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MSc. Global Development and Planning

Community Water Management: Participation of Water User Committees in Public Groundwater Infrastructure Management in Uganda. A Case of Namayingo Town Council.

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List of acronyms and abbreviations

CAO	Chief Administrative Officer
CBOs	Community Based Organizations
CWM	Community Water Management
DRA	Demand Responsive Approach
DWD	Directorate of Water Development
GOU	Government of Uganda
HPM	Hand Pump Mechanic
IFAD	International Fund for Agricultural Development
MDGs	Millennium Development Goals
MFPED	Ministry of Finance, Planning and Economic Development
MLHUD	Ministry of Lands, Housing and Urban Development
MWLE	Ministry of Water, Lands and Environment
MoES	Ministry of Education and Sports
MoH	Ministry of Health
MoLG	Ministry of Local Government
MWE	Ministry of Water and Environment
NDWO	Namayingo District Water Officer
NEMA	National Environmental Management Authority
NGOs	Non-Government Organizations
NTCWO	Namayingo Town Council Water Officer
O&M	Operation and Maintenance
PEAP	Poverty Eradication Action Plan

RWSA	Rural Water Supply Network
SDGs	Sustainable Development Goals
UBOS	Uganda Bureau of Statistics
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UWSANET	Uganda Water and Sanitation NGOs Network
WUCs	Water User Committees
WWAP	United Nations World Water Assessment Program

Abstract

Water is a critical natural resource not only to life and natural ecosystem functioning, but also, for economic and social development. The global recognition of the role of water in development dates back in 1977 with the United Nations Water Conference in Mar del Plata. Since then, water has remained pivotal in the development of nations. Specifically, groundwater is critical to sustainable development, meeting the global water needs of over 1.5 million people daily. However, it is rarely well managed. This study therefore examined community water management, and analysed the participation of water user committees in public groundwater infrastructure management in relation to functional sustainability in Namayingo Town Council. Community water management was adopted to involve communities in groundwater development and management, and enhance the sustainability of rural water systems in Uganda. Yet, non-functionality of water sources upsurges, and the Ministry of Water and Environment continues to offer technical solutions. However, it is important to analyse the social and community factors, maintenance, and water sector policy and institutional frameworks that impact on the participation of water user committees and functional sustainability. For empirical evidence, empirical investigation was based on a case study design taking a qualitative approach. Findings revealed that community water management remains rhetoric in Namayingo Town Council. In policy documents, the model promises sustainability. However, non-functionality of water facilities reveals the inability of the model to address sustainability. There was lack of participation of water user committees in the initial stages of groundwater infrastructure development. Further, the practice of the national water sector policies at community level exacerbated by inadequate institutional support did not support the institutional and economic structures of water user committees. Hence, participation and inadequate social capital were key in understanding the lack of functionality sustainability of groundwater facilities in Namayingo Town Council, Uganda.

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To you all, I am not in the best position to reward you and neither can I manage. May the good Lord, our rewarder, reward you abundantly!

Declaration

I hereby declare that this Master's Thesis: ***Community Water Management: Participation of Water User Committees in the Management of Public Groundwater Infrastructures. A Case of Namayingo Town Council, Uganda*** has never been submitted to any university excepting the University of Agder for any academic qualification. I confirm that I do not refer to others, or use their work without stating it. Thus, all references are given in the reference list.

Ronald Ngobi **Tuesday, 31st May, 2017.**

Dedication

For Daveen Birungi Ngobi and Darwin Muwanguzi Ngobi.

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Chapter one: Introduction

1. Background

Water is a critical natural resource to all life on earth. It spurs economic and social development, and supports natural ecosystems functioning (WWAP, 2012; Montgomery *et al*., 2009, UN-Water, 2008; Karr, 1997; Koudstaal *et al.*, 1992). The global recognition of the critical role of water in the development of nations dates back in the 1977 following the United Nations Water Conference in Mar del Plata (Koudstaal *et al.*, 1992). Water has since remained globally instrumental in poverty alleviation programmes: food production, drinking water, sanitation, energy and industrial production (UNEP, 2012; Montgomery *et al*., 2009; UN-Water, 2008). To the United Nations, *"When people are denied access to clean water at home or when they lack access to water as a productive resource their choices and freedoms are constrained by ill health, poverty and vulnerability"* (UNDP, 2006a, p.2). Furthermore, water was critical to the Millennium Development Goals (MDGs) (UNEP, 2012; Morris *et al*., 2003). Equally, it is central to Sustainable Development Goals (SDGs)[1] (UN-Water, 2016). Goal 6 of the Agenda 2030 for sustainable development is linked to health, food security, climate change, resiliency to disaster and ecosystems (UN-Water, 2016; UN, 2015; WWAP, 2015a; WWAP, 2015b). To this end, water resources management is critical to social well-being and economic development, considering its indispensability in all life on earth (Khalayim *et al.*, 2016).

Water covers about 70% of the earth's surface. However, only 3% is freshwater, and a small percentage including groundwater suits human use. Although the appreciation of the crucial role of groundwater in development is recent (Moris *et al*., 2003), groundwater remains critical to sustainable development (Conti *et al*., 2016) as abridged in two ways. First, it acts as a freshwater reservoir (Morris *et al,* 2003). Second, it provides water to about 1.5 billion people globally daily (Conti *et al*., 2016; Nsubuga *et al.,* 2014; Kulabako *et al.,* 2007; Morris *et al.,* 2003). In Saudi Arabia, groundwater was, for example, critical to agricultural development, which saw the 'social balance' between the rural and urban places (Abderrahman, 2005). In Africa, about 71% of the drinking water is sourced from groundwater infrastructure (Hope, 2015; Mileham *et al*., 2009). Particularly, in rural Sub Saharan Africa, groundwater is easy to access, reliable, and does not require treatment before use (Harvey & Reed, 2004; MacDonald

[1] These are seventeen goals, with one hundred sixty-nine targets adopted by countries and spearheaded by the United Nations to end poverty, protect planet earth and achieve prosperity for all by 2030.

& Davies, 2000). Undoubtedly, Sub-Saharan African countries like Uganda largely depend on water from groundwater infrastructure for most of the water needs. About 61% of the drinking water in Uganda, for example, is from groundwater infrastructure such as boreholes, protected springs and shallow wells (Nsubuga *et al.*, 2014). Morris et al (2003) note that groundwater has not been well managed. As such, its critical role in development is unkempt. Indeed, the United Nations reveals that 1.8 billion people globally use drinking water sources that are contaminated increasing their susceptibility to diseases such as cholera, typhoid, dysentery and polio (UN-Water, 2017). Essentially, the acute role of groundwater in development requires implementation of management practices that can ensure proper infrastructure management and functional sustainability (Conti *et al*., 2016). In Uganda, Community Water Management (CWM) was adopted to ensure sustainable management of public groundwater facilities in rural areas (Mugumya, 2013; MWE, 2011; Sloots, 2010). Supported by the water sector policy and institutional frameworks, CWM presumes ownership, operation and maintenance of water facilities by water users through water user committees (WUCs) (Mugumya, 2013; MWE, 2012 & 2011; Sloots, 2010; Harvey & Reed, 2007). The purpose of this study is to examine CWM, and analyse the participation of WUCs in public groundwater infrastructure management in relation to functional sustainability in Namayingo Town Council.

1.2. Problem statement

Management of public groundwater infrastructure in the rural areas of Uganda is based on the CWM model (MWE, 2015; 2014 & 2011). As a prerequisite, communities formulate an eight-year operation and maintenance plan to qualify for a public water infrastructure (MWE, 2011). However, although this is the ideal, there are practically few communities with operation and maintenance plans, and even those that have them, they are improperly implemented (MWE, 2011). Moreover, academic critique has emerged arguing that CWM does not lead to functional sustainability of groundwater infrastructure (Van Den Broek & Brown, 2015; Day, 2009). Access to safe drinking water has increased to over 65% in the rural areas of Uganda (MWE, 2016; UBOS, 2014a). Paradoxically, this access rate encompasses partially functional and non-functional water infrastructure (MWE, 2015). As such, relative studies have regarded the increasing access to safe water alongside increasing non-functionality of water infrastructure a contradiction (Moriarty *et al*., 2013). Like in other African countries (Alexander *et al.*, 2015), non-functionality of groundwater facilities in Uganda remains an endemic problem in rural water systems (MWE, 2011), despite a national functionality increase of 86% (MWE, 2016;

SNV, 2016a). Yet, still the national functionality has registered fluctuations over the years (MWE, 2016; UNASNET, 2016). For example, functionality of groundwater infrastructure reduced from 88% registered in 2015 to 86% in 2016 (MWE, 2016). Certainly, non-functionality of public groundwater infrastructure affects sustainable water availability and quality (MWE, 2011). It undoubtedly encumbers the country's efforts towards Goal 6: *"Ensure availability and sustainable management of water and sanitation for all"* of the *2030 Agenda for Sustainable Development* (UN-Water, 2016, p.8; UN, 2015).

The CWM model has widely been accepted (Bakalian & Wakeman, 2009). However, there is limited knowledge on the factors for either failure or, success of functional sustainability of water infrastructure (Dube, 2012). The Ministry of Water and Environment of Uganda attributes non-functionality majorly to technical breakdowns of water facilities, and continues to offer technical solutions (MWE, 2015). Technical solutions are profoundly significant and indispensable (Peter & Nkambule, 2012). However, it is important to analyse the social and community, maintenance, and water sector policy and institutional frameworks (Van Den Broek and Brown, 2015; Spaling *et al*., 2014; Juwana *et al.*, 2012; Marcus & Onjala, 2008; Mays, 2006; Brikké & Bredero, 2003) that impact on the participation of WUCs and functional sustainability. Analysis of the participation of WUCs and how this participation enhances functional sustainability is missing. It is against this backdrop that this study examines the CWM model, and analyses the participation of WUCs in relation to functional sustainability of public groundwater infrastructure management in Namayingo Town Council.

1.3. Study objectives

The overall objective is to examine community water management, and analyse the participation of water user committees in public groundwater infrastructure management in relation to functional sustainability of pubic groundwater facilities in Namayingo Town Council.

1.3.1. Specific objectives

- To examine the appropriateness of water sector policy and institutional frameworks in supporting the participation of water user committees in public groundwater infrastructure management in Namayingo Town Council.
- To assess the role and organizational capacity of water user committees in public groundwater infrastructure management in Namayingo Town Council.

- To examine the hindrances to participation and functional sustainability of public groundwater infrastructure from the water user committees' perspective.
- To assess how the water sector policy and institutional frameworks enhance functional sustainability of public groundwater infrastructure in Namayingo Town Council.

1.4. Research Questions

1. How do water sector policy and institutional frameworks support the participation of water user committees in public groundwater infrastructure management Namayingo Town Council?
2. What is the role and organizational capacity of water user committees in public groundwater infrastructure management in Namayingo Town Council?
3. What do water user committees in Namayingo Town Council perceive as the hindrances to their participation and functional sustainability of public groundwater infrastructure?
4. How do water sector policy and institutional frameworks enhance functional sustainability of public groundwater infrastructure in Namayingo Town Council?

1.5. Overview of area of study

The study was conducted in Namayingo Town Council, Namayingo District. Namayingo District is located at the shores of Lake Victoria, Eastern Uganda. It is a recent District curved out of Bugiri District in 2010. The Town Council is located along the Musita- Lumino highway, about 188 kilometres by road from Kampala. Equally, it is about 43 kilometres by road, south of Bugiri Town (Ministry of Lands, Housing and Urban Development (MLHUD), 2013). The Town Council houses the administrative headquarters of Namayingo District, with about 66% and 10% of the population depending on subsistence farming and remittances respectively (UBOS, 2014b). The rest of the population is engaged in fishing and illegal gold mining outside the Town Council. The 2014 National Population and Housing Census revealed that Namayingo Town Council had about 15,740 people (UBOS, 2014b, p.311). However, the Directorate of Water Development (DWD) reveals that the Town Council had a population of about 16,677 as of May, 2017 (DWD, 2017).

In terms of water coverage, 62% of the Town Council population has access to safe water (DWD, 2017). The Town Council has 16 boreholes and 14 shallow wells. But, only 14 boreholes and 6 shallow wells are functional (DWD, 2017). Also, of the 9 rainwater tanks that

are communally managed, only one is functional. The National Water Atlas indicates that Namayingo Town Council has 8 protected springs, and they are functional (DWD, 2017). However, two protected springs were found non-functional. Yet, even the one working was partially functional given the low water yield that was observed. But this is further elaborated in Chapter six on empirical findings and analysis. In a nutshell, functionality of public groundwater facilities in Namayingo Town Council is tied at 62% (DWD, 2017). Besides, community water management of groundwater facilities in the Town Council is rated at 80%, standing out to be the major management option (DWD, 2017).

1.6 Thesis Methodology in Brief

I employed a qualitative research strategy because I was interested in qualitative data explained in words, opinions and experiences as opposed to numbers. I chose a case study research design, and employed qualitative data collection methods such as semi-structured interviews, focus groups, document review, and participant observation. Purposive sampling and convenience sampling techniques informed the sampling frame for both villages and participants. The study lasted for nine months (October, 2016- May, 2017). However, pre-testing of instruments and actual empirical data collection took two months (January-March, 2017) in Namayingo Town Council, Namayingo District. Collected data was transcribed, processed and organized in themes to allow partner matching. Thereafter, data was presented, discussed and analysed in line with the research objectives and theoretical and conceptual frameworks that were adopted for this study.

1.7 Thesis Outline

This thesis is sectioned into seven chapters informed by the University of Agder thesis writing guide and the guidance of my supervisor as briefed below.

Chapter one presents the background of the study with an introduction, problem statement, overall objective, specific objectives, area of study overview and the methodology brief.

Chapter two defines key concepts and terminologies used in the study, and contains a review of related literature, analysing studies and reports on CWM, functional sustainability of groundwater infrastructure, and examines groundwater infrastructure in Uganda.

Chapter three presents the theoretical and conceptual frameworks. Specifically, it analyses social capital and participation, and bestows a conceptual framework connecting the theoretical

framework and the research specific objectives. The conceptual framework recapitulates the main aspects in social capital and participation, water sector policy and institutional frameworks and the roles of WUCs, and how they jointly contribute to functional sustainability of groundwater facilities.

Chapter four explains the research design and methodology that I adopted for this study. It explains the different qualitative methods employed in the thesis. Importantly, it justifies choice of the thesis methodology: the research strategy, design, data collection methods, sampling, ethical considerations and limitations to the study.

Chapter five analyses the contextual landscape of groundwater infrastructure management in Uganda. Particularly, this chapter analyses the water sector policy and institutional frameworks and how they support participation of WUCs and enhance functional sustainability. Further, it analyses the roles and organizational capacity of WUCs, hindrances WUCs face, how the water sector policy and institutional frameworks enhance functional sustainability, and the study area.

Chapter six presents the empirical findings and analysis in relation to the research objectives and theoretical and conceptual frameworks developed for this study.

Chapter seven presents the conclusions drawn from the empirical findings and analysis, and provides recommendations. It answers the research questions formulated in this chapter, and provides the rationality for functional sustainability not only in Uganda, but in Sub-Saharan Africa.

Chapter Two: Literature Review

2. Introduction

In this chapter, I define the key concepts used in this study and, review literature related to CWM and functional sustainability in Sub Saharan Africa, and groundwater infrastructure in Uganda.

2.1. Key concepts and definitions

Under this section, I explain the key concepts used in this study for clarity. These include among others; operation and maintenance and WUCs.

Operation and Maintenance (O&M)

Operation refers to the daily running and handling of groundwater infrastructure (MWE, 2011). While, maintenance refers to all activities conducted to sustain a water source and ensure its proper working condition (MWE, 2011). It involves preventive maintenance- regular inspection of the infrastructure to foresee and reduce breakdowns. It equally encompasses corrective maintenance which takes care of minor repairs and replacement of broken parts to ensure functional sustainability of groundwater infrastructure.

Water user committees (WUCs).

The study adopted a working definition of WUCs as groups of people voted by the community to collect and manage water user fees, handle materials (spare parts), and provide labour and time to ensure the operation and maintenance of groundwater facilities[2]. WUCs members are elected by community water users to oversee the management of groundwater infrastructure on behalf of the community. Under the CWM model, WUCs are the drivers of the Demand Responsive Approach (DRA) (Mugumya, 2013). Principally, communities show interests for water by applying through their local council leaders to either the Town Council or Sub-County (Ministry of Water, Land and Environment (MWLE), 1999). The National Water Statute[3], 1995 and National Water Policy, 1999 provide for the formation and composition of WUCs: chairperson, treasurer, secretary, publicity, caretaker and the village local leader (MWLE, 1999; GOU, 1995). For CMW to achieve functional sustainability of groundwater facilities,

[2] Groundwater facilities include boreholes, protected springs and shallow wells (MWE, 2016 & 2015).
[3] A statute that addresses the ownership, control and use of water resources in Uganda that was enacted in 1995 by government of the Republic of Uganda.

participation of WUCs is pertinent. Therefore, given the ever-increasing non-functionality in Sub-Saharan Africa, and Uganda, it is inexorable to analyse the participation of WUCs in the management of public groundwater infrastructure. Although this is analysed under the subsequent section 2.2.1, I momentarily point out that the act of forming WUCs implies community management, not community participation (Harvey & Reed, 2007) as the former is underscored at the post-construction phase of the water project. Yet, the later demands for surrendering the decision-making authority to communities to decide not only the technology type, but also, the choice of the most appropriate management system including the decision not to manage the water infrastructure by themselves (Harvey & Reed, 2007). Such decisions press for active community participation which cannot be achieved through the formed WUCs. Essentially, management through WUCs reduces the participation of community members in groundwater facilities. Arguably, communities participate by proxy through WUCs.

2.2. Community Water Management

Community Water Management is a 'bottom-up' management model facilitated by the government to ensure that WUCs take a central role in the development, ownership and management of water infrastructure (Harvey & Reed, 2004). According to Harvey and Reed (2004, p.41), the Local Government is pivotal in the CWM model. It acts as an 'enabler' to facilitate, regulate, support, conduct capacity building, and monitor other actors involved in rural water systems (Mugumya, 2013). Besides, the government through policy and institutional frameworks can either enhance or adversely impact on functional sustainability of water facilities (Harvey & Reed, 2004). Although the water sector policy and institutional frameworks are elucidated in Chapter five, it is prudent to emphasize here that the roles and responsibilities of the key actors such as WUCs, private sector, NGOs and Local Government are defined by the policy and institutional frameworks (Harvey & Reed, 2004). Importantly, policies and institutional frameworks shape the foundation of the Demand Responsive Approach (DRA) and institutional support (Van Den Broek & Brow, 2015; Harvey & Reed, 2004). As such, some authors view water sector policy and institutional frameworks as being critical to the "building blocks" of functional sustainability of water facilities (Montgomery *et al*., 2009; Harvey & Reed, 2004).

Extension of the CWM model to water resources management dates way back in the 1980s, and the International Drinking Water and Sanitation Decade (1981–1990)[4] (Van Den Broek & Brown, 2015; Hope, 2015; Marks *et al.*, 2014; Moriarty *et al*., 2013; Komives *et al*., 2008). It emerged as both a management model and an answer to the government top-down service delivery. The International Drinking Water and Sanitation Decade incepted the paradigm shift from the supply-driven approach to the demand-driven approach as the former was associated with early non-functionality of water infrastructure (Bakalian & Wakeman, 2009; Komives *et al*., 2008). The model has since emerged as a predominant water management option in the rural Sub-Saharan Africa (Hope 2015; Harvey & Reed, 2007). It became widely accepted by the 1990s (Van Den Broek & Brown, 2015) as the preferred water management model to enhance sustainability of public groundwater facilities in rural areas (Moriarty *et al*., 2013). At this point, it was recognised that there was profound need to involve communities in technology choice and institutional governance, involve women in the management, and require communities to cater for the O&M of groundwater facilities (Bakalian & Wakeman, 2009). However, this cannot be automatically achieved. It arguably calls for juxtaposition of community management and community participation in rural water projects.

The CWM model presumes that an external agency develops the water infrastructure (Mugumya, 2013; Bakalian &Wakeman, 2009; MWLE, 1999), and water users through WUCs take over the ownership and O&M of groundwater infrastructure (Moriarty *et al*., 2013; Harvey & Reed, 2007). However, although the system has received a 'soft landing' in the Sub-Saharan region, critical studies reveal that it has failed to answers the sustainability question that continue to engulf rural water projects (Van Den Broek & Brown, 2015; Hope, 2015; Foster, 2013; Montgomery *et al*., 2009; Harvey & Reed, 2007). In fact, critical studies such as Blaiki (2006), Page (2003), Cleaver (1999) and Mamdani (1996) of the "*Common Pool Resources Management in Africa*" have regarded it as a "myth" (Hope, 2015). To Moriarty et al (2013, p.329), CWM has not failed on principle, but its foundation on volunteerism and informality has been detrimental. In a nutshell, CWM cannot match the ever-increasing water demands and expectations of rural water users (Moriarty *et al*., 2013). Although Moriarty et al (2013) provide fascinating findings about CWM, they are quiet on the participation of WUCs, and especially

[4] The international Drinking and Sanitation Decade (1981-1990) saw the concerted global effort to increase access to rural water and sanitation, and this birthed the community water management model (Moriarty *et al*., 2013).

how participation can be enhanced to achieve functionality of water sources. Besides, the model demands for appropriate institutional support to WUCs (Lockwood, 2003), but as Komives et al (2008) comment, it does not clearly define the support required by WUCs.

2.2.1. Community management or community participation?

Certainly, the two concepts are different, but invariably used interchangeably in the discourse of the CWM model. Harvey and Reed (2007) make the dichotomy of the two concepts, not only to depict their difference, but also, to reveal the critical need to draw the difference in line with functional sustainability. To begin with, Harvey and Reed (2007) reveal that while community participation is a prerequisite for sustainability of rural water systems, community management is not. Essentially, community participation from the water project onset embraces partly what is referred to as management, and it is critical to water infrastructural sustainability (Spaling *et al*., 2014; Kamruzzaman *et al*. 2013; Dube, 2012; Marcus & Onjaja 2008; Harvey & Reed, 2007; Mays, 2006). In fact, Carter, Tyrrel, and Howsam (1999, p.295) agree that sustainability in rural water projects cannot be achieved without community participation. Indeed, community participation and involvement in decision making are critical to the success of the CWM model (MWE, 2011; Harvey & Reed, 2007 & 2004).

Specifically, community participation involves sensitization and mobilization of communities to be part of planning and implementation of water projects (Harvey & Reed, 2004). It is, however, noted that community participation builds the foundation for community ownership of water facilities (Harvey & Reed, 2007), but it does not guarantee community's willingness and ability to ensure operation and maintenance of their water sources. Harvey and Reed (2007) look at community participation as an empowering process as reflected in their definition of community participation. They define the concept as a "*consultative empowering process designed to establish communities as effective decision-making entities* (Harvey & Reed, 2007, p.367). It is, however, noted that community participation is an inclusive process. As Harvey and Reed (2007, p.367) point out, it is either externally or internally generated within the community, with information sharing to inform decision making. Through community participation, community members deliberate on water issues through dialogue. This is pertinent for functional sustainability of groundwater infrastructure (Harvey & Reed, 2007).

However, it is similarly paramount to point out that community participation is not a panacea for the sustainability of groundwater infrastructure. Barnes, Roser and Brown (2011, p.179)

argue that participatory approaches do not automatically translate into sustainability since community decisions are dependent on how communities perceive issues. To this effect, Carter, Tyrrel, and Howsam (1999, p.294) explicitly stress that it is the inclusion of all stakeholders at all levels of the water project that matters. This empowers water users and cuts operational costs and consequently produces sustainability. In contrast, with community management, the community is at the centre of development programmes by taking control over the management and O&M roles and responsibilities (Harvey & Reed, 2007). Thus, community management is premised on WUCs (Harvey & Reed, 2007). WUCs manage water facilities on behalf of the community. Besides forming WUCs, community management involves training and capacity building of WUCs, collecting water user fees, and management and implementation of O&M by the WUCs. The dichotomy between community participation and community management is illustrated as depicted in figure 1 below.

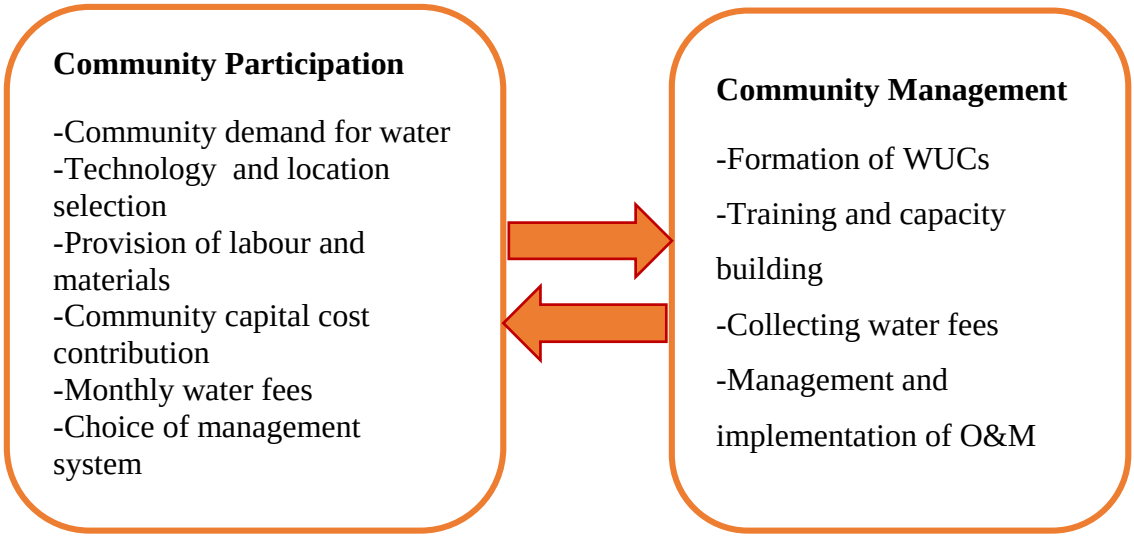

Figure 1: Community participation and Community Management dichotomy (Harvey & Reed, 2007, p.369).

2.2.2. The Community Water Management model in Uganda

Like other Sub-Saharan African countries (Van Den Broek & Brown, 2015; Day, 2009; Montgomery *et al*., 2009; Harvey & Reed, 2004), CWM is the pronounced water management model in the rural areas of Uganda (MWE, 2015; 2014 & 2011). MWE (2011, p.8) points out that the CMW model has varied benefits such as sustainability, community empowerment and less O&M cost. Therefore, CWM was adopted to address the maintenance of groundwater facilities, and encourage women and community participation in groundwater infrastructure management (MWE, 2016). It therefore, labours to ensure functionality of water facilities,

rather than the water resources. As earlier observed in Chapter one, the model is presumed to provide a lasting solution to the sustainability question in the water and sanitation sector (MWE, 2016). It is specifically thought to be the best option to operation and maintenance of rural water facilities (MWE, 2011 & 2004). But, has sustainability been achieved in rural water systems given the endemic non-functionality of groundwater facilities in rural areas such as Namayingo Town Council? By and large, with the skyrocketing non-functionality of rural water systems, the promises of CWM advanced by MWE are more of rhetoric than a reality.

2.3. Functional sustainability

The study adopts the definition of functionality by the MWE and the Uganda NGOs network in the water sector. They define functionality as the percentage of public water facilities working at the time of "spot check" (UWASNET, 2016; MWE, 2016; 2015 & 2006). It is the indicator for monitoring water services in Uganda (MWE, 2006). However, this does not capture functional sustainability as it incorporates partially functional water infrastructure that are found at least working at the time of spot check. Conversely, the 1992 Agenda 21 bestows the definition of sustainability. It defines sustainability as *''…the integration of environmental and development concerns for the fulfilment of basic needs and improved living standards for all*'' (UN, 1993, cited in Montgomery *et al*., 2009, p.1018). However, in the water supply sector, studies reveal multifarious interpretations of sustainability. Harvey and Reed provide an all-encompassing understanding of sustainability. They explain;

> A water service is sustainable if the water sources are not over-exploited but naturally replenished, facilities are maintained in a condition which ensures a reliable and adequate water supply, the benefits of the supply continue to be realized by all users indefinitely, and the service delivery process demonstrates a cost-effective use of resources that can be replicated (Harvey & Reed, 2004, p.7 & 2003, p.115).

Notably, there are few water facilities in the Sub Saharan Africa which suit the above criteria given the ever-increasing non-functionality rates. On the other hand, it is equally challenging to advance a universal definition of functional sustainability. Arguably, this can be associated with the fact that the concept is neoteric although indispensable in rural water projects with far reaching impacts. Montgomery et al (2009, p.1017) reveal that it has been challenging since the 1992 Agenda 21 to measure and integrate sustainability in water projects. As such,

functional sustainability is a recent integration, and the concept is still hazy with limited evidence in rural water supplies (Montgomery *et al*., 2009).

In Sub-Saharan Africa, functional sustainability is still an ideal goal rather than a reality given the skyrocketing non-functionality of improved water infrastructure (Alexander *et al.,* 2015; Van Den Broek & Brown, 2015; Montgomery *et al*., 2009). Arguably, the ever-increasing non-functionality reveals scanty O&M, and absence of sustainable water services to water users (Montgomery *et al*., 2009). Indeed, proper and sustainable O&M are critical to functional sustainability (UWASNET, 2016; Van Den Broek & Brown, 2015). It is, for example, estimated that about 80% of the improved sources in Sub-Saharan Africa are non-functional (Alexander *et al.,* 2015; Marks *et al.,* 2014). Particularly, a survey of 11 countries within Sub-Saharan Africa revealed non-functionality results of about 80%, and petrifying in individual countries (Montgomery *et al*., 2009; Sutton, 2004). Furthermore, a study by the World Bank and UNDP on the functionality of improved water facilities in 16 Sub-Saharan African countries concluded that O&M are pertinent in improving functional sustainability (Montgomery *et al*., 2009). In South Africa, about 70% of the boreholes surveyed were non-functional. In Tanzania, of the 7,000 wells and boreholes sampled, only 45% were functional (Montgomery *et al*., 2009). The situation is similar, and has remained endemic and overly fluctuating in Uganda (UNASNET, 2016, MWE, 2016). For example, the 2011 study on the effectiveness of CWM in Uganda by MWE revealed petrifying results. It found out that 24.3% of the sampled improved water sources were partially functional, 4.6% were only functional during rainy season and 18% were completely down (MWE, 2011).

Sustainability in rural water systems is premised on several factors. These among others include; sector policy and institutional frameworks, financial and economic climate, social and community factors, technology and natural environment, spare parts supply, and maintenance and monitoring (Van Den Broek & Brown, 2015; MWE, 2011; Montgomery *et al*., 2009; Harvey & Reed, 2004). Importantly, these factors do not operate in isolation, but as 'building blocks' to address the sustainability question as critically argued by Montgomery et al (2009) and Harvey and Reed (2004). Equally, Carter Tyrrel, and Howsam (1999, p.294) coin what they refer to as the 'sustainability chain'. Central to the 'sustainability chain' is the inherent synergy embedded within the four factors where failure of one adversely impacts on sustainability (Carter *et al.,* 1999). These include: motivation, maintenance, cost recovery and

continuing support (Carter *et al.*, 1999). Consequently, this study adopts the definition of functional sustainability as:

> A continuation in water supply services over a long period of time after the initial investment, or the ability of the water source to continuously yield adequate clean and safe water for the users at any particular time (Lockwood & Smits, 2011; Bakalian & Wakeman, 2009, pp.8-9; Carter and Rwamwanja, 2006 cited in Mugumya, 2013, p.11; Brikké, F. & Bredero, 2003, p.3).

In understanding functional sustainability of rural water projects, it is pertinent to coin the measures of sustainability. Indeed, Harvey and Reed (2004) point out four factors to analyse sustainability, and these are profoundly important to this study. These include; effectiveness which measures whether the objectives for establishing the water facility have been met or not. This is an encompassing measurement of sustainability as it looks at the functionality of the water facilities, the quantity and quality of water, and to whether people's health and income have been improved (Harvey & Reed, 2004). Similarly, equity considers whether all community members have access to water services, including the disadvantaged and poor people. Importantly, Harvey and Reed (2004, p.10) argue that under equity, affordability, accessibility, gender and vulnerability issues are pertinent to ensure equity of water services. Also, efficiency is another indispensable measure of sustainability. To Harvey and Reed (2004, p.9), efficiency looks at "*the output produced per unit of resources*". This is viewed in terms of how human efforts and funds are efficiently used for the water infrastructure to successfully operate (Harvey & Reed, 2004). Lastly, replicability is important in measuring sustainability. Harvey and Reed (2004, p.10) comment that replicability is essential in developing new water infrastructure to improve sustainable access to safe and clean drinking water. It encompasses the technical, environmental, financial and institutional aspects which ought to be flexible to ensure replicability (Harvey & Reed, 2004).

2.4. Groundwater infrastructure in Uganda

Groundwater significantly differs from surface water given its unique physical and chemical forms in which it occurs (Tuinhof *et al*., 2006). However, groundwater and surface water are both part of the same hydrological cycle. Groundwater lies under the aquifers, moving from recharge points to discharge points. Like the rest of the Sub-Saharan Africa (Hope, 2015; Mileham *et al*., 2009; Harvey & Reed, 2004; MacDonald & Davies, 2000), groundwater is the

main source of drinking water to the rural population of Uganda (UBOS, 2014a; Nsubuga *et al.,* 2014). However, although development of groundwater dates way back 1930s, (Nsubuga *et al.,* 2014), the National Framework for Groundwater Source Protection was developed in 2013. This inherently presents a weakness in groundwater infrastructure management in the country. The management guide is neoteric. Therefore, what has been guiding the protection of groundwater facilities until 2013? Notwithstanding, groundwater in Uganda is tapped through different infrastructure and technologies. That is; boreholes, shallow wells and protected springs (Nsubuga *et al.,* 2014) as discussed below.

Boreholes and shallow wells

In Uganda, nearly 1,500 boreholes are constructed yearly to serve rural areas, rural growth centres, emergency water supply projects, individual domestic water supplies, industrial water supplies, and small town water supply projects (Sloots, 2010). As noted in Chapter five, such boreholes are constructed by Central Government, Local Government, private sector and NGOs and CBOs. In the Ugandan context, boreholes are deeper than thirty meters and draw water from deeper aquifers (Nsubuga *et al.,* 2014; MWE, 2013). The National Framework for Water Source Protection, 2013 points out that the water yield of boreholes depends on the geology of the area (MWE, 2013, p.13). Therefore, the deeper the borehole, the more the water yields as it taps into productive water aquifers (MWE, 2013). However, non-functionality of boreholes due to water quantity issues (MWE, 2015 & 2011) is high which points to how and where boreholes are constructed in relation to the national standards. But, do WUCs understand the water development and construction standards? Are WUCs given the appropriate information on how water facilities are constructed and the recommended depth? I argue that given the CWM model that emphasizes formation of WUCs (Van Den Broek & Brown, 2015; Harvey & Reed, 2007), it is arduous for communities to receive the appropriate information required to inform decision making at the initial stages of water projects. But, communities can only make technological and management decisions if they are given appropriate information. This requires emphasizing community participation (Harvey & Reed, 2007).

Similarly, shallow wells are not much different from boreholes as the technology set up is the same. However, boreholes are deeper than shallow wells which are less than thirty meters deep. Nsubuga et al (2014, p.1306) posit that shallow wells are more reliable than boreholes, but they easily get contaminated by external pollutants. Importantly, protection of boreholes and

shallow wells is pertinent to reduce on threats such as pollution from the environs entering through cracks that leads to their non-functionality (MWE, 2013). MWE recommends for the protection of shallow wells and boreholes as depicted in figure 2 below to ensure proper use and circumvent encroachment by livestock (MWE, 2013).

Figure 2: Protected borehole/shallow well (MWE, 2013, p.18).

Protected springs

Unlike shallow wells and boreholes, protected springs are situated at points where the flow of unconditioned water remains uninterrupted at the point where water is released to the surface (Nsubuga *et al.,* 2014). Protected springs have the potential to provide clean and safe water (MWE, 2013), but they are susceptible to contamination if not well managed. Pollution from the facility's environs and agricultural pollutants contaminate protected springs water at water collection points (MWE, 2013). As such, MWE recommends for protection of springs with fences at the water collection point constructed about one hundred meters from the water head as depicted in the figure 3 below.

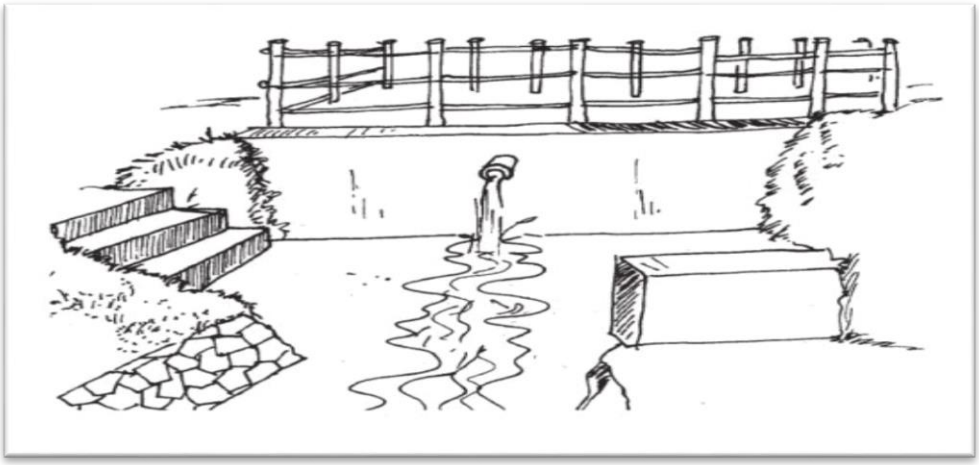

Figure 3: Protected spring (MWE, 2013, p.21)

Chapter Three: Theoretical and Conceptual frameworks

3. Introduction

In this chapter, I present the theoretical foundations and conceptual framework that ostensibly shape the water sector policy and institutional frameworks and the participation of WUCs in groundwater infrastructure management for functional sustainability. Particularly, I present the theoretical framework on social capital and participation, and their relation to groundwater infrastructure management. The chapter encapsulates the theoretical framework and the research objectives with a conceptual framework at the end.

3.1. Theoretical framework

The social capital theory provided the theoretical framework for analysing the participation of WUCs in groundwater infrastructure management in Namayingo Town Council. Like the concept of participation, social capital has received considerable acceptance among development practitioners (Grootaert, 2001; Pretty & Ward, 2001). However, its conceptualization is equally inadequate, or even lacking (Krishna & Uphoff, 2002). Nonetheless, studies emphasize shared knowledge, rules, trust, bonds, norms of reciprocity, social networks, interconnectedness and expectations that enhance collective action in communities and institutions (Øyhus, 2016; Bouma *et al.*, 2008; Pike *et al.*, 2006; Putman, 2001; Grootaert, 2001; Pretty & Ward, 2001; Ostrom, 2000). Central to social capital is the consensus that social bonds and social norms are critical to sustainable livelihoods as they lessen the cost of working together through cooperation (Pretty & Ward, 2001). Certainly, as argued by Pretty and Ward (2001, p.211), people feel secured and willing to invest in collective activities because they are confidence that even others will invest in such activities.

Uphoff and Wijayaratna (2000, p.1876) categorize social capital into structural and cognitive. Structural social capital encompasses the roles, rules, precedents, procedures and networks that result in collaborative actions. (Krishna & Uphoff, 2002; Uphoff, 2000; Uphoff & Wijayaratna, 2000). The rules, roles and procedures coined under structural social capital are similar to the bylaws and the roles of WUCs. In contrast, cognitive social capital consists of shared norms, values, attitudes and beliefs that influence mutual collective action (Krishna and Uphoff, 2002; Uphoff, 2000). Both categories influence interactions, coordination, and collaboration among community members (Grootaert, 2001). And, importantly, as stressed by Pretty and Ward (2001, p.209) and Van Den Broek and Brown (2015, p.52), participation in collective actions

increases with social capital. Although these studies highlighted here present fascinating analyses of social capital, only a few such as Krishna and Uphoff (2002), Uphoff (2000), Uphoff & Wijayaratna (2000), Pretty and Ward (2001), and Ostrom (2000) have discussed social capital in relation to water resources management. Therefore, social capital by Øyhus (2016), Bouma et al (2008), Pike et al (2006) and Putman (2001) was not followed since it did not directly link with the objectives of this study. Nonetheless, their informative and critical analyses were eminent in informing the general analysis of social capital in this study since the concepts were similar.

How social capital influences groundwater infrastructure management

There is growing consensus that social capital in form of trust, bonds, norms of reciprocity and social networks impacts on water management and sustainability (Van Koppen and Kuriakose, 2016; Kobayashi *et al*., 2014; Pretty & Smith, 2004; Pretty, 2003; Pretty & Ward, 2001; Uphoff & Wijayaratna, 2000). It is increasingly becoming certain that social institutions and networks provide a fundamental comprehensive informal framework through which communities can share information, coordinate varied activities and implement collective actions (Grootaert, 2001; Pretty & Ward, 2001). People learn to solve community water related problems by devising local solutions premised on human network, local connection and shared knowledge (Kobayashi *et al*., 2014; Pretty & Ward, 2001; Ostrom, 2000).

According to Kobayashi, Syabri and Ari (2014; p.3), social capital is the foundation of CWM. Particularly, Pretty and Smith (2004, p.633) point out that the CWM model is one of the collective management options based on trust, reciprocity, norms, sanctions, common rules and connectedness within groups. Similarly, Van Koppen and Kuriakose (2016) agree that sustainability of rural water management depends on social capital. It lessens the cost of collective action, sharing information, facilitates cooperation, and increases people's confidence to participate in collective activities to solve water management problems (Bakalian & Wakeman, 2009; Pretty & Smith, 2004; Uphoff & Wijayaratna, 2000). Indeed, Pretty (2003, p.1912) concurs that social norms are key to sustainable management of common resources such as water. He argues that people are willing to participate in collective activities where social activity exists (Pretty, 2003, p.1912). Specifically, Ostrom (2000, p.177) argues that the norms of reciprocity enhance symmetrical relationships among the members involved in long term reciprocal relationships. Like Pretty and Ward (2001, p.211), Ostrom argues that when

members learn to trust each other and make commitments, they create impact unlike in the absence of social capital (Ostrom, 2000, p.177). In other words, the norm of reciprocity creates an environment where each member is responsible for each other's welfare while expecting the others to do the same (Pretty & Ward, 2001; Ostrom, 2000). Ostrom Elinor makes an interesting analysis of social capital in relation to the costs of management and problem solving. She argues that people devise ways when faced with opportunities or problems, and the decision taken to handle such a problem sets the precedent for handling activities, costs and benefits in future (Ostrom, 2000, p.177).

Equally, Uphoff and Wijayaratna's (2000) study on the "*Demonstrated benefits from social capital"* revealed that social capital is critical if water users are to mobilize resources, execute their roles and address challenges (Uphoff & Wijayaratna, 2000, p.1878). In relation with Ostrom's (2000, p.178) 'rule systems', it is noted that groundwater infrastructure management is based on bylaws (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995), which are a form of social capital that help members to offset social and collective action problems. Pretty and Ward (2001, p.211) concur that common rules and norms help to place group interests above individual interest. Importantly, Ostrom emphasize the need for local institutions to direct the formulation of rules to guide allocation of benefits and responsibility of paying associated costs (Ostrom, 2000, p.178). Pretty and Ward (2001, pp.209-210) coin the acute importance of the role of the government to supplement social capital in the management of natural resources.

However, social capital is not a panacea to water management problems. Social capital can be detrimental as it eliminates the participation of some community members (Ostrom, 2000; Portes, 1998, cited in Øyhus, 2016). Following the works of Portes (1998), Granovetter (1973) and Sen (2001), Øyhus (2016, p.2) argues that *"Social networks can restrict access to opportunities; they can restrict individual freedom*". In particular, it marginalizes women in the management process of common resources (Van Koppen & Kuriakose, 2016). To Ostrom (2000), a majority rule taken as a rule to guide collective choice decisions opens non-existing opportunities, but eliminates others. She further argues that voting, for example, is not by nature, it is a rule which provides opportunities for some, but eliminates others (Ostrom, 2000, p.176). Notwithstanding, I, however, argue that the benefits of social capital in rural water management can superimpose its challenges. Certainly, social capital has, for example, been instrumental in managing groundwater in the Saurashtra region of Gujarat, India (Van Koppen

and Kuriakose, 2016), irrigation water in Sri Lanka (Uphoff & Wijayaratna, 2000) and in Australia (Pretty, 2003).

3.2. Participation in community development programmes

Participation is an ambiguous concept. Development practitioners and commentators define it differently. It therefore, becomes challenging to advance a universal definition for participation (Oakley, 1990). Nonetheless, Oakley and Marsden (1984) advance two alternative interpretations to explain participation which I adopted in this study. First, that participation occurs when communities are 'mobilized' to involve in government development. Second, when participation is from 'below'. With the later, local people are empowered to develop initiatives and collective actions to social problems (Oakley and Marsden, 1984).

Similarly, Oakley (1990) looks at participation as both a *mean*s and *end*. As a means, participation is used to achieve foreordained development goals and objectives choreographed by government officials (Oakley, 1990). Such participation is informed by a top-down approach. Essentially, realization of the results of participation superimposes the 'act' of participation. Consequently, development programmes with participation as a 'means' fail as community participation varnishes. In contrast, as an 'end', participation is interpreted as a long-term process intended to reinforce local people's abilities to involve and perform active roles in development initiatives (Oakley, 1990). However, Sherry Arnstein looks at participation in terms of ladders- the famous Arnstein's (1969) 'ladder of participation' (Norad, 2013; Cornwall, 2008).

How participation is illustrated in groundwater infrastructure management

Globally, participation of stakeholders is envisaged in several policy documents that applaud the critical relevance of the participation of key stakeholders in water resources management (Carr *et al*., 2012; Koppen *et al*., 2008; Harvey & Reed, 2004). This follows a multiplicity of international conventions, statements and declarations that have acknowledged the role of community involvement in natural resources management. These include among others, the World Commission on Environment and Development (1987), Rio Declaration on Environment and Development and Agenda 21, and the Arhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Carr *et al*., 2012). Such conventions have been cardinal in shaping community participation in natural resources management. Essentially, participation is identified as a

prerequisite to enhance improved natural resources management, and ensure that communities freely participate in the management of their resources (Carr *et al*., 2012; Cleaver, 1999).

In relation to water, the 1980s global water reforms voiced by the Dublin Statement on Water and Sustainable Development (1992) and the Agenda 21 highlighted participation as an overarching principle in water resources management (Carr *et al*., 2012; Bakalian & Wakeman, 2009; Koppen *et al*., 2008; UN, 1992). It is presumed that water resources management involves a multitude of stakeholders with varied interests (Carr *et al.,* 2012; Koppen, 2008). As such, participatory approaches are believed converging points to bring the different actors together to make decisions in a transparent and democratic way (Gonzalez-Villarreal & Solanes, 1999). However, this cannot be automatically attained as participation per se presents challenges and limitations. As Cleaver (1999, p.597) emphasizes, participation has been accepted without questioning. It is not my intention to question participation, but I build on the gaps that indeed other studies have highlighted. Fundamentally, it is argued that the rhetoric of participation in water resources management has been calculatingly and judiciously adopted by governments to abdicate their financial and political responsibilities to communities, especially on difficult water management issues (Carr *et al*., 2012; Harvey & Reed, 2007). Further, it is equally viewed as an embodiment of community manipulation (Carr *et al*., 2012). Dube (2012, p.3) agrees that participatory management options such as CWM aim to offload governments in developing nations the financial burden of managing water infrastructure. Critically, radical studies indicate that the CWM model, a participatory model is implemented by either failed or fragile states (Dube, 2012, ICE *et al.*, 2011). This calls for well-choreographed activities to harness the benefits of the participation of WUCs or community involvement in groundwater infrastructure management.

3.3. Conceptual framework

Several cross cutting dimensions associated with the participation of WUCs and functional sustainability of community managed public groundwater infrastructure have been advanced by several studies. Alexander et al (2015, p.978), for example, coin institutional support, social capital, and physical infrastructure aspects as critical to the participation of WUCs and functionality of community managed water sources. Certainly, these factors do not work in isolation, but along with varied components such as capacity building of WUCs, technology choice and functional community water demand. Importantly, such sustainability factors are in

consonance with social capital at the community level (Alexander *et al.,* 2015; Mugumya, 2013). Equally, Management, finance, accountability and maintenance are profoundly paramount in shaping WUCs' participation and functional sustainability (Alexander *et al.,* 2015; Van Den Broek and Brown, 2015; Spaling *et al*., 2014; Mugumya, 2013). Alexander et al (2015, p.978) quickly point out that such factors are dependent on the local environment, social and community dimension for functional sustainability to be achieved. Arguably, local environment, social and community dimension connote an embodiment of social capital at the community level. As Mugumya (2013, p.227) observes, the functionality of Local Government is critical to the functionality of WUCs and HPMs. But also, collaboration between the Local Government water officials and WUCs right from the onset of the water project is vital to build trust, social network and a working relationship which are key to functional sustainability. This results in empowerment of WUCs and builds the basis for future ownership of water sources and community willingness to ensure O&M (Van Den Broek & Brown, 2015; Harvey & Reed, 2007 & 2004). Thus, with effective Local Government water officials and participation of WUCs invigorated and fuelled by social capital, a functional CWM is enhanced hence functional sustainability (Pretty & Ward, 2001). Modifying and building on the works of Alexander et al (2015) and Mugumya (2013), I developed the conceptual framework for my study as depicted in figure 4 below.

In this framework, the water sector policy and institutional frameworks provide for the roles and participation of WUCs at the community level. Similarly, the water sector policy and institutional frameworks enhance a functional CWM and functional sustainability of groundwater facilities. A functional CWM is itemized by community participation in planning (at initial water project stages), regular community meetings, periodic preventive groundwater infrastructure maintenance, collection and payment of monthly water user fees, transparent and proper management of water user fees, well-developed community water bylaws, motivated WUCs, accountable Local Government water officers, easy access and use of water services information, easy contacts between WUCs and HPMs, and close contact between local council leaders and WUCs. The roles and organizational capacity of WUCs enhance a functional CWM. However, the roles are equally influenced by a functional CWM, and premised on social capital. Invariably, a functional CWM is premised on social capital with noticeable aspects of trust, social networks, norms, sanctions, common rules and bylaws and local connections as discussed in section 3.1. Like Alexander et al (2015) and Mugumya (2013), I concur that the

above factors are critical both to the participation of WUCs and functional sustainability of groundwater facilities. This can be indicated by increased functionality of water facilities, increased proper water infrastructure use, increased service efficiency and equity, and increased access to quality safe and clean water.

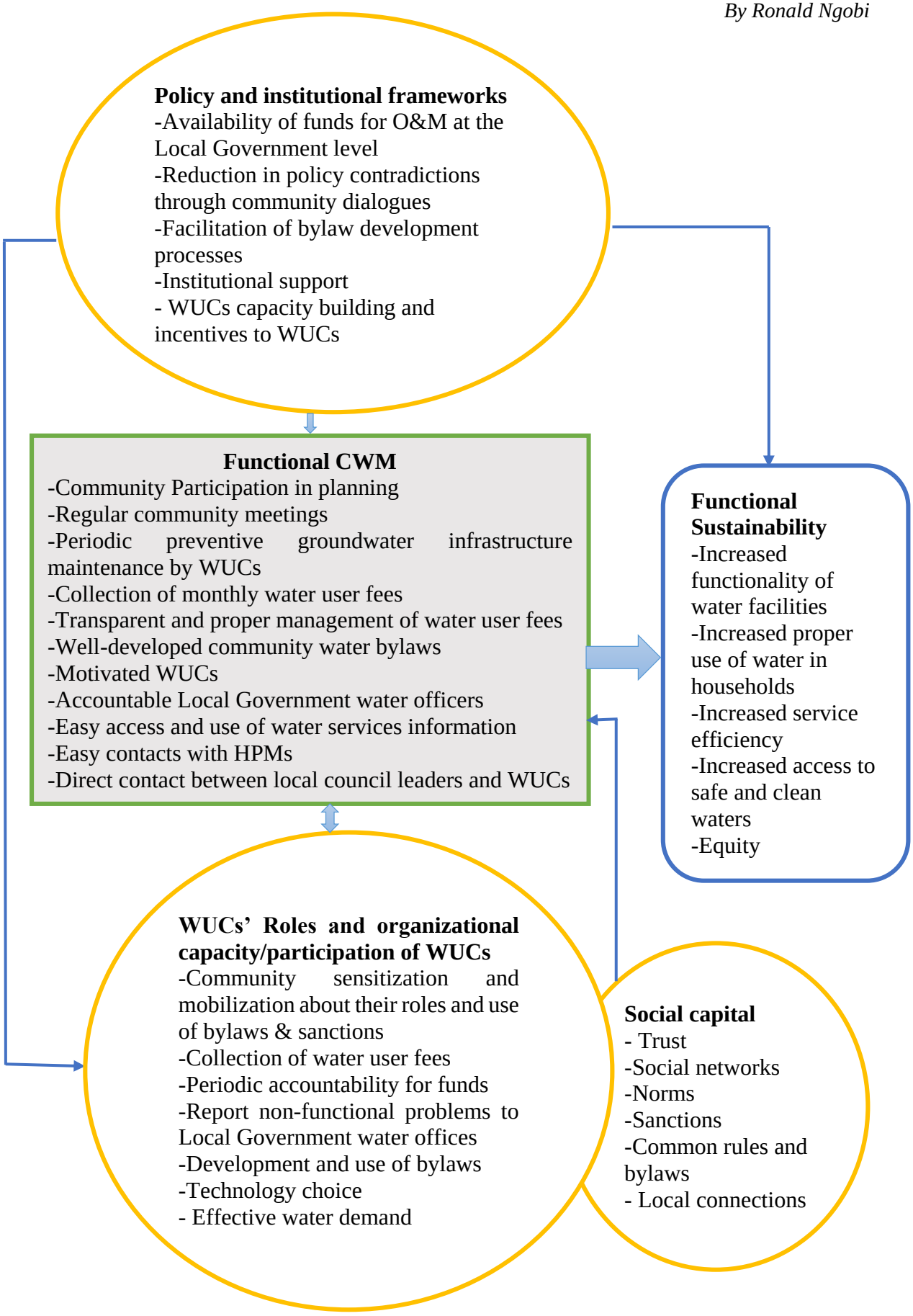

Figure 4: Conceptual Framework: Modified and built on Alexander et al (2015, p.979) and Mugumya (2013, p.228)

Chapter Four: Research Design and Methodology

4. Introduction

In this Chapter, I present the methodology that I adopted for the empirical investigation. Particularly, I present my epistemological and ontological positions, research strategy, research design, data collection methods, sampling, data analysis, ethical considerations and the study challenges and limitations.

4.1. Epistemological and ontological considerations

Epistemology and ontology guide knowledge construction in the social world (Bempah, 2011). Epistemological consideration is preoccupied with "*what is regarded as acceptable knowledge in a discipline*" (Bryman, 2012, p.27). Central to epistemology is whether studies on social problems should be informed by the same principles, procedures and ethos that guide natural sciences (Bryman, 2012). This is complex, but two contrasting considerations: positivism and interpretivism are coined. However, critical to this study is the interpretivist epistemological consideration that I adopted for this study. This was centred on a fundamental position that people and social institutions are far different from atoms and molecules of natural sciences (Bryman, 2012). Specifically, I understood that the participation of WUCs in groundwater infrastructure management could be interpreted by WUCs, Local Government water officers, local council leaders and community water users.

Similarly, I took a constructionist ontological position because as explained by Bryman (2012, p.33), social phenomena and how they are defined (meaning) are constantly accompanied by social actors. Literally, "…*social properties are outcomes of individuals*" (Bryman, 2012, p.380). Therefore, this ontological position was adopted because the participation of WUCs in groundwater infrastructure management has been interpreted as a social fact. Thus, this has provided the meaning that explains the importance of WUCs for functionality of groundwater facilities.

4.2. Research strategy

As Dyveke (2009) comments, choosing a research strategy is premised on varied considerations. To Blanche, Durrheim and Painter (2006), the goal of research is fundamental in selecting the strategy to employ. Similarly, the choice can be premised on the research questions for which the study intends to answer (Marshall, 1996). The research questions help to distinguish qualitative and quantitative research strategies not only based on the type of data

required, but also, the philosophical beliefs that underpin therein (Yin, 1994). Bryman's (2004) perspective on the research strategy is an insightful one. He views a research strategy as a direction for doing research (Bryman, 2004). This study sought for perceptions, knowledge and experiences of WUCs on their participation in groundwater infrastructure management. Their ideas, views and opinions were expressed in words, not quantity. Therefore, a qualitative strategy was employed as qualitative research is concerned with words (Bryman, 2012). The qualitative research strategy helped me to understand the study context to 'dig deep' (Mukisa, 2009; Blanche *et al*, 2006) into the participation of WUCs as revealed by the study participants. However, this does not portend that I did not use quantities in this research study.

4.3. Research study design

A research design refers to the framework for data collection and analysis (Bryman, 2012). It is the connection between research questions, empirical evidence and conclusions drawn after fieldwork (Yin, 1994). In this study, a case study design was adopted with varied qualitative research methods, based on three reasons. First, the design was adopted to conduct an 'in-depth analysis' of CWM and the participation of WUCs in groundwater infrastructure management (Creswell, 2013; Bryman, 2012). Second, participation of WUCs being a contemporary issue, it was possible to empirically investigate it deeply, and in its real life through a case study design (Yin, 2003; Yin, 1994). Third, case studies are adopted for governance-related studies emphasizing the intrinsic value of the research findings as opposed to producing generalizable findings (Stewart, 2012). This study explored CWM, and specifically analysed the participation of WUCs in groundwater infrastructure management. This is a water governance-related issue, which equally informed my choice of the case study research design. But importantly, Yin (1994, p.13) posits that a case study design is an "*all-encompassing method*" as it incorporates varied and specific approaches to data collection that embraces triangulation of data and analysis. Undoubtedly, triangulation was an indispensable aspect in this study as it helped to safeguard validity of the study findings.

Importantly, a 'case' is critical to the case study design, but fundamentally challenging to identify (Baxter & Jack, 2008; Yin, 1994). Bryman (2008, p.53) highlights that the term 'case' is usually used to denote a location. But interestingly, he quickly acknowledges that a 'case' is a 'focus of interest'. It is, however, important to specify that a case is essentially the study unit of analysis (Miles and Huberman, 1994, in Baxter & Jack, 2008, p.545; Yin, 1994). Hence, WUCs constituted the 'case' based on the proposition that the participation of WUCs is central

in CWM and functional sustainability of groundwater infrastructure. Furthermore, and pertinently, the role of WUCs, and how they manage the challenges they are faced with in the management process is pertinent for functional sustainability of water sources.

4.4. Sampling

Arguably, sampling is a confusing process in any research project (Marshall, 1996). It requires an understanding of the basic differences between quantitative and qualitative research strategies. It refers to the 'points' of data collection, which may include people, documents, institutions and any information to be included in data collection (Mugumya, 2013). Since the study employed a qualitative research strategy, sampling of respondents and villages was conducted and guided by purposive sampling and convenience sampling techniques as detailed in the subsequent sub-sections.

4.4.1. Sample size

Determining a sample size in qualitative research studies is a challenging process (Bryman, 2012; Marshall, 1996). Although Cohen, Manion and Morrison (2000, p.93) seem to agree with Bryman's (2012) position, they quickly stress that the research strategy can still help to determine the sample size. Yet, to Marshall (1996, p.522), it is important for a qualitative research to study an 'appropriate sample size'. With this understanding, filed data were collected from 38 study participants. These included; the Namayingo District Water Officer (NDWO) and Namayingo Town Council Water Officer (NTCWO). Besides, the sample included four community water users, four local council leaders, and 28 members of WUCs. However, the exact sample size was defined during data collection, as new categories, themes and explanations ceased emerging while in the field. It was possible to arrive at data saturation because collected data were analysed daily after fieldwork to identify gaps, but also, to ensure that further coding was unlikely. Groundwater sources that did not have WUCs at least had caretakers, who in this case were the local council leaders. Therefore, data was collected from local council leaders to get perspectives and views of how they were managing public groundwater infrastructure in their communities.

4.4.2. Sampling procedures

Purposive sampling and convenience sampling techniques guided the sampling process. Purposive sampling was used to select the nine villages that were studied. This was purposely conducted to strike a balance between villages with non-functional water sources and villages

with functional water sources. It was also used to select water facilities that had WUCs and those that did not have committees. Arguably, purposive sampling can be employed to select study cases that are severely affected by the problem under investigation (Blanche *et al.*, 2006). This equally justifies the choice of this sampling technique. The NDWO and NTCWO were purposefully selected as key informants given their technical knowledge and experience in rural water systems. Besides, they are key in the CWM model as discussed in Chapter five. Purposive sampling was used as depicted in figure 5 below.

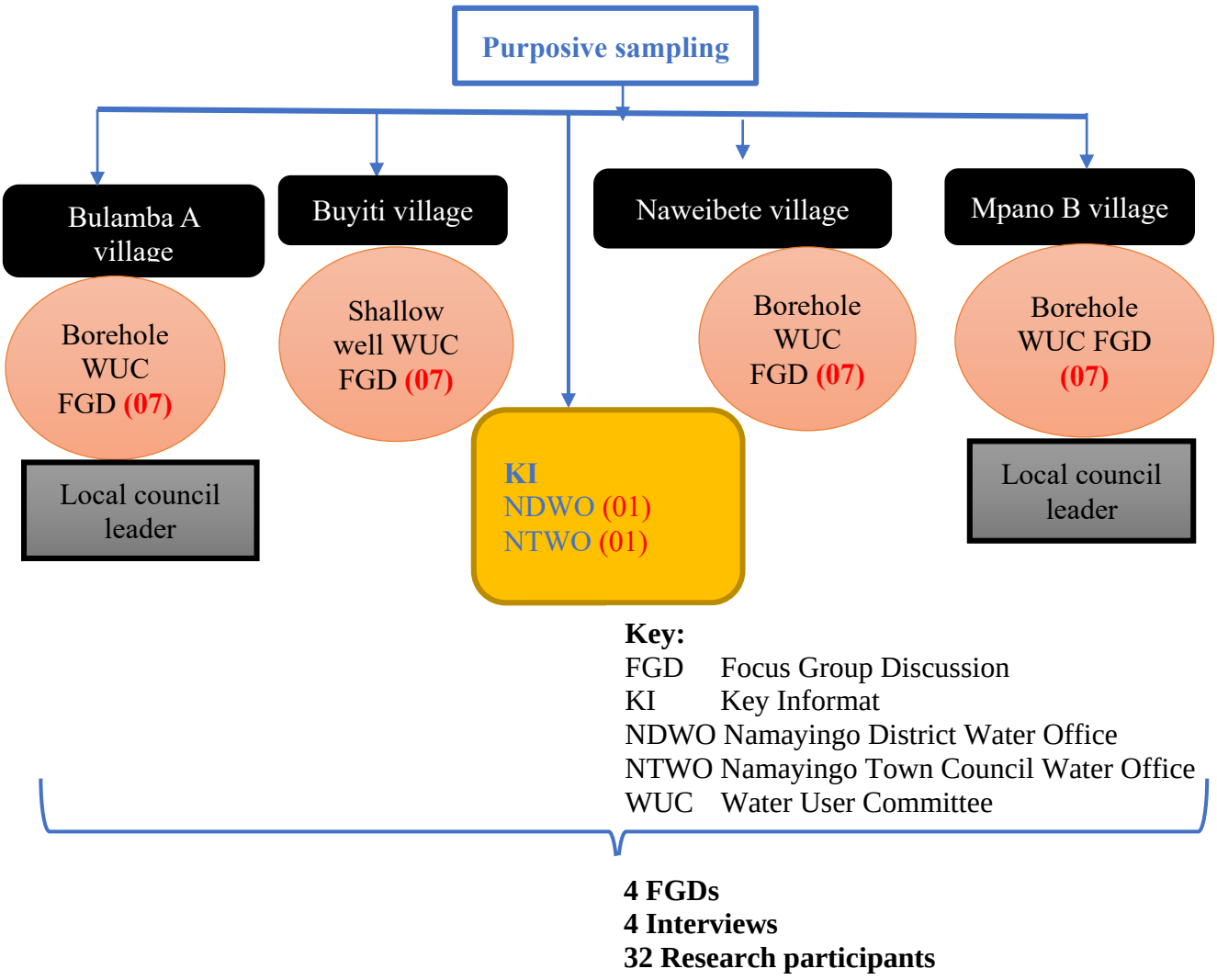

Figure 5: Purposive sampling frame (Author, 2017).

Likewise, convenience sampling was used to select community water users in the purposively sampled villages. Marshall (1996, p.523) explains that convenience sampling is precise, involving selection of the most accessible participants. In addition, it saves time and funds. It was challenging to find committee members to interview in villages with water facilities

without WUCs. As such, local council leaders in such villages were conveniently sampled as depicted in figure 6 below. Equally, water users were conveniently sampled because they would be easily accessed at water sources. However, I want to re-echo that villages from which the local council leaders and water users depicted in figure 6 below were purposively sampled.

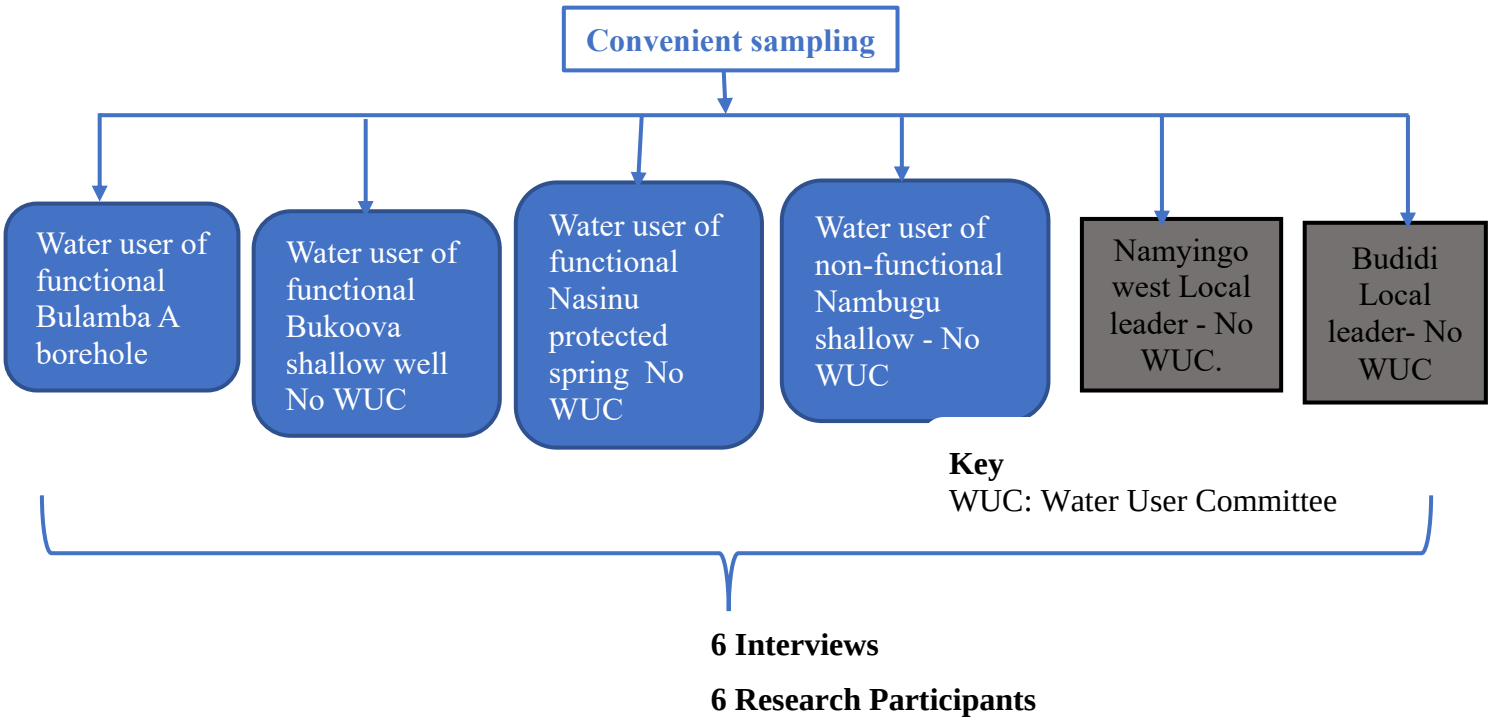

Figure 6: Convenient sampling frame (Author, 2017).

4.5. Data Collection methods

Taking a qualitative research strategy, I employed document review, semi-structured interview, focus groups and participant observation for this research study. However, it is equally important to emphasize at this point that research instruments were administered by the fieldwork assistant and I during fieldwork. But, I did not surrender my power as the researcher to the fieldwork assistant. I took all fieldwork decisions, though I was sometimes advised by the fieldwork assistant.

4.5.1. Semi-structured interview

Interviews are widely used in qualitative data collection (Bryman, 2012 & 2008; Longhurst, 2003; Drever, 1995). In this study, I employed semi-structured interview because it helped me to locate respondents' 'points of view', and pose follow-up questions to probe on critical issues. This gave me room to get detailed responses on the participation of WUCs (Bryman, 2012 &

2008). In addition, semi-structured interviews were flexible, giving study participants freedom to talk and express themselves freely. This suited the case study design (Longhurst, 2003; Drever, 1995) that I adopted for this study. Worth mentioning, semi structured interviews included in-depth interviews with water users, local council leaders, key informants- DWO and NTCWO because of their expert, valuable knowledge and experience in the CWM model (Nicholas, 1991). The key informants offered profound data on water sector policy and institutional frameworks, and clearly discussed the roles of different stakeholders in rural water systems. They were willing to participate in the study and share their knowledge (Gilchrist *et al.,* 1999). Semi-structured interviews were equally conducted with local council leaders and water users.

4.5.2. Focus Groups

Focus groups entail interviewing more than one participant with shared characteristics relevant to the study (Bryman, 2012; Longhurst, 2003). Focus groups helped me to generate the rich knowledge and experiences of the members of WUCs on how and what they thought about their participation in groundwater management as groups (Powell & Single, 1996; Kitzinger, 1995). As discussed under Chapter five, WUCs are the local institution primarily responsible for managing public groundwater infrastructure. Notably, they had considerable experiences and knowledge in public groundwater infrastructure management. Since they work in teams, not individuals, it was paramount to organize focus groups to collect their opinions, views and perceptions as groups. However, it was challenging to collect all the committee members because they did not leave in the same areas. Moreover, some members had businesses in town to attend to since focus groups were outside their normal committee meeting schedules. Critically, Bryman (2008, p.479) cautions that arranging focus groups and analysing their data are quite challenging. With this in mind, four focus group discussions of WUCs were conducted. Worth noting, the ideal number of each WUC as per the water sector policy framework is seven, and I also aimed at having seven members per focus group.

Namayingo Town Council had a list of public groundwater facilities depicting those with WUCs and those without committees. And, I intended to pick samples from the three technologies in rural water systems: boreholes, shallow wells and protected springs. However, all protected springs lacked WUCs. Therefore, primary data through focus groups were collected from only WUCs for boreholes and shallow wells. Yet, still only one shallow well

had a WUC. Again, the intention was to have two focus groups of WUCs of non-functional water facilities and two focus groups of WUCs of functional water sources. However, it was later noted that non-functional groundwater facilities did not have WUCs because they had been non-functional for years and committee members discarded their roles and become inactive. This necessitated taking a fieldwork decision to conduct one focus group with a WUC of a functional shallow well. It is prudent to point out here that convenient sampling was used within purposive sampling to get three functional boreholes from three villages with WUCs to constitute the four WUCs for focus groups. But, and pertinently to point out is that each focus group included women because of their vast interests in water resources.

4.5.3. Document review

Document review is a process which involves using documents to investigate social phenomena (Gibson & Brown, 2009). Document review was profoundly important in this research study. It was a challenging task of finding, analysing and making meaning of the documents (Bryman, 2012 & 2008) relevant to this study. It necessitated quality time and information literacy to ensure authenticity, reliability and credibility of documents. Policy documents, strategies, water sector performance reports, implementation frameworks on CWM were searched, identified and analysed to answer the research questions besides collected data (Gibson & Brown, 2009). These were documents authored by MWE, Namayingo Town Council, and NGOs in the water sector, and independent studies. However, I was unable to review documents authored by Namayingo District because the NDWO and other officials declined to grant me permission to access their literature, but rather referred me to the Town Council Planner. Through the office of Namayingo Town Clerk, I was granted access to documents related to groundwater management that were authored by the Town Council. Similarly, it was challenging to process the permit to access Town Council literature, but it did not in any way affect data collection. Consequently, two documents from the Town Council were accessed, reviewed and analysed. That is; the "Status of Water Sources in Namayingo Town Council" (Namayingo Town Council Water Office, 2016), and "Namayingo Town Council Structural Plan 2015-2025" (MLHUD, 2013). Document review did not only provide secondary data to answer specific research questions, but also, informed sampling and several fieldwork decisions.

The Ministry and Local Government documents were given the priority, but triangulated using documents and journals from independent studies and NGOs in the water sector. Specifically, documents provided rich secondary data on water sector policy and institutional frameworks, roles and responsibilities of WUCs, challenges WUCs face, and how policy and institutional frameworks enhance functional sustainability in Uganda. An understanding of water sector policy and institutional frameworks, considering its implementation guidelines and practices, guideline, and constraints was indeed boosted by document review as depicted in Chapter five. To ease document review, a document checklist was developed which helped to gather data aligned with the research specific questions formulated in Chapter one.

4.5.4. Participant observation

There is a thin line between participant observation and ethnography. However, the bottom line is the immersion of the researcher in the community to observe behaviour, listen to conversations, ask questions and take field notes (Spradley, 2016; Bryman, 2012; Musante & DeWalt, 2010; Bryman, 2008). Participant observation was an important method for collecting qualitative data (Creswell, 2013; Bryman, 2012). But, this was challenging as it required a clear articulation of what was to be observed (Jorgensen, 1989). I observed how water users were using public groundwater infrastructure. In addition, I observed the nature and state of public water infrastructure that were functional and non-functional in Namayingo Town Council. It is important to note that my observation was informed by the National Framework for Protection of Water Sources, 2013 of MWE. Besides, it was premised on the need to observe the measures of ownership such as ongoing management and status of groundwater facilities. In a nutshell, the research objectives, collected data, and how these informed choices of data collection methods were summarised as depicted in the table below.

Objective	**Data collected**	**Method used**
To examine the appropriateness of the water sector policy and institutional in supporting the participation of water user committees in public groundwater infrastructure management.	-Water sector policy framework -What the policy states on WUCs -Water sector institutional framework -Guidelines on groundwater management -How they manage water -How guidelines encourage participation of WUCs	Focus Groups Semi-structured interviews Participant observation Document review
To assess the role and organizational capacity of water user committees in public groundwater infrastructure management.	-Roles of WUCs -How WUCs have played their roles -How WUCs can fulfil their roles -Mechanisms used to -Their relationship with water users	
To examine the hindrances to participation and functional sustainability of public groundwater infrastructure from the water user associations' perspective.	-Hindrances to the involvement of WUCs -Constraints of the water sector policy in supporting the participation of WUCs	
To assess how water sector policy and institutional frameworks enhance functional sustainability of public groundwater infrastructure management	-Water sector policy and institutional efforts being implemented. -How the efforts enhance functional sustainability of groundwater infrastructure.	

Summary of Research objectives, collected data & data collection methods (Author, 2017)

4.6. Data processing and Analysis

Quality control in qualitative research studies is a constable ground. It is arguable whether reliability and validity can be incorporated into qualitative studies and measure research quality, rigour and potential (Bryman, 2012). These research criteria have been developed in quantitative research, and challenging to be used in qualitative research studies with little alteration of their meanings and overlooking the inherent importance of the measurement aspects (Bryman, 2012 & 2008). But, informed by my interpretivist epistemological and

constructionist ontological positions, study participants were given freedom to give their views and opinions without interruption. I only interpreted what participants had expressed. Besides, data were triangulated while in the field as the study involved different categories of participants and varied data collection methods.

Qualitative data are always unstructured and cumbersome to analyse (Bryman, 2012). They include field notes, discussions, interview transcriptions, and among others. According to Huberman and Miles (2002, p.309), analysing qualitative data involves "… *defining, categorizing, theorizing, explaining, exploring and mapping…*". Taking the grounded theory, clear interview transcripts were developed daily after fieldwork. Also, daily morning meetings with the fieldwork assistant were conducted to discuss the emerging field findings, experiences and lessons. Such meetings were helpful as they generated several empirical findings which consequently informed data analysis. The fieldwork assistant was a master's student of the University of Osnabruck. His research experience and education background in public policy was profoundly helpful in understanding preliminary field findings and the various community challenges which emerged during the fieldwork. Data were coded, labelled, separated, compiled and organized (Bryman, 2012) for processing and analysis. Finally, partner matching was employed, and presentation, discussion and analysis of findings proceeded in relation to participation, social capital, research objectives and conceptual framework as depicted in Chapter three above.

4.7. Ethical considerations

Ethical approval is a critical research portion. It is concerned with the protection of the welfare of research participants (Blanche *et al*., 2006). Importantly, research ethics are not a prerequisite for a research project, but rather a consideration that they impact on the research design and quality of research findings (Gibson & Brown, 2006). To Allan Bryman following Diener and Crandall's (1978) categorization, research ethics are premised on four principles. That is; 'harm to participants', 'lack of informed consent' 'invasion of privacy' and 'deception' (Bryman, 2012 & 2008). Before data collection, a reconnaissance study was conducted in Namayingo Town Council. It was through this study that an official permission to conduct data collection was granted by the Town Council authorities on submission of an application letter to the office of the Town Clerk. The application letter clearly defined the research topic, purpose, target participants, schedule, geographical scope of the study, and most importantly,

the literature I required from the Town Council. However, although the Town Council had granted permission, further meetings were held with local council leaders within the Town Council seeking for their permission and consent to collect data in their respective villages. Furthermore, detailed verbal explanations about the research purpose and objectives were made to all study participants. Always, data would only be collected after receiving consent from study participants. Similarly, study participants were guaranteed that their participation in the study was voluntary, and that they would withdraw at any point they so wished. It was further explained to participants that privacy, anonymity and confidentiality of information given would be upheld. Lastly, study participants were always requested before I would use the digital recorder and camera to take photographs. In a nutshell, adherence to the above ethics helped me to create an appropriate environment which enhanced free sharing of information, views and opinions by the study participants, especially on issues study participants deemed sensitive.

4.8. Study experiences, challenges and limitations

Overall, academic researchers are easily interpreted as 'data miners' by study participants. Undoubtedly, communities are often involved in various research studies on different topics as research study participants. Thus, I was compelled to overly inform study participants of how this study would contribute to national programming and policy formulation besides being educational. Ideally, study findings are always hoped to contribute to national policy formulation and reviews. Yet in reality, this may not directly benefit the study participants. Or, if it does, it may take time given the complexities involved in public policy formulation and programming.

Given the political economy, culture and socio-demographics of the study participants, community expectations were high and inevitable. Initially, Local Government water officials perceived the fieldwork assistant and I as officials from the MWE. But, others thought we were contractors because it was time for lobbying and processing the pipe water systems. However, the fieldwork introduction letter from the University of Agder, student identification cards and acceptance letter from the Namayingo Town Clerk were presented to equipoise this perception. Yet, still the officials expected some allowance after interviews on realising that the fieldwork assistant and I were students from European universities. Equally, community participants (water users, WUCs and local council leaders) expected that the fieldwork assistant and I

would; (i) provide them with funds to buy spare parts for their water infrastructure, (ii) give them money for participating in the study, and (iii) help them to speak to the Local Government water officials to help them in issues of water management. Certainly, such characteristics were not peculiar from what transpires in the rest of Uganda. However, I had previously worked as a Field Officer with Mayuge District NGO Forum where I could directly interact with communities. Such prior experience as a social worker helped me to handle community expectations. Also, I have a degree in Adult and Community Education, a course that grounds professionals in dealing with communities and adults. Thus, I managed to deal with community expectations without blocking an atmosphere of free information sharing.

By its location within the vicinity of Lake Victoria, Namayingo Town Council houses people from different ethnic groups from within Uganda, but also, Kenya, Tanzania and Kenya. This is because of the fishing activities and fertile soils that favour agricultural production. There was a multitude of languages, although residents had a native language that could unite them. Language barrier was a challenge as most of the study participants could not speak and understand English. The English language was only used during semi-structured interviews with the NDWO and NTCWO, while focus groups and semi-structured interviews with WUCs, water users and local council leaders were conducted in local languages. Although some study participants could speak the Lusoga language, my language, some participants within the same groups, for the case of focus groups spoke different languages. Hence, I got an interpreter, who also served as my fieldwork guide.

However, it is cautioned that involvement of translators compromises the dialogue between the researcher and respondents. As revealed by Temple and Edwards (2002, p.2), it is impractical to move literal meanings from one language to another. What happened was a somewhat fascinating in the sense that such study participants could understand our local language, but they were unable to speak. Similarly, the fieldwork assistant and I could understand their local languages, but we were unable to speak. Therefore, literal meanings of words were not affected since either group (participants and researchers) were just unable to speak the other's languages, but could understand the meaning. Also, daily evening meetings with the fieldwork guide were conducted to go through the recordings to clarify statements that seemed ambiguous and unclear to me.

Namayingo Town Council was one of the most recent Town Councils created following the implementation of the decentralization policy premised on the ideology of extending services near to people. Whether the promised extension of services near to people was achieved after Namayingo Town was granted the Town Council status is not a preoccupation of this study. However, like other rural areas, Namayingo Town Council was poorly served with a developed road transport network. This was a limitation to our free and quick movement to villages especially those outside and away from the Central Business District[5] of Namayingo Town Council. This was acutely felt on rainy days. To ease our movement, the fieldwork assistant and I would move on *boda boda*[6] since it was the easiest and quickest means of transport in the Town Council. Interestingly, this transport means is cheap, but it would be expensive because of the bad roads which were always almost impassable on rainy days. With my experience with *boda boda* cyclists because they are widely used in Uganda, I always convinced them to reduce the transport fares. Besides, we could walk to such hard to reach areas, and sometimes move to gardens to collect data from study participants as fieldwork coincided with the rainy season which kept people busy in their gardens.

Accessing documents required permission from information 'gate-keepers' both at the District and Town Council. Besides being a long process, it was possible for the District officials not to 'let me in,' and access data on Namayingo District. I made various attempts, especially through the District Water Office and the District Planner. However, all my efforts were futile when all offices contacted wanted to receive authorization from the Chief Administrative Officer. Yet, besides being busy, the Chief Administrative Officer was rarely available at the District headquarters. In a nutshell, I did not access literature at Namayingo District. Equally, although the process of getting permission and literature at the Town Council was also a challenge one, I was nonetheless able to receive literature that I wanted to inform literature review, sampling and data collection.

[5] The commercial and business center of Namayingo Town Council.
[6] The local name for hired motor cycle transport means in Uganda.

Chapter Five: Contextual Landscape of Groundwater Management in Uganda

5. Introduction

In this chapter, I present the description of water sector policy and institutional development in Uganda. Similarly, I bestow the physical locations of Uganda, Namayingo District and Namayingo Town Council. Particularly, I depict how the water sector policy and institutional frameworks support the participation of WUCs and enhance functional sustainability. The roles and organizational capacity of WUCs and the various hindrances they face are equally analysed. Notably, analysis in this chapter is informed by documents authored by MWE, NGOs and research findings of previous studies.

5.1. Water sector policy and institutional frameworks

One of the specific research objectives was to examine the appropriateness of water sector policy and institutional frameworks in supporting the participation of WUCs in groundwater infrastructure management. Certainly, Uganda has well-defined water sector policy and institutional frameworks that guide the management of public groundwater facilities through CWM in rural areas. According to Harvey and Reed (2004, p.11), policies can adversely impact on the sustainability of water facilities and the participation of key actors in rural water projects. Indeed, as non-functionality of groundwater facilities in the rural areas of Uganda continues to skyrocket, it is judicious to critically analyse the water sector policy and institutional frameworks in the country. For example, what is the suitability of the water sector policy and institutional frameworks in supporting WUCs? Apart from pronouncing WUCs as the groundwater infrastructure "managers", does the policy pronounce more about how they are supposed to do what they are mandated? Does the policy put in place robust and appropriate institutional support for WUCs to enhance their participation in groundwater infrastructure management? Does the policy in anyway prepare WUCs for the water management roles? Is the policy prepared to address the varied hindrances WUCs face in the management of water facilities? Brikké and Bredero (2003, p.1) agree that when policy and institutional frameworks are not supporting, the institutional support to communities is hindered, and sustainability is subsequently affected. These are further analysed as depicted in the subsequent sections.

5.1.1. Water sector Policy Framework

Water supply and use is addressed in the 1995 Constitution of the Republic of Uganda. As such, access to clean and safe water is a constitutional right for all Ugandans, and it is a

constitutional obligation of the government of Uganda to provide clean and safe water to Ugandans without conditions that would deny them such a right (MWE, 2011). Specifically, the supreme law, the 1995 Constitution of Uganda observes that, *"every person is entitled to clean and safe water"* (MWLE, 1999, p.15). Specifically, groundwater infrastructure management is anchored on several water sector policies, with over-arching objectives as discussed below.

The National Water Policy, 1999

The National Water Policy was formulated in 1999 to provide an integrated approach to manage water resources in a sustainable and beneficial way to Ugandans (MWE, 2011; Sloots, 2010; MWE, 2007 & 2004). Certainly, the integrated approach recognizes water as both a social and economic good- social value and economic value of water (MWE, 2011; Sloots, 2010; MWE, 2007; MWLE, 1999). The policy embraces the need for the coordination and collaboration between water and sanitation (Nsubuga *et al.*, 2014, MWLE, 1999). As stressed by Nsubuga et al (2014, p.1311), this coordination is critical to ensuring that water and sanitation continue to attend to both environmental health and sanitation issues in the country. This is, however, challenging to achieve given the mismatching accessibility and coverage statistics of water and sanitation in Uganda (MWE, 2016). Importantly, the National Water Policy, 1999 provides for the management of groundwater facilities through WUCs (MWLE, 1999). Informed by the National Gender Policy, 1999, the policy requires that half of the membership of WUCs must be occupied by at least two women with key positions (MWE, 2011; MWLE, 1999). It is critical to draw a dichotomy that while this policy requires management of water facilities by WUCs, it is the National Water Statute, 1995 that demands for the creation of these committees. The overall policy objective is:

> Sustainable provision of safe water within easy reach and hygienic sanitation facilities, based on management responsibility and ownership by the users, to 75% of the population in rural areas and 100% of the urban population by the year 2000 with an 80%-90% effective use and functional sustainability (Nsubuga *et al.,* 2014, p.1311; MWE, 2004, p.4; MWLE, 1999, p.15).

It is debatable whether the country achieved such an objective by 2000. But certainly, with the rocketing non-functionality of water facilities, such an objective remains an ideal. Yet, it remains the water policy objective of Uganda. It is, however, evident that the policy embraces

not only the participation of WUCs and women in the management process (MWE, 2004; Harvey & Reed, 2004; MWLE, 1999), but also, the ownership of water facilities by water users for sustainability. However, do communities understand "ownership"? This is not clearly addressed by the National Water Policy, 1999. Although it bestows ownership of groundwater infrastructure to water users through WUCs, the National Water Statute, 1995 vests ownership to the Directorate of Water Development (MWE, 2011, MWLE, 1999, GOU, 1995). Does this present a policy framework contradiction, and how does it impact on the participation of WUCs? Interestingly, ownership is thought to be instilled at the onset of water supply projects through capital cost contribution (MWLE, 1999; GOU, 1995). Although this would be the ideal, MWE however, agrees that the government and other donor agencies implement water projects without the involvement of communities at initial stages (MWE, 2011, p.17). Besides, paying capital cost contribution does not automatically translate into ownership. Essentially, there are community members who either deliberately or otherwise fail to contribute towards capital cost. Also, the notion of interpreting the community as a homogenous entity (MWE, 2011) is inherently disingenuous. Communities are composed of people with different interests in water. In such an arena, it is arduous to instil the sense of community ownership of groundwater infrastructure.

The National Water Policy, 1999 recognizes CWM as the management model for public groundwater infrastructure in rural areas of Uganda (MWE, 2011 & 2004; MWLE, 1999), and advances decentralisation of water management functions and capacity building for sustainable water management (Nsubuga *et al.,* 2014). Practically, WUCs are not professionals in water resources management, and dearth of capacity building adversely impacts not only on the level of participation, but also, efficiency and effectiveness are hampered (Harvey & Reed, 2007). The policy does not address how and when WUCs are to be trained in issues of water management which subsequently affects their participation and functionality. Yet, functionality of WUCs directly impacts on the functionality of groundwater facilities (MWE, 2011). For example, due to inadequate training of WUCs in financial management, some committees have disappeared due to poor financial management and loss of community trust (MWE, 2011). Worth noting, the National Water Policy, 1999 is pillared by six guiding principles, but participation of WUCs in groundwater infrastructure management under CWM is guided by five principles as below.

1. Institutional reforms promoting an integrated approach, including changes in procedures, attitudes and behaviour and the full participation of women at all levels in sector institutions and in institution making.
2. Community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes.
3. Financial viability of public utilities should be assured through sound financial practices, achieved through better management of existing assets, and widespread use of appropriate technologies.
4. Provision of services through demand driven approaches in which users are fully involved and contribute to the cost of facilities and services to promote ownership and sustainability.
5. Allocation of public funds for water supply development activities will take into account that priority is given to those segments of the population who are presently inadequately served or not served at all, and who are willing to participate in planning, implementation and maintenance of the facilities (Sloots, 2010; MWE, 2007; MWLE, 1999).

Besides the National Water Policy, 1999, there are several sector policies that are pertinent in informing public groundwater infrastructure management in Uganda. These include: The National Water Statute (1995), Poverty Eradication Action Plan (2004), the Local Government Act, 1997, National Gender Policy (1999), National Health Policy (1999), and the Environmental Health policy (2005). These are analysed below.

Water Statute, 1995

The National Water Statue, 1995 is a comprehensive framework that provides for use, protection and management of water resources in Uganda (Sloots, 2010; MWE, 2004; GOU, 1995). In line with groundwater infrastructure management, the statute provides for ownership and management of water facilities by water users through WUCs (MWE, 2004; GOU, 1995). Essentially, the statute jointly with the National Water Policy (1999) mandate WUCs to manage public groundwater facilities on behalf of communities (MWE, 2004; MWLE, 1999; GOU, 1995). However, it does not highlight the tenure of WUC members. Yet, with voluntarism and informality on which WUCs operate, committee members on self-elimination gradually abandon their roles when they lose interest over the years (Moriarty *et al.*, 2013;

MWE, 2011). This hence creates a leadership and management vacuum subsequently leading to non-functionality of committees. Therefore, the tenure of WUCs is important to ensure timely and proper election of WUCs to enhance the functionality of WUCs and water facilities (MWE, 2011). Similarly, the Water Statute, 1995 is silent on how the participation of WUCs can be enhanced perhaps through capacity building. Interestingly, the statute requires that the amount of the monthly maintenance fees to be collected by WUCs is to be decided by the Director of the Directorate of Water Development at the MWE (MWE, 2004). However, this is unsustainable and practically challenging given the fact that there is a dearth of direct interaction between the MWE and WUCs. Alternatively, this would be proposed through District Water Offices, but, still given the diversity in income levels across regions, it may be unattainable to establish the right amount of money affordable by water users. Besides, why would the amount to be paid by water users be predetermined? The MWE through Local Government would provide information regarding water user fees to communities at the initial water project stages to provide a foundation for informed decision making on the amount of money to be paid.

Poverty Eradication Action Plan (PEAP)

Given the development trajectory of Uganda, poverty eradication remains a preoccupation of the Ugandan government (MWE, 2007). The PEAP is an all-encompassing document that guides all the government's efforts towards poverty eradication. It therefore, provides the backbone for formulation and implementation of all sector policies in the Ugandan (Sloots, 2010). The framework was incepted in 1997, and revised in 2000 and 2004 to recognise the polygonal nature of poverty in the country. It is against this backdrop that water supply and management is deliberately planned to address the PEAP objectives (MWE, 2007). PEAP, therefore, presents the guiding strategies for implementing activities in the water sector (Nsubuga *et al.*, 2014; Sloots, 2010). Importantly, it recognizes water as a key priority sector if Uganda is to eradicate poverty (Nsubuga *et al.*, 2014). All the PEAP guiding strategies are hinged on two pillars. That is: enhancing production, competitiveness of Uganda's products to increase households' incomes including water for production and water resources management, and human development (Nsubuga *et al.*, 2014; Sloots, 2010; MWE, 2007). Importantly, PEAP is not implemented in isolation, it is guided by robust and comprehensive policy and legal frameworks on water resources management (Nsubuga *et al.*, 2014) which are engrossed on the 1995 Constitution of Uganda (Sloots, 2010).

The Local Government Act, 1997

This Act defines the exact roles and responsibilities for the different players at the different levels of government that are involved in the development and management of groundwater infrastructure (MWE, 2011; Sloots, 2010; MWE, 2007). Fundamentally, the provision of water facilities is a cardinal responsibility of Local Governments in conjunction with MWE. As such, the Act empowers Local Governments at all levels to plan and implement development programmes in consonance with local pressing needs (MWE, 2011 & 2007). Essentially, following the decentralization policy, the Ugandan government vies to ensure that local people are involved in development interventions that are choreographed to elevate their livelihoods. In the O&M of groundwater facilities, for instance, Local Governments are required to plan and allocate resources for O&M activities and be advanced to WUCs (MWE, 2011 & 2007). Conversely, involvement of local people in planning and implementation of such development programmes remains mere rhetoric as there is inadequate evidence to support such an assertion. Moreover, MWE admits that quite often government and other agencies provide water systems to rural communities without their involvement (MWE, 2007).

Besides, the Act empowers local council leaders to enact by-laws to guide the management of groundwater infrastructure in their respective areas (MWE, 2007 & 2011). The by-laws are implemented by WUCs, but the Act provides for local council leaders to be the ones to enact such laws. WUCs are only required to propose the content which is again subjected to certification by the Attorney General for consistence with the 1995 Constitution of Uganda (MWE, 2011 & 2007). There is nothing inherently wrong with certification of by-laws because it even gives them a legal face. However, it is gruelling for a WUC in the village to have its by-laws certified by the Attorney General in Kampala- about 188 kilometres from Namayingo Town Council. It is impractical, and where possible, it is bureaucratic and increases chances of corruption especially in an already corruption stricken environment.

The National Gender Policy, 1999

The National Gender Policy was formulated in 1999 to streamline efforts in support of gender equity (Sloots, 2010; MWE, 2007). Gender equity is vied in socio-economic activities to embolden women to take key decision making positions in the country. This policy aligns with the National Water Policy, 1999, especially on the representation of women on WUCs (MWE, 2007). The National Water Policy, 1999 pronounces that at least three positions on the WUC

membership are reserved for women, and at least two with key positions (MWLE, 1999), and this is respected countrywide. The National Gender Policy, 1999 is further elaborated by the Water Sector Gender Strategy, 2003 which was developed to establish empowering approaches to achieve gender equity, participation, access to resources in poverty eradication programmes (MWE, 2011; Sloots, 2010; MWE, 2004). Importantly, this strategy emphasizes among others but importantly, equal representation in decision making, capacity building on gender training and analysis, promotion of gender disaggregated data and integration of hardware, gender and hygiene aspects (MWE, 2004). These issues are established but silent in the National Water Policy, 1999, and the Water Sector Gender Strategy, 2003 labours to amplify them.

Arguably, the National Gender Policy, 1999 and the Water Sector Gender Strategy, 2003 are paramount because collection and management of water is a principal issue to women (MWE, 2011; Sloots, 2010; MWE, 2007). Non-functionality of groundwater facilities adversely impacts on the productivity and life of women. It is important to note that although success has been achieved in involving women in groundwater infrastructure management, a lot remains desired especially in terms of capacity building to prepare them for such roles (MWE, 2011). Besides lacking the required management skills and confidence, the "women's triple role[7]"of women presents a heavy workload for women. Although these will be elucidated in the section on hindrances, it is paramount to point out that water management roles compete with household roles that have been socially constructed for women especially in the African context. Hence, women are left with limited time to attend or even chair village meetings and training (if any) which adversely impacts on their participation. Neither the National Water Policy, 1999 nor the National Gender Policy, 1999 address how women ought to participate in water management. Yet, it is urgently imperative to devise means of ensuring effective participation of women in water management (MWE, 2016), though it is not a preoccupation of this study.

The National Health Policy, 1999

The National Health Policy (1999) entirely identifies and addresses the major causes/contributors of the disease burden that hits Uganda (Sloots, 2010; MWE, 2007). Such diseases include; Malaria, HIV/AIDS, Tuberculosis, and Diarrhoea. It is not by coincidence that people in the rural setting carry the highest chances of registering fatalities from such

[7] Women's triple roles include; reproductive, productive and community managing role

diseases given the low safe water and sanitation coverage (Sloots, 2010) coupled with the inability to access medical services due to poverty levels. As such, the government of Uganda through the Ministry of Health (MoH) and MWE prioritises rural areas where there is low safe water and sanitation coverage (Sloots, 2010). According to MWE (2007, p.7), this is addressed through the promotion of personal hygiene and sanitation both at household and community levels. Essentially, the interaction between the MoH and MWE at the national level as discussed under the institutional framework is anchored on the National Health Policy, 1999.

The Environmental Health Policy, 2005

The framework encompasses all the government's environment health priorities which inform planning and implementation of development programmes at all levels in the country (MWE, 2007). Specifically, the policy's goal is to attain "*a clean and healthy living environment for all citizens in both rural and urban areas*" (Sloots, 2010; p. 9; MWE, 2007, P.7). The policy sets out several principles, but the following are relevant to groundwater resources management in rural areas.

1. Every Ugandan has a right to a clean and healthy environment but there are responsibilities that need to be fulfilled at every level.
2. There is need to place considerable emphasis on community mobilisation and proactive assistance in order to accelerate change and bring about widespread improvements in sanitation and hygiene behaviour.
3. Interventions should maximise community participation and empowerment, to encourage and enable people to take responsibility for environmental health matters under their direct control.
4. Interventions should respond to the differing needs of men, women and children, while recognising that women are the main users of water and sanitation facilities.

5.1.2. The Water Sector Institutional Framework

The CWM model is premised on several institutional actors. The institutional framework provides for such actors and the varied roles they are mandated by the water sector policy framework (principles of action). In the attempt to enhance functional sustainability of rural water systems, it is crucial to identify these key actors and clearly define their roles (Spaling et al., 2014; Mandara *et al*., 2013; May, 2006; Harvey and Reed, 2004; Brikké & Bredero, 2003). According to Mandara, Butijn and Niehof (2013, p.82), CWM demands for an interaction

between the actors, and transfer of responsibilities to the end users. Indeed, Harvey and Reed (2004, p.37) agree that there are varied stakeholders in the rural water sector. Also, understanding their role and capabilities are critical to cognize the institutional support required to enhance functional sustainability (Mandara *et al.,* 2013). Although analysing stakeholders is not a preoccupation of this study, understanding their interplay is critical to inform the discussion and analysis of the water sector institutional framework.

But what is the case for Uganda?

Uganda has since 1990s implemented the decentralization policy, which has subsequently ushered in a devolution of responsibilities from the Central Government to Districts and Sub-Counties/Town Councils (Nsubuga *et al.,* 2014; Mugumya, 2013). As earlier noted, there has been a shift of water resources management functions from the Central Government to the Local Governments (Mugumya, 2013). In this shift, Districts have become the main implementing agents of the water management functions and activities, though the Central Government retains the policy formulation function. It is worth noting that the adoption of the decentralization policy in 1990s coincides with the adoption of the CWM model as the answer not only to the unconvincing government top-down service delivery, but also the pending sustainability question in the rural water sector (Hope, 2015; Van Den Broek and Brown, 2015; Marks *et al.,* 2014; Moriarty *et al*., 2013). Like the rest of Sub Saharan Africa, in Uganda, the institutional framework is critical to the rural water supply sector as it defines the roles and responsibilities of the actors involved (MWE, 2011). However, still and critical to point out, the institutional framework is multi-layered, comprised of different levels- from the Central Government to water users. In other words, there are varied players, and the analysis below is to reveal how this multi-layered framework either supports or constrains the participation of WUCs in the groundwater infrastructure management.

The Central Government/ Ministry of Water and Environment

The MWE is the main player in water development, management and governance in Uganda. It is a cardinal responsibility of MWE to formulate and prepare national policies, legislations, standards and regulations, and priorities of water development and management that guide the water sector (Nsubuga *et al.,* 2014; Ssozi & Danert, 2012; MWE, 2011; Sloots, 2010; MWE, 2007 & 2004). Furthermore, MWE is charged with the lead reasonability of managing, monitoring and evaluating sector development programmes to track performance, efficiency

and effectiveness in service delivery (Nsubuga *et al.*, 2014; Ssozi & Danert; 2012; Sloots, 2010; MWE, 2007 & 2004). Besides, it concurrently advances financial and technical support services to the Local Government and other players (Ssozi & Danert, 2012; MWE, 2007).

At the national level, there are several line ministries which MWE directly partners with in the management of water. First, the MoH and the Ministry of Education and Sports (MoES) promote hygiene and sanitation in households and schools respectively (Nsubuga *et al.*, 2014; Ssozi & Danert, 2012; Sloots, 2010; MWE, 2004). Particularly, MoH prepares policy documents aimed at promoting sanitation and hygiene. However, are households in rural areas of Uganda sensitized about sanitation promotion? In contrast, MoES ensures that all schools in the country have the required sanitation facilities, and concurrently advances hygiene education to students (Sloots, 2010; MWE, 2007). However, has the MoES registered success? The 2016 Sector Performance Report revealed that sanitation in schools had worsened to 70 students per one latrine stance, and access to hand washing had reduced to 30% in schools (MWE, 2016, p.vi). On the other hand, the Ministry of Gender, Labour, and Social Development (MGLSD) ensures gender responsiveness and community development (Nsubuga *et al.*, 2014; Ssozi & Danert, 2012; Sloots, 2010; MWE, 2007). This ministry is critical to the participation of women in the management of water facilities under the CWM model. Specifically, MGLSD aids in formulation of gender responsive policies, and ensures that Districts undertake their staff through capacity building to implement water management roles with gender lenses (Ssozi & Danert, 2012; MWE, 2007). The relevancy of gender responsive efforts is illuminated in sub-section 5.4.1 on gender mainstreaming.

Local Governments

The Local Governments encompass Districts, Sub-Counties and Town Councils. The participation of Local Governments in the management of water resources is anchored on the Local Government Act, 1997 which empowers them to provide water services to communities (Nsubuga *et al.*, 2014; Ssozi & Danert, 2012; Sloots, 2010). It is, however, imperative to point out that each of these Local Governments is independent, but work in coordination and collaboration with each other following the government decentralized planning, procurement, reporting, financial management policy (Ssozi & Danert, 2012). Under the CWM model, Local Governments are supposed to facilitate the formation of WUCs (MWE, 2016 & 2015) and ensure their participation (Sloots, 2010). Besides, creation of awareness of water sector policies

and institutional support are cardinal responsibilities of Local Governments (Brikké & Bredero, 2003). However, some Local Governments do not facilitate formation of WUCs which severally affects the management of such water facilities (MWE, 2015). Districts provide institutional support and technical guidance to Sub-Counties and Town Councils during sector planning and budgeting, implantation and monitoring (MWE, 2004; Brikké & Bredero, 2003).

Furthermore, Districts co-fund budgets for major repairs, and provide guidance and supervision to ensure that O&M meets the standards. At the post-construction phase, Districts are charged with the responsibility of monitoring water quality monitoring to ensure that water provided is apposite for drinking and other chores (Sloots, 2010; MWE, 2004). Importantly, Districts are responsible for monitoring the performance of O&M of water sources, and provide and devise actions to address O&M challenges whenever spotted. Arguably, such responsibilities draw District Water Offices near WUCs. This in itself, can arguably be a motivational factor and empowering especially when Districts and WUCs come together to identify management challenges and jointly devise solutions in a horizontal relationship. But, are District Water Officers qualified to effectively and appropriately execute their groundwater management roles? Ssozi & Danert's (2012) report found out that only 48% of the District Local Governments had qualified staff in District Water Offices as by April 2011. Actually, they further found out that some Districts, especially new ones had District Engineers concurrently working as District Water Officers (Ssozi & Danert, 2012, p.7).

In contrast, Sub-Counties and Town Councils are under the decentralization system mandated to plan and oversee development programmes within their jurisdiction (MWE, 2004). Essentially, they prepare water management plans and budgets, with O&M of water facilities taking a pivotal mark (MWE, 2011). Like Districts, Sub-Counties and Town Councils incorporate post-construction support and major repairs in the budget plans (MWE, 2004) to ensure that water sources are functional, and even those that breakdown are rehabilitated. The MWE (2004, p.10) confirms that when there is good planning by the Sub-Counties and Town Council, it is possible to train, monitor and provide 'back-up' support to WUCs. However, this presents a challenge in itself. WUCs are not involved in the planning processes for O&E (MWE, 2011), but expected to participate in training and implementation. Participation is not automatic; it is probable that some committee members may overlook the importance of such training and do not show up.

Non-Government Organizations and Community-Based Organizations

In Uganda, there are several non-profit making organizations involved in the water sector both at the national and local levels. They play a critical role in mobilization of resources, planning, training and supporting user communities through WUCs (Ssozi & Danert, 2012; Sloots, 2010; Brikké & Bredero, 2003). Through the Sector Wide Approach (Ssozi & Danert, 2012; Sloots, 2010; MWE, 2007), there is a cooperation between Districts and NGOs, and CBOs that enables Districts to subcontract NGOs to sensitize WUCs through construction and post-construction follow-up (Ssozi & Danert, 2012). This collaboration is engrossed in the District Implementation Manual, 2007- the comprehensive guidelines for the National Rural Water and Sanitation Programme in Uganda (Ssozi & Danert, 2012; MWE, 2007).

Under the Uganda Water and Sanitation NGO Network (UWASNET), there are currently over 200 NGOs and CBOs engaged in water supply and management in Uganda (Ssozi & Danert, 2012; Sloots, 2010; MWE, 2007). These are both Local and International NGOs which mobilise resources to complement the government's constitutional responsibility of delivering and managing safe water especially to the rural people (Ssozi & Danert, 2012; Sloots, 2010). Specifically, they construct new water facilities, mobilize communities, and aid in O&M, and importantly train WUCs and Local Government water officials in water resources management (MWE, 2016; Ssozi & Danert, 2012; Sloots, 2010; MWE, 2007). In respect to water management, NGOs and CBOs have been cardinal in mobilizing communities for participation, facilitating WUCs formation and capacity building, training of hand pump mechanics (HPMs). Notably, such efforts aim at enhancing functional sustainability of water facilities (MWE, 2016). For example, NGOs and CBOs jointly pooled a sector investment of about US$ 1,799,590 towards CWM activities in 2016 (MWE, 2016).

Private sector

Under the CWM model, the private sector is critical to the functionality of groundwater infrastructure since Uganda implements the privatization policy (Sloots, 2010). Through a synergistic relationship, the private sector executes activities that are beyond the mandates of water users (MWE, 2007 & 2004). The private sector encompasses HPMs, masons and plumber who have expert knowledge in maintenance and repair of groundwater facilities (Sloots, 2010; MWE, 2007). Besides mobilising and training WUCs (MWE, 2004), the private sector supplies spare parts to communities. But, does the private sector have the required skills

to execute the mandated roles? Certainly, Harvey and Reed (2003, pp.115-116) reveal that in Uganda and Kenya, for example, where the private sector is involved in the rural water sector, private people do not have the necessary required skills and expertise. Moreover, involvement of the private sector is eliminating DRA to facility-driven approach which tremendously undermines functional sustainability of water facilities in the long-run (Harvey & Reed, 2003).

However, as MWE (2011, p.29) points out, availability, quality and provision of spare parts continue to be a challenge in the CWM model in Uganda. Distribution of spare parts from suppliers to communities is not streamlined, and it remains an endemic problem in the rural setting. This profoundly undermines functional sustainability of water infrastructure (Brikké & Bredero, 2003; Harvey & Reed, 2003). However, Harvey and Reed (2003, p.115) comment that developing countries adopted handpump standardization policies which have resulted in the use and domination of either one or two public domains pumps. This has created monopoly of such public domains pumps, some of which are of poor quality. Nonetheless, the Directorate Water Development is undertaking several initiatives under the current sector reforms to address this challenge (Sloots, 2010; MWE, 2007). For example, to support local the manufacturers and suppliers and establish regional distribution centres and District spare parts dealers (MWE, 2004). However, these initiatives are yet to be implemented although they have far reaching impacts (MWE, 2016).

Besides, due to the standardization policy of two models of hand pumps in the country, local manufacturers are asphyxiated resulting into dependency on imported poor quality spare parts (Harvey & Reed, 2003). Additionally, Harvey and Reed (2003, p.115) posit that due to the economic liberalization policy by the World Bank/IMF, even countries like Uganda and Kenya with local manufacturing capacity find it cheaper to import spare parts than manufacturing locally. Such arrangements encumber sustainability of water facilities since spare parts and hand pumps are not only of poor quality, but also not readily locally available (Harvey & Reed, 2003). It calls for deliberate planning to ensure harmony among the water sector policy framework, economic liberalization and the Directorate of Water Development initiatives such as supporting local manufacturers of hand pumps and spare parts.

Community Water Users

The water sector policy framework provides for ownership, maintenance and management of rural water facilities by communities under the CWM model (Sloots, 2010; MWE, 2004;

MWLE, 1999, GOU, 1995). Essentially, ownership and management are captivated through community capital cost contribution, participation in planning, preventive maintenance, and repairs and payment of water user fees (MWE, 2004). Ideally, every community is required by the National Water Statue, 1995 and National Water Policy, 1999 to establish WUCs to manage the water infrastructure (MWE, 2004; MWLE, 1999; GOU, 1995). Under the CWM model, through DRA, communities show interest by demanding for a water source (Bakalian &Wakeman, 2009) through the Local Government. Similarly, as part of the decentralization policy, communities are required to make a cash contribution towards capital cost, and this depends on the technology choice as depicted in the table below.

Technology choice		Community contribution
Protected Spring	Small	US$ 13
	Medium	US$ 13
	Large	US$ 28
Shallow well		US$ 28
Borehole		US$ 56

Initial capital cost contribution and technology type (Sloots, 2010, p.12).

However, Bakalian and Wakeman (2009, p.4) point out that capital cost contribution is one of the most controversial areas of the CWM model. They advance three arguments in their analyses. First, they point out that quite often, those without improved water sources are always the poorest, and it becomes challenging for such people to pay such amounts. Second, and related to the above, that poor households are trapped in the "vicious cycle of poor health, limited education, and low economic productivity". Therefore, it is only improved services such as safe water that can uplift their livelihoods. Third, that improved water service provision positively impacts on people's health, and so the need to balance marginal social benefits and marginal social costs (Bakalian & Wakeman, 2009, pp.4-5). Given the adverse poverty levels in most rural areas of Uganda, communities contribute differently towards the capital cost. Some bring chicken, millet, ducks, and among others (Sloots, 2010). It is the responsibility of the WUCs to convert such items into cash that is later submitted to the District Water Officer. However, DRA has presented several challenges. Yet, it profoundly impacts on the sustainability of water infrastructure (Harvey & Reed, 2003). At some point, the water demand is manufactured by either local government or NGOs (Harvey & Reed, 2003).

Nonetheless, DRA is not a panacea to the sustainability problem in rural water projects. As Harvey and Reed (2003, p.117) posit, the community's interest in an improved water source does not spontaneously translate into community willingness to own, maintain and manage the water source. Indeed, Harvey and Reed's (2004) study on the *sustainability of rural water supply in Africa* reveals that "*…neither a contribution to capital cost nor a sense of ownership necessarily leads to a sense of responsibility for, and willingness to manage…"* (Harvey & Reed, 2003, p.117). In line with the Local Government Act, 1997 discussed in sub-section 5.1.1, Local Government is required to provide follow-up and back-up support to communities to ensure the functionality of not only structures, but also, the water infrastructure established (MWE, 2004). However, there is inadequate support advanced to communities under the CWM model (Harvey & Reed, 2003). In a nutshell, the water sector institutional framework is presented as depicted in figure 7 below.

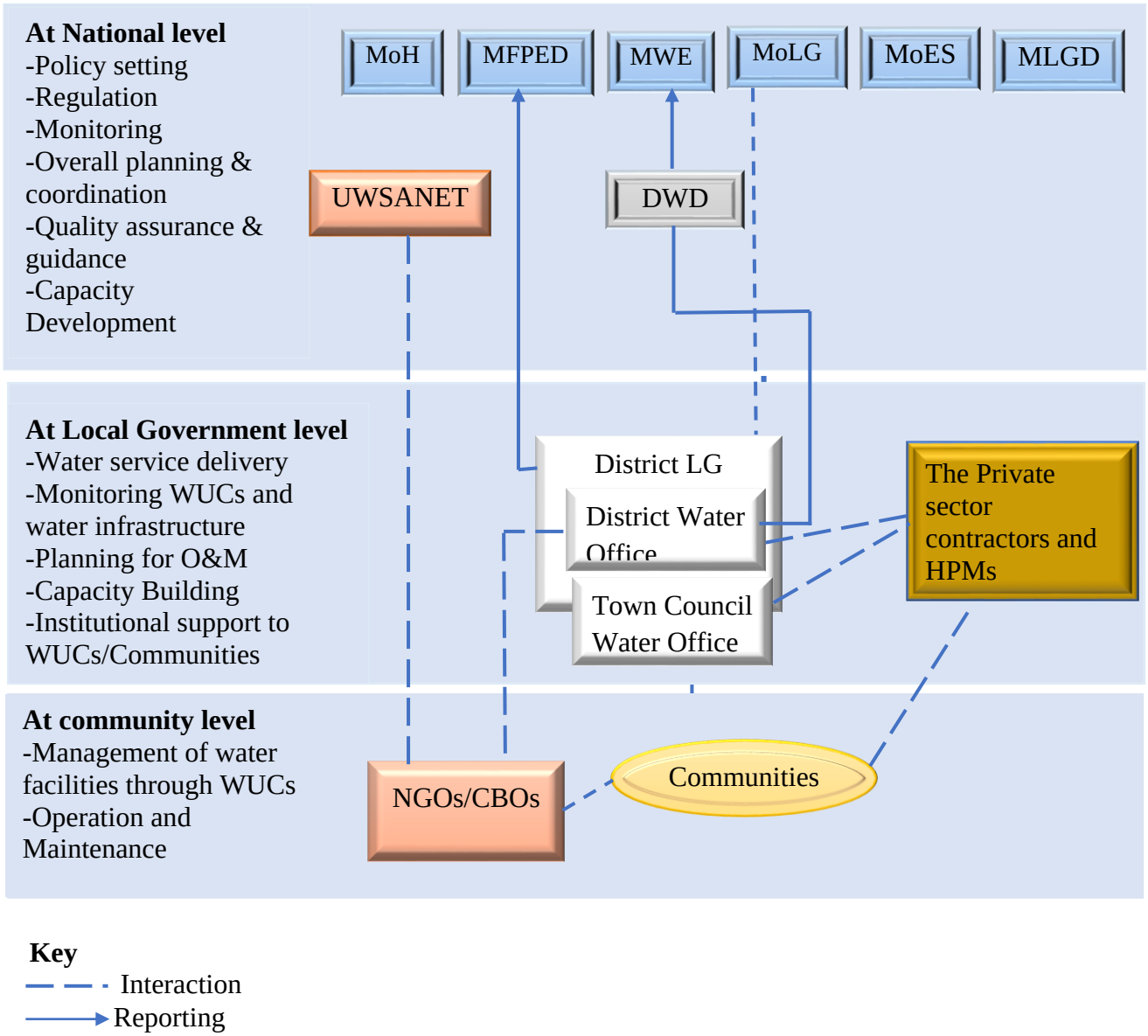

Figure 7: CWM model. Adapted and modified Institutional framework of Rural Water Supply in Uganda (RWSN, 2012, p.6)

5.2. The role of WUCs in groundwater infrastructure management

Under the CWM model, management of water resources is a responsibility of user communities (MWE, 2011; Bakalian & Wakeman, 2009; MWE, 2004), and this is determined by the water sector policy and institutional frameworks (Harvey & Reed, 2004; MWLE, 1999; GOU, 1995). Ideally, water users participate in planning, contribute maintenance fees and formulate rules and regulations (bylaws) on how to use water sources (MWE, 2011). But practically, these management responsibilities are executed by elected WUCs (Mutono *et al.*, 2015; MWE, 2011 & 2004; Harvey & Reed, 2004; MWLE, 1999; GOU, 1997 & 1995). Particularly, WUCs are

responsible for the O&M of boreholes, protected springs and shallow wells developed in their communities (Mutono *et al*., 2015; MWLE, 1999). Importantly, the composition of WUCs takes a gender perspective with women taking at least three positions on each WUC. Principally, WUCs members are elected democratically through election in community meetings based on trust and social networks (social capital) as highlighted by Ostrom (2000).

The National Water Policy, 1999 highlights that committees are responsible for preventive maintenance of water sources for functionality (MWLE, 1999, pp.19-20). They therefore, mobilize water users to pay, and collect the monthly water user fees from community water users (Mutono *et al*., 2015; MWE, 2011 & 2004; MWLE, 1999). However, do WUCs efficiently execute these maintenance roles? Also, how effectively are these roles played? Critically, do water users willingly pay maintenance fees? Ostensibly, there is a contradiction in government's policies, which makes it hard for WUCs to collect monthly user fee from water users (MWE, 2011). Indeed, there are several social services such as education, health and roads that citizens access without paying although with issues of equity and quality. Why pay for water? It, therefore, becomes challenging for WUCs to ask for the monthly water user fee from water users because users believe water is a social service, and it is the constitutional obligation of the state to provide (MWE, 2011 & 2004). Yet, collection and payment of water is critical to functional sustainability of groundwater infrastructure. To the World Bank,

> Sustainability can only be ensured if tariffs generate enough resources to operate the system, finance the expansion of the service to new customers, and ultimately replace the infrastructure after its useful life (World Bank, 1999, p. iv, cited in Bakalian & Wakeman, 2009, p.9).

Furthermore, WUCs manage collected funds and provide accountability to water users after expenditure. But, do WUCs practically provide accountability to community water users? What is the implication of lack of accountability on community trust, cohesion and belief in collective action? To ensure sustainable functionality of water sources, WUCs conduct periodic servicing as a preventive measure against non-functionality (MWE, 2007 & 2004). Certainly, the monthly water user fees collected cover not only major repairs after infrastructure breakdown, but also, preventive maintenance such as oiling parts of the infrastructure and tightening loosening bolts (Mugumya, 2013). To ensure quality of water resources and the "safe water

chain[8]", WUCs sensitize water users on good sanitation, and cleanliness of water infrastructure and jerrycans[9]. There are varied activities in Uganda that have the potential to hurt water environment and water infrastructure (MWE, 2013). It is the role of WUCs to ensure that such activities do not directly harm the sanitation of the water infrastructure and their environs. Similar to low the safe water coverage, access to improved sanitation in the country is still poor, and this has potential to adversely affect the quality of groundwater (MWE, 2016 & 2015; Mugumya, 2013). It is, therefore, incumbent upon WUCs to sensitize water users to ensure good sanitation and hygiene for quality water. This is because protection of groundwater facilities is critical to the protection of people's health and livelihood (MWE, 2013).

Similarly, activities such as poor farming practices in wetlands and deforestation adversely affect the ability of water catchment areas to store water, which subsequently affects protected springs discharge and groundwater levels (MWE, 2013). Thus, there is unreliable water quantity, which consequently leads to non-functionality of groundwater sources (MWE, 2013). However, this may be too much for WUCs to attain. Arguably, ensuring protection of groundwater sources for water quality and quantity may require attaining a balance of the interests of individuals who conduct activities which affect groundwater. This may be a challenging undertaking for WUCs given the fact that the water sector policy framework does not provide for how this can be achieved.

5.3. Hindrances to the participation of WUCs

5.3.1. Collection and management of user fees

The water sector policy and institutional frameworks mandate WUCs to collect monthly user fees from community water users to cater for management of groundwater infrastructure under the CWM model (MWLE, 1999; GOU, 1995). However, how the fees are levied, collected, used and managed remain acute challenges for WUCs (Bakalian & Wakeman, 2009; MWE, 2004). There is inadequate capacity of WUC members to manage funds (Bakalian & Wakeman, 2009), subsequently leading to loss of trust and confidence by water users in committee members (MWE, 2004) especially when the funds are mismanaged. The water sector policy

[8] The various stages involved in ensuring that water is safe from the point of abstraction (at the water source) to the point of consumption (drinking).
[9] Plastic containers used especially in Uganda for fetching water from water sources to homes. They are predominately used in rural areas where people move long distances to fetch water.

and institutional frameworks do not provide for how maintenance funds are to be managed. Ideally, how to keep and manage funds would be addressed at the initial water project stages as noted by MWE (2004). However, this is practically hard to achieve given the traditional nature in which rural water interventions are implemented that locks water users/WUCs out of the critical planning and implementation phases (MWE, 2007). Communities are argued to open bank accounts to save the money, but the less developed financial and banking sector in rural areas coupled with apathy from communities and the small amount collected make such a recommendation futile.

Accountability and transparency among WUCs remain a desired goal. The MWE recognizes that WUCs do not provide accountability to water users depicting expenditure of the collected funds (MWE, 2004). However, though impractical, MWE advises communities to institute robust penalties to committee members who mismanage funds as an avenue to address this hindrance (MWE, 2004, p.22). But, communities propose only bylaws which are moreover certified by the Attorney General for conformity with the supreme law (MWE, 2011; GOU, 1995). Yet, still access to safe and clean water is constitutional right to all Ugandans. It therefore becomes practically impossible to sanction penalties on defaulters and fraudulent of water user fees. Moreover, WUCs do not have a legal status, and squarely lack knowledge and skills of formulating bylaws, which again adversely impacts on their participation and implementation of such policies (MWE, 2011).

5.3.2. Intra-community power differences

Globally (for example, the Dublin Statement on Water and the Environment), and locally, water sector policies envisage the participation of women in water resources management under the CWM model. But, do such policies capture the implications of the intra-community power differences which undoubtedly influence effectiveness and equity in groundwater management? Meinzen-Dick and Zwarteveen (1998, p.337) argue that women's participation in water management is minimal, and it remains rhetoric. They argue that although such policies identify women as a marginalised group, they pay less attention on the differences in the water priorities and needs of men and women, and the acute struggles women face to control the water resources (Meinzen-Dick & Zwarteveen, 1998, p.338). As earlier commented, women's participation in community management work such as water management is part of the "women's triple role" beside reproductive and productive roles (Meinzen-Dick &

Zwarteveen, 1998; Moser, 1989). This presents challenges to women's participation in associations such as WUCs (Meinzen-Dick & Zwarteveen, 1998). Coupled with social norms, such roles further confine women to household chores. In Uganda, the water sector policy framework guarantees the involvement of women in water management which is such a good initiative. However, water sector reports provide limited evidence on the improvement of women's participation in water management and its probable positive impact on functional sustainability. Besides, gender differences in water use and management are not well discussed at the initial water project stages, though recognised. Meinzen-Dick and Zwarteveen (1998) make an interesting observation that women are eliminated from water management from the onset of the water intervention projects. They mention that water construction activities such as providing man power, constructing fences around water sources, and bringing stones (during construction) are physical and thought to be for men, which eliminates the participation of women (Meinzen-Dick & Zwarteveen, 1998, p.339).

5.4. Water sector policy and institutional frameworks and functional sustainability

The fourth research objective was to analyse how the water sector policy and institutional frameworks enhance functional sustainability of groundwater infrastructure. To begin with, national policies either directly or otherwise impact on the sustainability of rural water systems (Harvey & Reed, 2004). However, Harvey and Reed (2004, p.11) interestingly observe that most of the water policies, especially in the Sub-Saharan African region are generic in nature being informed by the directives of World Banks and International Monetary Fund (Harvey & Reed, 2004, p.11). In the Ugandan context, MWE has undertaken varied policy efforts aimed at improving functional sustainability in the rural water sector. These include the following as discussed in the subsequent sections.

5.4.1. Gender Mainstreaming

Women play a critical role in groundwater infrastructure management (MWE, 2016 & 2015). Yet, as earlier noted, their participation is troubled with several challenges, but most acute, the "women's triple role", and inadequate skills and confidence to participate in water infrastructure management (Meinzen-Dick & Zwarteveen, 1998; Moser, 1989). In line with the National Water Policy, 1999, the National Water Statute, 1995 and the National Gender Policy, 1999, MWE adopted a gender based approach that underscores the need to foster a nexus between men and women in water infrastructure management (Sloots, 2010). This is purposely

to enhance the efforts and insights from both men and women (MWE, 2016). According to MWE, the indicator for gender mainstreaming in rural water projects is the *"the percentage of Water and Sanitation Committees with at least one woman holding a key position*" (MWE, 2016, p.130 & 2015, p.42). Ideally, the indicator demands that the Local Governments oversee and facilitate the formation of WUCs and train the formed committees to become gender sensitive (MWE, 2016 & 2015), and ensure that at least each committee has at least a woman holding a key position. Yet, as presented earlier, the water sector policy framework requires that membership of WUCs should constitute at least three women, with at least two in key positions as chairperson, treasure and caretaker. Does this present a policy contradiction? Or, a gap between the policy framework and policy practice?

Several efforts have been made and implemented by the MWE and the line ministries (discussed in section 5.1.2), Local Governments and NGOs to achieve gender mainstreaming in the rural water sector. But important to this study are the Local Government advocacy meetings. The 2016 Sector Performance Report revealed that out of the 111 Districts in Uganda, 108 Districts had conducted advocacy meetings by the end of 2016 (MWE, 2016, p.128). These advocacy meetings have been conducted to build political commitment, change political attitudes and rally women's self-confidence and management skills (MWE, 2016). It is revealed that such meetings have created awareness among communities about gender issues in relation to water infrastructure management (MWE, 2016 & 2015). In a nutshell, 84% groundwater sources in the 111 districts had women with key positions on WUCs by 2016 (MWE, 2016). But has such an initiative enhanced functional sustainability of water facilities? Paradoxically, the water sector report does not reveal the percentage of water facilities functional because of women assuming key positions on WUCs following the implementation of advocacy meetings. Arguably, this might be misleading especially at policy level given the fact that the report is inaudible on whether women's inclusion on WUCs after advocacy meetings translates into their meaningful participation and functional sustainability.

5.4.2. Training Water User Committees

In this study, although debatable at this level, I hold a presupposition that the participation of WUCs in public groundwater infrastructure management is critical to functional sustainability. In support, MWE agrees that "*functionality, ownership and sustainability of water and sanitation facilities depend largely on effective management*" (MWE, 2016, p.132). Essentially, this makes WUCs training profoundly paramount to build the capacity of

committee members to enable them perform their roles and responsibilities not only within the confinements of the sector policy framework, but also, to effectively enhance functional sustainability (Bakalian & Wakeman, 2009).

Unequivocally, MWE notes that WUCs are in dearth of knowledge on decision making, lack understanding of whether water users follow rules within the water sector policy framework, and lack incentives to operate as a community (MWE, 2016, p.132). I agree with the MWE especially in terms of the inadequate capacity of WUCs given the fact that committee members are not professionals fully trained in the water management domain. This adversely affects the bonds that would enhance collective action in the community as interestingly pointed out by Ostrom (2000). Moreover, Ostrom (2000, 174) argues that Central Government and Regional/Local Governments adversely impact on social capital that acts a lubricant for water management under the CWM model. Arguably, when WUCs are trained by Local Governments and other actors, meaningful participation and effective management are enhanced hence a functional CWM as earlier illustrated in the conceptual framework in Chapter 3 (section 3.3). Thus, effective management of groundwater facilities is achieved; which together with appropriate institutional support from Local Government Technical support units (TSU) deliver functional sustainability of water facilities (MWE, 2016). However, this is ought to be a cycle as depicted in figure 8 below with capacity building of WUCs and institutional support being central to functional sustainability.

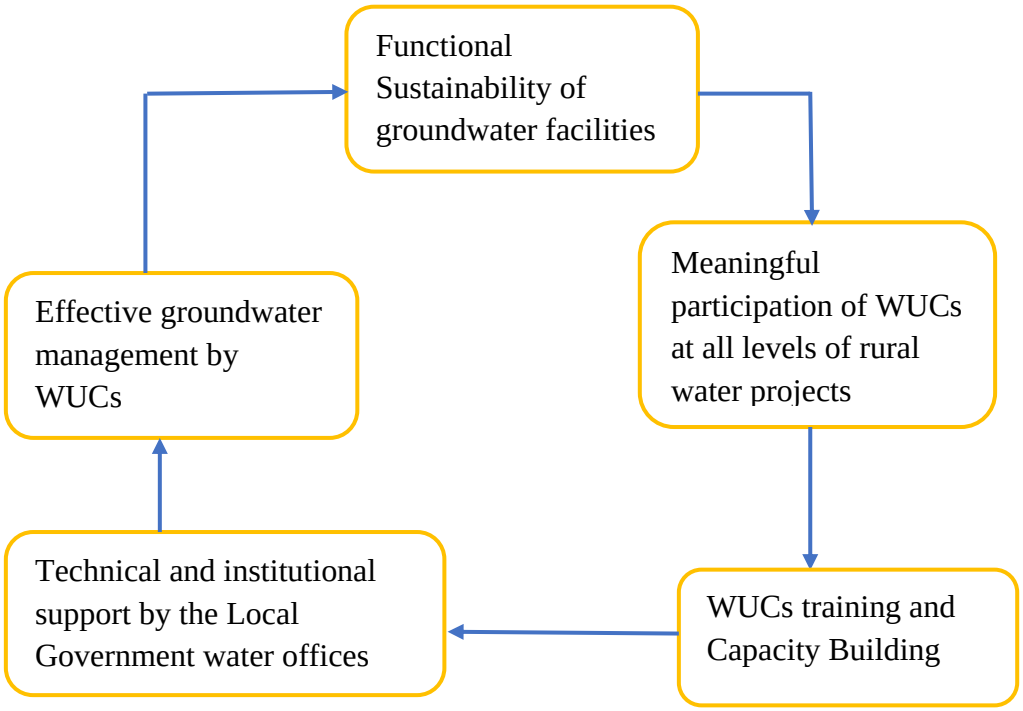

Figure 8: Typical Functional Sustainability Cycle (Author, 2017).

Indeed, a relative number of water sector performance reports have acknowledged that when WUCs are trained, they have the potential to meaningfully participate in the management of water infrastructure to ensure functional sustainability (MWE, 2016 & 2015). However, it is paramount to complement training with institutional support to WUCs (Bakalian & Wakeman, 2009). As discussed in Chapter 5 (sub-section 5.1.2), it is incumbent upon the Local Governments to provide institutional support to WUCs (MWE, 2011; 2007 & 2004). In contrast, advancement of technical/institutional support by the Local Government Technical Support Units (TSU) is still short of what is required (MWE, 2016). Besides, there is a mismatch between the number of WUCs formed and those trained as depicted in figure 9 below.

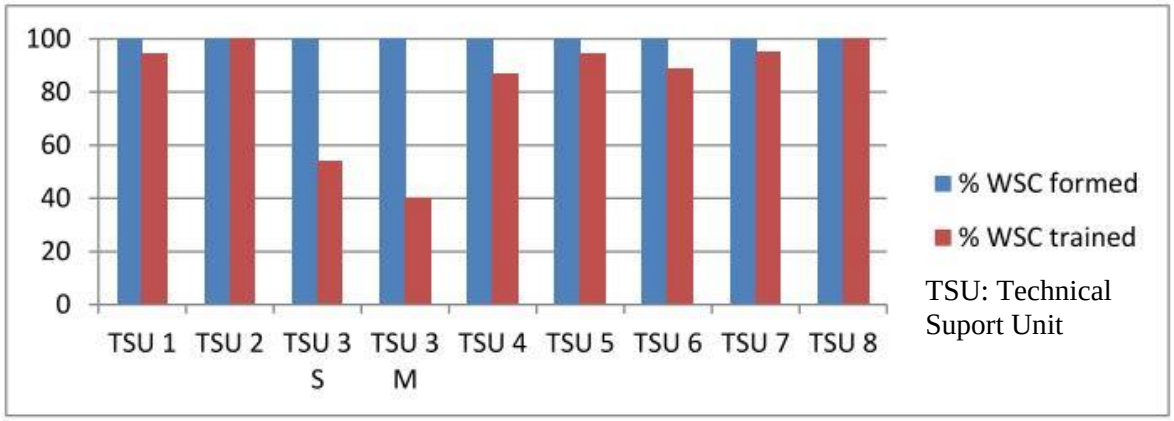

Figure 9: Percentage of formed and trained WUCs (MWE, 2016, p.132)

From the figure 9 above, it is evident that training and technical support to WUCs is still wanting. Yet, they are critical to not only the functionality of WUCs, but also the functional sustainability of water facilities (MWE, 2016; Harvey & Reed, 2004). Besides, gender training initiatives discussed in sub-section 5.4.1 above can be effectively implemented through capacity building of WUCs. MWE, for example, reveals that between 2015 and 2016, 14 new WUCs were formed and trained in gender issues which consequently uplifted the percentage of women representation to 49% nationally (MWE, 2016, p.133). However, such training exercises are not tailored to the specific positions and responsibilities that women hold and execute on WUCs. Although it may be practically challenging to achieve, it is germane to juxtapose training programmes targeting positions women hold with corresponding responsibilities women execute as WUC members (MWE, 2016). This can arguably foster meaningful and impactful women's participation in terms of functional sustainability of groundwater facilities. But as Bakalian and Wakeman (2009, p.6) postulate, non-technical issues such as continued women involvement in groundwater infrastructure management have received little attention in national policy frameworks. Much emphases are skewed to ensuring only women involvement, unlike their continuous and meaningful involvement.

5.5. Study area

This section provides information on Uganda, Namayingo District and Namayingo Town Council where the study was conducted.

5.5.1. Physical location and size of Uganda

Uganda is an East African country sharing boarders with Kenya to the East, Tanzania to the South, South Sudan to the North, Democratic Republic of Congo to the West, and Rwanda to

the Southwest (UBOS, 2014a). Uganda is a landlocked[10] country, and it lies between 10 29' South and 40 12' North latitude, 290 34 East and 350 0' East longitude. Uganda covers a total area of 241,551 square kilometres, of which land covers 200,523 square kilometres, and about 36,330 square kilometres of water (UBOS, 2014a; Mukisa, 2009). Geographically, Uganda enjoys the equatorial type of climate characterised by plenty rainfall and sunshine because of its strategic location astride the equator (UBOS, 2014a; Mukisa, 2009; National Environment Management Authority (NEMA), 2005). Besides, the country is endowed with varied physical features such as rivers, lakes, mountains, forests and swamps which all combined to define its climate and hydrological cycle. Further, Uganda has fertile soil, which coupled with plenty rainfall favours agricultural activities. It is, therefore, unsurprising that agriculture has remained the pillar of Uganda's economy since the early post-independence period with about 80% of its population involved in this sector (UBOS, 2014a). However, agricultural activities are predominately pronounced in the rural setting, though majorly subsistence farming.

Currently, agriculture contributes about 50% of the export earnings with tobacco and coffee being the country's largest export commodities (UBOS, 2014a). Nonetheless, given the contemporary global climate change, rainfall partners and mean annual temperatures are drastically changing and unevenly distributed. For example, the mean annual temperatures have changed from 160°C to 300°C. Moreover, the Northern and Eastern parts of the country sometimes experience mean annual temperatures exceeding 300°C, while the South Western region experiences mean annual temperatures below 160°C (UBOS, 2014a). On the other hand, the Central, Eastern and western regions receive two rainfall seasons (NEMA, 2005). That is; from March to May, and September to November. Yet, the Northern region receives one rainfall season, from April to October with some minimal rain between November to March (UBOS, 2014a). Consequently, most parts of Uganda receive between 750 mm and 2,100 mm of rain annually.

Administrative units in Uganda

Following the decentralization policy that Uganda adopted in 1990s, the country is divided into one hundred and eleven districts and one city as the local administrative units (UBOS, 2014a) as depicted in the figure 10 below. Under the decentralization policy, the Central Government

[10] Uganda does not have a coastline, or a direct route to the sea. It depends on the Mombasa port for her imports and exports.

devolves governance and political functions to Districts which are viewed as the basic administrative units in the country. It should, however, be noted that the Central Government retains the responsibility of policy formulation, and other related supervisory roles (UBOS, 2007; MWE, 2007 & 2004). In terms of population, the 2014 National Population and Housing Census estimated the population of Uganda at 34.6 million persons. However, it was projected to increase to about 40 million by 2040 given the high population growth rate and fertility rate of Uganda (UBOS, 2014a). Importantly, the 2014 National Population and Housing Census Report indicated that 34% households use borehole water, and 29% source water from unimproved water sources. Further, it revealed that 33% of the rural residents collect water from unimproved water sources as opposed to 16% in urban centres (UBOS, 2014, p.32).

Figure 10: The current map of the Republic of Uganda (Guide To Uganda, n.d)

5.5.2. Location of Namayingo District

Namayingo District is located at the shores of Lake Victoria, Eastern Uganda. It is a recent District that was curved out of Bugiri District in 2010. The District is located along the Musita-Lumino highway, 188 kilometres by road from Kampala, Southeast of Jinja District. Equally, it is about 43 kilometres by road, South of Bugiri District (MLHUD, 2013). The District shares boarders with Bugiri District to the Northwest, Busia District to the Northeast, the Republic of Kenya to the East and Southeast, the Republic of Tanzania to the South, and Mayuge District to the West and Southwest. Although this was captured under the study limitations, for clarity in this section, I would like to emphatically point out that it was challenging to access literature

specifically on Namayingo District. The causes were twofold. First, the District is relatively recent, and given its rural location with limited access to internet, there were no documents accessible on the internet, neither does the District have a website. Second, although efforts were made to access literature from the District headquarters, such efforts were futile as the approached offices waited for authorization from the Chief Administrative Officer (CAO)[11]. It was very hard to access the CAO despite the tremendous attempts I made. Subsequently, I had to rely on the Wikipedia page[12] of Namayingo District for information about its location. I am aware that this might be a weakness given the contestable authenticity and credibility of Wikipedia information. But, I maintain that it does not in any way affect the authenticity and credibility of the study.

Nonetheless, I accessed documents from the MWE and the National Water Atlas website for specific literature on groundwater infrastructure in Namayingo District. Water access in Namayingo District is uneven. The National Water Atlas depict that safe water access vary from 10% in Bugana Sub-County to 73% in Buswale Sub-County (DWD, 2017). Namayingo District has about 547 water points serving about 124,311 people (51% access). But, of the 547, about 127 groundwater points have been non-functional for about 5 years (DWD, 2017). The District has 36 protected springs, 161 shallow wells and 217 boreholes. However, only 17 springs, 117 shallow wells, and 188 boreholes are found working at the time of spot check (DWD, 2017). Concisely, functionality in Namayingo District is rated at 78%, but this is below the national average of 88%, and the 90% 2015 government target (SNV, 2016b; IWSC-Uganda, 2015). Worth noting, the CWM model is the major management option adopted as depicted in figure 11 below.

[11] The head of the District Technical and Human Resources teams
[12] Namayingo District Wikipedia page https://en.wikipedia.org/wiki/Namayingo_District

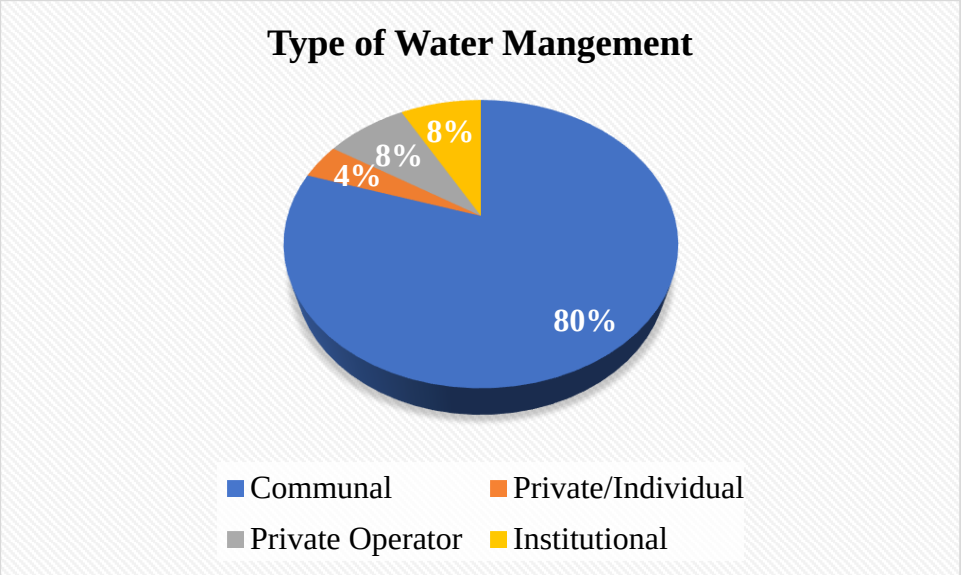

Figure 11: Groundwater Management type in Namayingo District (DWD, 2017)

5.5.3. Location of Namayingo Town Council

According to MLHUD (2013, p.10), Namayingo Town Council shares boarders with Nsono Parish in the West, Busia District in the East, Gondohera Parish in the South and Bubango Parish in the North as depicted in figure 11 below. Administratively, Namayingo Town Council is constituted of five wards. That is; Bulamba, Namayingo Central, Nambugu, Nasinu and Budid. The five wards are further divided into 27 villages covering an area of approximately 27.16 kilometres squared (MLHUD, 2013). Namayingo Town Council is the economic centre of Namayingo District. This is one of the contributing factor for its growth as people from other Sub-counties and trading centres in the District conduct their trading business in the Town Council. It is equally a residential area for a large proportion of people who commute to their gardens for agricultural activities. It is, however, noted that the Town Council lacks defined residential zones in terms of density (MLHUD, 2013). Most of the families in the villages outside the town stay in mud and wattle structures, but a few permanent houses noticed within the town and the nearest outskirts.

Namayingo Town Council is a located on a plateau with an average altitude of 1200 metres above the sea level. It lies within the Lake Victoria basin, with a few swamps and some seasonal streams especially in the Northern side of the town (MLHUD, 2013). The soils are dominantly rocky in town, but dark grey fertile soil as one moves towards the lower parts of the town. This justifies the concentration of agriculture in this area in the lower parts of the Town Council

(MLHUD, 2013). Namayingo Town Council predominately experiences tropical climate. However, with clear characteristics of equatorial climate such as rainfall received during day time (mid-day). MLHUD (2013, p.14) attributes this to the location of the Town Council within the environs of Lake Victoria. Similarly, Namayingo Town Council is dominated by informal businesses as its economic base. Businesses such as grinding mills, metal fabrications, welding, and wood work were noticed concentrated in the town. However, these are conducted on a small scale. Nonetheless, the Town Council has the potential of industrial development once deliberate planning efforts supported by the government policy of value addition are implemented (MLHUD, 2013). Its location along Musita-Busia road coupled with the available electricity and cheap labour can spur industrial development in the Town Council.

The National Water Atlas reveals that about 63% of the people in Namayingo Town Council had access to safe and clean water as of April, 2017 (DWD, 2017). Certainly, about 37% of the Namayingo Town Council population rely on unimproved and unprotected water sources. Yet, still the 63% access rate encompasses access to non-functional and partially functional water infrastructure. The access rate therefore becomes inherently contestable. Is it access to the water as a resource? Or, access to the water infrastructure? The indicator for water access not only in Uganda, but also across the Sub-Saharan region is the percentage of people within 1,000 meters (rural) and 200 meters (urban) with access to an improved water source (MWE, 2016 & 2015). However, this indicator connotes access to water infrastructure, not the water resource. The challenge with measuring water access in terms of access to improved water sources has the danger of considering that even communities with non-functional and partially functional water facilities have access to safe water. Yet, practically such communities resort to unimproved water sources because of the unpredictability of improved water sources.

The Town Council has 16 boreholes and 14 shallow wells. But, only 14 boreholes and 6 shallow wells are functional (DWD, 2017). Also, of the 9 rainwater tanks that are communally managed, only one is functional. Besides, the non-functionality of such facilities remains attributed to technical breakdowns (DWD, 2017), and little is known about the participation of WUCs in the management process. In general, Namayingo Town Council has a functionality rate of 62% (DWD, 2017). But, this is much below the 88% national average, and the 90% government target (SNV, 2016b; IWSC-Uganda, 2015). Again, this functionality is equally arguable since it includes water facilities that are partially functional. Importantly, low functionality of water infrastructure adversely impacts on sustainable access to improved water

sources. Marks, Komives and Davis (2014, p.2), for example, argue though at a regional level, that low access to improved water in Sub Saharan Africa is partly due to the lack of functional sustainability of water facilities. Against this backdrop, I was motivated to study the CWM model, and analyse the participation of WUCs in public groundwater infrastructure management in Namayingo Town Council. It is, therefore, hoped that my study findings will provide insightful knowledge on functional substantiality to guide the implementation of rural water supply systems in Uganda as the country strives towards attaining Goal 6 of the Agenda 2030. In the figure 12 below, I present the map of Namayingo Town Council.

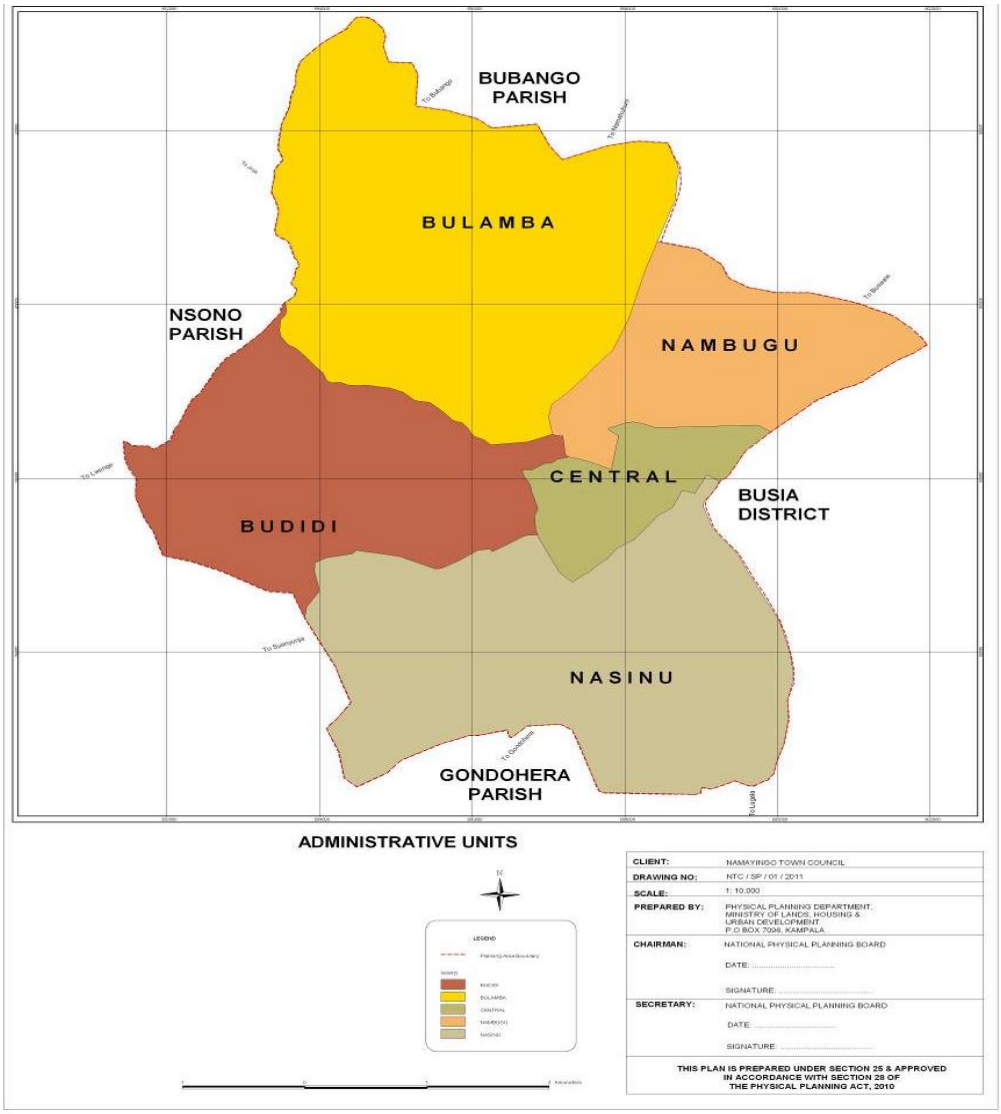

Figure 12: Map of Namayingo Town Council (MLHUD, 2013, p.12).

Chapter Six: Empirical findings and Analysis

6. Introduction

In this Chapter, I present the empirical findings of data collected through semi-structured interview, focus groups and participant observation. These findings are presented and analysed in consonance with the research questions, reviewed literature, social capital and conceptual framework. This chapter is sub-sectioned to take account of the four research questions. Sub-section one handles the demographic characteristics of the participants in terms of ages, gender, positions held and duration in such positions. Sub-section two responds to research question one on water sector policy and institutional frameworks. It examines the appropriateness of the water sector policy and institutional frameworks, and how the frameworks either support or constrain the participation of WUCs in public groundwater infrastructure management. Sub-section three handles research question two on the role and organizational capacity of WUCs in public groundwater infrastructure management. It presents empirical findings on the mechanisms WUCs employ in managing public groundwater sources, and the effectiveness of such mechanisms. Sub-section four responds to research question three on what WUCs feel are the hindrances to their participation in public groundwater infrastructure management. Lastly, sub-section five handles research question four on how water sector policy and institutional frameworks enhance functional sustainability of groundwater infrastructure. It specifically analyses the efforts being made by the MWE to enhance functional sustainability.

6.1. Demographic characteristics of respondents

Data on age, position held, gender and duration of serving in their respective positions were deliberately collected to create a clear picture of the nature of respondents that participated in the study as discussed in the ensuing sub-sections

6.1.1. Respondents by Gender

The study involved 15 male participants and 23 female participants. The gender disparity in groundwater infrastructure management in Namayingo Town Council was overt. However, I had intended to collect data from both men and women equally. All participants were asked why there were more women in groundwater infrastructure management than men. Consensually, results revealed that women held vast interest in water as the principal water users since they stayed home most of the time. A male member of a WUC acknowledged that;

> …women are the owners of water. When there is inadequate water in the home, women are the ones to move long distances looking for water! (Focus Group, 03).

Such comments depict how water infrastructure management was critical to women. But, isn't such an assumption based on gender inequalities between men and women in communities? Arguably, this is a gender role, socially constructed based on social norms and beliefs. This disputes findings of earlier studies (as discussed in Chapter three, section 3.1) that argue that social capital eliminates women in collective management actions in communities (for example, Van Koppen & Kuriakose, 2016). However, women were still a marginalised group in groundwater infrastructure management activities. Besides, as observed in Chapter three (section 3.1), water sector policy and institutional frameworks envisage women participation in rural water management. Particularly, they provide for at least three women representatives on WUCs, and with at least two in key positions as chairperson, treasurers or caretakers (MWE, 2011; Sloots, 2010; MWE, 2007 & 2004; MWLE, 1999; GOU, 1995). Therefore, this increased the number of women in water management. But, the number of women on WUCs per se does not automatically imply women's participation. Unsurprisingly, Meinzen-Dick and Zwarteveen (1998, p.337) find women's participation rhetoric. Practically, women's participation is limited on grounds of inadequate confidence and skills to handle water management activities, and further slackened by the "women's triple role" (MWE, 2011; Meinzen-Dick & Zwarteveen, 1998; Moser, 1989).

Besides, the water sector performance reports (MWE, 2016; 2015 & 2014) make mention of women as managers of groundwater facilities. However, this is inadequate because as earlier highlighted as a finding, such a notion is based on the fact that women are the principal water users (Meinzen-Dick & Zwarteveen, 1998). Moreover, such reports do not reveal a shift in decision making from men to women on WUCs as emphatically observed by Meinzen-Dick and Zwarteveen (1998, p.339). Indeed, it was empirically revealed that most critical decisions, especially on financial matters were advanced by the few men on water committees. Further, findings from focus groups revealed that even where women held key positions such as chairpersons of WUCs, breakdowns of water sources were reported to Local Government offices by men on such committees. As a justification, women on WUCs revealed that they were busy with household chores, yet, men were sometimes free. So, men could report non-functionality of water infrastructure to NDWO and NTCWO. Ironically, these are social

aspects which craft into gender stereotypes that continue to undermine women's participation even on WUCs (Meinzen-Dick & Zwarteveen, 1998). But, they remain unaddressed at water sector policy formulation and implementation levels. For example, the confinement of women in the household limits women's participation in management activities such as community water meetings. Interestingly, unlike the earlier refutation of the findings of previous studies on social capital, the confinement of women in households confirms the argument that social capital is capable of restricting access to opportunities and individual freedom of some community members especially women (Van Koppen & Kuriakose, 2016; Øyhus, 2016; Ostrom, 2002). Again, this inherently marginalises women in the management process of common resources such as water (Van Koppen & Kuriakose, 2016).

In contrast, although jokingly, men commented that they could not fully involve in water management activities because they were always busy with productive activities in town. This was however, not peculiar to the character of men in the Ugandan rural context. For example, during the unannounced field visits to various groundwater sources in Gulu District, Northern Uganda, Mirembe (2011) found out that women were holding key positions on WUCs. However, she reveals that men reported busy schedules, and so they could not find time for water sources management (Mirembe, 2011). But, if those with interest in the resource depend on the contribution of those with less interest, water infrastructure management is adversely impacted (Meinzen-Dick & Zwarteveen, 1998). In a nutshell, if women (with vast interest in water) depend on men (less interest) for money to pay the monthly water fees, water infrastructure management is affected. Thus, adversely impacting on functional functionality.

6.1.2. Respondents by position

Data were collected from NDWO and NTCWO as key informants. As observed in Chapter four, this category was purposely involved in this study because of their critical role in the CWM model. The water sector policy and institutional frameworks as discussed in Chapter five position the NDWO and NTCWO as key players in rural water management following the decentralization policy (Sloots, 2010; MWE, 2011 & 2007). The NDWO and NTCWO were asked the duration they had spent in their respective positions. This question was informed by the human resources gap that was identified during the analysis of the water sector institutional framework that revealed that only 48% of the District Local Governments in Uganda had qualified staff in the District Water Offices as by April 2011, and acute in new Districts (Ssozi

& Danert, 2012, p.7). I therefore intended to establish their level of experience in rural water infrastructure management. Through interviews, the NDWO and NTCWO revealed a clear understanding of rural water management. Particularly, findings revealed that they had served for three years by the time of fieldwork. The small time in office was attributed to the District recentness- incepted in 2010, and such offices were filled some years after District's inception.

Similarly, field data were collected from local council leaders from the four villages purposely sampled: two villages with WUCs and two villages without WUCs. I was aware that this frame would inherently connote a comparative study. However, it was purposely and carefully choreographed to only get insights into how villages with and without WUCs were managing their water facilities. Interestingly, although local council leaders are silent in the water sector policy and institutional frameworks, their role in groundwater infrastructure management was found significant in three ways. First, it was found out that WUCs executed their management roles under the supervision of local council leaders. Second, community water bylaws were enacted under the guidance and facilitation of local council leaders who could stamp and sign them before they were implemented as squarely observed by MWE (2004 & 2007). Besides, Local Government water officers revealed that local council leaders organized village water demand meetings, and mobilized community members to participate in water planning activities as required by the DRA. Third, in villages with water sources without WUCs, local council leaders took sole responsibility of groundwater infrastructure management. Pretty and Ward (2001) concur that local institutions are critical to natural resources management. They argue that poor management systems, inadequate maintenance, overexploitation and physical degradation of resources are inevitable in case of ineffective local institutions (Pretty & Ward, 2001, p.209). However, local institutions such as WUCs can be effective in water management when there is robust local connection with local council leaders and community water users. Invariably, this local connection is facilitated by social capital in form of norms of reciprocity and social networks (Ostrom, 2000).

Like with Local Government water officers, local council leaders were asked about the duration they had spent in office. Notably, this question was informed by the fact that like WUCs, local council leaders in Uganda work voluntarily and informally. Findings revealed that local council leaders had spent over thirty years in power. Like WUCs, the tenure of local council leaders influences groundwater infrastructure management. But because they work voluntary and

informally, it has been argued that local council leaders lose interest in water management activities over the years (Moriarty *et al.*, 2013; MWE, 2011). Besides, for example, villages with water sources without WUCs, findings revealed that it was challenging to instil the social norms and local connectedness that would enhance community collective action. This was because some members did not trust their local council leaders.

Equally, four water users were interviewed to provide their perspectives and insights into groundwater infrastructure. In a nutshell, WUC members formed the biggest category of the study participants. This was purposely designed to study a reasonably bigger number of WUC members as these were my focus in this study. Like earlier indicated in Chapter four, four focus groups of four WUCs in four villages were conducted. However, though the duration of time of WUCs significantly differed; none of them had lasted for more than four years by the time of fieldwork. Besides, this was not associated with the duration of water sources since installation. Study findings revealed that water users through voting[13] changed WUCs members after every two years. Although this was conducted democratically, findings revealed that most of the committees studied had some members who had served on older committees. WUC members were asked why some members would be voted back, and results indicated that water users profoundly trusted such members. While discussing connectedness, networks and groups as social capital forms, Pretty and Ward (20011, pp.211-212) unequivocally highlight that connected people always want to work together. Although voting back old members was presumably premised on trust, social norms and connectedness, it was inherently a challenge as the spirit of volunteerism cannot be kept for many years. Therefore, volunteerism and informality on which WUCs operate, the basis of the CWM model, changing of committee members (tenure) is critical to functional sustainability (Moriarty *et al.*, 2013; MWE, 2011).

6.2. Appropriateness of the Water sector policy and institutional frameworks

In research objective one, I examined the appropriateness of the water sector policy and institutional frameworks in supporting the participation of WUCs in groundwater infrastructure management in Namayingo Town Council. Specifically, empirical findings in this sub-section responded to how the water sector policy and institutional frameworks supports WUCs participation. And, how it constrains their (WUCs) participation in groundwater infrastructure

[13] Voting is done democratically. Community members under the supervision of the local council one chairperson for vote WUC members by show of hands.

management in Namayingo Town Council. In examining the CWM model, and the participation of WUCs, it is inescapable to examine the suitability of water sector policy and institutional frameworks. As an emphasis, WUCs and other key actors in rural water systems derive their mandates, roles and organizational capacity from the water sector policy and institutional frameworks.

6.2.1. Policy framework and practice

Water policies either directly or indirectly impact on the functional sustainability of water infrastructure (Bakalian & Wakeman, 2009; Harvey & Reed, 2004). It is against this backdrop that the study respondents were asked the policy on groundwater infrastructure management that Namayingo Town Council was using. Specifically, this question was asked to analyse the link or, even the gap between the water sector policy framework and policy practice on ground. Importantly, was what people knew about the policy framework influenced by the policy? Did what people know about the policy framework enhance functional sustainability? Did the policy framework relate with policy practice? Did policy practice lead to functional sustainability? Did the policy framework inherently pronounce functional sustainability? Did the policy framework inform policy practice? Did what people know inform policy practice, or policy practice informed what people know? And, did the policy framework inform what people know? This probable nexus either enabling or, disabling functional sustainability was presented and analysed as illustrated in the analytical model in figure 13 below.

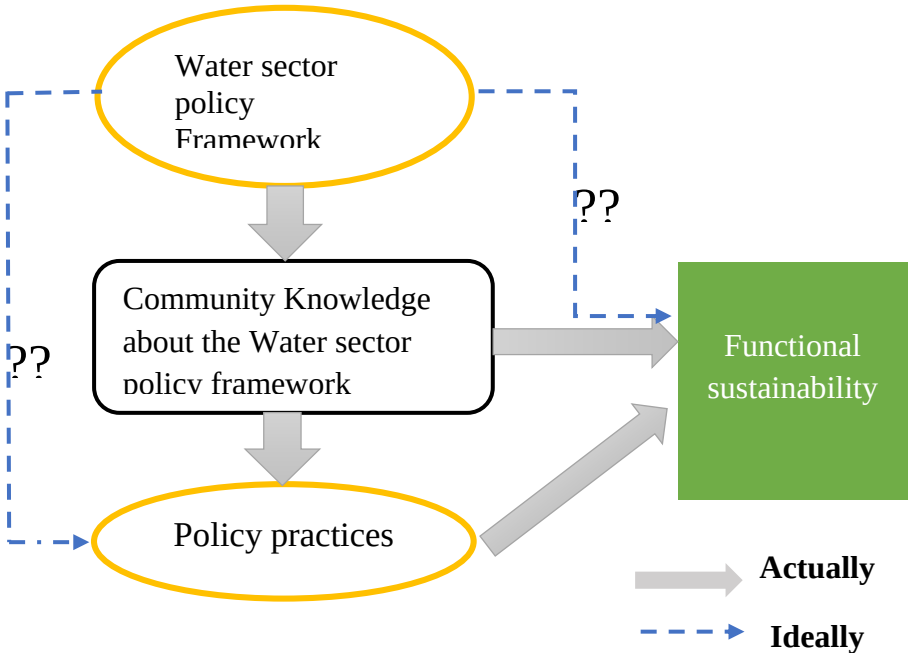

Figure 13: The analytical model for policy framework and policy practices (Author, 2017)

For clarity, the above model was used to analyse the findings on water sector policy framework and policy practices, and both the actual and ideal functional sustainability of water facilities. Based on knowledge from the reviewed literature and the analysis of the contextual landscape of groundwater infrastructure management in Uganda, I am aware that the water sector policy framework impact on the participation of WUCs in groundwater infrastructure management. Therefore, to analyse the participation of WUCs, it was prudent to first scrutinise how the policy framework influences policy knowledge, and enhance policy practice to inform the participation of WUCs in groundwater infrastructure management.

Findings revealed that NDWO and NTCWO were conversant with the water sector policy framework. However, there was an observable mismatch between their knowledge and understanding of the water sector policy framework and policy practice. Both the NDWO and NTCWO acknowledged that Namayingo Town Council was a lower Local Government unit that followed policies set at the ministry level. This was in consonance with the National Water Statute, 1995 and National Water Policy, 1999; which vest the sector policy formulation powers in the MWE (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995). Furthermore, the interview with the NDWO and NTCWO revealed that communities had to apply to the Town Council for new groundwater sources through local leaders. A question was posed to both the DWO and TCWO as to why communities themselves had to apply for water sources. This question was purposely asked to relate the discussion to DRA that is pronounced under the CWM model. Certainly, the Local Government water officials revealed that communities had to show interest as aligned with DRA principles. Although this is principally the ideal, WUCs and water users revealed that they never applied for their groundwater sources. A shallow well water user, for example, commented;

> We only saw people coming with a vehicle to our village. We did not know what they were coming to do, but our local council leader told us that they had come to construct a water source for us. Everyone in our village was happy since we had a water crisis at that time (Interview, 03).

Such comments reveal a mismatch between the water sector policy framework and policy practice. Similarly, such comments not only depict inadequate understanding of the entire water project by the community, but also, signal the absence of community participation in the initial stages of the water project. This undermines the participation of WUCs in water sources

management and the sustainability of groundwater facilities (Brikké & Bredero, 2003). Yet, the Local Government water officers knew what the water sector policy stipulates especially in relation to DRA that is central to the CWM model. Undoubtedly, the implementation of DRA significantly impacts on the sustainability of rural water systems (Bakalian & Wakeman, 2009; Harvey & Reed, 2003). In situations where community water demands are manufactured like depicted in the quotation above, there is dearth of community willingness to own the water facilities, maintain and participate in the management process of such water facilities (Bakalian & Wakeman, 2009).

Further, the pre-construction factors such as decision making and water project initiation (Bakalian & Wakeman, 2009) are overlooked where the water demand is manufactured. Yet, such factors such profoundly impact on the effectiveness and functionality of groundwater systems (Bakalian & Wakeman, 2009). All the community participants reported that they were not involved in the initial project stages. Findings revealed women were, for example, only required to provide food for those constructing the water sources. Yet, local council leaders were only required to provide security for the water drilling machines. Such participation is passive, and leads to non-functionality of water sources (Harvey & Reed, 2003), especially when the water project is not understood by water users (Brikké & Bredero, 2003). Besides, community's interest that was emphasized under DRA by the NDWO and NTCWO is not a panacea to the participation of WUCs and sustainability of groundwater infrastructure. Arguably, community interest does not encompass the community financial capacity to manage the water infrastructure (Bakalian & Wakeman, 2009; Harvey & Reed, 2007 & 2004). Besides, it does automatically not capture the social norms and social bonds (Pretty & Ward, 2001) that are profoundly germane in ensuring participation of WUCs and functional sustainability of water facilities. Critically, because WUCs are just mobilised by the Local Government to participate in the management of water sources, which is a key feature of community management (as discussed in Chapter two, sub-section 2.2.1), participation is bound to end because it is used as a *means* to achieve a predetermined objective (Oakley, 1990). Ultimately, this culminates in non-functionality of water facilities especially when members lose interest in participating in the management activities.

Furthermore, findings from semi-structured interviews with the NDWO and NTCWO indicated that all public groundwater sources in Namayingo Town Council are communally

owned through WUCs. Indeed, the water sector policy framework provides for the CWM as the management model, and fervently emphasizes management by WUCs (MWE, 2015; 2014 & 2011; Mugumya, 2013; Sloots, 2010; MWLE, 1999). Essentially, the striking principles of CWM are to involve women and communities in the water infrastructure development, ownership and management processes (Bakalian & Wakeman, 2009; Harvey & Reed, 2007). The MWE (2011, p.8) agrees that the CWM model enhances sustainability of water facilities, empowers communities and slackens the infrastructure management cost. Arguably, this is premised on trust, reciprocity, norms, sanctions, common rules and connectedness within communities which inform collective action (Bakalian & Wakeman, 2009; MWE, 2007 & 2004). It was found out that the management cost of water infrastructure was lessened because water users could contribute towards the water user fees, share information, cooperate, and confidently participate in collective management activities. I want to argue that this local connectedness was glued by social capital which could augment horizontal connections and interactions in communities (Pike *et al.*, 2006; Pretty & Smith, 2004; Pretty & Ward, 2001; Uphoff & Wijayaratna, 2000).

Paradoxically, it is challenging to realise the CWM principles without WUCs. Certainly, findings depicted that it was literally compulsory for all groundwater sources in Namayingo Town Council to have WUCs. The NDWO commented that,

> For every improved groundwater source in Namayingo District, a water user committee must be established to oversee its management on behalf of the community. And, on that committee, gender should be addressed (Interview, 01).

This aligns with the water sector policy framework which provides for the formation of WUCs to manage water infrastructure on behalf of communities (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995). However, field results found out that some water sources did not have WUCs. The NDWO and NTCWO, and local council leaders from villages without WUCs were asked why such water sources did not have committees. It was found out that such water sources had WUCs at the time of inception, but committees phased out over the time. The major cause of the non-functionality of such WUCs cited was the uncooperative water users. Yet, still such communities had not replaced the non-functional committees with active ones. Interestingly, the NDWO and NTCWO were aware of the absence of WUCs in such villages, but there were no initiatives to facilitate formation of new WUCs though the policy framework provides for

the Local Government to facilitate the formation of new WUCs (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995). To that effect, it presented a mismatch between policy framework and policy practice. Like earlier noted, if WUCs are not monitored or incentivised, they lose interest in water management activities because they operate informally and voluntary (Moriarty *et al.*, 2013; MWE, 2011). As per the water sector policy framework, it is incumbent upon the NDWO and NTCWO to monitor the functionality of WUCs (MWE, 2007 & 2004; MWLE, 1999). This however, calls for local-external connectedness between WUCs and the Local Government water officials which can only be strengthened through social capital (Pretty and Ward, 2001). I indeed argue that since the CWM model is premised on social capital (Van Koppen & Kuriakose, 2016; Kobayashi *et al*., 2014; Pretty & Smith, 2004; Pretty, 2003; Uphoff & Wijayaratna, 2000), trust and cooperation between WUCs and Local Government water officials are central to the participation of WUCs and functionality of water infrastructure.

Noticeably, it was found out that water sources without WUCs were in poor state. For example, Budidi borehole, Bukoova shallow well, Nambugu shallow well and Nasinu protected spring were found in a dreadful state. Water users and local council leaders were asked about some of the factors that were contributing to the poor state of such water facilities. The most striking reason was the dearth of community people willing to manage the water facilities because of the disobliging community members. It was observed that such water infrastructure did not have soak pits and fences to ensure quality water and proper water infrastructure use. Brikké and Bredero (2003, p.3) posit that poor water infrastructure use undermine management and sustainability of improved water services due to poor project understanding by users, failure to involve communities in planning and inadequate monitoring. Further, the National Framework for the Water Source Protection, 2013 recognises improper water infrastructure use as one of the major threats to sustainability of water sources (MWE, 2013, p.17). Indeed, for example, there was an observable dichotomy between what the MWE (2013) recognizes as an ideal standard protected spring and what was observed during fieldwork as depicted in the figures 14 and 15 below.

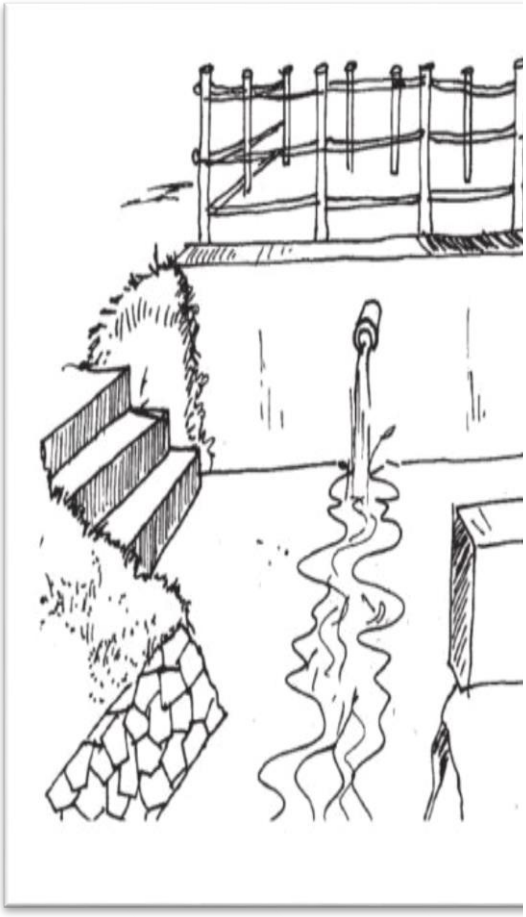

Figure 14: The ideal protected spring (MWE, 2013, p.21)

Figure 15: The actual protected spring of Nasinu village without a WUC

In comparison with the standard and recommended state of protected springs by MWE (2013) as depicted in figure 14, it was observed that the Nasinu protected spring was susceptible to contamination especially at the water collection point. Besides, it was noticed that the spring was constructed in a wetland prone to flooding. Yet, the National Framework for Water Source Protection provides for development of springs out of areas such as wetlands which are prone to flooding (MWE, 2013, p.21). Besides, the protected spring water yield was low. Although the water sector policy framework provides for WUCs to contact the District Water Officers in case of declining groundwater recharge detected by low water yield, Nasinu protected spring did not have a committee which could report such a functionality problem. Further, the interview with the water user indicated that Nasinu protected spring had never had a WUC. This further presented a contradiction between the water sector policy framework which

provides for all public groundwater sources to me managed by WUCs under the CWM model and the policy practice on ground.

6.2.2. Community ownership of groundwater facilities

As observed in Chapter five, CWM requires community contribution towards the initial capital cost. All the study participants were asked whether their communities had contributed towards the initial capital cost of constructing the water facilities in their villages. Empirical findings confirmed that communities had contributed towards the initial capital cost before they would be given the groundwater facilities in their areas. This was one the most striking pronouncements of the water sector policy framework that was implemented by both communities and Local Government water officials in the Town Council. Findings showed that cost capital contribution ranged from US$ 56 for boreholes; US$ 28 for shallow wells and US$ 14 for protected springs. This was in line with the community capital cost contributions revealed in Chapter five (sub-section 5.1.2). Further, the NDWO and NTCWO revealed that initial capital cost contribution was initiated to instil the spirit of ownership of water sources among communities. In agreement, focus groups and semi-structured interviews revealed that communities were contributing towards the capital cost. However, it was found out that most of the water users could not pay. Some WUCs reported that they could get money for capital cost contribution from their local politicians. The money was collected by WUCs and remitted to the District Water Officer. Besides the NDWO and NTCWO, WUCs, local council leaders and water users were asked about what they thought about the initial capital cost. Findings revealed that the participants had limited knowledge about initial capital cost though they had paid. Several responses were advanced, but most importantly, a committee member commented that;

> We also don't know why pay this money. But, they always tell us that we are supposed to pay it. It is supposed to be paid to the District where it is banked before they give water (Focus Group, 02).

As earlier noted in Chapter five, initial capital cost contribution remains a controversial area in the CWM model. The most striking argument is that the poorest of the poor are the ones often without improved water facilities, and they are financially debilitated to contribute towards the initial capital cost (Bakalian & Wakeman, 2009). Arguably, the inherent objective of community capital cost contribution is not aligned with the Supreme law (1995 Constitution of

Uganda) that views access to clean and safe water as a legitimate right for all Ugandans. There is nothing intrinsically wrong with community capital cost contribution, but the incapability of the vulnerable and poor people to pay the capital cost contribution is unheeded in the water sector policy frameworks. Like Marks et al (2013), I used two criteria to analyse community ownership of water sources: infrastructure condition and ongoing management. Through observation, it was noticed that most of the water sources were in poor conditions, especially those that did not have WUCs. Again, Nasinu protected spring, Bukoova shallow well, Mpano B shallow well, Budidi borehole did not have WUCs and their conditions were found wanting. In terms of sanitation of the infrastructure and their environs, none of the above sources had a soak pit, fence and clear drainage channel. For example, Bukoova shallow well had noticeable cracks which could contaminate water. However, the condition of water sources such as Mpano B, Nawebeite and Bulamba A boreholes that had WUCs were in a good state. They had fences, soak pits and clear drainage system.

On the ongoing management, findings revealed that all minor maintenance of groundwater infrastructure was done by community water users through WUCs. The NDWO revealed that minor maintenance was done when the maintenance cost was below US$ 84, above which was the responsibility of the District and Town Council to meet. However, through participant observation and semi-structured interview, the study found out non-functional groundwater sources which required both less and more than US$ 84. Yet, communities could not afford to pool the required money to repair the facilities. For example, the Nasinu borehole and Nambugu shallow well depicted in the figure 16 and figure 17 below had been non-functional for about two years and over six month respectively because water users could not afford to pool US$ 200 and US$ 120 respectively that was required to buy spare parts and pay the HPM. Equally, Buyiti shallow well had had a broken pumping handle for over two years, yet it required about US$ 42. But, community water users were unwilling to pay. Besides, the unwillingness by water users to pay the monthly user fee arguably signalled lack of the spirit of ownership of groundwater infrastructure.

Figure 16: Non-functional Nasinu village borehole

Figure 17: Non-functional Nambugu shallow well

I therefore argue that the act of contributing capital cost does not guarantee community ownership of groundwater infrastructure. Besides, community ownership of groundwater facilities does not automatically enhance effective management and functional sustainability (Harvey & Reed, 2007 & 2004; Van Den Broek & Brown, 2015). Harvey and Reed (2007, p.370) observe that ownership has been interpreted as a perquisite for management and sustainability of water facilities. However, they do not find a direct relationship between ownership, management and sustainability (Harvey & Reed, 2007). They make an interesting dichotomy between communal ownership and individual ownership. Essentially, when an individual owns a water source, it becomes their responsibility to manage and ensure its operation. In contrast, when a water system is communally owned, disagreements and mistrust over its management always emanate (Harvey & Reed, 2007). Similarly, Marks, Onda and

Davis (2013) acknowledge that although ownership has been associated with sustainability, it is a theoretical perspective not informed by empirical findings.

Overall, WUCs, local council leaders and water users were asked to comment on the available guidelines on groundwater infrastructure management that were available in Namayingo Town Council. In this question, I intended to examine how much WUCs, local council leaders and water users understood the water sector policy framework as they could mention sections of the water sector framework. Interestingly, unlike the NDWO and NTCWO, WUCs, local council leaders and water users revealed inadequate knowledge of the water sector policy framework. Yet, involvement of communities under the CWM model is inherently designed within the water sector policy framework. Local Government water officials were asked whether WUCs, local council leaders and water users knew the water sector policy framework. Although jokingly, the NDWO commented that WUCs, local council leaders and water users did not understand the entire water sector policy framework, but the District technical team would give them some sections which the team felt were crucial. While, the NTCWO reported that the water sector policy framework was full of voluminous documents which could not be interpreted by local people given their low literacy levels. This inherently creates a gap and the urgency for training and capacity building. Besides, findings from focus groups indicated that guidelines on groundwater infrastructure management were fixed and could bring misunderstandings in the community. However, they were critical to the functionality of water sources. As noted, it is a cardinal responsibility of the Local Government to create awareness of the national water sector policies among communities (Brikké & Bredero, 2003), and failure by WUCs to understand policies signals a weakness of the Local Government technical team.

The research findings revealed that at least WUCs, local council leaders and water users knew certain sections of the water sector policy framework. These included; contribution of the monthly user fee for O&M of water facilities, capital cost contribution (as discussed above) and enactment of bylaws. Although these were part of the policy framework and communities were implementing them, respondents were, however, unaware that such practices were envisaged in the water sector policy framework. As depicted in figure 12 above, this created a gap between the policy framework and policy practice. Essentially, what people knew and envisaged in the policy framework informed the policy practice. In a nutshell, it was overt that it was what people knew that was contributing to the functionality of their water sources. But,

this inherently presented challenges as discussed in section 6.4 on the hindrances to the participation of WUCs in groundwater infrastructure management.

6.2.3. Water Sector Institutional Framework

As Smits et al (2013, p.385) observe, institutional support has been crafted differently in different studies. These include institutional support mechanisms, follow-up support, post-construction support, and direct support (Smits *et al*., 2011). The bottom line, however, is the support advanced to those in charge of water management after construction (Smits *et al*., 2013; Komives, *et al*., 2008). Findings from the NDWO and NTCWO revealed that the District and Town Council technical teams periodically advanced post-construction support to WUCs in form of training, monitoring and maintenance of water facilities. Specifically, the Local Government water officers revealed that WUCs could be trained in recording keeping, managing books of account, cleanliness of water facilities, safe water chain- water safe from the point of collection to the point of consumption. Indeed, post-construction support to WUCs is central to the CWM model. The International Fund for Agricultural Development (IFAD) (2009) observes that WUCs need to be supported and trained in water infrastructure management to enhance sustainability of infrastructure. The agency argues that committees need to be monitored at least once per week (IFAD, 2009). This improves the participation of WUCs and functional sustainability of water infrastructure (Smits *et al*., 2013; IFAD, 2009).

However, Harvey and Reed (2007, p.372) highlight that there is inadequate empirical evidence depicting that governments effectively facilitate the CWM model. Indeed, through focus groups, all the WUCs studied revealed that post-construction support from both the District and Town Council was inadequate. Focus groups revealed that although some water points were being monitored though not often, most of the WUCs acknowledged that they had never been monitored by the water officials from the District and Town Council. Equally, all the WUCs studied revealed that they had never been trained in areas of water resources management. When asked whether such training would help them, members responded that skills that would be attained would be helpful in handling conflicts that emerged, manage finances and could improve how they were managing groundwater infrastructure.

Furthermore, the Local Government water officials revealed that the District and Town Council budgeted for maintenance under the post-construction budget. However, only two of the WUCs reported having received financial support from the District and Town Council to repair their

groundwater facilities. To this effect, it was found out that some villages were grappling with the maintenance of their groundwater facilities. Case in point, Buyiti shallow well depicted in figure 18 had had a short pumping handle for about two year, but the WUC had not received support from either the District or Town Council. Similarly, although the low water yield of the shallow had been severally reported to the NDWO and NTCWO as provided for by MWE (2013), the community had not received support from either the District or Town Council. Committee members reported that the Local Government water officials had directed the community to fetch water from the alternative borehole that had been constructed in the same village. However, they acknowledged that water users hesitated because of the poor quality of water from the alternative borehole. They revealed that the water from the alternative borehole would turn food black once used. A committee members asked,

> If that water can turn food black, do you think it is safe to drink? (Focus Group, 01).

Such a question revealed that such a committee member was unwilling to fetch water from the alternative water source constructed by the District. Unsurprisingly, users of unreliable water sources collect water from unimproved water sources which increases their susceptibility to diseases such as cholera, dysentery, typhoid and among others.

Figure 18: Buyiti shallow well with a short pumping handle for about 2 years

Institutional support is critical to the participation of WUCs (Smits *et al*., 2013; Harvey & Reed, 2007). Several studies indicate that water managers who receive institutional support perform better in terms of financial management, community participation, and O&M as opposed to those without (Adank *et al*., 2013; Smits *et al*., 2013; Schweitzer & Mihelcic, 2012; Kayser *et al*, 2010). Indeed, the interview with the NTCWO revealed that WUCs could only perform well when regularly monitored and provided with the necessary support from either the District or Town Council. However, as earlier noted, empirical results depicted that the support in form of training and monitoring were inadequate, and in some villages lacking.

To further understand the water sector institutional framework in Namayingo Town Council, the NDWO and NTCWO were asked about the structure of the water sector institutional framework in the Town Council. This question was equally informed by Chapter five analysis which revealed that WUCs derive their role and organizational capacity from the water sector institutional framework. Empirical findings depicted that Town Council was a lower Local Government unit, and it was following the MWE water sector institutional framework. In other words, all the actors in the MWE institutional framework (depicted figure 6, Chapter 5) were relevant and maintained in Namayingo Town Council. Though hastily, the NDWO interestingly emphasised the following as the functions of the District Water Office in groundwater infrastructure management as depicted in the block quotation below.

> In the Town Council, the District Water Office is only involved in maintenance and other technical support. The District repairs a water source when the cost is more than about US$ 84. Besides, the District Water Office in partnership with the Town Council conducts water quality and infrastructure functionality monitoring for all groundwater sources on quarterly basis. The District trains WUCs and during training, the District Water Office directly interacts with WUCs (Interview, 01).

In contrast, the NTCWO depicted loose understanding of the water sector institutional framework that the Town Council. Besides mentioning the MWE at the top, the NTCWO rather gave the organogram of the Town Council. However, a probe question was advanced on where water user committees report facility breakdown. Eventually, the interview with the NTCWO revealed that WUCs would report directly report to the Town Council which would write to the District Water Office seeking for technical and financial support. Further, it was found out that the Town Council water office would only deal directly with the District Water Office

during water mobilization meetings, monitoring, commissioning and annual Word Water Day celebrations. While the Town Council would deal with the MWE during lobbying processes, for example, pipe water, and technical and financial support. But, the relationship between the Town Council and the MWE was found out to be good. The water sector framework as revealed by the NDWO and NTCWO was illustrated as depicted in figure 19 below.

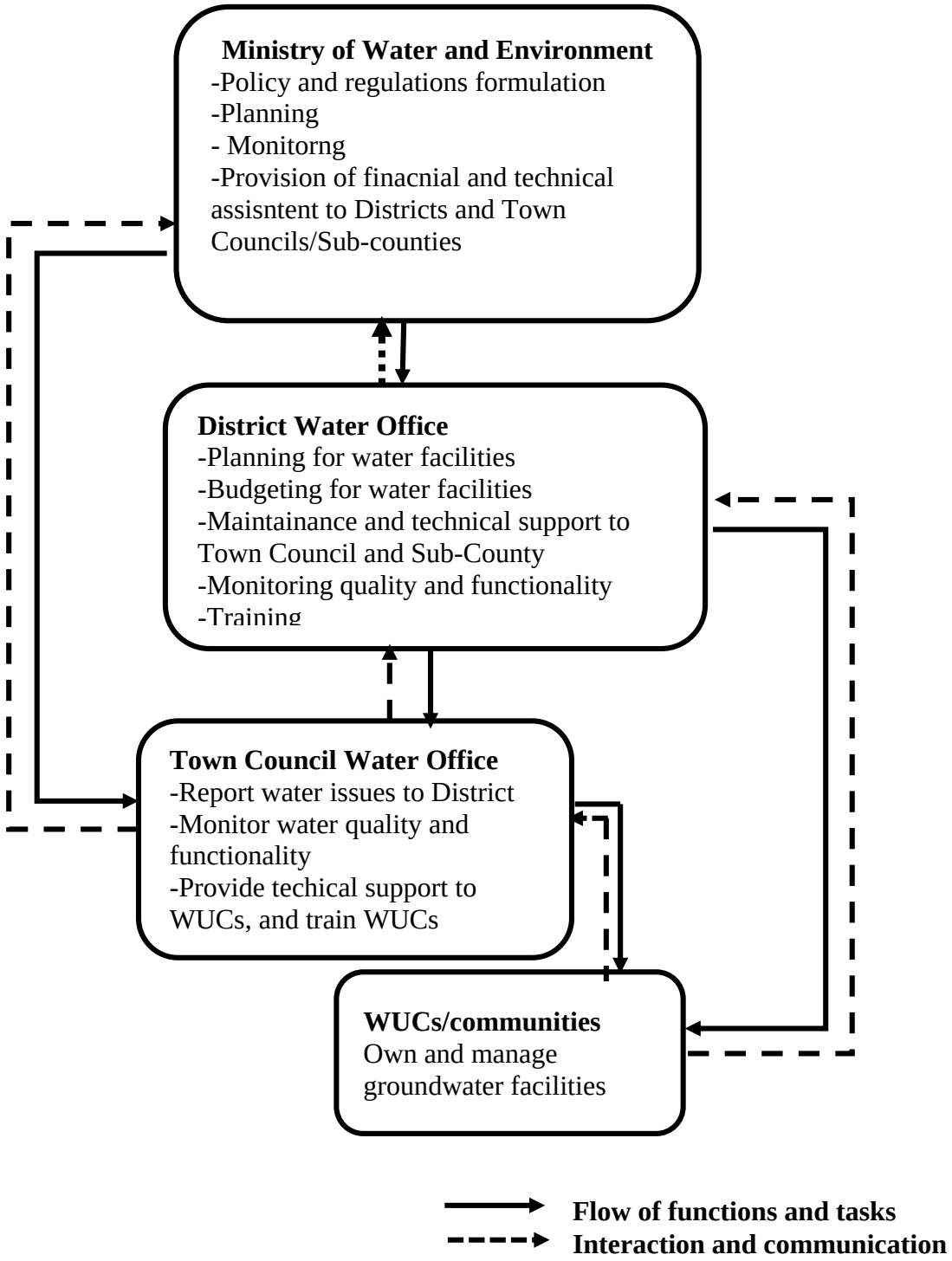

Figure 19: Institutional Framework in which Namayingo Town Council operates (Author, 2017).

The water sector institutional framework reported by the Local Government water officials did not so much differ from the one presented at the national level (section 5.1.2). However, it reveals limited interaction between communities and the technocrats at the Town Council, District and the MWE. It was clear that communities were at the receiving end of water projects. For example, as revealed in the study findings, the District Water Office only interacts with WUCs only during training. Moreover, findings had already revealed that none of the WUCs had undergone training. Similarly, there was absolute lack of interaction between the MWE and communities. Yet, still the interaction between WUCs and the Town Council was limited to technical support and training. It was noticeably revealed that there was no interaction between communities and the either the District or Town Council at the planning and construction stages. In groundwater development and management, participation can arguably be viewed at three stages: pre-construction, construction and post-construction (MWE, 2015; 2014 & 2011; Bakalian & Wakeman, 2009; MWE, 2007 & 2004). However, participation of WUCs/communities at pre-construction and construction phases is critical to participation at post-construction (Bakalian & Wakeman, 2009; Komives et al., 2008; Harvey & Reed, 2007). If WUCs are not involved in the initial project phase and construction phase, management of water infrastructure at the post-construction phase and functional sustainability are adversely affected (Bakalian & Wakeman, 2009).

Oakley and Marsden (1984, p.255) argue that participation "from the below" empowers communities to meaningfully involve in collective actions to social problems. As earlier highlighted, groundwater infrastructural management through the CWM model is a collective action (Van Koppen & Kuriakose, 2016; Pretty & Smith, 2004; Uphoff & Wijayaratna, 2000). It demands for the participation of communities from the onset of the water project as users build mutual trust, agree on the norms of reciprocity, rules and behaviours on how to use the common resource (Pretty, 2003; Ostrom, 2000). Findings further revealed planning and allocation of groundwater sources was done by the District and MWE technical teams that could deliberately eliminate WUCs at both the planning phase and construction stage. The NTCWO commented;

> The Ministry of Water Environment and District technical planning teams sometimes bypass us the technical people on ground. If they can bypass us who are technical, do you think they involve communities at the planning phase or construction phase? (Interview, 02).

Empirical findings further found out that planning meetings with communities were deliberately skipped because technocrats wanted to spend less money on such groundwater projects. Yet, ideally, information on the technology to choose would be advanced to communities through planning meetings to enable communities make informed decisions on the technology to use (Brikké & Bredero, 2003). To Harvey and Reed (2004, p.18), this is based on three principles. First, water users are supposed to get information on a range of technology before taking choice. Second, willing and ability to handle O&M of facilities. Third, willing and ability to finance the cost of O&M on a long-term basis. Although the water sector policy and institutional frameworks in Uganda encompass the above principles, they are however, not clearly addressed. As Harvey and Reed (2004, p.18) posit, these principles are inadequately investigated before a water facility is established. The absence of planning meetings denies communities the cardinal opportunity to choose the technology to use. In a nutshell, such arrangements can arguably adversely impact on functional sustainability of the water infrastructure because water users were given the technology which they cannot sustain (Brikké & Bredero, 2003).

6.3. Role and organizational capacity of WUCs

The second objective of this study was to assess the role and organizational capacity of WUCs in groundwater infrastructure management. To begin with, the NDWO and NTCWO were both asked to comment on the role and capacity of WUCs in managing groundwater infrastructure. The NDWO and NTCWO being the implementers of the water sector policy and institutional frameworks in the Town Council, I purposely asked them this question to establish whether WUCs were performing their roles within the confinements of the water sector policy and institutional frameworks. Besides, I intended to know whether these Local Government water officials were following up WUCs in the Town Council.

6.3.1. Community satisfaction with the role of WUCs

Interestingly, the NDWO and NTCWO commended the work the WUCs were doing, and acknowledged the fact that committee members were working voluntarily. They pointed out that because of volunteerism, WUCs did not put in a lot of efforts, which was inherently a challenge to functional sustainability of groundwater facilities. The NDWO commented,

> To a certain extent, water user committees have been effective. But, they are only active when their water sources break down. They are simply reactive instead of being preventive (Interview, 01).

Both officials revealed that non-functionality of groundwater sources was majorly due to absolute lack of periodic servicing of groundwater infrastructure by WUCs. As such, the role of WUCs was found central to functional sustainability of water facilities.

Relatedly, a similar question was posed to the local council leaders and water users to get their comments on how WUCs were performing their roles in regards to groundwater infrastructure management. Local council leaders and water users from villages with WUCs revealed that their WUCs were functional and effective, and worked hard to ensure that their groundwater facilities were functional. They applauded the WUCs which signalled an ideal cooperation which was indeed indispensable to the enhancement of functional sustainability of water facilities. A water user community responded;

> Our borehole has never been down for more than three days after breakdown. The committee members take precautionary measures to establish when the borehole is about to breakdown. They prepare before the borehole breaks down. It does not just breakdown at once. It warns before breaking down, and the committee members ensures that it takes preventive measure (Interview, 05).

To the contrary, local council leaders and water users from villages with water sources without WUCs depicted that the absence of WUCs was adversely impacting on the functionality of their water sources. They pointed out that there were no robust mechanisms for managing their water sources. WUCs were asked to assess their performance by giving themselves percentages out of hundred. This question was posed to assess the commitment and performance of WUCs from their own perspectives. Interestingly, all the WUCs awarded themselves above 70%. However, it was noticeably challenging for committee members to agree on the performance percentage as some members felt they did not deserve such because of the internal challenges. The fundamental and cross cutting reason for performing above 70% was the fact that committee members were struggling to ensure that the water facilities were working. For example, a committee member commented,

> …the committee deserves 70% because we have done a lot within this small time we have in office in terms of cleaning the water source, enacting and implementing bylaws, and involving community members to ensure the operation and maintenance of our borehole (Focus Group, 02).

6.3.2. The Roles and organizational capacity of WUCs

The role and organization capacity of WUCs are determined and influenced by the national water sector policy and institutional frameworks (Harvey & Reed, 2004). This is in consonance with the CWM model where all the groundwater facilities are community owned. WUCs were asked about the role they play in groundwater infrastructure management. Findings revealed that WUCs performed the following roles. First, WUCs were charged with collecting the monthly water user fee from community water users. Importantly, all the respondents reported that every water user was obliged to pay a monthly user fee about US$ 0.28 towards the O&M of the water infrastructure.

Paradoxically, findings revealed that collection of user fee was among the challenging roles that WUCs in Namayingo Town Council played. Although the water sector policy and institutional frameworks provide for the payment of user fees by communities to cater for O&M of water facilities (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995), it does not provide for the mechanisms for collecting the levied fee. Besides, focus groups revealed that the US$ 0.28 that every water user paid monthly was insufficient to cater for both periodic maintenance and repairs of groundwater facilities. Equally, the sector policy framework provides that the monthly user fee to be levied is supposed to be set by the Director of DWD, however, this is practically impossible as findings revealed that the fee was decided by the whole community. As noted, communities are not water professionals; as such, they could not come up with the rightful amount that would sufficiently cater for O&M of water facilities. Therefore, WUCs stressed that most of the time, the collected funds were insufficient to cater for the operation and maintenance of water facilities.

Second, findings revealed that WUCs involved community members in groundwater infrastructure management processes. Specifically, water users were involved in cleaning and clearing soak pits, fencing boreholes to ensure proper use, and cleaning the water infrastructure and their jerrycans to enhance the "safe water chain". Although the water sector policy framework provides for management of groundwater facilities through WUCs (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995), it does not provide for the participation of water users in the management process. Arguably, the silence of the water sector policy framework on the participation of water users besides contributing towards capital cost and user fee undermines the social capital on which the CMW model is core founded (Van Koppen & Kuriakose, 2016; Kobayashi *et al*., 2014; Pretty & Smith, 2004). In other words, it eliminates the participation

of community members who are not on the elected WUCs, but capitalises on the social capital within the committee members.

Third, it was found out that it was the role of WUCs to report non-functionality of groundwater infrastructure to the District Water Office and the Town Council Water Office. For example, focus group discussion with Bulamba A village borehole WUC members revealed that their borehole had been non-functional for about six months. But, committee members revealed that they worked hard to ensure the functionality of their water facility. They reported to both the District and Town Council seeking for both financial and technical support. However, they revealed that the District and Town Council Water Offices always delayed to respond. This was a disappointment to the WUC members. Bulamba A borehole WUC members responded that when they reported the non-functionality of their borehole, the Town Council Water Office informed them to provide 60% of the total cost of repair (about US$ 500). Indeed, the committee collected the money from water users, but it was often insufficient. As such, a loan of about US$ 100 was solicited from a community member to raise the 60% of US$ 500. On payment of the 60% to the Town Council, the District rehabilitated the borehole. As discussed under the water sector institutional framework (section 2.5.2), the District and Town Council plan and budget for O&M, and it is this budget that caters for major repairs (MWE, 2011; 2007 & 2004). It was surprising that the community had to collect the 60% before the borehole could be rehabilitated. Moreover, the water sector policy framework is silent on the percentage contribution from the community in case of cost sharing during rehabilitation of water sources.

Besides, as depicted in section 6.2.2, the NDWO reported that all repairs beyond about US$ 84 were to be handled by the District and Town Council. Yet, in this case of Bulamba A borehole the 60% of US$ 500 was far beyond the US$ 84 the bar for community repair. Thus, members revealed unwillingness to report any other related water non-functionality to either the District or Town Council because they felt that they were unassisted. This adversely impacts on the participation of WUCs and impedes functional sustainability of water facilities. As emphasised earlier in Chapter three, social capital, the foundation of CWM (Van Koppen & Kuriakose, 2016; Kobayashi *et al*., 2014; Pretty & Smith, 2004; Pretty, 2003; Uphoff & Wijayaratna, 2000) should not only 'glue' communities, but also communities and the Local Government water officers (Pretty & Ward, 2001; Ostrom, 2000). It is important that the community trusts the District and Town Council water officers, and on the other hand, the District and Town Council trust communities to enhance a sense of collective action and togetherness.

6.3.3. Mechanisms WUCs use in public groundwater infrastructure management

Particularly, research question two (Chapter one) analysed the mechanisms that WUCs use in the management of public groundwater infrastructure in Namayingo Town Council. The study revealed the following findings as paragraphed below.

Community Water Meetings

Findings from interviews with the Local Government water officers revealed that WUCs conducted village water meetings with the help of the local council leaders. Such meetings were profoundly useful as they would provide platforms for WUCs to give accountability and feedback to water users regarding the expenditure of the collected funds. Besides, they commented that village water meetings were cardinal in creating trust and bond that would enhance good cooperation between WUCs and community water users. The International Rescue Committee (IRC) while understanding the factors for effective water source management in Gulu District, found out that good cooperation between water users and WUCs is central to the functionality of both the water facility and WUCs (Mirembe, 2011). However, empirical findings revealed that such meetings were rarely conducted. WUCs revealed that the major reason for irregular meetings was majorly due to the fact that most of the community water users were uncooperative and could not show up for such meetings. Again, Mirembe (2011) agrees that the absence of regular meetings culminates into ineffective management of the groundwater sources. Certainly, even if WUCs are trained in water resources management but overlook conducting regular water meetings, their commitment is lessened, thus non-functionality of the water facility.

Enacted community water bylaws

Findings revealed that every water source that had a WUC enacted bylaws to streamline and guide the roles of WUCs. Findings found out that bylaws constituted the following. Communities had agreed opening and closing hour of the water infrastructure. It was clearly stipulated in the community water bylaws the hours beyond which water users would not access the infrastructure. Indeed, the NTCWO commented;

> Our communities here use the lock and key methodology, and the method is very effective. The water source caretaker closes and opens as agreed on by community members (Interview, 02).

This was however determined by the water collection hours to ensure that some community members were not denied their constitutional right to access safe and clean water. However,

findings depicted that villages without WUCs did not have bylaws, and some of their water sources did not have agreed locking and opening hours. It was reported that if the local council leaders tried to lock water sources in the night, some water users, especially those who could not pay would break the padlocks used to lock. A local council leader reported;

> Some community members refuse to pay the monthly user fee, and these are the same people who break the padlocks we use to lock the water facility. They are so uncooperative make everything hard (Interview, 03).

This confirms to the findings of previous studies discussed in Chapter three that social capital in form of rules and bylaws can restrict and deny some community members access to a common resource (Ostrom, 2000). Further, the community water bylaws constituted the role of community water users in groundwater infrastructure management. Besides contributing the monthly user fee, it was reported that bylaws provided for fencing the water infrastructure to ensure proper water infrastructure use. WUCs, local council leaders and water users reported that community people were required to provide labour and poles to provide a fence around the water facilities. Indeed, such arrangements connote community participation when the rest of the community are actively involved in the management process (Harvey & Reed, 2007) as discussed in Chapter two. Still, it was observed that water sources with WUCs at least had fences, unlike those without committees. Local council leaders from villages with water sources without WUCs reported that it was challenging for them to mobilise community members to fence their water sources. As such, their water sources did not have fences which would make it difficult to enforce proper infrastructure use, but also, to be inaccessible by livestock. Because they lacked bylaws, they did not have a streamlined mechanism for managing their water sources. Thus, a local council leader commented;

> …as a community, that is how we gamble with managing our borehole (Interview, 05).

Furthermore, community bylaws encompassed the need for all community water users to clean both their jerrycans and the water infrastructure and their environs to ensure improved sanitation and quality water. On such days, water users were required to equally clear the water drainage system that could channel water into the water facility soak pit. Indeed, it was observed that water sources with WUCs that operated basing on the enacted bylaws had relatively clean infrastructure as opposed to those without committees. For example, Budidi village borehole (depicted in figure 20 below) did not have bylaws. As such, the borehole had poor sanitation. Moreover, it did not have a fence to avoid encroachment by livestock.

Poor sanitation especially at the water collection point.

Figure 20: Budidi village borehole without a fence and under poor sanitation

Importantly, the bylaws required WUCs to register all water users. Indeed, findings revealed that WUCs that had a list of water users, and they would always update their register. Worth noting, the water sector policy framework provides for the enactment of bylaws by local council leaders (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995). However, it requires for such bylaws to be certified by the Attorney General to ensure conformity with the National Constitution. Although this is the ideal, in practice, as revealed by the study findings, none of the communities had their bylaws certified by the Attorney General before they were sanctioned. Furthermore, although the sector policy framework requires that bylaws are enacted by the local council leaders, but content proposed by WUCs, respondents reported that bylaws were proposed by community water users, and WUCs were only supposed to implement. Again, in relation to policy framework and policy practice, it is overt that it was

what people knew that informed their practices. Besides, results revealed that the bylaws were rarely followed especially by errant community members.

6.4. Hindrances to Participation

6.4.1. Insufficient water quality and quantity

Focus groups revealed that low water yield coupled with poor quality water hindered the participation of WUCs. The interview with the NTCWO revealed that during construction, some contractors defied the national standards for constructing groundwater facilities, and could construct sub-standard groundwater infrastructure. It was found out that such water contractors wanted to spend less money on construction and get much profit. All respondents agreed that water facilities dried up especially in dry seasons. However, the cause of this was twofold. First, findings revealed that in some instances the Town Council technical team was bypassed during the procurement process as it was always done in higher offices at the District and the MWE. Besides, water users could not understand such procurement processes, and neither involved at the planning phase. For example, the NTCWO commented,

> If they can bypass us, how about the local person in the village? (Interview, 02).

Second, because partners NGOs implemented projects with objectives, goals, and timeframes, they sometimes defied water quality and quantity standards when constructing groundwater sources. Indeed, Moriarty et al (2013, pp.329-330) observe that although the CWM model has registered some success, water quality and quantity are yet to be addressed. Certainly, there is consensus that rural water systems easily fail especially in Sub Saharan Africa due to water quality and quantity issues (Moriarty *et al.*, 2013; Improve International, 2012; Evans, 1992). Moriarty et al (2013, p.333) argue that in understanding the CWM model, it is important to look beyond access to infrastructure, and consider the water quality and quantity, access and reliability of rural water systems.

The National Framework for Water Source Protection, 2013 indicate that communities are supposed to report water quality and quantity issues to the District Water Office (MWE, 2013). It was, however, found out that WUCs of water sources with water quality and quantity issues had severally reported such issues to the District and Town Council, but could not get feedback. WUCs reported that it was challenging to ask for the monthly user fee from water users when water sources had water quality and quantity issues. Focus group discussions with the WUCs of Bulamba A village borehole and Buyiti shallow well depicted in figure 21 and figure 22

respectively indicated that the water yields of their water sources were very low. Buyiti shallow well could hardly give 1000liters of water daily. Also, WUC members confirmed that their borehole would take about 30 minutes to fill 20litres. The Bukoova shallow well would hardly yield 100 litres of water daily. Besides, Nasinu protected spring would take 15 minutes to fill 20litres. Yet, the NTCWO posited that a functional water source was supposed to fill 20liters within 5 minutes. Arguably, all the groundwater facilities studied had water quantity concerns.

Figure 21: Bulamba A village borehole with low water yield

Figure 22: Buyiti village shallow well with low water yield

Interview with a water user at Nasinu village protected spring depicted that the facility had never broken down, but the water yield had tremendously dropped over the years. Besides, much as the water source was reliable, some water users who stayed at the extreme end of the village found it hard to access due to distance. Also, the quality of water was contestable given the poor sanitation of the environs and stagnation of water at the water collection point. Notwithstanding, water from the protected spring was used for both domestic chores and drinking. Like earlier observed, insufficient quality and quantity of water are a hindrance to the participation of WUCs in groundwater infrastructure management.

Equally, findings revealed that some of the water sources studied were unreliable which caused acute water problems in their villages. Boreholes at Naweibete, Bulamba A, and Bukoova and Buyiti shallow wells were unreliable. Respondents revealed that although they agreed on the hours when to collect water and when to leave the infrastructure to rest, the idea had brought misunderstandings in the community because of water shortages. Some water sources were so unreliable that water users had to nearly abandon them. Case in point, a water user at Bukoova village shallow well responded;

> Our borehole brings very little water. It takes about five hours to fill a 20litres jerrycan. Every morning I bring my jerrycan and leave it here and keep on pumping in bits until it gets full. Most of the community members do not fetch water from here because it would be wastage of time to come here for water that is not available (interview, 03).

Besides, Naweibete village borehole and Bulamba A borehole often broke down which was costly for the community to repair. However, on the frequent breakdown of water facilities, the NDWO and NTCWO reported that WUCs did not conduct periodic maintenance of water facilities. The NDWO, for example revealed that WUCs were only effective whenever their water sources broke down, "WUCs are reactive instead of being preventive" (Interview, 01). Because WUCs operate voluntarily and informally (Moriarty *et al*., 2013), constant breakdown of groundwater sources frustrates their efforts given the fact that they have other individual activities to do to earn a living.

6.4.2. Failure to contribute maintenance fee

First, findings revealed that communities were supposed to conduct minor maintenance below the cost of about US$84. But, minor maintenance was supposed to be conducted using the monthly user fees collected by WUCs. However, findings from focus groups and semi-structured interviews with local council leaders revealed that collection of maintenance fee was one of the most difficult roles of WUCs. It was reported that some community water users did not want to pay the monthly water user fee that was levied per water user, especially those who were uncooperative. This affected not only the functionality of water sources, but also, the functionality of WUCs. Indeed, the NTCWO revealed that some water sources with minor repairs were abandoned because of failure by water users to contribute maintenance fee. One committee member commented;

> Community members do not want to pay, and resort to abusing us. No one is willing to work for free and be paid by abuses from community members (Focus Group, 04).

Harvey and Reed (2007, p.370) agree that WUCs are often disappointed by the failure of water users to contribute towards maintenance fee. Arguably, this is due to the absence of the legal status of WUCs and inadequate community cohesion (Harvey & Reed, 2007). Although the sector policy framework provides for WUCs (MWE, 2007 & 2004; MWLE, 1999; GOU, 1995), it was empirically revealed that committee members did not have the legal back up to operationalise their mandate. A local council leader, for example, vehemently reported;

> WUC have no legal powers. The bylaws enacted are not enough. They even lack control over groundwater infrastructure because they only manage them on behalf of other community water users. So, what can they do for water users who do not pay the operation and maintenance fee? (Interview, 03).

Similarly, the focus group discussion with committee members of Naweibete borehole revealed that some water users wanted to pay the monthly user fee, but often failed due to the adverse poverty levels that had engulfed their village. A committee member commented;

> You cannot expect someone to pay US$ 0.28 per month when his/her family is going without basic needs such food, medication, and education (Focus Group, 03).

Harvey and Reed (2007) postulate that when communities are poor, they are incapacitated to contribute maintenance fee to conduct infrastructure repairs. Equally, the International Fund for Agricultural Development (IFAD) while drawing on experiences from water user groups in irrigation management argue that recovering costs in community managed water projects is challenging due to the adverse poverty levels in rural areas (IFAD, 2009). Notwithstanding, sustainability of groundwater facilities positively impacts on poverty reduction. It reduces disease burdens, medical costs, the amount of time spent collecting water, and facilitates income generating activities (Harvey & Reed, 2004). Arguably, a vicious cycle is created when adverse poverty curtails sustainable management of groundwater infrastructure, which compels communities to fetch water from unimproved water sources. Consequently, communities are infested with diseases, a situation that increases government health expenditure on water related

diseases, and communities spend productive hours walking for long distances for water. During interviews with local council leaders, it was noticed that they were already associating the rampant outbreak of diseases such as cholera, dysentery and typhoid with the poor water quality from both (some) improved groundwater sources and unimproved water sources. Indeed, it was found out that although Bukoova village had a shallow well, community water users were fetching most of the water from unimproved water sources because community members failed to pool money to repair the improved water source. Equally, Bulamba A village had one borehole, but like earlier highlighted, it was unreliable because of the low water yield that could not match the community water demand. The alternative protected spring in the villages was completely non-functional (though not captured as non-functional in the National Water Atlas of Namayingo District), and water users were collecting water from unimproved water sources as depicted in the figures 23 and 24 below.

Figure 23: Non-functional Bulamba A Protected Spring

Figure 24: Unimproved alternative unimproved water source for Bulamba A

Further, findings established that users of water sources with low water yield were unwilling to pay the monthly water fees because they believed that they would not receive value for their money in terms of the water. Because WUCs could not solely afford the maintenance and repair of such water facilities, they were left non-functional as spare parts were so expensive for them to acquire. The interview with the NTCWO revealed that some groundwater facilities were non-functional because WUCs could not buy the spare parts to repair their water sources. Importantly, it was reported that spare parts were expensive because communities could not manage to maintain the technology type and pipe materials that had been used. However, this was attributed to the fact neither the water users nor the WUCs were involved in the procurement and tendering processes of their water sources at the planning. Besides, communities were not the one to choose the technology to use. Moreover, as discussed in Chapter five, the standardization policy of two

models of hand pumps in the country limits the scope of technology from which communities can choice (Harvey & Reed, 2003). The spare parts are imported and sold expensively to communities, which costs communities cannot afford given the adverse poverty especially in the rural areas.

Furthermore, findings revealed that some users deliberately refused to pay the monthly user fees expecting the government to repair water facilities for them. A committee member reported some water users argued that, "water is for free, why to pay?" (Focus Group, 02). This confirms Harvey and Reed's (2007, p.370) claim that community members cease paying maintenance fee once WUCs they lose the trust and respect of water users. Equally, water users cease contributing maintenance fee once they get detached from the Local Government and feel that the government has abandoned its cardinal responsibility to provide water services (Harvey & Reed, 2007). Besides, water users are unwilling to contribute towards the groundwater infrastructure maintenance funds when communities start perceiving that government is responsible for maintaining their water sources (Harvey & Reed, 2004). This therefore requires availability of trust and connectedness between communities and Local Government water officials. In contrast, it was challenging for WUCs to keep money that had been collected from water users. A WUC member commented;

> … in 2015, our treasurer ran with the money that we had collected after she divorced. As a community, we lost all the money that we had collected. The community lost trust in us because we had to tell them the truth (Focus Groups, 01).

Interviews with the Local Government water officers equally revealed that WUCs had a challenge of managing and keeping the collected monthly user fees. When asked about what as technical people in the CWM model were doing to address this challenge, they reported that they were training WUCs in areas of financial management. However, there was dearth of evidence to substantiate the position of the Local Government water officials that they were training WUCs in how to handle the collected funds.

6.4.3. Volunteerism and informality

It empirically revealed that WUCs were working voluntarily and informally in groundwater infrastructure management in Namayingo Town Council. Findings from the interviews with the Local Government water officers revealed that because WUCs were operating on a voluntary

basis, committee members were not putting in a lot efforts, and subsequently members were only effective whenever their infrastructure broke down. They acknowledged that WUCs could only perform well when they were trained. Findings from focus groups indicated that the spirit of volunteerism was affected by two predicaments. First, like noted in section 6.1.2, the unclear tenure of WUC members was inherently a challenge. Although communities would change WUCs, however, they were voting back the same members on new committees. As noted, the spirit of volunteerism shrinks as members stay on the committee for years and years (Moriarty *et al*., 2013). Second, it was reported that some communities were uncooperative and could deliberately refuse to follow the enacted bylaws. Two WUCs reported this as a big hindrance to their participation, pointing out that they were unwilling to continue working with uncooperative members. A committee member reported that;

> Most of water users are uncooperative even when they participated in the enactment of the bylaws. This affects our participation because no one is willing to work for free and get paid by abuses from community members. Water users can even refuse to attend community water meetings whenever organized. They even broke the new padlock we had just bought for locking the borehole. We sometime feel like leaving everything… (Focus Group, 02).

Such comments revealed that WUC members were demotivated, and as the NTCWO commented, it was prudent that committee members get training, capacity building, incentives and post construction support from the District and Town Council technical teams.

6.4.4. Inadequate post-construction support

Post construction support in form of training WUCs, maintenance and repair (technical and financial support), and monitoring of both the functionality water sources and functionality of WUCs emerged as the greatest hindrance of WUCs participation. The Local Government water officials reported that post-construction support was catered for in the District and Town Council annual budgets. They further stressed that institutional support was being advanced to communities on a quarterly basis. However, after thorough probing to establish the number of water sources which were, for example, monitored in the financial year of 2016/2017, the NDWO reported that the District was constrained by limited financial logistics. As such, the managed to support only about 20% of the groundwater sources in the District and 0.02% in the Town Council. Contrarily,

all local council leaders, water users and WUCs reported that post-construction support was profoundly inadequate and even lacking in some villages. With monitoring, only one WUC responded that Local Government water officials had monitored their water sources. There is nothing intrinsically wrong with monitoring the functionality of water sources, it is, however, important to monitor the functionality of WUCs to understand the varied challenges they are faced with which translate into the non-functionality of the water infrastructure. Unsurprisingly, some WUC members expressed ignorance about capacity building, and reported that they were unaware that they were supposed to undergo training in groundwater infrastructure management. Interestingly some local council leaders reported that instead of training WUCs, the District and Town Council technical teams had resorted to speaking to local leaders and expected them to teach WUCs.

Although the NDWO reported that the Local Government was responsible for maintaining and repairing groundwater infrastructure with the maintenance cost above about US$ 84, there was, however, unsatisfying evidence to support this. There was only one WUC that reported that their borehole had been repaired by the Local Government water offices. However, committee members revealed that the District asked for 60% of the US$ 500 that was needed before they would be helped. It was further revealed that Nawebeite village borehole, for example, had been non-functional for two years because community members failed to contribute about US$278 before the District Water Office would top up to rehabilitate their borehole. Nambugu village well had been non-functional for six months by the time of fieldwork, but it required about US$195 to repair and the community could not afford. Equally, Buyiti village shallow well had had a short handle for over two years, and it required about US$ 100, the community was unable to raise. All the above maintenance and functionality had severally been reported both at the District and Town Council water offices, however, it was revealed that communities had neither received support from the District nor the Town Council. With expressions of disappointment, water users, WUCs and local council leaders reported that both the District and Town Council assured communities that the Town Council had embarked on lobbying and processing the pipe water meter system and groundwater sources were being discouraged. As such, villages such as Nambugu and Bukoova which did not have alternative improved water sources resorted for demanding for new improved water sources. But, they reported that the District assured that them that it could not allocat new

groundwater sources since the Town Council was supposed to have pipe water systems. A community local commented;

> We have tried our level best to demand for new water sources, but the District and Town Council water officials have refused because of pipe water. Yet, we do not know when pipe water will reach Namayingo Town Council because it is now coming to five years since they promised us that pipe water was come (Interview, 03).

However, it was found out that because of the inability and unwillingness by the Local Government s to either maintain the available water infrastructure or, provide new ones, communities with acute water problems had resorted to using water from unimproved water sources as depicted figures 24 and 25 below.

Figure 25: Bukoova shallow well with maintenance issues, under poor sanitation

Figure 26: Bukoova Village alternative unimproved water source

6.5. Efforts to enhance participation of WUCs

As depicted in Chapter one, the last study objective assessed how the water sector policy and institutional frameworks enhance functional sustainability of public groundwater infrastructure in Namayingo Town Council. Interestingly, the study findings revealed differing results from the Local Government water officers and community people (local council leaders, WUCs and water users). Findings from the interviews with the NDWO and NTCWO revealed that efforts under implementation were majorly in two broad categories: training and capacity building and maintenance and monitoring. First, they reported that the District and Town Council water offices were training WUCs to build their capacity in groundwater infrastructure management. Such programmes included financial management, book keeping, public management, and physical water quality test. Furthermore, the Local Government water officers revealed that they were conducting maintenance and rehabilitation of previously non-functional groundwater facilities. Interestingly, when the Local Government water officers were asked about some of the water sources that had been maintained and rehabilitated by either the District or Town Council within the financial year of 2016/2017, the NDWO did not mention any, though the NTCWO coined out Bulamba A village borehole. However, the officials reported that such efforts were effectively increasing the participation of WUCs. Particularly, they established that once a previously non-functional water facility was repaired and rehabilitated, the WUCs became active and water users were willing to pay user fees because they did not want to have a non-functional water source after suffering. Thus, functional sustainability was enhanced. The NDWO responded that;

> When WUCs are trained, they are reminded about their role, how to make bylaws and keep records and good financial discipline. They become active and ensure that the water source is working. They do not want to have the facility down after going through hard moments of water crisis in their community (Interview, 01).

However, training and rehabilitation of previously non-functional facilities do not automatically bring about functional sustainability. I argue that the factors for functional sustainability of water facilities cannot be skewed to capacity building and rehabilitation. Undoubtedly, non-functionality of water facilities in Namayingo Town Council was rocketing. Importantly, it was revealed that maintenance and training were closing the gap between WUCs and the District and Town Council technical teams. Consequently, it was always easy for the District technical team to identify non-

functionality issues before they would demand for major repairs. However, data given by the NDWO and NTCWO were triangulated by posing the same questions to the local council leaders, WUCs and community water users. On a contrary, all the WUCs studied responded that they had never been trained by either the District or Town Council. Equally, local council leaders from both villages with WUCs and without reported that they had never received any communications from the Local Government regarding the training and capacity building programmes for either WUCs or those involved in water infrastructure management. For example, a local council leaders commented;

> Previously, there was a female official from the District who used to move around teaching households on water issues. However, this has phased out of late. Our WUCs have never been trained in issues of water infrastructure management. What the Town Council does is to speak to local council leaders, and implore them to educate their WUC members about water resources management (Interview, 04).

Indeed, two WUCs equally reported that they used to receive some education on water resources management monthly, but this was about ten years back. However, they reported that such programmes ended. It was found out that instead of training WUCs and water users, the District and Town Council officials would instead move to villages without notifying either local leaders or WUCs with intentions of arresting water users with dirty jerrycans. With dissatisfaction and disappointment, local council leaders and waters users expressed that such officials were confiscating their jerrycans, but again asked for money from community members to retract their jerrycans. To the users, this was not the form of support they expected from either the District or Town Council water officials. This adversely impacted on the trust and connectedness between communities and Local Government officials which to Ostrom (2000) are critical to management and functional sustainability of water resources.

WUCs were asked whether training in water infrastructure management was useful to them. They reported that lack of training was negatively impacting on their understanding of water management. On the other hand, of the four WUCs studied, it was only the Naweibete borehole WUC members who reported that their borehole had been monitored by officials from the Town Council. However, they acknowledged that this was conducted only twice a year. When asked

about the relevance of monitoring their water sources by Local Government water officials, findings revealed that such an initiative would help to invigorate committee members and remind water users about their cardinal responsibility of paying user fees that would help to ensure O&M and subsequently translate in functional sustainability. Mirembe (2011) affirms that WUCs members often feel motivated, especially by the encouraging remarks advanced to them by the water officials.

Chapter Seven: Conclusions and Recommendations

7. Introduction

This Chapter blends the discussion of findings to draw conclusions and recommendations. For emphasis, the aim of the study was to examine CWM, and analyse the participation of WUCs in public groundwater infrastructure management in relation to functional sustainability in Namayingo Town Council. Therefore, the conclusive statements and recommendations drawn are in line with the above overall study objective.

7.1. Conclusions

7.1.1. The rhetoric of the CWM model

In this study, I examined CWM as reviewed in Chapters one, two and five. As shown in Chapter two, it was observed that CWM emerged as a management model, but also, to end the top-down government approach of delivering rural water systems. As elaborated in Chapter two, CWM is premised on the basis that communities demand for water facilities, own the water facilities, and are responsible for O&M of such facilities to bring functional sustainability to fruition. As discussed in Chapters five, the water sector policy and institutional frameworks provide for community management of rural water systems, and demands for the creation of WUCs. It clearly stipulates the roles and responsibilities of WUCs: collection of user fees and ensure the periodical maintenance and breakdown repairs to ensure functional sustainability of water facilities. However, findings as discussed in Chapter six revealed varied discrepancies that I want to note in this conclusion. First, there were several public groundwater facilities without WUCs, and there was dearth of mechanisms through which such communities were involved in water management. It was noted, as discussed in Chapter six that water demand was manufactured by the Local Government and other water supply agencies as communities were neither involved in water demand meetings nor planning. This contradicts with DRA that is emphasized under the CWM model. On a positive note, however, the number of women representation on WUCs was promising. But, there was inadequate evidence to depict that the participation of women resulted in functional sustainability of water facilities.

Second, participation of WUCs in public groundwater infrastructure management in Namayingo Town Council is low and used a *means* to achieve the foreordained government programmes. As discussed in Chapter six, WUCs only participated in post-construction management, but

eliminated in the initial stages of water infrastructure development. Certainly, participation takes different forms. WUCs participated after being mobilized by the Local Government. This happens because the government believes that rural water development programmes can only be achieved when communities are involved as captured in the objective of the National Water Policy, 1999. In other words, the results of participation drive the act of participation. However, as observed in Chapter five, development programmes with such participation where communities are only mobilized and sensitized to participate fail as participation that is choreographed at the top demises. This kind of participation is crippled by loss of interest and the spirit of volunteerism of WUCs, especially once members feel that they are compelled to participate. It is therefore unsurprising that there were several water facilities without WUCs. Besides, the interaction between the Local Government and WUCs was unclear being impaired by the absence of training and monitoring programmes which could increase the motivation for participation. Thus, the sense of participation among WUCs was unavailable, and this adversely impacted on functional sustainability.

7.1.2. Water sector policy and institutional frameworks

The water sector policy and institutional frameworks remain equivocal to communities: WUCs, local council leaders and water users. Uganda has a robust water sector policy framework energized by a clear water sector institutional framework, but there is inadequate understanding of these frameworks by communities. The community knowledge and understanding of the water sector policies coupled with policy inconsistencies and incoherence were identified as key issues adversely impacting on WUC participation and functional sustainability of water facilities. There is lack of a clear path for policy implementation at different levels, but acutely in communities. There is clear coordination between the Central Government (MWE) and the Local Government (as discussed in Chapter five). However, there are inadequate activities at the community level emanating from this coordination. WUCs are detached from the Local Government water offices. Yet, as revealed in Chapter six, the role of Local Government water officers is critical to functional sustainability under the CWM model. Water facilities managed under the CWM model become non-functional once WUCs are discarded by the Local Government water officers. Certainly, poor execution of the roles and responsibilities by key players in the CWM model, notably, results in the non-functionality of water facilities. Importantly, WUCs can only effectively execute their roles if they understand the sector policy and institutional framework which provides for their

roles. It is the role of Local Government water officers to train, teach, facilitate and sensitize communities/WUCs to understand the sector policy and institutional framework. Failure by the Local Government to execute their mandated roles and responsibilities has created a huge gap between the sector policy framework and policy practice at the community level. Thus, it adversely impacts on functional sustainability of public groundwater infrastructure in Namayingo Town Council.

Besides, institutional support to WUCs by the Local Government water officials was minimal in Namayingo Town Council. This was further enfeebled by the transition from rural water systems to urban pipe water systems that the Town Council was undergoing. This presents two quandaries. First, Local Government water officers seem to have literally relinquished their critical role of advancing the appropriate post-construction support to WUCs. This is because the Local Government has concentrated on lobbying and processing for the pipe water system. As such, some WUCs are either phasing out or, demotivated, and this is adversely impacting on the functionality of water facilities. Therefore, post-construction support directly impacts on the functionality of WUCs, and the functional sustainability of groundwater infrastructure. WUCs lack the required organizational capacity to execute the roles and responsibilities they are mandated to do. There is nothing inherently wrong with lobbying for the pipe water system, however, it is pertinent to give quality attention to the existing groundwater infrastructure to preclude infrastructure wastage. Arguably, given the poverty rates in Namayingo Town Council, not all residents will afford pipe water, though they will have accessibility. Secondly, the water sector policy framework does not clearly address the transition from rural water systems to urban pipe water systems. Although the water sector policy framework requires that urban centres to have pipe water systems due to sanitation challenges, how and what can be done during this transition stage is inadequate or even missing.

7.1.3. Role and organization capacity of WUCs

The functionality of communally managed groundwater infrastructure equally depends on the sustainable contribution of the monthly user fees, and this is a role of WUCs. The funds collected are used for both preventive maintenance and repairs in case of infrastructure breakdown. However, some community members were willing to pay, but financially incapacitated due to adverse poverty levels. Yet, there were water users with the capacity to pay, but unwilling and

demotivated. Nonetheless, those willing to pay, though impecunious, paid their user fees provided they trusted the WUCs members and had functional water infrastructure. Therefore, social capital was critical in groundwater infrastructure management. This conclusion agrees with findings of previous studies that have concluded that social capital is central to the CWM model. Besides, how communities perceive the way Local Government officials execute their roles influence their willingness and motivation to pay user fees. For example, as observed in Chapter six, some community members were unwilling to pay user fees because they felt it was the role of the government to repair water facilities.

Furthermore, community bylaws are critical to the participation of WUCs and functional sustainability of groundwater facilities managed under the CWM model. Although bylaws were in consonance with the water sector policy framework, they were not well developed and lacked clear enforcement and sanctions to non-compliant water users. Paradoxically, some villages lacked enforceable community bylaws, and it was in the discretion of water users in such communities to decide either to pay or, not. Notably, some WUCs effected sanctions such as denying non-compliant members access to clean and safe water. However, such an act contradicts with the water sector policy framework and supreme provision in the Constitution of Uganda, 1995 which observe access to safe and clean water as a fundamental right to all Ugandans. There was inadequate support from the Local Government for advocacy and development of bylaws that support the participation of WUCs. I conclude that the lack of well-developed bylaws coupled with weak sanctions to non-compliant water users adversely impacts on the participation of WUCs and functional sustainability of groundwater facilities.

Besides, as noted in Chapter five and Chapter six, WUCs and local council leaders informally and voluntarily manage public groundwater infrastructure. But, their tenure in office was not clear, yet they lose the motivation and interest required to effect their roles and responsibilities over the years. This is augmented by inadequate training, absence of monitoring and lack of incentives given to WUCs by the Local Government. The absence of training and monitoring compromises the sense of community solidity, cohesion among committee members, and their organization capacity to manage groundwater facilities. There were instances where WUCs were replaced by local council leaders to oversee groundwater infrastructure management. But, local council leaders were incapacitated and incompetent to execute such roles. Practically, it was challenging for local

council leaders to win community trust which is profoundly important in CWM. Because of mistrust, local council leaders were unable to collect the monthly user fees, resulting into insufficiency of funds whenever water sources could break down. Consequently, such water sources were either left non-functional or, leaders had to borrow money to repair the water facilities. Yet, collecting contributions to service the loan was equally a challenging activity.

In a nutshell, the participation of WUCs in groundwater infrastructure management and social capital on which CWM is premised were key to functional sustainability. The deficiency of participation and social capital were critical to understanding the inadequacy of functional sustainability in Namayingo Town Council and Uganda. Although non-functionality of water facilities does not inherently point to the failure of the CWM model, it reveals that the model is short of addressing the sustainability question in rural water systems. As such, it can be argued that the CWM model is more of an ideal than a reality. This conclusion is in agreement with earlier studies as discussed in Chapter five that have postulated that the CWM model is just rhetoric.

7.2. Recommendations

7.2.1. Motivation and incentives to WUCs

The Local Government water officials should incentivise WUCs to motivate committee members to continue volunteering in public groundwater infrastructure management. As discussed in Chapter six, WUCs operate voluntarily and informally, yet amidst several challenges. Specifically, uncooperative community water users abuse committee members, and some water users do not want to contribute the monthly user fees levied to ensure O&M of water infrastructure. On the other hand, the inadequate institutional support from the District and Town Council water offices all combined frustrate the volunteerism spirit of WUCs. Arguably, WUCs can persevere such challenges if motivated and incentivised by the District and Town Council. However, there is need to distinguish such incentives from financial gains such as money as this can create misunderstandings in communities especially if water users perceive committee members as their employees. Also, it is costly, and the District and Town Council water offices may not have the financial muscle to sustainably facilitate such initiatives given the meagre budgets within which they operate. Ideally, incentives such as certificates of recognition can be advanced to hard working WUCs of functional water sources by District and Town Council water officials on important days such as World Water Day. Besides, regular support through regular field visits and

monitoring by the District and Town Council water offices can be a motivating a factor per se. Essentially, when WUCs are in touch with the Local Government water officials, members are able speak out the acute problems they face. Consequently, together with the Local Government, WUCs can device solutions to such problems.

7.2.2. The tenure of WUCs should be defined

The water sector policy and institutional frameworks does not address the tenure of WUCs, and for the case of Namayingo Town Council, most of the WUCs had lasted for more than two years. Moreover, even those that would elect new committees, members of old committees would be voted back on new committees. For example, a case of Bulamba A village borehole WUCs had lasted for two months by the time of fieldwork, but four of the members had served on the previous WUCs. Given the circumstances and dynamics which curtail the work of committee members, the spirit of volunteerism, interest and motivation reduce over the years. As such, regular election of WUC members, with a clear defined tenure in office is pertinent. Essentially, this can reduce monotony which can adversely impact on volunteerism. Having the same members on the committee has a weakness in itself, and it is possible for such members to advance their own intentions and interest as opposed to addressing groundwater infrastructure management crises that could affect the community as a whole.

7.2.3. Offering institutional support and capacity building

There should be regular and systematic ongoing institutional support to WUCs. This study found out that institutional support is critical in the CWM mode. However, this was inadequate and even missing in most of the villages. Specifically, capacity building should target both WUCs and local council leaders as the two institutions need to mutually work, and appreciate the synergistic nature of cooperating on which trust and collective actions are premised for functional sustainability of water sources. Community involvement is not enough, adequate institutional support in form of financial and technical assistance should be a priority of the Local Government to ensure prompt repair and maintenance of not only non-functional groundwater infrastructure, but also, preventive maintenance for functional facilities. This should be streamlined to avoid counter-accusations and institutional mistakes which adversely impact on the participation of WUCs and functional sustainability of water facilities. Importantly, the Local Government should not perceive

institutional support to WUCs as a favour, but rather as a prerequisite to support the participation of WUCs and functional sustainability of groundwater infrastructure.

The hindrances that WUCs are faced with as presented and analysed in Chapter six can be offset by institutional support and capacity building. Functional sustainability can only be attained when WUCs are functional and members execute their mandated roles effectively. However, this is not automatic; it is attained when WUCs are regularly monitored, trained and supported by Local Government water officials. Specifically, WUCs should be trained in financial management, conflict resolution, leadership code and conduct, community mobilization and technical skills. It was evidenced that Namayingo Town Council had a HPM responsible for all the repairs and maintenance of groundwater facilities within the Town Council. However, his performance was ineffective and unsatisfying which ruined his relationship with Water User Committees. Besides, he always delayed to attend to the call of WUCs. As such, there is need to equip some members of WUCs with technical skills to empower them to handle minor repairs and maintenance. Management of maintenance funds was found to be a challenge. The NDWO commented that there were efforts to ensure that WUCs in the Town Council create a credit and saving cooperative to ensure that maintenance funds are properly handled and made productive. However, this can be challenging without capacity building and support to committee members. Capacity building can improve financial management of WUCs, thus accountability and subsequently builds trust (social capital) among community water users, which is fundamental to functional sustainability.

7.2.4. Pre-construction participation

Meaningful participation of WUCs in the planning processes for water sources is critical to effective management of groundwater sources. This study established that the WUCs reported in this study were never involved in the pre-construction stage. Although it may be true that the formation of WUCs at the post construction stage of water facilities does not affect O&M, building rapport, trust, bond partnership and local-external connectedness between WUCs and Local Government officials at the planning phase are pertinent for functional sustainability. Besides, it increases the participation of WUCs and squarely reduces misunderstandings and poor performance which is signalled by non-functional water sources. Further, the aspect of water infrastructure ownership should be at the onset of water project. Besides, it is impractical to use ownership as the measure of the community's ability to manage and maintain the water

infrastructure. Community water users should be granted full decision making authority to decide on the technology and choose the most appropriate water management system that best suit their communities without the influence of the either the Local Government or NGOs and CBOs. Similarly, there is need to involve committee members in effective water demand to build the basis for future ownership, participation and willingness to ensure O&M.

7.2.5. Collective enactment and implementation of bylaws

As discussed in Chapter six, it was evident that WUCs in Namayingo Town Council execute their roles in accordance with water community bylaws. Although enactment involves local council leaders as the lowest unit of government, implementation should equally involve such local council leaders. WUCs lack a legal status as they work informally, and it can only be prudent when local council leaders form the composition of WUCs for effective implementation of bylaws. Bylaws are enacted, but not followed, especially by errant community members, and WUCs do not have the authority to evoke force. Besides, the Local Government water officials should conduct community sensitization about bylaws. Like noted in Chapter four, bylaws among others encompasses how much and when water users are required to contribute towards monthly water user fees. However, WUCs are ineffective in collecting the fees, yet some water users are also defiant. This leaves a lot to be desired. As such, there is need for community sensitization to invigorate the spirit of collective action among community water users and WUCs. Bylaws are enacted, but it is not automatic for water users to follow them, especially by community members who do not participate in their enactment. Therefore, there is need for an all-inclusive community sensitization approach for water users to understand and appreciate the need for bylaws in public groundwater resources management. Such sensitization campaigns can create a fertile ground to explain to water users the water sector policies, and what they demand of them. At this point, post-construction support by the District and Town Council water officers should not only end at exemplifying to WUCs the various samples of bylaws to inform their enactment, but facilitate community sensitization campaigns on the need of bylaws as a prerequisite for sustainability. This however, requires ample time, resources and careful planning as behaviour changes is a process.

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Appendices

Appendix 1: Research Plan (Oct, 2016- Jun, 2017)

Activity	Status	Duration								
		2016			2017					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
THESIS PROPOSAL										
Draft of Literature Review	Completed									
Obtaining necessary permission	Completed									
Establishing field contacts	Completed									
Developing interview guide	Completed									
DATA COLLECTION										
Pilot-testing the interview guide	Completed									
Conducting data collection	Completed									
THESIS WRITNG & SUBMISSION										
Data Organization	Completed									
First Draft	Completed									
Second Draft	Completed									
Final Thesis Submission	Completed									

Appendix 2: Research Interview Guide for the District &Town Water Council Officers

UNIVERSITY OF AGDER

MSc. Global Development and Planning
Research Interview Guide
(For Town Council and District Water Officers)

22nd February, 2017

Dear Respondent,

I am Ronald Ngobi, a student of the University of Agder, Norway. I am currently studying a Master of Science Degree in Global Development and Planning. As part of the requirements for this programme, I am conducting a research study on *Community-Based Water Management: Participation of Water user committees in Public Groundwater Infrastructure Management in Uganda, a Case of Namayingo Town Council*. I kindly request you to provide me with information regarding this study by answering a few questions that I am going to ask you. I recognize your valuable time, and sincerely appreciate your efforts. Please note that the information provided will be treated as confidential and only used for research purposes. It will not be analysed individually, and your responses will be kept anonymous in the analysis. Your participation is voluntary and, you reserve the right to opt-out at any time during the research.

Kind Regard,

Ronald Ngobi

Section A: Profile of the respondent		
Item No.	**Question**	**Additional elaboration**
1.	Position held	
2.	How long have you been in this position?	
3.	Duty station	
4.	Sex	
5.	Contact information for follow-up	
Section B: Appropriateness of the policy and institutional framework in supporting the participation of WUCs in public groundwater infrastructure management		

6.	What policy does Namayingo Town Council possess on public groundwater infrastructure management?	What are the stipulations of this policy? Probe the presence of WUCs
7.	How does the policy on public groundwater infrastructure management in Namayingo Town Council ensure that relevant parties are involved?	Probe the presence of relevant personnel in water management issues. For example, • Technical personnel • Financial advisors • WUCs
8.	What does the policy on public groundwater infrastructure management state about the participation of WUCs in this regard?	Probe the participation and role of WUCs. For example, • Ensuring the sustainability of water infrastructure • Ensuring the functionality of groundwater infrastructure • Communicating community water issues to the responsible authorities • Ensuring responsible infrastructure and water resources use
9.	What is the structure of the institutional framework of public groundwater infrastructure management in Namayingo Town Council?	Probe the presence and roles of the following authorities: • MWE • District water department • Town council water department
10.	How has the law enhanced the participation of WUCs in public groundwater infrastructure management in Namayingo Town Council?	Probe further for the specific law and what it states?
Section C: The role and organizational capacity of WUCs in public groundwater infrastructure management		
11.	What is your comment on how WUCs have played their role regarding public groundwater infrastructure management in Namayingo Town Council with regard to the policy?	Probe whether water user committees have played their roles in line with the policy. For example, • Ensuring the sustainability of water infrastructure • Ensuring the functionality of groundwater infrastructure • Communicating community water issues to responsible authorities • Ensuring responsible infrastructure and water resources use

		• Ensuring quality water resources for communities • Mass awareness about the operation and maintenance of groundwater infrastructure • Mobilising funds for maintaining water infrastructure
12.	How can WUCs ensure that they fulfil the roles they are mandated to do?	Probe the following mechanisms water WUCs use to fulfil their roles: • Direct involvement in the operation and maintenance of public groundwater infrastructure • Communicating community water issues to responsible authorities • Mass awareness of the operation of the groundwater infrastructure • Mobilising maintenance funds
13.	How effective are these mechanisms in ensuring the functionality of groundwater infrastructure in Namayingo Town Council?	Probe the effectiveness of the following methods • Direct involvement in the operation and maintenance of public groundwater infrastructure • Formulating operational and maintenance plans • Monitoring water infrastructure and communicating community water issues responsible authorities • Mass awareness of the operation of groundwater infrastructure • Mobilising maintenance funds
Section D: Hindrances to the participation of WUCs in public groundwater infrastructure management		
14.	What are the hindrances to the involvement of WUCs in the public groundwater infrastructure management in Namayingo Town Council?	Probe the existence of the following hindrances: • Inadequate policy support on their involvement • Unclear institutional framework for their involvement • Non-existence of water user associations • Lack of necessary literacy skills of the water user association members

		• Lack of technical expertise of the water user association members • Failure by water users to contribute financially. • Lack of understanding of local community water needs by the water user association members • Lack of cooperation among WUCs and community members • Limited awareness of water user committees about the operation of groundwater infrastructure
15.	What are the constraints of the policy and institutional framework in supporting the participation of WUCs in public groundwater infrastructure management in Namayingo Town Council?	Probe in line with the following constraints: • Lack of clarity of the policy • Lack of policy implementation capacity (in terms of human resource, financial resources, time) • Lack of clarity of the institutional framework
Section E: How the water sector policy and institutional frameworks enhance functional sustainability of groundwater infrastructure		
16.	What efforts are being implemented by MWE and the Local Government to enhance functional sustainability of public groundwater infrastructure in Namayingo Town Council?	Probe these efforts at: • Policy level • Institutional level • Operational level
17.	How are the above efforts influencing the participation of WUCs in groundwater infrastructure management?	Probe: • Policy level efforts • Institutional level efforts • Operational level efforts
18.	How are the efforts above enhancing functional sustainability of groundwater infrastructure in Namayingo Town Council?	Probe in the context of: • Infrastructure functionality • Quality of water supply

End

Thank you for your cooperation

Appendix 3: Research Focus Group Guide for WUCs

UNIVERSITY OF AGDER

MSc. Global Development and Planning
Research Focus Group Guide
(For Water User Committees)

22nd February, 2017

February, 2017.

Dear Respondent,

I am Ronald Ngobi, a student of the University of Agder, Norway. I am currently studying a Master of Science Degree in Global Development and Planning. As part of the requirements for this programme, I am conducting a research study on *Community-Based Water Management: Participation of Water user committees in Public Groundwater Infrastructure Management in Uganda, a Case of Namayingo Town Council.* I kindly request you to provide me with information regarding this study by answering a few questions that I am going to ask you. I recognize your valuable time, and sincerely appreciate your efforts. Please note that the information provided will be treated as confidential and only used for research purposes. It will not be analysed individually, and your responses will be kept anonymous in the analysis. Your participation is voluntary and, you reserve the right to opt-out at any time during the research.

Kind Regard,

Ronald Ngobi

Section A: Profile of the respondents	
Item No.	**Question**
1.	Village
2.	Sex
3.	The position held on the committee
4.	Time spent on the committee
5.	Age group (at least the average age bracket)
Section B: Appropriateness of the policy and institutional framework in supporting the participation of WUCs in groundwater infrastructure management	

6.	What do you comment about the available guidelines (policy) on groundwater infrastructure management in your community?
7.	How is your committee involved in the management of public groundwater facilities in your community? Probe the level at which they are involved in relation to pre-construction, construction and post construction project levels of water facilities
8.	How does your committee manage public groundwater infrastructure in your community? Probe for their understanding about the different departments such as MWE, District Water Office and Town Council Water Office
9.	How has the law on water management enhanced your participation in public groundwater infrastructure management in your community? Probe further for the specific law and what it states (if they are aware).
Section C: The role and organizational capacity of WUCs in groundwater infrastructure management	
10.	What roles does your committee play in groundwater infrastructure management in your community in line with the available guidelines? Probe whether committees have played their roles in line with the policy. For example, • Ensuring the sustainability of water infrastructure • Ensuring the functionality of water infrastructure • Communicating community water issues to authorities • Ensuring responsible infrastructure and water resources use • Ensuring quality water resources for the communities • Mass awareness about the operation of groundwater infrastructure
11.	Which mechanisms does your committee use to fulfil the roles you are mandated to do? Probe the following mechanisms committees adopt to fulfil their roles: • Direct involvement in operation and maintenance of public groundwater infrastructure • Reporting community water issues to respective authorities • Mass awareness about the operation and maintenance of groundwater infrastructure • Mobilising maintenance funds water infrastructure
12.	In your view and on a scale of 100%, what percentage would you give yourselves in terms of effectively fulfilling your role as water managers with regard to the available guidelines?
Section D: Hindrances to the participation of WUCs in groundwater infrastructure management	
13.	What are the hindrances to the involvement of your committee in public groundwater infrastructure management in your community? Probe in line with the following hindrances: • Lack of policy support on their involvement

	• Lack of clear institutional framework for their involvement • Non-existence of WUCs • Limited necessary literacy levels of the committee members • Lack of technical expertise of the committee members • Failure of the water users to contribute financially towards maintenance • Lack of understanding of local community water needs by the committee members • Lack of cooperation among water user association members • Lack of cooperation among community members • Lack of mass awareness of committees about the operation and maintenance of the groundwater infrastructure
14.	What are the constraints of the guidelines mentioned above in supporting your involvement in groundwater infrastructure management in your community? Probe in line with the following constraints: • Inadequate clarity of the policy • Limited policy implementation capacity (in terms of human resources, financial resources, time) • Inadequate clarity of the institutional framework
Section E: How the water sector policy and institutional frameworks enhance functional sustainability of groundwater infrastructure	
15.	What efforts are being implemented by the MWE and Local Government to enhance the involvement of your committee in public groundwater infrastructure management in your community? Probe these efforts at: • Policy level • Institutional level • Operational level
16.	How are the efforts above influencing the involvement of your committee in public groundwater infrastructure management in your community? Probe at the following levels: • Policy level efforts • Institutional level efforts • Operational level efforts
17.	How are the efforts above enhancing functional sustainability of public groundwater infrastructure in your community? Probe in the context of: • Infrastructure functionality • Adequate water supply by the infrastructure • Quality of water supply

End

Appendix 4: Research Interview Guide for local council leaders & water users

UNIVERSITY OF AGDER

MSc. Global Development and Planning
Research Interview Guide
(For local council leaders and water users)

22nd February, 2017

Dear Respondent,

I am Ronald Ngobi, a student of the University of Agder, Norway. I am currently studying a Master of Science Degree in Global Development and Planning. As part of the requirements for this programme, I am conducting a research study on *Community-Based Water Management: Participation of Water User Committees in Public Groundwater Infrastructure Management in Uganda, a Case of Namayingo Town Council.* I kindly request you to provide me with information regarding this study by answering a few questions that I am going to ask you. I recognize your valuable time, and sincerely appreciate your efforts. Please note that the information provided will be treated as confidential and only used for research purposes. It will not be analysed individually, and your responses will be kept anonymous in the analysis. Your participation is voluntary and, you reserve the right to opt-out at any time during the research.

Kind Regard,

Ronald Ngobi

Section A: Profile of the respondent		
Item No.	**Question**	**Additional elaboration**
1.	Village	
2.	Sex	
3.	Age	
4.	Position held in the community	
Section B: Appropriateness of the policy and institutional framework in supporting the participation of WUCs in public groundwater infrastructure management		
5.	Do you know of any guidelines on groundwater infrastructure management in your community?	

6.	How do you manage water sources in your community?	Probe for the presence of water committees. Are there any WUCs you know of in your community? Find out the presence of WUCs at: • Village level • Water source level
7.	How do the guidelines on public groundwater infrastructure management encourage the involvement of WUCs in your community?	Probe on the areas of involvement: • Direct involvement in the operation and maintenance of public groundwater infrastructure • Formulating operation & maintenance plans • Monitoring water infrastructure and communicating community water issues to the authorities • Mass awareness of the operation of the groundwater infrastructure • Mobilising maintenance funds
8.	What is your understanding of the management structure of public groundwater management in your community?	Probe their awareness of the presence of the following authorities: • Ministry of Water and Environment • District Water Office • Town Council Water Office
9.	How has the law on groundwater infrastructure management influenced the participation of WUCs in your community?	Probe further the specific law, and what it states (if they can).
Section C: The role and organizational capacity of WUCs in public groundwater infrastructure management		
10	What is your comment on how WUCs have played their role regarding groundwater infrastructure management in your community?	Probe whether WUCs have played their roles in line with the available guidelines. • Ensuring functionality of groundwater infrastructure • Communicating community water issues responsible authorities • Ensuring responsible infrastructure and water resources use • Ensuring quality water resources for the communities • Mass awareness of the operation of the groundwater infrastructure

11	WUCs are supposed to play their role in line with the available guidelines. How has this been achieved in your community?	Probe the following mechanisms WUCs adopt to fulfil their roles: • Direct involvement in the operation and maintenance of groundwater infrastructure • Communicating community water issues responsible authorities • Mass awareness about the operation of groundwater infrastructure • Mobilising maintenance funds
Section D: Hindrances to the participation of WUCs in groundwater infrastructure management		
12	What constraints do you see in the available guidelines which may deter the participation of WUCs in the management of groundwater facilities in your community?	Probe the existence of the following hindrances: • Lack of policy support on their involvement • Lack of clear institutional framework for their involvement • Non-existence of WUCs • Lack of necessary literacy levels of the committee members • Lack of technical expertise of the committee members • Failure of the committee members to contribute financially • Inadequate understanding of local community water needs by the committee members • Lack of cooperation among the committee members • Lack of cooperation among the community members • Lack of awareness of community members about the operation of groundwater infrastructure • Lack of clarity of the policy • Lack of policy implementation capacity (in terms of human resource, financial resources, time) • Lack of clarity of the institutional framework

Section E: How the water sector policy and institutional frameworks enhance functional sustainability of groundwater infrastructure		
13	What efforts are being implemented by the Local Government to enhance the participation of WUCs in the management of public groundwater infrastructure in your community?	Probe these efforts at: • Policy level • Institutional level • Operational level
14	How are the efforts above influencing the participation of WUCs in the management of public groundwater infrastructure in your community?	Probe: • Policy level efforts • Institutional level efforts • Operational level efforts
15	How have these efforts enhancing functional sustainability of public groundwater infrastructure in your community?	Probe in the context of: • Infrastructure functionality • Adequate water supply by the infrastructure • Quality of water supply

End

Thank you for your cooperation

Appendix 5: Research Observation Guide

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MSc. Global Development and Planning
Research Observation Guide

22nd February, 2017.

1. Observe the composition of water user associations. Compare men to women ratio.
2. Observe the nature/state of public groundwater infrastructure
3. Observe the age (duration) of public groundwater infrastructure
4. Observe the functionality status of the public groundwater infrastructure
5. Observe the quality of water provided by the public groundwater infrastructure
6. Observe the water facility utilization
7. Observe any other observable phenomenon.