well.

2.7 MULTIPLE-USE WATER SERVICES FOCUS ON WOMEN

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Multiple-use schemes offer opportunities for women to improve their overall wellbeing and that of society by providing additional uses for water rather than single uses. The public sector was responsible for artificially creating these sub-sectors and categorising water uses for single purposes (IRC and IWMI, 2009), when in practice communities naturally use water for a variety of purposes. Multiple-use schemes recognize that water has many applications and priorities such as domestic use, kitchen gardens, livestock watering, and fisheries, many of which are traditionally the responsibility of women.

Add-ons to irrigation schemes can include steps to irrigation canals to enable access to water for drinking, laundry and other domestic activities, or simply maintaining water in seasonal irrigation canals throughout the year for domestic uses. Similarly, schemes primarily designed for domestic uses can become multiple-use schemes (or 'domestic-plus' schemes). For instance, if 50–100 litres per capita per day are provided, three litres per capita per day is designated for drinking and cooking.

The water in excess of domestic needs is used for horticulture, livestock, or small-scale enterprise. Additionally, multiple-use schemes recognize women's concurrent roles as farmers, housekeepers, livestock keepers, and entrepreneurs. Hence by their very nature

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multiple- use schemes should be participatory and community-driven. Planners look at *all* users' priorities for *all* water applications and sources instead of the single-use public sector mandate. Moving beyond the sectoral boundaries of the single-use water subsectors, this 'inclusive community-based participatory planning' approach involves men and women alike, leading to a more 'gender-balanced water intervention' (IWMI, 2006).

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2.8 MUS AND LIVELIHOODS

MUS offers three main advantages compared to single-use water service delivery models: 1) more livelihoods improvements, 2) more environmental sustainability, and 3) strengthened integrated water resource management (IWMI, IRC, GWP, 2006).

2.8.1 Livelihood Improvements

In terms of livelihood improvements, MUS concurrently improves health, food security, and income, and reduces women's and girls' drudgery, especially among the poor in rural and peri-urban areas where their multi-faceted, agriculture-based livelihoods depend in multiple ways on access to water. Livelihood benefits mutually reinforce each other. Thus, MUS gives "The most MDG per drop" (Renault, 2008). Livelihood benefits tend to be more durable because participatory planning empowers communities to articulate their own priorities, thus enhancing ownership and willingness to pay for services. From the domestic sector perspective, adding income opportunities improves the ability to pay, hence, MUS unlocks new financing streams (Butterworth, 2008).

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2.8.2 Environmental Sustainability and Justice

In terms of environmental sustainability and water efficiency, MUS recognizes that people use and re-use conjunctive water sources in ways that optimize, for them, the efficient development and management of rain, surface water, soil moisture, wetlands, and groundwater, and other related natural resources within their local environment. Even within the homestead, households can use up to nine different water sources, as found in Thailand Penning de Vries and Ruaysoongnern, (2010). Focusing on the poor, MUS especially safeguards poor people's rights to water, food and livelihoods and their fair share of the resource in quantitative terms, and exposes poor people's greater vulnerability to unsafe water in qualitative terms.

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2.8.3 A Focus on Community Integrated Water Management

In opening up new livelihood and environmental opportunities, MUS recognizes that the natural intersection of multiple uses and multiple sources starts locally, at household and community level. MUS is bottom-up International Water resources Management (IWRM), starting with local users as clients and active participants instead of 'aid recipients'. MUS complements past IWRM efforts in two new ways. First, while IWRM tended to be a 'push' from the top-down (e.g. by establishing basin organizations), MUS is a 'pull' for integration from below, where human well-being and water resources are integrated.

Second, past IWRM efforts tended to prioritize governance over infrastructure development. The 'S' in MUS stands for "services" in the sense of reliably ensuring the availability of water in certain quantities and qualities, at certain times, and at certain sites, during the full project cycle and after the construction phase. Services

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result from the appropriate balance between sustainable infrastructure investments and water governance.

2.8.4 Multiple-Use Water Services and Income

Globally, interest in MUS is on the rise and there is increasing recognition of the relevance of this approach to meet the challenges of feeding a rising population. The MUS Group is a network of over ten organisations, with more than four hundred individual members. It acts as a platform for networking, promoting research and documenting and disseminating lessons related to MUS. International Water and Sanitation Centre (IRC) is currently hosting the Secretariat of the MUS Group.

IRC, together with partners in the MUS Group, has been developing the MUS approach as part of its innovation and action research in the Water Supply, Sanitation and Hygiene (WASH) sector. This approach seeks to open up the scope of water interventions, and in consequence, encourage changes in water regulations and policies so that these can genuinely meet all people's water needs, particularly around the household.

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The UN is highlighting water and food security, the International Water and Sanitation Centre (IRC) is calling for policy changes to promote the use of water at home to boost people's livelihoods. Homestead-level, small-scale production from livestock and vegetable gardens make a difference for millions of poor families. IRC and partner organisations are pressing for the value of water use for food and income at household level to be accorded greater recognition and reflected in byelaws and local policies, as well as in the implementation of Water, Sanitation and Hygiene (WASH) programmes.

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The promotion of domestic water supplies for productive use in addition to drinking, cooking and washing comes under the multiple-use water services (MUS) umbrella. This approach and movement, which IRC has been supporting since 2003, recognises that people require water for all their livelihoods needs. "Many poor families in rural and urban areas do not have access to irrigated lands, or even rain-fed fields. For them, the homestead represents an important site of production, but one that is often ignored. And this is a site for which domestic supply systems can provide water," said IRC Director Nico Terra on the eve of World Water Day 2012.

John Butterworth, Senior Programme Officer at IRC said that families earn an income and improve their diets when they can be productive at or near their homes. "We only need a small amount of water for drinking, cooking and personal hygiene, but so-called domestic water supplies do something extra that is rarely recognised - food production at the homestead. For example, small gardens are frequently irrigated from domestic water supplies, and a few livestock may drink much more than their owners."

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2.9 WATER USES

In rural communities, households generally comprise the house where people have shelter and relatively extensive areas to develop agriculture activities that provide their livelihoods. In these homesteads, besides domestic uses, water uses are related to irrigation for growing vegetables, staple food, wood for fuel, fruit and trees; livestock watering, coffee processing, and small business such as beer brewing, catering, pottery, hair salons, laundry, car washing, etc. In these contexts, production is diversified, and each water use is an important factor to produce livelihood outcomes such as household

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income and food security (Van Koppen et al., (2009). Some of the most representative categories of water uses at rural homesteads are described below:

2.9.1 Water for Domestic Uses

Norms by international organizations suggest a minimum requirement of 20 l/day from a water source within 1 Km of the household, as a quantity sufficient for drinking, basic personal hygiene and for physical well-being and dignity. This quantity increases to 50 lpcd when bathing and laundry needs are included (UNDP, 2006). In different countries there are different basic needs figures used for planning purposes, for instance for South Africa those are 25 lpcd, 55 lpcd in India Moriarty et al., (2004), 60 lpcd in Zimbabwe and 40 lpcd in Swaziland (Wallingford, 2003). Sometimes those targets are smaller for rural areas in comparison to targets for urban areas as in the case of Colombia, where the target for areas less than 2500 inhabitants is from 100 - 150 lpcd and for communities with population higher than 125000 there are not superior limit for water provision specified on the designing guidelines (Rivera, 2010).

The Figure 2.4 presents the average water use per person per day for developing and developed countries prepared by Shen (2010) with data from the United Nations Human Development Report 2006. This graph shows the differences on water use between developed and developing countries going from negligible quantities in Mozambique through levels inferior to those promoted by International Agencies as minimum requirements (50 lpcd) for countries such as Rwanda, Uganda, Ethiopia to the other extreme of United States and Australia, where the per capita consumption exceed 450 lpcd. In the case of developed countries, the average water use of mainland Europeans is more than 200 lpcd (UNDP, 2006), and UK appears as the developed country with the lowest per capita consumption in the graph, with about 150 litres'.

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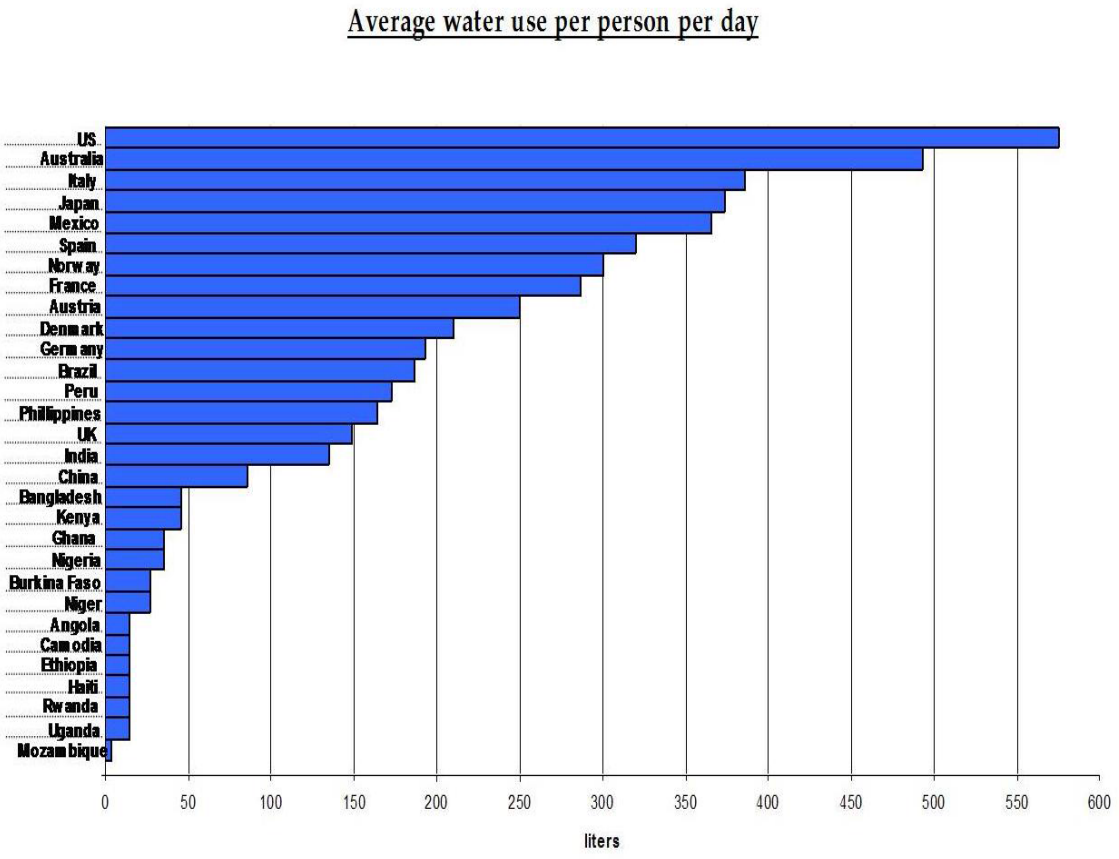

Figure 2.4 Average Water Use

Source: Shen, 2010

2.9.2 Water for Agriculture

Worldwide, agriculture is the largest user of water, accounting for 70% of the total consumption (UNEP, 2007). This water share is very much higher in some developing countries like Pakistan (97%), India (93%), China (87%), Colombia (61%), and Egypt (86%).

Agriculture uses water through evapotranspiration, transpiration by plants and evaporation from soils. In recent years there is an increasing interest in making a distinction between the water withdrawal for agricultural purposes from rivers, reservoirs, lakes and aquifers, from the rainwater stored in the soil and directly used by

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the plants. The first one has been called ―blue water and the latter ―green water Molden et al., (2007).

Furthermore, agriculture which uses only green water is called rainfed. Irrigation is required when the water requirements of the plants cannot be satisfied only with the rain and thus, blue water needs to be added to maintain adequate soil moisture levels for crops to achieve their potential yields. Globally, around 80% of agriculture evapotranspiration is directly from green water Molden et al., (2007); Rockstrom et al., (2007). In Latin America, the percentage of cultivated land under rainfed systems is almost 90%, supporting both permanent crops such as rubber, coffee, and annual crops such as wheat, maize and rice Molden et al., (2007). It is important to understand this branch of the hydrological cycle for livelihoods and food production.

Irrigation water accounts for the majority of crop water use in areas subject to dry season or in arid areas. However, many production systems classified as rainfed involve applications of supplemental water to alleviate plant stress in special stages of their production cycle and to reduce vulnerability of farmers during short term dry spells (two or three weeks) or seasonal drought Sulser et al., (2009). Estimation of water demands for agriculture, depending on the purpose of the assessment, may require extensive data such as cropped area, crop growth periods, crop evapotranspiration coefficients by crop growth stages, reference evapotranspiration, cropping patterns, water use efficiency, effective rainfall, soil and water quality (salinity), water infrastructure type, water management, etc. Rosengrat et al., (2002). FAO (2013) have developed procedures, guidance and tools that allow making crop water requirement estimations by using the mentioned information. Procedures for detailed estimations are extensively described in Allen et al., (1998) and Brouwer et al., (1992).

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2.9.3 Water for Livestock

Livestock production systems support about 4 billion people, constituting the livelihoods of at least 70% of the world´s rural poor. About 20 million km in Central and South America are dedicated to this purpose and from those, 70% accounts for non-irrigated or rangeland systems. Livestock are an important source for family income providing products as milk or meat, manure, farm power, etc. and are a vital strategy to enhance income and cope with unexpected family expenses or shocks Peden et al., (2007).

For livestock production systems, even at small scale, the benefits derived depend on adequate water provision. In reference to the concerns expressed by different authors in relation to the impact of livestock production systems over water resources at global and local scales, especially the large volumes —though it is necessary to produce human food for livestock, Peden et al., (2007) bring out, how for more poor regions in developing countries, livestock keepers feed their animals mostly with crop residues, suggesting that water requirements are not as great as is thought.

There is not much literature related to water consumption by animals and even the most recent sources refer to a Report by Pallas (1986) —Water for animals. According to the Pallas Report, livestock water consumption is affected by food intake, quality of the food, air and water temperature. In relation to the demand for food, it varies according to the type and class of animal and life stages such as pregnancy, lactation or fattened. Other aspect is the content of water in the forage, which depends on the season, i.e. during the wet season grass may contain as much as 80 percent water. Content of salts on the forage is another factor i.e. major content of salt in plants used as forage in semi-

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arid areas increase water demand. The water requirement also increases with air temperature.

2.9.4 Water for Multiple Uses

A household water supply in the range of 50 – 200 lpcd was identified for those present at the Johannesburg Symposium on 'Water, Poverty and Productive Uses of Water at the Household Level' in 2003, as an adequate quantity for multiple needs and the sustainable use of the water sources. Compared to survival norms of some countries, this quantity is large, although is similar to quantities provided in urban supplies Moriarty et al., (2004).

In rural areas, as has been discussed, most of the income-generating activities depend on water, and these uses may account for significant proportions of the water demand. Within this type of communities, demand estimation may require greater depth of analysis of household livelihoods, potential uses, required quantities and their daily, weekly, monthly and seasonal variations for a more informed decision about the required service level (Nicol, 2000). The analysis should be extensive so as to effectively provide alternatives to meet household demands Moriarty et al., (2006). Further, it requires for the engineers to investigate options with which they are not familiar Deverill et al., (2002).

Table 2.3 summarizes quantities of water used for people in MUS systems, either designed for MUS or planned for single uses, but used for multiple purposes Van Koppen et al., (2006). All the cases correspond to household connections. It can be seen from these figures how domestic uses are less variable, and productive uses appear in a more wide range. In the case of South Africa, the proportion of water used for domestic

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activities is related to the Basic Needs policy existent in South Africa. Domestic values from South American Countries, Colombia and Honduras, are similar; and it is interesting that the 45 lpcd used for planning purposes in Nepal includes livestock use as part of this allowance.

Table 2.3 Water consumption for MUS systems according to different authors

Source	**Perez de Mendiguren Castresana (2004)**	**Roa & Brown (2009)**	**Smits et al.,. (2010)**	**Mikhail (2010)**
Country	South Africa	Colombia	Honduras	Nepal
Domestic	25 lpcd	67 lpcd	64 lpcd	45 lpcd
Domestic+/ Productive	65 lpcd	250 lpcd	123 lpcd	400 – 800 l/day/hhb

Source: Author's Construct (2015)

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Relating to productive uses, the Reported values are more variable. In Nepal, this range can be associated with household´s economic capacity. Mikhail (2010) mentioned that well off people have been able to have more access to some irrigation technologies that have been promoted, while the poor have had less access and this range may be linked to that situation. Something similar has been reported by Smits et al., (2010), where the value of 123 lpcd is the average consumption of different population groups (farmers, labourers, ranchers, etc.) where some categories use far more water in productive activities than others. Roa and Brown (2009) also make differences on the water quantities required in this area when people have different productive activities, which

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can be linked to assets as well. Therefore, the productive use of water may depend on several factors, not only level of service and quantity provided.

2.10 RURAL WATER SUPPLY IN GHANA

At the national level, the water sector is overseen by the Water Directorate of the Ministry of Water Resources, Works and Housing (MWRWH), while sanitation is dealt with by the Environmental Health and Sanitation Directorate (EHSD) of the Ministry of Local Government and Rural Development (MLGRD). The legal owner of rural water supply assets is local government in the form of Metropolitan, Municipal and District Assemblies (MMDAs). The lead agency for Ghana's National Community Water and Sanitation Programme and for rural water supply in general, is the Community Water and Sanitation Agency (CWSA). Community Water and Sanitation Agency (CWSA) was established on 30th December 1998 by an Act of Parliament (Act 564) as the statutory body to manage the National Community Water and Sanitation Programme (NCWSP). The primary objective of CWSA, under Act 564, is "to facilitate the provision of safe water and related sanitation services to rural communities and small towns" in Ghana.

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2.10.1 A Model for Rural Water - Community Ownership and Management (COM)

The water services delivery model in rural Ghana is anchored on Community Ownership and Management (COM) and it is also the main management philosophy underlying Ghana's rural water sector. Under this overarching philosophy, two main models exist for providing water services: point-systems (typically boreholes and

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covered wells) for low density rural settlements, and piped systems with standpipes and household connections for small towns.

The level of service provided under these models is defined by norms set by CWSA. Point-systems and standpipes are designed to provide 20 litres per person per day (lpcd) of good quality water. In addition, the norms state that this should be within 500m of users homesteads and that no more than 300 people should have to share a single source. For household connections the norm for quantity is 60lpcd (Moriarty et al.,, 2010). Where they are provided, household connections typically cover about 20% of the population of the town.

Under COM, both point-systems and small-towns are expected to be managed and paid for by their users. Day to day management lies with community structures who exercise delegated responsibility on behalf of local government. For rural point-sources these structures are called water and sanitation committees (WATSANs) and for small-towns Water and Sanitation Development Boards (WSDBs). The duties of WSDBs and WATSANs include collecting tariffs from users and using these for day to day operation and maintenance.

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WATSANs and WSDBs are supposed to be supported in their management activities by local government agencies called District Water and Sanitation Teams (DWSTs) – who are in the process of being incorporated into new District Works Departments (DWDs) - with CWSA playing a backstopping and facilitating role. In addition, CWSA tends to play a dominant role in initial construction activities due to its concentration of specialist skills.

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An important shift in sector emphasis in recent years has seen a rapid increase in the number of small-town piped systems constructed, and almost all recent donor-financed projects have focused on small-towns. Small-town systems bring with them generally higher and more reliable levels of service than point-systems, but with higher costs Nyarko et al., (2011).

2.11 SUMMARY

This chapter began with the theoretical and conceptual framework namely the capability approach, and the demand response approach. These theories were used to explain the key phenomenon of multiple uses of water, community participation, water service levels and water uses. There were discussions on water availability, water use and management in agriculture in Sub Saharan Africa (SSA), multiple use water services concepts and practices. The literature also discusses the potential impact of the MUS system on aspects such as poverty and access to water in rural areas.

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CHAPTER THREE

METHODOLOGY

3.1 Research Design

The study is a non-interventional study and adopted the qualitative research design. Since much is known about the existence of the problems with water in the region, based on results from previous studies such as CWSA, (2010), Nyarko et al., (2011) and Lawra DMTDP, (2014-1017). The qualitative design is the most appropriate design to adopt because it is employed to facilitate the systematic collection and presentation of data that give a clear and in-depth picture of the current situation as well as fulfilling the purpose of the study, which is to explore multiple use water services (MUS) and its effect on rural livelihoods. This is with the aim of contributing to knowledge that will help reduce poverty through the provision of water for varied uses in the Lawra District in the Upper West Region of Ghana.

This research follows the qualitative case study methodology. The qualitative case study methodology has been extensively used in multiple uses of water research, especially within the Challenge Program on Water and Food (CPWF) CPWF-MUS (Van Koppen and Smits, 2010). Four studies on MUS reviewed for this research have been carried out, using the case study approach: Perez de Mendiguren Castresana (2004) in South Africa, Mikhail (2010) in Nepal; and in South American countries Smits et al., (2010) in Honduras and Roa and Brown (2009) in Colombia.

The methodological orientation of this study emanates from the social constructivists perspective in social research. According to Creswell (2009), social constructivists hold the assumption that individuals seek understanding of the world in which they live and

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work. Individuals develop subjective meanings of their experiences - they develop subjective meanings of their experiences-meanings directed toward certain objects or things. These meanings are varied and multiple, leading the researcher to look for the complexity of views rather than narrowing meanings into a few categories or ideas. The goal of research, then, is to rely as much as possible on the participants' views of the situation being studied.

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3.1.1 Justification of Research Design

This method was selected because as stated by (Yin, 2003), it is appropriate when ―how or ―why questions are being formulated, the investigator has little control over events, and the focus is on contemporary phenomenon within real life context. This method also contributes to the knowledge of individual, group, organizational, social, political and related phenomena, and allows combining a full variety of qualitative and quantitative evidence.

Furthermore, ***Case studies*** are a strategy of inquiry in which the researcher explores in depth a program, an event, an activity, a process, or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time (Stake, 1995). This study explores in depth the multiple uses of water processes and how it affects livelihoods.

3.2 Sources of Data

Data for this study were collected from both primary and secondary sources. A hallmark of case study research is the use of multiple data sources, a strategy which also enhances data credibility (Yin, 2003). The primary data sources include interviews, observations,

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photography and a focus group discussion. Secondary sources were mostly documentary analysis from books, journals and other publications.

3.3 Study Population

The study is situated in the Lawra District in the Upper West Region (UWR). The Upper West Region is one of the four regions in Northern Ghana noted as the poorest (GLSS Survey, 2008). The District has characteristics that are relevant for a study on household multiple use water services. Some of these characteristics include but not limited to inadequate improved water facilities, poor maintenance of water facilities, and inadequate facilities that permit the use of water for diverse purposes. The District was selected based on two main criteria, namely relevance to the study and as an area of interest by the sponsors of this study.

The totality of individuals or objects upon which a social inquiry is applicable is what Twumasi (2001), refers to as the population. The population is also referred to as the "universe" to which research findings can be extrapolated. That is, the group to which inferences are made based on a sample drawn from the population. In this study, the focus is not to make inferences but rather to explore the issues being studied. The target population were households comprising men and women resident in the District for at least one year, public agencies and non-governmental organizations engaged in the fashioning out of various water supply and management strategies in the Lawra District of the Upper West Region of Ghana.

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3.4 Sampling Techniques

Sampling is a process of scientifically selecting cases or respondents for a research (Neumann, 2006). The selection of the sample for this study was done with non-

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probability sampling techniques. The reason behind the choice of the non-probability techniques stems from the guiding philosophical principles surrounding the use of qualitative case study methodology. The idea behind qualitative research is to purposefully select participants or sites (or documents or visual material) that will best help the researcher understand the problem and the research question. This does not necessarily suggest random sampling or selection of a large number of participants and sites (Creswell, 2009).

Consequently, five communities in the Lawra District were purposefully selected. The households, community leaders, private and public sector officials were all purposively selected. This helped the researcher to target those elements of the study population that were of particular relevance to the study.

3.4.1 Sampling Procedure

To start with, there are some communities in the District where the MUS development strategy is being implemented. All communities were selected with a purposive non-probability sampling technique. This comprised three communities where the multiple use development strategy (MUS) is being implemented and two communities where no MUS activity was found as at the time of data collection.

The reasons why the selected communities included those without any MUS systems (herein referred to as non-MUS communities) is to be able to find out if there are any MUS system in a community that was not officially selected by NGO's as well as to seek the views of non-MUS communities on the multiple uses of water.

It is important to mention that the Lawra District since 2012 had just one town council, namely The Lawra Town Council and Three Area Councils namely Babile, Eremon

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and Zambo. This division was also taken into consideration in the selection of the study communities. On the household level, eighteen households were selected from the three communities with MUS whilst twelve households were selected from the two communities where arguably no MUS facility exists.

3.4.2 Sampling for Households

Rural communities are more homogeneous in their ways of living and tend to have similar interest and aspirations as compared to their urban counterparts. The sampling of households in this study was informed by the United Nations description of a community as a "basic harmony of interest and aspiration" (Conyers, 1981 as cited by Fielmua, 2011). This is particularly important to planners because it means that the members of a community are likely to have similar views of current and future development in their area. One member of a household (head or spouse) in the communities was interviewed after being accidentally selected.

During the pilot test and reconnaissance visit, it was discovered that the communities were homogenous. Consequently, considering the homogeneous nature of the people in terms of water usage, livelihood activities, governance and culture as well as the wide distances between communities in the District; the following respondents were selected.

The distribution of the respondents in Table 3.1 indicates that the main unit of analysis for this study is the household. The households sampled form about eighty seven percent of the total respondents. This is solely due to the need to meet the objective of the research. Consequently, considering the homogeneous nature of the people in terms of the need for water, water facility management practices, governance and culture as

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well as the wide distances between traditional divisions in the District, thirty household open ended questionnaires (see appendix II) were used in the study area, one community leader (a chief), two private sector professionals in the water sector were interviewed and two public sector workers. In addition, two focus group discussions (see appendix IV) were held in Zambo Tangzu and Tabier.

Table 3.1: Distribution of Respondents by Category, Methods and Instruments

Category	Methods	Instruments
Household	Unstructured Questions	Observation, FGD, Photography and Questionnaire
Community Leaders	Unstructured Interview	Interview Guide
Private Sector (NGO	Unstructured Interview	Interview guide
Public Sector	Unstructured Interview	Interview guide

Source: Field Data, 2015

3.4.3 Key Variables and Units of Measurements

According to Babbie (2007) study variables can be put in a logical grouping of attributes. He noted that, unit of analysis in a research are the same as unit of observation. Miller and Brewer (2003) have shown that variables help in moving a research from a conceptual to empirical levels, using the variables as key elements of the research problem. Table 3.2 shows the description of independent variables and their units and scales of measurement. As a result, data in this study are largely measured at the nominal and interval levels.

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Table 3.2: Key Variables and Measurements

VARIABLES	*UNIT OF ANALYSIS*	*SCALE OF MEASUREMENT*
Participation	Contribution to planning and design	Interval
Household size	Number of people in a household	Count
Water Facility	Number of Water Facility	Interval
Occupation	Type of occupation	Nominal
Water Usage	Types of Uses	Nominal
Health Impact	Reduced diseases	Nominal

Source: Authors Construct, 2016

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3.5 Data Collection

Data collection is the precise, systematic gathering of information relevant to the research sub-problems, using methods such as interviews, participant observation, focus group discussions, narratives, case histories Neumann (2006). Also, qualitative researchers typically gather multiple forms of data, such as interviews, observations, and documents rather than rely on a single data source (Creswell, 2009).

The use of open ended questionnaires, focus group, documentary analysis, in-depth interviews, and direct non-participant observations formed the basis of primary data collection for the study. The secondary source constitutes text books, published and unpublished articles, journals, library and internet search, government publications, official documents from the District Assembly, the regional Community Water and Sanitation Agency (CWSA), the District Water and Sanitation Team (DWST) and other related literature.

3.5.1 Data Collection Procedure

It was determined that an introductory letter from the Faculty of Integrated Development Studies, University for Development Studies is required before going to

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the field to collect data. As a result, a letter was secured. Data was collected through various visits to the respondents with the help of two (2) assistants from the Lawra District. The research assistants helped by means of travelling to meet the household heads in the study communities. The communities were located at various areas and therefore it was appropriate to use the research assistants to help gather the data for the study in timely manner.

The administration of questionnaires formed the basis of primary data collection. The questionnaires were self-administered especially for the households and with the help of the two research assistants. The importance of candid responses was emphasized.

For key informants, the interviews were hand written and conducted in English. According to Neumann (2006) the advantage of self-administration of questionnaires is that the survey is by far the cheapest, and it can be conducted by a single researcher.

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3.5.2 Reconnaissance and Pre-Testing

The researcher embarked on a reconnaissance visit to the sampled communities in the Lawra District so as to get familiarized with the study area, arrange interview appointment with District officials, as well as arrange for logistics (accommodation, transport, recruiting local enumerators etc.). Data for the study were collected within a five week period. The first two weeks involved a non-participant observation of the general physical and social characteristics of the community, water sources, and water usage. During the observation, the researcher had preliminary discussions with some community members as well as pre-tested the instruments. This helped in refining questionnaire before the actual data collection began in the subsequent weeks.

Table 3.3: Distribution of Sampled Communities by Council and MUS Community

Council	Non-MUS Community	MUS Community
Eremon		Dowine Nayiri
Lawra	Tabier	Kalsagri
Zambo	Zambo Zoopal	Zambo Tangzu

Source: Field Survey, 2015

Table 3.3 above provides a complete list of the five communities sampled for this study on household multiple use water services.

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3.5.3 Data Collection Instruments

Table 3.4: The Distribution of Data Collection Instruments

Instrument	Total Sampled
Open ended questionnaires	30
Documents	N/A
Focus group	2
Key informant interviews	5
Observation	N/A

Source: Field Survey, 2015

The main tools used during this study were open ended questionnaire, document reviews, direct observations, focus group discussions and unstructured interviews.

3.5.4 Key Informant Interviews

Five (5) in-depth interviews were conducted with respondents chosen purposively as part of this qualitative study. However, gender and knowledge in the subject matter were the key determinants for the selection of informants. The key informants were drawn from public and civil society actors in the water management sector in the Lawra District. Here, two different tools were employed to solicit information from respondents. The interview guide/protocol was used to gather data from literate respondents while an open ended questionnaire was used to collect data from illiterate respondents such as the chiefs and other opinion leaders.

Also, interviews were held with institutions such as the Community Water and Sanitation Agency (CWSA), PRONET North and the District Water and Sanitation Team of the Ministry of Water Resources, Works and Housing (MWRWH). This was to establish their thoughts on the multiple uses of water and its effect on the livelihoods of the people.

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3.5.5 Direct Observations

Field observation in research is a technique of gathering data through direct contact with an object – usually another human being (Twumasi, 2001) Observation is an important source of primary data in community studies providing supplementary information and clarifications on participant interviews (Polkinghorne, 2005). Observational data ranged from daily activities, facial expression, clothing, vocal tones and gestures of interviews to the general physical characteristics of the environment within which the interviewees live. Relevant observed data are those that throw light on the meaning of a participant's oral comments contributing to understanding and clarification of issues under study (Babbie, 2010).

The researcher undertook field trips to five (5) communities namely Dowine Nayiri, Kalsagri, Zambo Tanzu, Tabier, and Zambo Zoopal to observe the physical state of water supply facilities, understand how facilities were being used, the different purposes for the usage etc. This provided first-hand information on the status of the water supply facilities at the various communities. To achieve this, an observation guide was prepared which contained a list of items observed in the field. Field observations were used to shed light on the water needs, access and awareness of MUS practices.

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This were done by recording all that was observed daily. Extensive field notes were taken during the observation in order to be able to fully explore the topic.

3.5.6 Focus Group Discussions

Focus group discussions were an important means of gathering data in the study area. Two FGDs in the Zambo Tangzu and Tabier communities were organized. The communities were purposefully selected. The FGDs were held to solicit the views and experiences of men and women regarding the multiple uses of water and its effect on their livelihoods in the study area. The discussions were recorded and transcribed.

3.5.7 Photography and Documentary Analysis

Photography was used to translate some data (which are creatures of the mind) into real images that present a quick visual impression of observed phenomena. As a thesis grounded in the qualitative social research tradition, we relied heavily on documentary analysis of secondary data such as policy and research documents on rural water, the multiple uses of water amongst others.

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3.6 Profile of Study Area

3.6.1 Location and Size

The District is one of the eleven Districts that make up the Upper West Region. It lies in the north-western corner of the Upper West Region in Ghana between longitude 2°25 W and 2°45W and Latititude 10°20N and 11°00S. It is bounded to the North by Nandom District, to the East by Lambussie-Karni District, to the South and West by the Republic of Burkina Faso (see figure 3.1). The total area of the District is put at 1,051.2 square km. This constitutes about 5.7% of the Region's total land area, which

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is estimated at 18,476 square km. The District is estimated to have 157 communities with 95% of the inhabitants in the rural areas. The population density is about 89 per square kilometre, making it the most densely populated District in the region (Lawra DMTDP, 2014-1017).

3.6.2 Relief and Drainage

The District is gently rolling with a few hills ranging between 180 and 300M +-above sea level. It is drained by the main river – the Black Volta, to the west making a boundary between the District and the Republic of Burkina Faso. The Black Volta has several tributaries in the District; notable amongst them are the Kamba/Dangbang, Nawer, Duodaa. These, if utilized, could offer an agro-based employment for the youth who migrate to the south in search of non-existing jobs during the dry season (Lawra DMTDP, 2014-1017).

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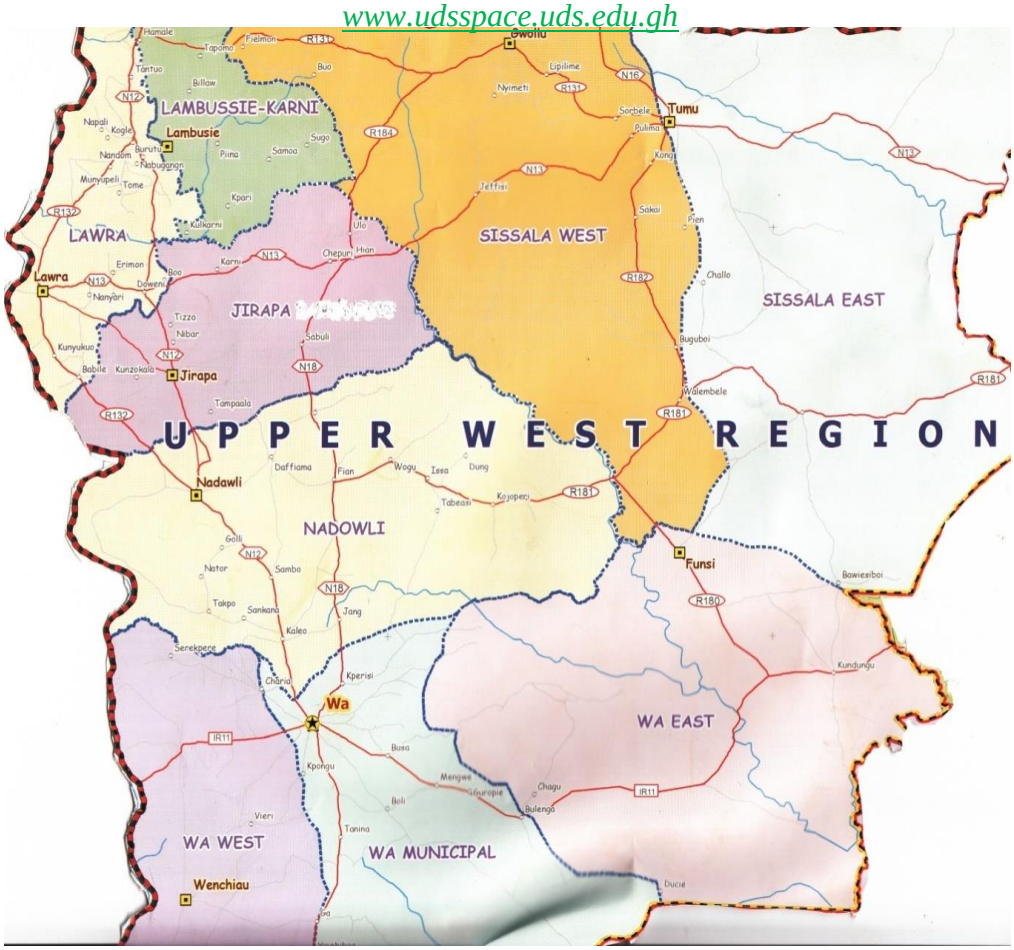

Figure 3.1 Upper West Regional Map

Source: Upper West RCC, 2015

3.6.3 Vegetation and Climate

The District lies within the Guinea Savannah Zone which is characterized by short grasses and few woody plants. Common trees in the District consist of drought and fire resistant trees such as baobab, dawadawa, shea trees and acacia. The vegetation is very congenial for livestock production, which contributes significantly to household incomes in the District. The greatest effect on the vegetation is the prolonged dry season. During this period, the grass becomes dry and the subsequent bush burning leaves the area patchy and mostly bare of vegetation. Consequently, the torrential early

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rains cause soil erosion. Bush burning reduces the vegetative cover and transpiration and this affects average annual rainfall totals resulting in low agricultural yields as farmers depend mostly on rain fed agriculture.

The climate of the District is the tropical continental type with the mean annual temperature ranging between 27°C to 36°C. The period between February and April is the hottest. Climatic changes of late, however, affects the weather pattern. Between April and October, the tropical maritime air mass blows over the area which gives the only wet season in the year. The rainfall pattern leads to the migration of the youth, a factor associated with the underdevelopment of the human resource base of the District.

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3.6.4 Population Size and Density

The 2010 Population and Housing Census recorded a total of 54,889 people in the Lawra District with a growth rate of 1.9%. It comprised 26,346 (48%) males and 28,543 (52%) females, indicating a sex ratio of 1:1.08. The District takes a share of 7.8% of the population of the Upper West Region (GSS, 2013). With a growth rate of 1.9, however, the population of the District was estimated at 58,127 in 2013, with a male population of 29,005 and a female population of 30,226. The size of the population puts pressure on existing social and economic services, as well as the natural environment which serves the main source of livelihood for majority of the people. The situation is even compounded by the recent establishment of the Lawra Health Assistants Training School, which has resulted in an influx of a youthful population into the District capital and a consequent effect of pressure on housing and community facilities some of which were provided without consideration for this student population. In spite of its effects on housing and community services, the student population has increased demand for

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goods and services in the District, with a potential of increasing incomes of farming households and as well create non-farm employment.

The District has a youthful population. About 51% of the people are within 15-64 age cohorts, 41% are children of less than 15 years, whiles the remaining 8% are the aged of above 64 years. An analysis of the age structure of the population points to a dependency ratio of 93.6. By implication, each person within the active age group of 15-64 years is expected to cater for 0.93 person or less than one person on the average. This indicates a less dependency ratio, even though it is higher than the regional average of 91.3. However, the picture may be misleading since some of the people in the active age group are not in any active economic engagement, and hence cannot be depended on. This is even worsened by the high level of unemployment in the District.

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3.6.5 Spatial Analysis of the Population

The spatial analysis of the District seeks to portray how socio-economic development infrastructure is spread across the District. It attempts to measure the centrality indices of settlements in a geographical unit. It therefore provides an insight into the District's space economy. The output of the process is a ranked/ordered set of settlements in the District (Lawra DMTDP, 2014-1017).

3.6.6 Irrigation Infrastructure

The Lawra District Assembly places a high priority on irrigation facilities to enhance dry season vegetable production. Under the GSOP project, the District rehabilitated two (2) dug outs at Boo and Brifoh Manguol which have all been completed and handed

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over to the communities. Two (2) other dugouts at Methaw Yipala and Kalkatou have been awarded for rehabilitation. These are expected to be used for dry season vegetable production as well as rearing of animals.

Other communities with dams include Eremon Naburinye and Eremon Bure and Babile. Of all the dams and dugouts in the Districts only Babile dams have Water Users Associations (WUA), the rest are yet to form the WUA.

The Lawra District Assembly in collaboration with PRONET North and Concerned Universal (NGO) constructed seven (4 hand dug wells and 3 tube wells) for both drinking and dry season vegetable production for communities in the District. These facilities are currently being used for the purpose of drinking, rearing of livestock and dry season vegetable production by the beneficiary communities. The facilities are still in quite good conditions.

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3.7 Validity and Reliability

According to Leedy & Ormrod (2005) reliability is the degree of consistency or dependency with which an instrument measures the attribute it is designed to measure whiles validity is the extent to which an instrument measures what it actually intended to measure. For Babbie (2007) the validity of the study questions whether the assumptions and conclusions drawn by the researcher tally with the initial research problem and whether the findings are comprehensible (p. 143-149). Even if the methods of data collection have high reliability, it may not mean that these methods are the best in producing the most valid conclusions in an enquiry. To ensure validity, formal and informal pilot studies were employed to ensure face and content validity. Operational measures were adopted from previous studies and based on conceptual definitions with

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strong theoretical grounding. The researcher also cross-checked (triangulate) views with related documents provided for the research by respondents.

Reliability questions the application of methods in gathering and producing the same data under the same conditions. Reliability was ensured by making sure that errors were minimized by strictly adhering to the defined sampling and analytical procedures. Leading questions were avoided in order to reduce prediction by the respondents. Questions on the questionnaire were thoroughly checked. This helped in the development, translation and assessment of clarity of the questionnaire by the researcher and by those on whom the questionnaire was tested.

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3.8 Confidentiality Issues

In ensuring confidentiality and acceptability of the study, the researcher ensured that the research was designed, conducted and Reported in accordance with recognized scientific competence. Respondents of this study were assured of utmost confidentiality. The anonymity of participants (Women, Chiefs, Opinion leaders and other key informants) were protected by numerically coding each returned questionnaire and keeping the responses confidential. While conducting the individual interviews with the selected respondents, they were assigned numbers for use in their descriptions and reporting the results. The researcher observed the cultural norms and knowledge of research participants. Participants were made aware of the objective and that participation was entirely voluntary. Informed consent was obtained from all participants of the study.

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3.9 Methods of Data Analysis

Considering that this study made use of qualitative data, data collected on the field were cleaned, coded, and analysed manually. The responses to each question were organized into six themes namely, the demographic characteristics of respondents, water sources and usage, water supply system and participation, the multiple uses of water, household income, livelihood impact and the challenges.

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The process of data analysis involved structuring and bringing logical order to the volume of data collected. The essence was to put the data in contextual form so as to enable the researcher answer the research questions as well as address the objectives. The analysis was done with both a thematic and content analysis. According to Babbie (2010), thematic analysis involves using the ideas from the informant. The informant is the subject hence a lot of narratives, textual information and direct quotations are used. On the other hand, in content analysis, information is inferred from the informant (respondent). It gives room for the usage of figures, percentages, graphs and frequencies. In this study, only objective two was analysed using content analysis whereas all others were analysed with a thematic analysis.

The FGDs were recorded using digital recorders and later transcribed (written out in a book). The information from interviews were recorded, transcribed and categorised in order to draw out essential patterns. These were then presented in the form of text and narratives based on empirical evidence. The household questionnaires were analyzed manually and some of the outputs have been presented in tables and figures while some of the focus group discussions, and observations have been presented as case stories.

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3.10 SUMMARY

This chapter described the study design and the methods utilised in obtaining the results of this study. The study used the qualitative case study approach because the researcher needed to explore in depth the multiple uses of water services using a variety of data collection instruments. Interviews, observations, focus groups and documentary analysis were used. The chapter also discussed details of the sampling procedures and how the communities were selected using non-probability sampling. Lastly, the study profile and data analysis techniques were described showing how themes presented in the results were obtained.

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CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This section presents and discusses the data on households multiple uses of water services (MUS) in the communities as collected on the field. It is organized in two sections. The data is presented in the first section and the discussion in the second. The data presentation and analysis are based on the issues relevant to the study such as the background characteristics of the respondents, water sources and usage, challenges with water, water service provision and livelihood activities in the five communities.

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4.2 DATA PRESENTATION AND ANALYSIS

4.2.1 Background of the Respondents

4.2.1.1 Gender and Age Distribution of Respondents

In the household survey, thirty household heads or their knowledgeable representatives were interviewed from the communities. About seventy six percent of these respondents were females and twenty four percent were males.

According to the age distribution in the data, all the respondents were at least nineteen years old and above, and about 53.3% of them were under forty years old. The rest were between the ages of forty-one and seventy three (46.7%).

4.2.1.2 Household Size and Marital Status

Out of the thirty household respondents, majority (about 83.3 %) were married whilst a few (about 3.3%) were separated or divorced. Others (13.3 %) were widowed. Generally, the number of people in a household in the study area were large. According to the Ghana Statistical Service (2005), a one member household is single, household

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size of 2 – 5 is small, 6 – 8 is large and a household of 9 or more members is considered very large. Based on these definitions, 40% of the households are very large while 47% of them are large. 10% of the households are small and about 3% are single.

Table 4.1: Distribution of Household and Marital Status of Respondents

	Marital Status	
Category	Freq	%
Single	0	0
Married	25	83.3
Separated/Divorced	1	3.3
Widowed	4	13.3
TOTAL	30	100

	House Hold size	
Category	Freq	**%**
Single	1	3.33
Small	3	10
Large	14	46.67
Very large	12	40
TOTAL	30	100

Source: Field Data, April/May 2015

4.2.1.3 Educational Level

The variable highest educational level was requested due to the fact that it could affect people's attitudes and beliefs on multiple uses of water. Specifically the kinds of sources to be used, the quality of water, the distance from the residence to the source of water, how water is used amongst others. It was discovered from the responses that majority of the respondents had never been to school.

The results revealed that about 63% percent of the respondents never went to school whilst about 17% had basic education. 10% had secondary education. 7% had middle school or a junior high school education. Only 3% had a tertiary qualification.

Table 4.2: Distribution of Educational level of Respondents

Level of Education	Frequency	%
None	19	63.33
Primary	5	16.67
Middle School/JHS	2	6.67
Secondary	3	10
Other Tertiary	1	3.33
College/Polytechnic	0	0
Total	30	100

Source: Field Data, April/May 2015

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4.2.1.4 Occupation of Respondents

From Table 4.3 there is information on the occupation of the respondents during the two major seasons of the year. During the wet/farming season, all the respondents said they were predominantly crop farmers. The data discloses that in the dry season, there is no one who is involved in crop farming activities due to the lack of rainfall.

Subsequently, about 50% of the households seek alternative self-employment options in the form of petty trading activities, livestock production, brewing, shea butter extraction, smock making, weaving during the dry season. Moving on, 20% indicated that they are into dry season gardening and the remaining 30% indicated that they had nothing to do. The researcher observed men sitting idle under mango trees chatting or playing games. One of them said the following:

"This is the dry season and we cannot farm, even our borehole is spoilt so it is hard for us to survive. Some people here have gone as far as Techiman and Kumasi so they can survive this season". (Respondent, Zambo Zoopal)

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Table 4.3: Distribution of Main Occupation by Season

OCCUPATION	DRY SEASON		WET SEASON	
	Frequency	%	Frequency	%
Farming/Crop production			30	100
Gardening	6	20		
Self-employment	15	50		
Nothing	9	30		
Total	30	100	30	100

Source: Field Survey, April/May 2015

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4.2.2 How the Multiple Uses of Water is Practised in the Study Area

This section presents data collected on how the multiple uses of water service is practiced in three MUS communities namely Dowine Nayiri, Kalsagre and Zambo Tangzu. To examine the MUS practice in the above mentioned communities, three parameters were used as identified in the literature. These are the types of water infrastructure available, the distance to the source of water and the level of participation.

4.2.2.1 An overview of the physical features of the multiple use water system in communities

In the communities, MUS has been mostly about the installation of water infrastructure like the borehole, hand dug wells (with a rope pump). The newly designed boreholes were fenced and had an extension that allowed spilled water to be either collected for watering of gardens or for drinking by animals. From the three MUS communities used in this study, below is a list of identified multiple use water services completed and on-going in the communities (see pictures attached in Appendix VI).

- Rehabilitation of borehole with Afridev HP or NIRA HP
- Manually drilled borehole
- Rehabilitation of existing Hand Dug Well (HDWs)
- Drilling of conventional borehole
- Fencing of new water points
- Promoting hand washing services
- Establishment of hand washing stations (tippy taps)
- Installation of tippy taps
- Training of community mobilizers and WUA executive

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In Dowine Nayiri, Tabier, Kalsagri (JHS) it was observed that there was the rehabilitation of borehole with Afridev HP or NIRA HP in each community. In Zambo Tanzu, it was observed that there was the drilling of conventional boreholes, in Zambo Zoopal, rehabilitation of three (3) existing Hand Dug Well (HDWs) whilst in Faalu, a manually drilled borehole was observed.

In addition to the above, there were two unique MUS water infrastructure in Zambo Tangzu and Kasagri. The system was an overhead tank with multiple collection points and was powered with electricity. As a result, when the electric power goes off; people cannot fetch the water.

In two Lawra communities, the water tanks have the same capacity. Each water tank (reservoir) is Rambo 1000 (50 drums of water). Each of the facilities had three main collection points for different purposes. These points are; domestic collection point (where people draw water for domestic uses), collection points within the garden and a collection point for animals (see Appendix VI for photographs). Within each fenced garden, there are two collection points.

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4.2.2.2 The State of Hand Pumps in the Communities

The rural communities in the District have a total of two hundred and fifty boreholes (CWSA, 2015). The number of HDW and all other sources are not sufficiently documented. Indeed, the DWST believes the other sources of water must be known and Reported whereas the CWSA team argue the other sources are unimproved so must not be documented. Figure 4.1 shows the type of hand pumps in the District. The figure displays that there are a total of 186 AfriDev hand pumps, 29 Ghana modified India Mark II and 26 Nira AF-85. These represent 77%, 29% and 26% respectively. During

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the interview with the Head of the District Water and Sanitation Team (DWST), it was revealed that the AfriDev is currently the preferred choice.

"The AfriDev is currently the preferred choice due to its modern technology, flexibility and ease of use and as compared to the other two types (Ghana modified India Mark II and Nira AF-85". (Head, DWST Lawra)

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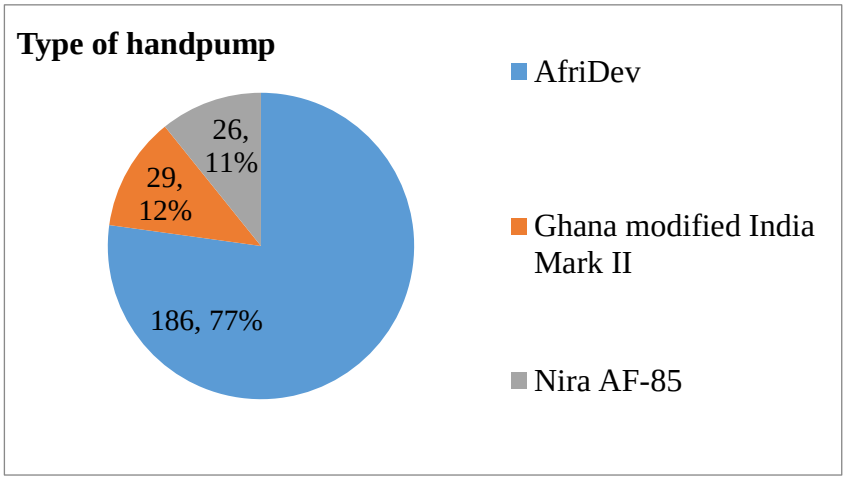

Figure 4.1: Types of Hand pump

Source: CWSA, 2015

4.2.2.3 Multiple Use Water System and Usage

This section sought to find out the current MUS systems that have been installed or implemented. Also, the study sought to find out the awareness and usage of respondents of the MUS system. This was to enable the researcher ascertain the level of information received about MUS amongst rural respondents because how does one get involved with or accept what you do not know exists? To do this, enumerators were trained to clearly explain the idea of using water for multiple purposes and also the types of MUS

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infrastructure to the respondent. As a result, these respondents were expected to indicate by a YES or NO if they have used any such system in the past. Wherever respondents indicated there was an MUS system, we followed up to visit the facility to observe it. The results, show that 53% said they know about using water for multiple purposes and 47% said they do not know.

Out of the 30 respondents sampled (both MUS and non-MUS communities), nine currently had and used facilities (HDW, borehole, etc.) that allowed them to access water for multiple uses. 21 do not use an MUS facility. The number of respondents using an MUS facility represents 30% whilst those who do not use an MUS facility represent 70%.

"I can confirm we began to pilot some new water infrastructure in about twelve communities in the Lawra District as part of our efforts to increase the multiple uses of water services"(Winrock officer, Wa)

A few years ago I was informed by the CWSA that some NGOs are coming to install some new water facilities that will allow the communities in Lawra to be able to use water for varied uses. We had a meeting and some of our staff members went with them to the site to facilitate the process (Head, DWST, Lawra).

"At Pronet North, we identified the limited access to water in some communities as a problem and we have partnered with some other NGOs to provide improved water systems and services so that some of the rural communities in Lawra can have access to water for varied uses" (Water resources development officer, Pronet North).

4.2.2.4 Service Level Indicators

Figure 4.2 indicates the percentage of reliable Hand pumps (HPs) is about 86%, the percentage of uncrowded Hand pumps is about 50%, percentage of reliable Hand

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pumps, the percentage of Hand pumps with users within the 500m is 14%, the percentage of hand pumps with perceived acceptable quality is 93% and the percentage of hand pumps that can produce at least twenty litres per capita per day in the dry season is 40%.

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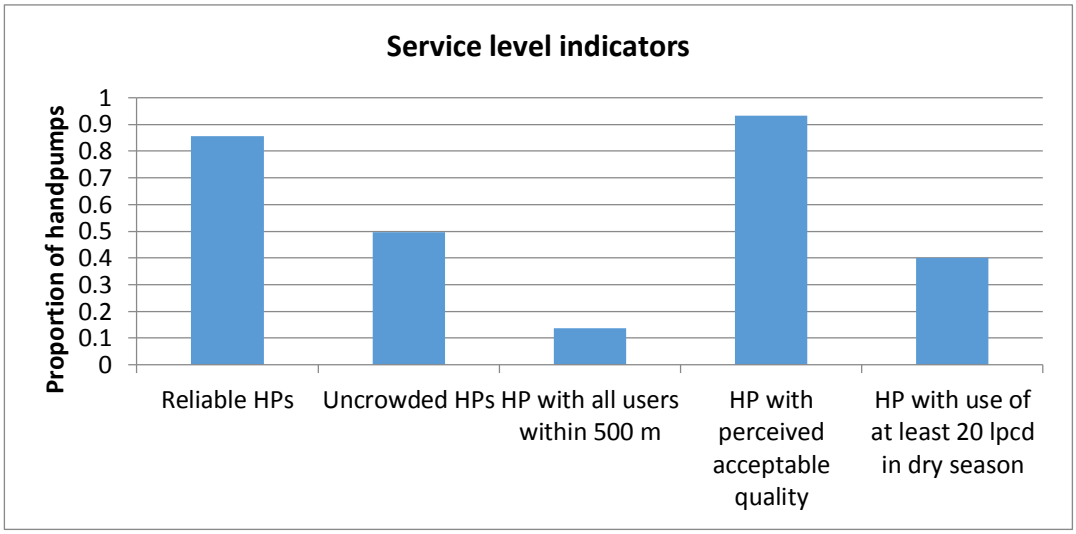

Figure 4.2 Hand pump Service Level Indicators

Source: CWSA, 2015

4.2.2.5 Community Participation in Water Service Delivery

Community participation has been espoused as a key ingredient for sustaining projects, especially when external support ceases. This is to ensure that benefits are equitably shared and cost borne by all parties. As Patrick, Butterworth, and Koppen (2004: p16) put it*; "the provision of water services, that include water for productive uses, needs to be planned to ensure that benefits are inclusive or pro-poor. In planning, implementation and research, it is important to hear and act upon the voices of the*

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poor, women, and children, recognising that otherwise benefits may be captured by elites". In this study, community participation was assessed at two levels. The first level was on the involvement in the planning and design of the water supply facility. The second level focused on the contribution during the provision of the system.

The choice of the type of technology to be provided was determined by NGO's based on assessed water needs of communities. The communities had no influence over the choice of technology type. There was however, active community participation in the following categories;

Identifying and selecting possible water sources: The community members participated in the selection of water sites. This was however led by household heads and the "Tendana". It was established that the "Tendamba" released portions of the land for the siting of the system. With this background, 20 respondents mentioned they were involved during the planning of the water facility and 10 said they were not involved. When probed further as to why they were not involved, the reasons given included "*I was not around*" *"I was not contacted", "I was still a child" and "I was not living in the community"*

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On the second level, 13 respondents said they did not contribute in any way during the provision of the water facility. The remaining seventeen said they contributed in the following ways clearing of site, made financial contribution, carried equipment, and performed other unskilled construction work. This indicated the kinds of participation by the households.

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4.2.2.6 Distance to the Source of Water

The most frequent time taken for the respondents in arriving at the water point or source was about thirty minutes and the lowest time was a minute. This is slightly above the nationally accepted distance. Considering that one of the key water service provision indicators is that water users must be within 500m (or 10 minutes) of households. Nevertheless, it is important to stress that were six households that spent close to an hour (about three kilometres) before getting to the point systems. It was observed that majority of the respondents used a basin, bucket or gallon ('Kuffour gallon') in fetching water from the borehole, HDW or river. During observational visits, it was observed that all the water collectors were elderly women during the mid-mornings. In the evenings the younger girls were seen crowded around the water points.

"During the dry season, my family finds it difficult to get to the borehole. This is because we walk for close to an hour to get there. We have complained to the Assembly man but we are yet to hear from him" (Community member, Tabier).

4.2.3 Effects of Various Sources of Water on Domestic and Productive Livelihood Activities

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4.2.3.1 The Sources of Water

Water sources and usage are critical for households survival. This section sought information on sources of water used in the communities under the study. This was meant to meet the second objective to explore how various sources of water affect domestic and productive livelihood activities.

This will give current evidence of these sources and the need for other unavailable sources. The data on water usage will help to understand and analyze the different uses

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of water by the community. The frequency of usage could also indicate the type of needs of the community for which an MUS facility can be purposefully targeted.

According to the respondents for the study, the major sources of water in the Lawra District include hand dug wells (HDW), boreholes, and surface water (river, stream, and pond). Twenty three (23) household respondents said borehole was their main source of water, five (5) said it was the hand dug well and only two (2) used surface water.

"Today, I can confidently say that our sources of water are much better than when I was a little boy. Now we have boreholes, wells and sometimes my people fetch from the river" (Chief of Tabier).

"The places where we get water are the borehole, the well and the river along the black Volta" (FDG Participant, Tabier).

Also, some of the water sources such as hand dug wells, dugouts, pipe and surface water (river, stream, and pond) have been classified by the Community Water and Sanitation Agency (CWSA) as unimproved sources of water. During an interview, the Upper West regional CWSA officer stated "*aside the hand pump, all other sources of water in the communities are classified as unimproved".*

From the above, the information reveals that majority of the respondents rely on the borehole (hand pump) as their main source of drinking water.

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4.2.3.2 The Uses of Water

The uses of water from respondents' perspective confirmed that water in the communities was used for both domestic and productive activities. This was because all respondents indicated the various domestic and productive activities. The domestic activities recorded included cooking, bathing, drinking, washing and cleaning whereas the productive activities included brick making, gardening, pito brewing, food processing, animal rearing, pottery and handicrafts.

4.2.3.3 The Sources of Water for Domestic Activities

Table 4.3 provides the multiple uses of water for domestic activities as recorded from respondents. From the table, it can be seen that majority of the respondents use the borehole/hand pump for most domestic activities. For instance twenty seven (27) households indicated that they preferred to use the borehole for cooking and drinking as opposed to just one household that used surface water for cooking and drinking. In addition, only two households used the hand dug well for cooking and drinking. This phenomenon cuts across all the other domestic activities.

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Table 4.4 Distribution of Main Domestic Activities and its Sources of Water

	Sources of Water		
Activities	**Borehole**	**Surface water**	**Hand Dug Well**
Cooking& Drinking Only	27	1	2
Bathing only	24	3	3
Washing& Bathing	23	2	5
Drinking only	26	0	4
Washing & cooking only	23	5	2
Cooking Only	27	2	1
All	20	7	3

Source: Field Data, April 2015

Majority of respondents indicated that they used borehole for the following domestic activities: Cooking, bathing, drinking, washing. A few (two respondents) used water from the river for washing, and bathing.

"I use the water I fetch from the borehole to cook, wash, bath and clean my house" (FGD Participant, Zambo).

"In my compound, we use the water I and my daughters fetch from the borehole to cook, wash, bath, and clean" (Female Community member, Zambo).

"The water we fetch from the river is used for washing and cleaning my compound, we use the water I and my daughters fetch from the borehole to cook, wash, bath and clean" (Female Community member, Kalsagri).

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"As you can see the borehole is not far from our house, so my wife and other family members use it for everything" (Male Community member, Dowine Nayiri).

4.2.3.4 The Sources for Productive Activities

During the data collection, household respondents provided the following as the productive activities they engage in. These include brick making, gardening, pito brewing, food production and processing, pottery, and handicrafts, animal rearing, construction, shea butter. This list of productive activities was corroborated by the chief of Tabier as below:

"In Tabier we are mostly farmers during the raining season. However, in the dry season many of my people rely on the limited water sources to do pito, backyard gardening, shea butter and provide water for their animals" (Chief, Tabier).

This was further supported by an officer at the MUS office in Wa.

As part of our activities in the District, we have collected data on the livelihood activities in some communities in the Lawra District, some of these activities include Agricultural activities (MUS officer, Wa).

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During the field observation, it was noted that the above mentioned productive activities were being undertaken. I saw a household with animals (pigs, goats, and poultry). There were other households that had backyard gardens as well as a brick making facility.

Table 4.4 provides evidence of the main productive livelihood activities and the sources of water. The table shows that household use multiple sources of water for their productive activities. Also, it shows that regardless of how the water sector is organized,

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households use water not only for domestic activities but also for other unplanned purposes. For an illustration, construction and brick making was discovered to be an increasing productive or economic activity (especially during the dry season). From the data, nineteen (19) households use the hand pump (originally intended for domestic uses) for construction and brick making, four (4) households use surface water and seven (7) use the hand dug well.

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Table 4.5 Distribution of Main Productive Activities and its Sources of Water

	Sources of Water		
Activities	**Borehole**	**Surface Water**	**Hand Dug Well**
Food processing &production	28	2	0
Construction &Brick making	19	4	7
Pottery & Handicrafts	*8[3]	0	5
Gardening	*14	1	0
Pito Brewing	23	5	2
Sheabutter Extraction	25	3	2
Animal rearing	20	1	9

Source: Field Data, April 2015

All the activities on Table 4.4 require the use of water. The water facility has not only opened more opportunities for the people in the dry season, but has also taken away the drudgery associated with activities such as pito brewing and shea butter production. The shea butter is mostly processed for both household usage and commercial purposes.

* Some households did not engage in this activity

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4.2.3.5 How the Multiple Sources of Water has Affected Livelihood Activities

In this study, livelihoods refers to water related activities that contribute to people's means of living such as farming, livestock, or other trades, like brick-making Renwick et al., (2007). In exploring how the various sources of water have affected livelihood activities, two key impact areas were explored. They are the impacts on health (hygiene and sanitation) and on economic (productive) activities. Respondents were asked to relate how the provision of a water facility that allows for water to be used for varied uses had impacted in their economic activities. The indicators for measuring impacts on economic activities were increased income and improvements in time spent on productive activities.

Interview responses with key informants:

In considering the ways in which the provision of borehole and improved water delivery in the various communities are identified, all key informants interviewed during data collection expressed an improvement in income and an increase in the time spent on productive activities. For example when asked if there has been a change since the water project was provided, the Head, DWST noted *"there are lots of impact, infact the impact is great. The people now use water for many activities such as pito brewing, sheanut extraction, vegetable gardening etc. these were not possible a few years ago when we had water crisis. I have no doubt the sudden increase in these activities has added to the income of these rural folks"*.

Another key informant said yes, we have seen an increase not only in the activities embarked by these households but also a slight jump in income as a result of the new water projects (MUS Officer, Wa).

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During the Focus group discussion (FGD) discussion, most of the participants indicated that the provision of the water facility has helped them undertake an additional economic activity. One of the participant said *"I used to rely on only income from only my farm crops but now I can also use clean water from the borehole for my pito"*. Another participant said *"I have added a backyard garden because I can use the waste water from the borehole to water my vegetables.*

Furthermore, when respondents (households) were asked if the provision of the MUS water facility in their communities had enabled them to undertake any economic activity, the majority (63.3%) of the respondents responded in the affirmative saying that they have found alternative economic activities. However, the remaining 36.7% of the respondents indicated that they have not got other economic activity as a result of the provision of water.

It was observed that in the communities, a number of boreholes were between five to twenty minutes walking distance from the households. This meant the distances were not too far as was the case in previous years. Subsequently, respondents were asked to relate how the provision of a water facility that allows for water to be used for varied uses had impacted in their health and sanitation. The indicators for measuring impacts on health and sanitation were improved sanitation and reduction in water borne diseases.

During the focus group, one of the participant said *"Today, we are very blessed. We have enough water for our livestock, household and other uses. Our children go to school, we have fresh vegetables from our gardens for good meals. We no longer frequent the hospital due to ill health". (Community member, Tabier)*

Another participant said *"We had serious difficulties getting potable water for household use. The only borehole we had was always crowded and we spent so much time waiting for our turn. Some people were compelled to fetch water from other unwholesome sources. Now we have adequate potable water to drink and use for other purposes". (Community member, Zambo)*

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Interview responses with key informants

"We no longer hear of the many water borne diseases that the communities complain about" (Head, DWST).

I cannot say much about the impact on revenue but what we know is that there has been a drastic reduction in the long distance between the improved source of water and the household. Also the health and sanitation situation has improved (Officer, CWSA).

Also, the majority of respondents answered in the affirmative to the question would you say there is a general improvement in health due to the regular delivery of water to your household. To the question, have you ever been diagnosed of any waterborne disease as a result of using water for multiple uses? Majority indicated no.

This new facility makes us neat and healthy. We used not to get water to bath and wash our clothing regularly. Now we can bath as and when we need and eat good food. There is also no more fighting at the pipe because the pressure has now been reduced on the only borehole we used to have (Community member, Zambo Zoopal).

The above is one of the comments from a respondent on how satisfied she has been. Thirty (30) households who use the water system were asked about their level of satisfaction. Twenty two (22) out of the thirty (30) were very satisfied, five (5) were satisfied and three were somewhat satisfied. None of the respondents said they were not satisfied. In addition, all respondents said the community had benefited from the water facilities in that there has been a reduction in the number of people at the facility due to the ease of access. This has also reduced the pressure on the water points, there are no more fighting at the water point, no difficulty in the search for water.

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4.2.4 Households Perception on How the Existing Water System Meets their Needs.

Two indicators were used to assess household perception on how the water systems meet their needs. These are the quantity of water needed for all activities and the adequacy of the sources of water. When asked if the sources of water were enough for daily needs? All thirty (30) household members said that the sources of water for their daily needs were not enough. The reasons given were categorized into a) limited or single source for water b) long distance c) limited water flow d) spoiled water source and e) conflict at the water point. From the data collected, more than half of the households indicated that the sources of water were limited or from a single source. A few indicated that there was limited flow of the water.

"The places where we get water are not enough for us daily because we have just two good sources of water. We have complained to the Assembly man and even at the District office but they are yet to give us any additional good source of water. I hope we don't have to wait for too long" (participant, Zambo Tangzu).

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4.2.4.1 The Amount of Water Used for Domestic and Productive Activities

The amount or quantity of water needed for domestic and productive activities is critical in providing insight into how the existing water systems are able to meet the daily needs of the households. Out of a total of thirty households, thirteen indicated they used five basins (170 litres) of water daily, five used ten basins (340 litres) of water daily, three used six basins (204 litres) of water daily, two used twelve and fifteen basins each daily and the quantities of three, four, eight and eleven are used by a household each. The lowest number of basins fetched in a day was two (68 litres) and the highest was twenty basins (680 litres) according to those interviewed.

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"My house, we use five basins of water every day" (participant, Dowine Nayiri).

"In this house we use ten basins of water every day because we are a lot" (participant, Kalsagri).

"Here we use about six basins of water every day" (participant, Zambo Tangzu).

"My house uses fifteen basins of water every day" (participant, Tabier).

"I can say we fetch twelve basins of water every day to be used in this house" (participant, Zambo Zoopal).

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4.2.5 The Challenges Faced By Households in Accessing Multiple Water Sources for Productive Livelihoods

When our borehole spoils I have to walk for about three miles to the river before I can get water. Our borehole is overused and building an additional one will help us a lot (Respondent, Kalsagri community).

"The problems with water in Lawra are myriad. This include but not limited to

- *Inadequate community mobilization prior to and after water infrastructure*
- *Lack of proper management of water facilities*
- *Distance to water source, damaged and low quality water*
- *Political interference" (Water resources development officer, PRONET North).*

This section was used to understand specific problems faced by the community in accessing and using water. It assisted in identifying the causes and effects of water related problems. It is the hope that suggestions for improvements can be made.

The information gleaned from the respondents challenges were put into seven major themes as listed below:

- Damaged and spoilt boreholes

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- Long queue and long wait
- Inadequate water sources
- Distance
- Dirty water
- Water drought
- No money to fetch

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The recurrent problems mentioned by respondents were mainly threefold namely that the water facilities get damaged periodically, their improved sources of water were inadequate and this leads to long queues and too much pressure. Below is what Naa Sebastien, the Chief of Tabier had to say;

"Our borehole has been our only reliable and better source of water since the 1970's when I was a child. We have two other wells and a river. However, in the past few years, the only borehole we have gets spoilt every year around February. Last year, we had to gather every household to contribute since people do not make any contribution if the borehole is working. We spent about 2000GHC to repair 'the head' because that was the first time it broke down after it had been installed. This year we spent 350. Now it cannot pump water as it used to in the past. As a result, our women spend a lot of time trying to get water into the house. I have twenty two people living in my house and we use a lot of water. I have reported to the Assembly but we have not heard from them".

4.3 DISCUSSION

This section systematically discusses the four research questions raised in this study. It relates these questions to the theories and conceptual frame works. It answers the why's and how's of the findings as they relate to literature. It begins with the demographic characteristics and proceeds to the other research questions.

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4.3.1 Demographic Characteristics

Data on gender and age distribution of respondents revealed that about seventy six (76%) of these respondents were females and twenty four (24%) were males. This is important because women are mostly responsible for the majority of water related activities such as cooking, cleaning, washing, fetching water amongst others. These activities are domestic and hence women are socially conditioned to perform them. This social conditioning originates from cognitive development according to Lawrence Kohlberg (1966, 1969) when he suggested that children had made a cognitive judgement about their gender identity before they select same sex models for sex typed behaviours. As kids grow up, parents segregate their roles in the performance of household chores into girls do this and cannot do this and vice versa.

Furthermore, data on household size and marital status revealed that majority (about 83.3 %) were married whilst a few (about 3.3%) were separated or divorced. Others (13.3 %) were widowed. This affirms the view that the marriage institution is still very strong in rural Ghana (Apusigah, 2004). Also, 40% of the households are very large while 47% of them are large. Further, 10% of the households are small and about 3% are single. The average household size was eight. It is not unusual for households in Northern Ghana to have very large sizes (METSS-Ghana Survey, 2012).

The variable highest educational level was requested due to the fact that it could affect people's attitudes and beliefs on water issues. Specifically the kinds of sources to be used, the quality of water, the distance from the residence to the source of water and how water is used. It was discovered from the responses that majority of the respondents had never been to school.

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Education is a key that unlocks many doors, therefore the lack of education has the potential to be detrimental to an individual's personal growth and development. It can also lead to a lack of employment opportunities and subsequent inability to be financially independent. It is not very surprising to have the majority of women with little or no education because of poverty and the perceptions about girl's education. For instance, many girls go to school in rural areas only to acquire basic literacy and numeracy skills; after which they are either pressurized to get married or are betrothed. However, Kendie (1992) asserts that education and the involvement of women in water programmes improves community health. As a result, increasing the access of girls to education is highly needed.

In this study, the achievement of access to water for rural communities is but a subset of the objectives. The occupation of household respondents indicate their major source of livelihoods. There are a whole range of factors which determine why the poor take decisions and spread risk, and how they balance competing interests in order to survive both in the short and longer terms. During the wet/farming season, all the respondents said they were predominantly farming. This endorses agriculture as the major economic activity in the District, employing about 80% of the working population. About 80% of the farmers are into subsistence agriculture, producing small quantities of maize, millet, groundnuts, soya bean and cowpea. Animal production is a major agricultural activity undertaken by the people to supplement incomes from crop farming (Lawra DMTDP, 2014). Furthermore, the data discloses that in the dry season, there is no one who is involved in crop farming activities due to a lack of water (rainfall). This is very disheartening for the rural household as their source of livelihood is reduced.

Subsequently, about 56% of the households seek alternative self-employment options in the form of petty trading activities, livestock production, brewing, shea butter

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extraction, smock making, weaving during the dry season. Although some of the activities above require the use of water, it is not as much as the amount of water needed for farming. The 20% who automatically become unemployed during the dry season is very troubling considering that these people are without a source of livelihood during the dry season. A study by Quaye (2008) showed that the most important way of obtaining food when stocks run out was to buy the same food staples consumed from the market if the household could afford it. What if they cannot afford it?

Further, Quaye, (2008) revealed that one other alternative was to buy less preferred food from the market when the preferred one is not available or the frequency of food in-take was reduced from three to two times per day while the amount of food was also reduced in the period of food unavailability. This sometimes includes limiting adults and children food intake at meals and sometimes skipping a whole day‘s meal For the ILO (2007), the large share of informal employment is the inability of the formal sector (public and private) to expand and absorb the growing labour force.

The first research question is how the multiple uses of water services is practiced in the study area? This was assessed using the standardized water service provision framework as researched by Adank et. al (2013). Water services can be defined as the supply of a certain quantity of water, of a certain quality, accessibility and reliability. Service should ideally be assessed and monitored from a user perspective: what is the level of service that people have access to (in terms of quantity, quality, reliability and accessibility) Adank et. al., (2013). Two main measures were used, the existing water infrastructure and how much did the households participate.

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Estimates of rural water coverage range from 63.13% (CWSA, 2011) to 74% (JMP, 2011) and reflect steady progress over the last years. The overall goal of the MUS is to reduce poverty through the provision of water for varied uses (Van Koppen et. al., 2006). As a result, the planning and design of MUS infrastructure must be participatory, integrated (with other services) and reduce poverty. The quantity of infrastructure that facilitates the multiple uses of water for the study communities were inadequate. Some of the reasons given included too much demand for new facility, high cost of water facilities, poor maintenance, low income levels etc. In an interview with the Regional CWSA officer and the head, Lawra DWST, both emphasized that the supply for a particular water facility is linked with the population of the community making the demand amongst other factors. For instance, if a community's population is three hundred and they request for a new water facility for whatever reasons, the request will be rejected. Indeed, there was a file on the table of the head at the DWST that consisted of the many applications that had been submitted from the communities requesting for water supply facilities but had not been approved.

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Comparatively, according to Fielmua, (2012) a few MUS systems in the Nadowli District can be found and due to the lack of electricity in some of the communities and the high cost of using diesel powered generators, a NGO, Global Water Initiative (GWI) used solar to pump the water from boreholes for the various uses. In Nadowli, There were as many as six solar panels in one community.

4.3.2 The Process of water system delivery

As at 2011, the CWSA used the population range to decide which communities get which facility. This also depended on donor requirements. For instance, some donors in the past required that communities contributed 5% of the cost of the facility.

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However, currently CWSA does not strictly adhere to the 5% 'contribution condition' unless the donor makes it a requirement. The following shows the population range and the water supply facility previously provided.

Population Range Facility

Population Range	**Water Facility**
75-300	Hand Dug Well (HDW)
301-500	Borehole (BH)
501 – 50,000	Pipe System

Currently, the CWSA does not provide hand dug wells due to water safety issues. However, some NGO's and individuals continue to provide Hand Dug Wells as an alternative source of water to the communities. This raises issues of oversight and regulation. How effective has CWSA been in assuaging the provision of HDW's to these communities? Nevertheless, MUS and the capability approach are linked in that multiple use of water can be leveraged by empowering people to make their own choices and by building resilience in the face of shocks. That means preserving people's water entitlements.

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The MUS approach thrives on individual and community participation. A multiple use approach involves accessing the range of water needs in collaboration with end users, ensuring that women's and men's multiple needs are equally articulated (Butterworth, 2010). The evidence gathered from this study could not fully establish that the intended beneficiaries in the District participated in the planning and design of the water services provided such as boreholes, tippy taps. Indeed the majority of interviewed beneficiaries had no idea what MUS is and how it was implemented in the community. Officials of

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the District Assembly though had knowledge of the NGO implementing MUS in the District, they had no knowledge on the strategy the NGO embarked on to enter the communities. Does this imply a case of selective participation? Gaigher et al., (1995) mentioned poor community penetration by NGO's and CBO's as one the main impediments to community participation. The District Water and Sanitation Team leader indicated that he had expressed his dissatisfaction from the onset when the NGO mentioned plans of rehabilitating hand dug wells (HDW). This was because HDW's had been found to be unsustainable mostly because the depth drilled is lower than that of bore holes. As a result, in the dry season the water from hand dug wells (HDW) runs out and the communities begin to agitate for an improved source of water. Is this the case of an attempt to gain acceptance for an already assembled package? To tell the community what is going to happen by asking them what they think about it. To convince beneficiaries as to what is best for them (Botes and Rensburg, 2000).

On the second research question: how do the various sources of water affect domestic and productive livelihood activities, the results revealed that majority of the respondents rely on the borehole (hand pump) as the main source of water for domestic and productive livelihood activities. This confirms that, point sources remain the dominant source of water for rural households. This is in line with Ghana's 'National Community Water and Sanitation Programme' (CWSP). The CWSP projects were aimed at solving the problem of water scarcity and the sustainability of water supply facilities in rural Ghana. The development objective of CWSP-2 was to increase access and achieve effective and sustained use of improved community water supply services (WSS) in villages and small towns in Ghana (CWSP-2, 2011).

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Furthermore, water development provides numerous benefits to human livelihoods such as improved hygiene, labour availability and income (Moriarty and Butterworth, 2003). Providing more water and creatively designing water services around productive activities can enhance people's livelihoods and contribute a wider range of benefits than traditionally designed domestic systems Smits et al., (2010).

Moving on, what is striking is the fact that in the dry season there is a slight decline in the usage of boreholes due to many reasons such as faulty hand pumps, low water tables, and poor maintenance of the pumps amongst others. This confirms many studies such as Kendie (2002), Kangah (2009) and Lockwood and Smits (2011) assertion that households tend to vary water sources during the dry season. On the issue of the providers of the source of water (mostly boreholes) for the communities, the data revealed that majority of the households credit the government for providing the boreholes. As many as 23 households indicated the source of water was provided by the government as opposed to just 7 who mentioned the source as by individuals. This is contrary to information from CWSA which states that most water facilities were provided by non-governmental organizations such as CIDA, World Bank, JICA, World Vision, CARE, and EU amongst others. The question that arises then is, are these communities aware of the financiers or donors? If they are not, it increases the over-reliance on government (sometimes through the District Assembly) to provide water facilities whereas most of these facilities are donor funded.

Though majority indicated that they already use water for various needs other than just for domestic activities, they were unaware of the 'uniqueness' of the MUS concept. This can be understood because of the low levels of education. Again, majority of

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households in the selected communities even though are aware of MUS, do not have any MUS water system. As a consequence, there are more opportunities for MUS donors, funders and implementers to invest in these communities.

This study confirms the MUS premise that households need and use water for multiple purposes. As a result, the water sectors barrier of strictly providing water for single uses (domestic or productive) is unsustainable. MUS matches the - often informal - realities on the ground, in which rural and peri-urban communities use and re-use a number of different sources for a variety of uses to concurrently meet a range of both domestic and productive water needs. MUS builds on these existing assets, skills, and investments Adank et al., (2012). In addition, in the domestic sector, the accepted definition of basic needs leads to design norms that frequently are insufficient to provide the quantities of water required to develop home-based activities, limiting the livelihood possibilities of poor people (Moriarty and Butterworth, 2003).

In this study, livelihoods refer to water related activities that contribute to people's means of living such as farming, livestock, or other trades, like brick-making Renwick et al., (2007). This is slightly dissimilar to Chambers (1988) who defined livelihood as comprising the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintains or enhances its capabilities and assets both now and in the future, while not undermining the natural resource base. This study focussed on only the activities required for a means of living – especially the water related activities.

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Various studies on the productive use of water suggest that water is used for productive activities such as agriculture, gardening, horticulture, livestock-raising, car-washing, arts, ice-making, brick-making, pottery, butchery, and other small-scale commercial activities Van Koppen et al., (2009); Smits et al., (2010). Improvement in income and an increase in the time spent on productive activities are corroborated in this study as supported by Renwick et al., (2007); and Van Koppen et al., (2009). Whereas there were some improvements in the sanitation and reduction in water borne diseases, a lot still remains to be achieved by way of waste management and toilet facilities.

The third research question sought to find out if the water systems met the needs of the households. Water is a basic need and a productive asset. However, water supply programmes typically focus on providing water to meet basic or domestic needs, such as drinking, cooking, washing, and bathing, and fail to incorporate household-based productive use (Faures and Santini, 2008; Van Koppen et al., (2009). For example, additional benefits from productive use activities include improved health, food security, income generation, and women's empowerment Renwick et al., (2007); Van Koppen et al., (2009).

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The current water systems meets the needed quantity of the households amidst some non-functioning and sub-optimally functioning water infrastructure. However, the usage of some of the sources are more frequent than others, For instance, there were more boreholes (hand pumps) in the communities than any other source of water.

Access to water is critical in all aspects of life as reflected in the socio-cultural and economic lives of human societies. It has been estimated that in order to ensure our basic needs, every individual needs 20 to 50 litres of water free from harmful

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contaminants each and every day (UN World Water Development Report, 2003). However, other researchers have arrived at different positions. Point-systems and standpipes are designed to provide 20 litres per person per day (lpcd) of good quality water (Nyarko et al., 2011). Adank et al., (2013) states 20 litres per person per day (lpcd) whereas for Moriarty et al., (2010), for household connections the norm for quantity is 60 lpcd.

This study established that households used about 54 litres per person per day. In addition, the norms state that this should be within 500m of users homesteads and that no more than 300 people should have to share a single source (CWSA). As a result, even with the highest household size of 18 in the study, we can still be certain of 30 litres per person per day (lpcd) of water. This indicates that the minimum quantity of 20 litres per person per day (lpcd) is satisfied.

Considering the level of satisfaction, Sen (1999) as part of his human development approach developed a concept called **Functionings.** Functionings are defined as 'the various things a person may value doing or being' (Sen 1999 :75). In other words, Functionings are valuable activities and states that make up people's well-being – such as being healthy and well-nourished, being safe, being educated, having a good job, being able to visit loved ones. Functionings describe what a person is able to do or be. In the context of this research, when people's basic need for water is met, they enjoy the functioning of being well-nourished.

Lastly, the fourth research question was on the challenges households face in accessing multiple water sources for productive livelihoods. At any given time, a substantial proportion of water supply infrastructure is either not functioning or functioning sub-optimally Adank et al., (2013). This study confirms that indeed water supply

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infrastructure in the communities are 'either not functioning or functioning sub-optimally.' The reasons for poor functionality is mainly a lack of maintenance culture and the increase in rural population. The information gleaned from the respondents problems were put into seven major themes

The problems mentioned by respondents occur recurrently in some of the communities. According to the Lawra DMTDP (2013), though the water coverage looks remarkable, much is still expected since people still scramble for water in most communities especially in the dry season. Several other new settlements have no access to potable water. This emanates from the fact that, the settlement pattern is dispersed as well as the over aged nature of the water facilities. Drying up of borehole especially during the dry season also accounts for the inadequacy of potable water.

The challenges emanating from these study are confirmed by Moriarty et al.,(2004) and Van Koppen et al., (2006). Generally, these failures have more impact on the poorest, which are less capable to cope with them (Moriarty and Butterworth, 2003). Some of the Reported failures are damage to infrastructure, disruption of allocation schedules, deprivation of end-users and increase of conflict Van Koppen et al., (2006; Moriarty et al.,(2004).

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4.4 SUMMARY

This chapter presented and analysed the data on 'household multiple use of water services (MUS) and livelihoods in the communities collected in the field. The analysis was based on issues relevant to the study such as the state of water supply systems, water use patterns, demographics etc. Furthermore it discussed the four research questions raised in the study and related the questions to the literature, theories and conceptual frame works.

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CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS, CONCLUSION AND RECOMMENDATIONS

This final part of the thesis is presented in four sections. The first section deals with the summary of the major findings of the study and the second deals with the conclusions. The third makes some recommendations and the last section has some suggestions for further studies. This is in line with the implicit objective of research work – to add to knowledge.

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5.1 SUMMARY OF MAJOR FINDINGS

This aspect of the study summarizes the key findings of the study as regards; the current sources and usage of water in the study area, the MUS practice and the challenges with rural water supply.

According to the people interviewed in the study, the major sources of water in the Lawra District include hand dug wells (HDW), boreholes, and surface water (river, stream, pond). However, the usage of some is more frequent than others. For instance there were more boreholes (hand pumps) in the communities than any other source of water. Also, some of the water sources such as hand dug Wells (HDW), and surface water (river, stream, and pond) have been classified by the Community Water and Sanitation Agency (CWSA) as unimproved sources of water.

The information reveals that majority of the respondents rely on borehole (hand pump) as their main source of drinking water. This confirms that point sources remain the dominant source of water for rural households. This is in line with Ghana's 'National Community Water and Sanitation Programme' (CWSP). The CWSP projects were

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aimed at solving the problem of water scarcity and the sustainability of water supply facilities in rural Ghana.

The uses of water from the respondent's perspective clearly showed that domestic and productive activities are needed. Domestic activities such as cooking, bathing, drinking, washing and cleaning. Productive activities included brick making, gardening, pito brewing, food processing, weaving, pottery, handicrafts were dominant. This affirms the MUS premise that households need and use water for multiple purpose. As a result, the water sector's barrier of strictly providing water for single uses (domestic or productive) needs to be reformed.

In terms of how the multiple uses of water services is practised, the study revealed that the water infrastructure was inadequate. The evidence gathered from this study could not fully establish that the intended beneficiaries in the District participated in the planning and design of the water services provided such as boreholes, tippy taps. Indeed, the majority of interviewed beneficiaries had no idea what MUS is and how it was implemented in the community.

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5.2 Effect on Livelihoods

The majority of respondents answered in the affirmative to the question would you say there is a general improvement in health due to the regular delivery of water to your household. They also were emphatic that as a result of using water for multiple uses they have not been diagnosed of any waterborne disease.

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All categories of respondents clearly indicated there are improvements in income and an increase in the time spent on productive activities. Also, the provision of the water facility has helped them undertake an additional economic activity.

The major challenges of water in the District include damaged or spoilt boreholes, long queue and long wait, inadequate water sources, distance, dirty water, water drought and the lack of money to repair broken pipes. The other challenges include a poor maintenance culture, high cost of spare parts, lack of coordination amongst stakeholders, and inadequate finances.

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5.3 CONCLUSIONS

The study set out to explore the multiple uses of water services and its effect on the livelihoods of households in the Lawra District of the Upper West Region of Ghana. Considering that the multiple uses of water services approach seeks to improve rural livelihoods through the provision of an integrated approach that supports both domestic and productive water uses, the human development approach and demand responsive theories that seek to explain social service provisioning fits into the sociological analysis of this study.

The data gathered were used to qualitatively analyse the multiple uses of water services and its effect on the livelihoods of households in relation to predetermined indicators. From the analyses, the study confirmed the importance of variables such as participation, sources of water, uses of water, income, as well as health and sanitation.

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The present study, though limited in scope, clearly shows that the multiple uses of water services can improve key well-being outcomes, including income, health (sanitation and hygiene). However, the provision of water infrastructure alone may not translate into an enhanced livelihood without ensuring sustainability.

The research concludes that an integrated approach that supports both domestic and productive water uses will have the intended impact on beneficiaries, especially on rural households if deep rooted structural challenges, such as access to water facilities are taken into consideration in the design and implementation of the national rural water supply programme.

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5.4 RECOMMENDATIONS

As noted earlier, the development process should be assessed according to the extent to which it expands the 'capabilities that people have reason to choose and value'. As a result, below are some recommendations deduced from the findings and conclusions.

The participatory level of beneficiary households must be increased through transformative representation by the Assembly in collaboration with chiefs, Assembly members and NGOs. This involves the empowerment of those involved, and as a result alters the structures and institutions that lead to marginalization and exclusion. Communities tend to value their water supply facilities, make better use of the facilities and operate and maintain them more efficiently when they have contributed resources. In the planning, choice of technology and construction stages of a rural water project, the communities should be engaged effectively with a significant representation of women, particularly in the choice of the pump technology. This will stimulate the principle of ownership amongst the rural population. For instance, women have the

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responsibility of obtaining water for domestic use whereas planners in the past have mostly been men, and in many communities, religious and cultural beliefs make it virtually impossible for the views of women to be accepted by male planners. Thus, planning must, therefore, make full use of women for social research and investigation into their water needs. Their composition in the WATSAN committees should be greater than or equal to the males and they should be made to hold the key management positions within the committees.

The low level of income in the communities is a challenge that needs to be addressed. The District Assembly needs to consistently engage the private sector so as to attract domestic investments into the processing of agricultural produce on a large scale. The Assembly must also work at generating more revenue to invest in employment creating ventures as opposed to spending on only recurrent expenditures. This can create more employment for the District especially during the dry season.

From the study, it emerged that boreholes were the only approved source of water and a total of fifty eight hand pumps were either non-functional or functional at sub-optimal levels. These represent 23.2% of the total hand pumps in the District. The reason for this is the lack of an effective management and maintenance culture. The DWST is unable to effectively manage the water supply facilities due to inadequate logistics (financial and human resources). The WATSAN committees need to be actively engaged by MUS programme implementers so as to ensure that MUS facilities are adequately monitored. The WATSAN committees require periodic capacity development so as to be able to detect and repair minor faults of the system including record keeping on the facility.

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Beneficiary communities of MUS facilities need to be sensitized by the DWST on a continuous basis on the need to regularly maintain and clean the facilities so as to ensure their sustainability. For instance, pouring of dirty water in the area where the water facility has been located makes the place filthy and can result in infection. Also, children must be prohibited from playing around the facility, the use of sandals on the pad around the facility must be discouraged and the preparation of productive activities such as sheabutter, pito or dawadawa at the facility should not be allowed.

To solve the problem of a high non-compliance with national water service standards, it is recommended that the presence of CWSA at the District level should be strengthened by the Ministry of Works and Housing. At the moment, CWSA relies on the DWST officers. The DWST officers are under the public works department and hence have a divided attention. It is recommended that considering the necessary role played by CWSA, they need a physical presence and representation at the District level. Currently, the scheme of operating from regional offices with no CWSA staff 'on the ground' is unsustainable and must be reviewed.

Finally, the high annual increases in the prices of spare parts and scarcity can be resolved if the national CWSA encourages and equips the local manufacturers to produce the parts locally. The CWSA need to help increase the number of spare parts distributors in the Upper West Region to help reduce the pressure on the few distributors of spare parts in the region. This will provide spare parts dealers in the region alternative sources of spare parts.

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5.5 SUGGESTIONS FOR FURTHER RESEARCH

The researcher conducted the study in five communities in the Lawra District. It is suggested that a similar study be carried out in other communities in the country so that a comprehensive research document highlighting the overall impact of the multiple uses of water services either in the rural or urban areas can be developed for purposes of planning. Further research using other methods of research can be explored.

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APPENDIX I

Section I: BACKGROUND INFORMATION/ GENERALITIES OF THE RESPONDENT AND THE HOUSEHOLD

The background information consists of demographics such as age, gender etc. This is purposely to provide some basic information on the respondents so as to be able to establish the context and content of the respondents. Also the background information helps during the analysis of data with the use of cross tabulation. The information will help the researcher to understand how these characteristics affect the respondent in adopting MUS.

Section II: WATER SOURCES AND USAGE

Water sources and usage is critical as it allows for the researcher to acquire and document information on the many (if not all) sources of water used in the community. This will give an accurate evidence of these sources and the need for other unavailable sources. Water usage will help the researcher to understand and analyze the different uses of water by the community. The frequency of usage could also indicate the type of needs of the community for which an MUS system can be targeted.

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Section III: WATER SUPPLY SYSTEM

The researcher seeks to find answers to this section with the questions below so as to know and analyse the existing water supply system/s in the community. Who supplied these systems and why? Have these systems meet (or meeting) the water needs of the community

Are there any problems being faced due to these systems?

Section IV: MUS

Researcher is seeking to find out the knowledge, awareness and usage of respondents of the MUS system and practices. This will enable me ascertain the level of information received about MUS amongst rural folks.

Section V: WATER CHALLENGES

These sets of questions would be used to understand the specific problems faced by the community in accessing and using water. It would assist in identifying the causes and effects under an MUS framework. It is the hope that suggestions for improvements can be made.

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Section VI: HOUSEHOLD INCOME

This section needs responses for the sources of respondent's income so as to be able to access their ability or inability to subscribe for an improved water supply system under an MUS framework.

Section VII: LIVELIHOOD

How has the various sources of water affected the water related activities (domestic and productive)

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QUESTIONNAIRE FOR HOUSEHOLDS IN THE STUDY AREA

Good morning, I am a graduate student at the University for Development Studies studying about water in *Lawra.* Today, we would like to ask you some questions for our research. Participation is voluntary and the information obtained is confidential. Neither I, UDS, nor any other institutions will be able to know your answers to the different questions. Nevertheless, your answers will help us to understand what is required to improve the design, the administration of rural water supply systems and livelihoods.

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Verbal Consent

Hello, my name is_____

- **This research study will involve asking you a series of questions about your household's characteristics and water practices. Studies are done to find better ways to treat people or to understand things better.**
- **The answers you provide will be used for research purposes only, to better understand how water products can be designed to meet the needs of rural households in Ghana. Your answers will remain confidential.**
- **Participation is voluntary, refusal to participate will involve no penalty or loss you may discontinue participation at any time without penalty or loss. You can ask any questions you have before making up your mind. If you have any questions regarding the survey, you may contact me on 0505089705**.

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Do I have your permission to conduct the interview?

_____Yes, continue with survey

_____No, stop the survey

To be completed by interviewer at the time of the survey

APPENDIX II

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Question ID –

Date and time of interview:

Date (DD/MM/YYYY):……Time Started:……. Time Ended:……

Section I: BACKGROUND INFORMATION OF THE RESPONDENT
Please tick/write where appropriate.

1.
District:……Community/Neighbourhood;……
……..

2. Gender: (a) male [ ] (b) female [ ] 3.Age:……

4. Ethnicity (a) Dagaarti [ ] (b) Akan [ ] (c) Hausa [ ] (d) Ewe (e) Did not say (f) Other [ ],
(888) please
specify:……

5. Marital status
(a) Single [ ] (b) Married [c] Separated/Divorced (d) Widowed [ ] (e) Did not say (f) Other
[ ], please
specify:……..…….

6. What work do you do in the: Wet season: Dry season:

7. How long (in years) have you lived in this Community?……

8. What is your highest educational level completed?

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(a) None [ ] (b) Primary [c] Middle School/JHS (c) Secondary [ ] (e) College/Polytechnic or more (f) Other [ ], please specify:……

9. What is your role/position in this household? (a) Household head (b) Husband/Wife (c) Father/Mother (d) Son/Daughter (e) Brother/Sister (f) Other relative, which? _____ (g) 888 Does not apply

10. What is the total number of people living in this house?……

Section II: WATER SOURCES AND USAGE.

11 Where do you get water from? (List all sources)

.....
.....

12 Which of the above sources is available all year round?

.....
.....

13 Has any of the under listed constructed a source of water?
(a) Government [ ] (b) Non-governmental organization [ ] (c) Community [ ]
(d) An individual [ ] (e) Other [ ];
specify:……..

14 How many basins (buckets/gallons/pan) of water do you fetch in a day?.....
.....
15 How many basins (buckets/gallons/pan) of water do you use in a day?.....
..

16 What do you use the water for?

……
……
……

17 Are the sources of your water enough for your daily needs? (a) Yes [ ] (b) No [ ]

If No,
Why…….

18 Do some of the community members use water from any of the sources below?
(a). Rain water (b). Surface water (River, stream, pond, etc.) (c) Well (d). Other, specify: ……..
……

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19. How long (in time) does it take you to fetch water to your house?.....

20 Where do you fetch water for each of the following activities?

(a) Farming …… (b) Livestock …….
(c) Brick-making …… (d) Pito-brewing……
(e) Gardening …… (f) Bathing (personal hygiene) ……..
(g) Cooking & drinking …… (h) Cleaning & Washing ……
(i) Washing …… (j) Other, specify:……

21. Which sources of water do you use for income generating activities?

.....
…….

22. Why do you use the sources above for income generating activities?

.....……
…….

.....……
…….

Section III: PARTICIATION AND WATER SUPPLY SYSTEM

23. What are the water supply facilities in your community?
……
24. Did you contribute to the provision of the water facility? (a) Yes [ ] (b) No [ ]

25. If yes, what was your contribution in the provision of the water supply facility?
(a) Clearing of site [ ] (b) Financial contribution [ ] (c) Carrying pipes [ ]
(d) Performing other unskilled construction work [ ] (e) none of the above [ ]
(f) Other [ ];
specify:……

26. Were you involved in the planning and designing of the water supply facility?
(a) Yes [ ] (b) No [ ] If No, why were you not involved?

.....
…….
.....
…….

Section IV: MUS AND USAGE (interviewer to explain MUS)

27. Do you know about using water for multiple (MUS) uses? (a) Yes [ ] (b) No [ ]

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28 Which of the following do you use water for?

(a) Farming …… (b) Livestock ……..
(c) Brick-making …… (d) Pito-brewing……
(e) Gardening …… (f) Bathing (personal hygiene) ……..
(g) Cooking & drinking …… (h) Cleaning & Washing ……
(i) Washing …… (j) Other, specify:……

29 Has your household used any MUS system in the past five years? (a) Yes [ ] (b) No []

30 In general, how satisfied are you with the MUS system?

(a)Very satisfied, (b) Satisfied (c) Somewhat satisfied (d) not satisfied

31 What are the problems you face with the MUS system?

……
……
……

32 In your view, what can be done to improve the MUS system?

……
……
……

Section V: CHALLENGES WITH WATER

33 What are the problems (if any) you face with water?

……
……
……

34 Why do these problems happen?

……
……
……

35 What can be done about the above water challenges?

……
……
……

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Section VII: LIVELIHOOD BENEFITS

36 In which area/s of your life have you experienced improvement since using water for varied uses?.....

a. Economic Productivity

37 Has the provision of the MUS facility helped you in undertaking an economic or agricultural activity that otherwise you could not undertake before? (a)Yes [ ] (b) No [ ]

Please explain……

.....

38 Has there been any effect on the time used for the collection of water? (a)Yes [ ] (b) No [ ]

If yes, do you have more time now to engage in more productive activities?

.....

.....

39 What is the most important source of income for this household within the last year? (a) Crop production [ ] (b) Business/Self-employment [ ] (c) Livestock production [ ] (d) Non-farm wage labor [ ] (e) Mining [ ] (f) Remittances [g] Farm wage labor (g) Other [ ]; specify:…….

40 Has the provision of a system that allows you to use water for income generating activities helped to increase your earnings within the last year (a) Yes [ ] (b) No [ ]

b. Health Impacts

41 Would you say there is a general improvement in health as a result of the regular supply of water? (a) Yes [ ] (b) No [ ]

If Yes, Please

why……

……..

42 Have you ever been diagnosed of any waterborne disease before using the system that provides water for multiple uses? (a) Yes [ ] (b) No [ ]

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43 Have you ever been diagnosed of any waterborne disease as a result of (since you began using MUS) using water for multiple uses was provided? (a) Yes [ ] (b) No [ ]

44 Has the provision of the MUS facility provided enough water that helped you keep your household cleaner? (a) Yes [ ] (b) No [ ]

REMARKS

_____

_____

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APPENDIX III

INTERVIEW GUIDE FOR KEY INFORMANTS

Date and time of interview:

Date (DD/MM/YYYY):……Time Started:……. Time Ended:……

Section II: WATER SOURCES AND USAGE.

What are the sources of water for communities in lawra?.....

Who provided the water facility?.....

In your view, what do the community members use the water for?

……..

……..

Section III: WATER SUPPLY SYSTEM

What are the main water supply facilities in the communities?

……..

……..

Do the community members contribute to the provision of the water facility? (a) Yes [ ] (b) No [ ]

If yes, what kinds of contribution do they make towards the provision of the water supply facility?

……..

……..

……..

Section IV: MUS

Do you know about using water for multiple purposes? (a) Yes [ ] (b) No [ ]

What is/are the water source/s used for domestic tasks?

What is/are the water source/s used for each of the following productive tasks?

Have you ever heard of MUS before today? (a) Yes [ ] (b) No [ ]

What are the major constraints in the implementation of the MUS system in the area?

In your view, what can be done to improve the MUS system?

……
……
……

Section V: WATER CHALLENGES

What are these problems?

……
……
……

Why do these problems happen?

……
……
……

Has anything been done about the problems?

……
……
……

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Section VII: LIVELIHOOD BENEFITS

36 In which area/s of life would you say the households have experienced improvement since using water for varied uses?

.....

a. Economic Productivity

37 Has the provision of the MUS facility helped the households to undertake an economic or agricultural activity that they could not undertake before? (a)Yes [ ] (b) No [ ]

What reasons account for this explain

……..

.....

38 Can you say if there has been any effect on the time used for the collection of water? (a)Yes [ ] (b) No [ ]

39 What is the most important source of income for the households within the last year? Specify:……

b. Health Impacts

41 Would you say there is a general improvement in health as a result of the regular supply of water? (a) Yes [ ] (b) No [ ]

If Yes, Please what kinds of health improvements are these

……

……

42 Have the cases of waterborne diseases reduced or increased? (a) Yes [ ] (b) No [ ]

44 Would you say the provision of the MUS facility has provided enough water that helped with sanitation and hygiene? (a) Yes [ ] (b) No [ ]

REMARKS

_____

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APPENDIX IV

FOCUS GROUP DISCUSSION GUDE

Date and time of interview:

Date (DD/MM/YYYY):……Time Started:……. Time Ended:……

Name of FACILITATOR:……

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Section I: WATER SOURCES AND USAGE.

What are the sources of water for communities in Lawra?

Who provided the water facility?

What does the community members use the water for?

Section II: WATER SUPPLY SYSTEM

What are the main water supply facilities in your community?

Do the community contribute to the provision of the water facility?

(a) Yes [ ] (b) No [ ]

If yes, what are contribution in the provision of the water supply facility? (Probe further)

Section III: MUS

Do you know about using water for multiple purposes? (a) Yes [ ] (b) No [ ]

What is/are the water source/s used for domestic tasks?

What is/are the water source/s used for each of the following productive tasks?

Have you ever heard of MUS before today? (a) Yes [ ] (b) No [ ]

Has your household used any MUS system in the past five years? (a) Yes [ ] (b) No []

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What benefits have you gotten as a result of the MUS facility?

What are the major constraints in the implementation of the MUS system in the study area?

What can be done to improve the MUS system?

Section IV: WATER CHALLENGES

What are the water related problems facing this community?

Why do these problems happen?

Has anything been done about the problems?

What can be done about the above water challenges?

Section V: HOUSEHOLD INCOME

What is the most important source of income for the household within the last year?

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APPENDIX V

OBSERVATION GUDE

Observational data ranged from daily activities, facial expression, clothing, vocal tones and gestures of interviews to the general physical characteristics of the environment within which the interviewees live. Field observations were used to shed light on the water needs, access and awareness of MUS practices. This were done by documenting what and how respondents were doing during the time of visits and conversations.

1. What are the current water supply systems?
2. What are the current sources of water?
3. How do households use water?
4. Which sources of water are used for domestic and productive activities
5. What are the reason for Question 4
6. Do MUS systems exist and how are they used?
7. What is the physical state of water infrastructure?
8. Are there benefits for household's multiple use water services?
9. What are the challenges of households with regards to water?

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APPENDIX VI

SELECTED PICTURES

Plate 1 MUS with fenced wall

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Plate 2 Overtank that supplies water to MUS points

Plate 3 MUS water points and vegetable garden behind

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Plate 4 A dirty water point

Plate 5 Men sitting idle by a spoilt borehole

Plate 6 Researcher accessing a spoilt borehole after focus group discussion

Plate 7 Children fetching water at new MUS Hand Pump.

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Plate 8 Animals near a water facility

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