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Water governance in small towns at the rural-urban intersection: the case of Bushenyi-Ishaka, Uganda

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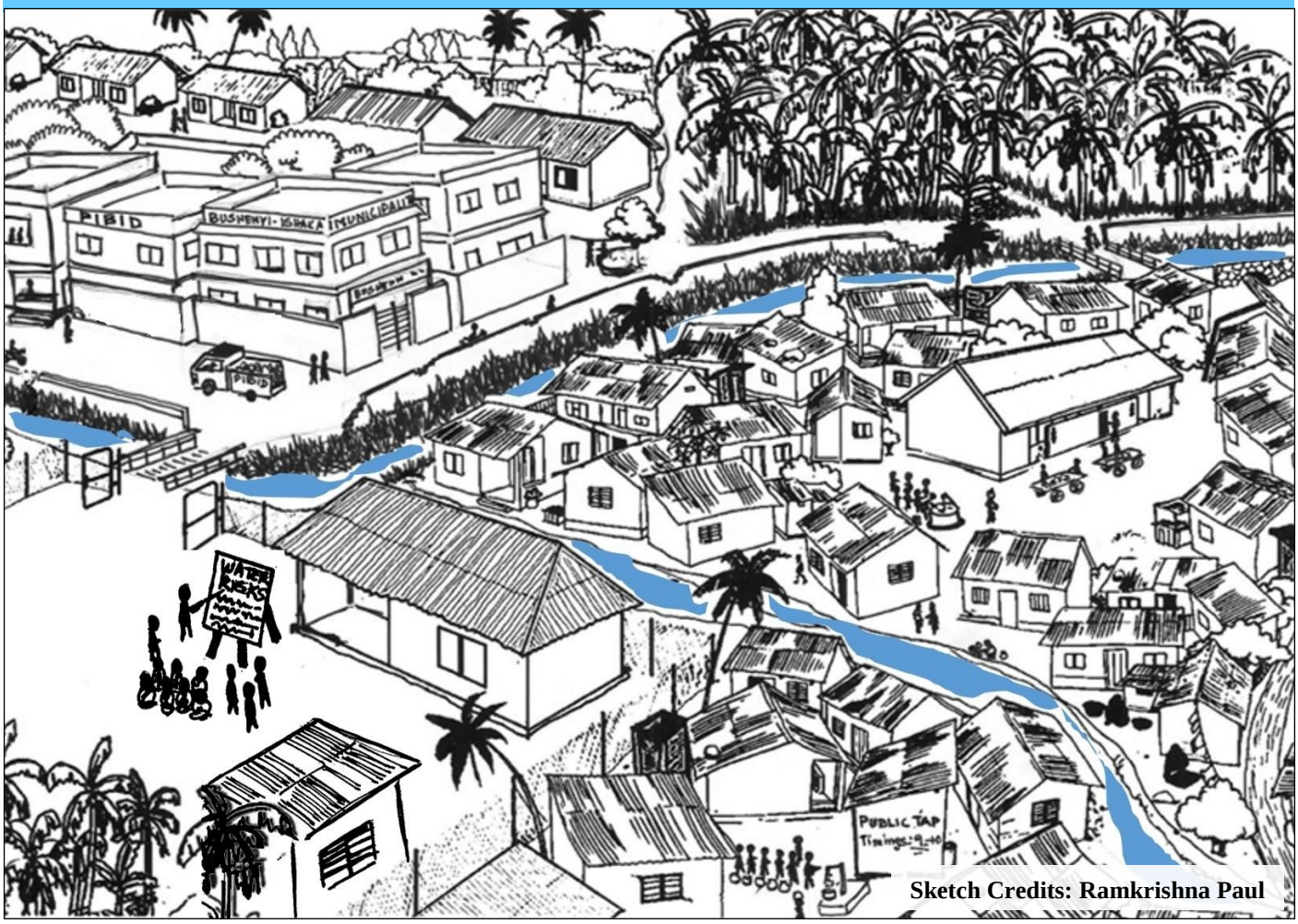

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Water governance in small towns at the rural-urban intersection: the case of Bushenyi-Ishaka, Uganda

Master of Science Thesis
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Abstract

Water as it flows through a town is continuously affected and changed by social relations of power and vice-versa. In the course of its flow, it always benefits some, while depriving, or even in some cases harming others. The issues concerning distribution of water are closely intertwined with the distribution of risks, at the crux of which are questions related to how decisions related to water allocation and distribution are made. Considerable amount of research has been done in highlighting the complexities of such decisions and produced inequities in the urban centres. However, very limited empirical based research is done on how these inequities are produced with respect to the flows of water and the distribution of risks in the context of a small town. Small towns are typically transitional entity between rural and urban areas, often characterized by the dynamics of rapid population growth and institutional change. With respect to water management, often the approaches followed are replica models used either in big cities or in small rural villages which either become less efficient or relatively more complex in the context of a small town.

Based on qualitative research interviews, in this research study I attempt to understand what is particular about water service provision and about everyday water use practices in small towns. Specifically, this research aims to contribute to the understanding of production and distribution of water related risks from the water users perspective. For this study, Bushenyi-Ishaka a small town in Uganda was selected as a case study. In the town I selected one most vulnerable area, Masya located in the peripheral parts and one less vulnerable area, Katungu located in the central part of the town to study the production and distribution of water related risks.

Comparing both the areas it was seen that water users of Masya are vulnerable to water related risks mainly produced as a result of not having piped water supply. Water users in Masya are not connected to the main piped network not only due to the geographic location of the area, but is influenced by the perceptions of few water utility staff members in key positions. Water users in Masya thus currently depend on protected and unprotected springs, while the water users in Katungu are mostly dependent on piped water supply. Apart from this often the residents of Masya and to less extent in Katungu also use water from the wetlands for various purposes, sometimes even practice farming in the wetlands. This ongoing encroachment is one of the major factors contributing towards the drying up of Nyaruzinga Wetland, which is the raw water source for the town. Highlighting the interconnected flows in the town, I show how excluding neighbourhoods like Masya from the piped system can no longer be ignored and needs to be connected to the piped network.

In terms of water management in Bushenyi-Ishaka, the town has a combination of both ‘urban’ (piped water systems) and ‘rural’ (spring system) water supply technologies. Continuously shifting from being a rural into an urban area, over the past years the town has seen an increase in urban water supply system. This shift has also affected the social dynamics of the area in terms of management approach. The conventional community based approach often considered ‘rural’ in nature is shifting towards a more ‘urban’ approach characterized by private household connections. Emphasizing on this transition I show the complexity of water management in Bushenyi-Ishaka as a small town which is neither completely rural nor completely urban, rather lies at the rural-urban intersection, where both the rural and urban dynamics co-exist.

Acknowledgement

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Coming from an engineering background and foraying into the territory of water governance, I would not have been able to conduct a research focusing on the social dynamics involved in daily water use practices without the support of my mentor, Dr. Jeltsje Kemerink - Seyoum. I am lucky to be mentored by you and thank you for being patient with me and for your critical feedback and guidance throughout the research period.

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Abbreviations

DFID	Department for International Development
DWD	Directorate of Water Development
EC	European Commission
IWA	International Water Association
KIU	Kampala International University
LC	Local Chairperson
NWSC	National Water and Sewerage Corporation
UBOS	Uganda Bureau of Statistics
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
WSP	Water Safety Plans
WU	Water User

CHAPTER 1

Introduction

1.1. Background

The United Nations indicates in its report that the world's urban population as per 2016 accounted for 54% of the total population, while the remaining is settled in rural areas (UN, 2016). This widely followed classification of rural and urban areas is based on factors such as governmental administrative boundaries and population density or even in some cases the type of technology used for providing the basic needs services, such as water supply and sanitation (Kudva, 2015; de Jong, 2000). This classification is even more arbitrary if we consider that the range of criteria varies from one country to the other. For instance in Peru, a cluster of more than 100 houses would form an urban area, whereas in Nepal an urban city would be formed only if the population is more than 9,000 (Kudva, 2015).

While this form of classification used by several governmental and development organisations picturizes the urban and rural areas as self-evident separate entities, in reality the picture is not so well defined. The question lies in defining the threshold of where urban stops and rural starts and more importantly what purpose does such a definition serve. There exists a fuzzy space, the 'grey area' where the rural and urban intersects (Hopkins, 2003; Moriarty et. al., 2002; Pilgrim et. al., 2007; Adank & Tuffuor, 2013). It is in this rural-urban intersection where small towns are located (see Figure 1), which are neither completely urbanized in terms of the infrastructure availability or the population density, nor they are completely rural in terms of livelihoods of people often depending on agriculture. As stated by Moriarty et al. (2002; pg. 1) *"small towns are difficult in nature"*. That being said, small towns are also claimed to host the majority of the population (Moriarty et. al., 2002; Adank & Tuffuor, 2013).

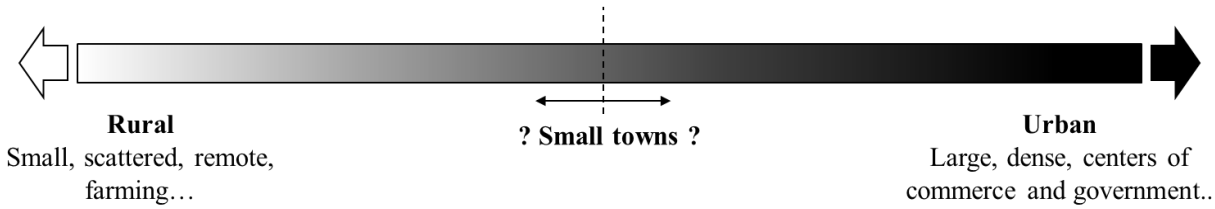

Figure 1: Rural-Urban intersection: placement of small towns (adapted from Hopkins, 2003)

Small towns are often believed to lack the social dynamics of rural areas, and are simultaneously said to lack the presence of institutional arrangements to effectively manage their natural resources (Moriarty et. al., 2002). In this vast spectrum of classifying urban and rural areas, small towns are typically transitional entities often characterized by the dynamics of rapid population growth and institutional change.

In general, the widely practiced norm for managing natural resources in these small towns is replica models of the approaches used either in the big cities or in small rural villages. That means that either a national organization takes up responsibility for providing basic services in a more centralized manner or the decentralized bottom-up participatory approach is followed, which usually materializes for rural villages. With respect to the management of natural resources in such towns neither the 'top-down' nor the 'bottom-up' approach is believed to effectively work out (Pilgrim et al., 2007). Either these approaches becomes less efficient or relatively more complex when applied in a context of small towns (Pilgrim et al., 2007). Also, as shown in the cases of small towns in Mali, Nigeria and Tanzania (Bah et al., 2003), these towns are often continuously affected by their close proximity to the urban centres and by the ongoing exchanges between the urban and the rural areas, specifically with respect to access to land and water. For instance, farming is still the primary economic activity for much of Africa's rural population (Bah et al., 2003) and most of the production is either targeted to the nearby 'urban' areas or in some cases to the international market. Also the availability of infrastructure such as connectivity to markets and access to modern farming equipment or even in some cases the exchange of knowledge are often seen as tools in transition of a rural area to an urban area (see also Sabet and Azharianfar, 2017; Bah et al., 2003). In such cases, the access to land and water is continuously affected by the existing rights systems whereas customary rights[1] are more applicable to the rural areas, while statutory rights[2] are more likely to be followed in the urban centres. Dependence on such dynamic factors makes managing the natural resources potentially more complicated in the small towns.

Even though there is ambiguity in characterizing small towns, from the limited empirical study done on such towns it can be seen that the land usage pattern is continuously shifting from agriculture to residential and industrial, specifically due to its rapid population growth and often due to its close proximity to the expanding urban centres. This process of land encroachment goes simultaneously with transforming the livelihoods of different group of users (Tacoli et al., 2003). In this transition phase of shifting from rural to urban, the poorest are usually the most affected. While the larger scale farmers often with better socio-economic status, who are producing for the market, can match up to the urbanization process, either by supplementing their farming techniques with modern equipment or by shifting to a higher value crop, it is the small-scale subsistence farmers who often lose out either because of lack of land, water or capital and eventually opt for non-farming employment opportunities (Bah et al., 2003, Tacoli et al., 2003). The effect of this is mostly seen among the younger generation, who thus move out of their hometowns in search for a better job opportunity in the urban centres. Despite of such increased migration patterns, as that of observed in the small towns of various African countries, the social links between the migrants and their kin is believed to be quite stable. For many migrants, this is not only being attached to their social identity but a way of distributing their assets and economic benefits among their extended family residing back 'home' (Bah et al., 2003; Liu and Liu, 2010). Migration thus can be seen as one of the key interface between urban and rural settlements, which also in some cases determines the settlement patterns in the small towns (Bah et al., 2003).

Such dynamic changes happening simultaneously in a small town bring about a produced unevenness, highlighting the heterogeneity of such towns. Such unevenness may not only be

[1] Land and water management done by traditional authorities like the village chiefs and communities
[2] Formalized land and water rights by the respective government and state bodies

limited to the land use and settlement patterns, but can also be observed in the provisioning of basic services such as water and sanitation facilities. In the study by Pilgrim et al., (2007) it was stated that the small towns in many cases have densely populated core areas which have access to piped water supply, whereas the peripheral areas are often served by alternative water sources. This pattern in the small towns can be attributed to the lack of financial[3], technical and human resources to independently manage its water resources, including providing piped water to the residents of the town (Pilgrim et al., 2007, Adank & Tuffuor, 2013). This characteristic of uneven waterscape formed is not only common to small towns, but is also seen in large towns and is attributed to the various technical, financial, socio-economic and political factors (see also Kooy et al., 2016; Rusca et al., 2017; Schwartz et al., 2015; Anand, 2011).

Uneven development in terms of providing water services is not only limited to piped water services or having access to 'improved[4] sources' (WHO/UNICEF, 2015) but depends on the quality of access in terms of accessibility and reliability of supply (Burt & Ray, 2014; Bain et al., 2014; Kooy et al., 2016; Rusca et al., 2017). It is also important to include the indicators for water quality. Emphasizing water quality, requires going beyond the internationally followed classification of 'improved' and 'unimproved sources', as prescribed by WHO/UNICEF (2015). Following the notion of 'improved sources' increases the probability of missing out on sources, which even though being under the category of 'improved sources', are still susceptible to microbial or any other form of contamination, as seen in case studies across the globe (Chakraborti et al., 2017; Ahmad & Khan, 2015; Dey et al., 2017; Boakye-Ansah et al., 2016). This deprived water quality varies in spatial terms within a region leading to disparities in health outcomes (Bain et al., 2014), adding to the unevenness in the town.

1.2. Problem statement

Water being a fugitive, forceful and unreliable resource (Savenije, 2001), as it flows through towns it is continuously affected and changed by social relations of power and vice-versa (Linton & Budds, 2014). In the course of its flow, be it freshwater or wastewater, it always benefits some, while depriving, or even in some cases harming others (Zwarteveen et al., 2017). This is seen in the case of Kampala, Uganda, where wastewater from septic tanks and pit latrines flow into the fresh water sources in the peripheral parts of the town which are raw water source for piped water supply to the town, thus affecting the quality of potable water and posing public heath risks for the population (Murungi & Van Dijk, 2014; Nakagiri et al., 2015). Or, for instance, in the case of Delhi, India, where the unavailability of water sources in certain parts of the city makes the residents more vulnerable towards opting for alternative sources to access water, sometimes even exposing them to the physical risks (Truelove, 2011).

As stated by Zwarteveen et al., (2017) the issues concerning distribution of water are closely intertwined with the distribution of risks, be it to the environment in terms of sustaining the

[3] As compared to the urban areas, small towns often have fewer industries present, which also reduces the possibility of cross subsidizing, resulting in increased water tariffs, which might not be feasible for domestic users to pay (Bah et al., 2003).

[4] An improved drinking water source is one that, by the nature of its construction, adequately protects the source from outside contamination, particularly faecal matter. Public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, rainwater and household connections are generally termed as improved sources. (WHO/UNICEF, 2015)

environmental flow or to humans in terms of risks related to water quantity and quality. At the crux of understanding how these risks are produced and distributed are questions related to who takes decisions related to solving the 'problems of water uncertainity and risk', how are water risks experienced and by whom, and more importantly which population is targeted to benefit from the decisions made? (see also Castro, 2007) Such decisions related to natural resource management occur in a multifaceted socio-political setting with numerous social actors, having different motivations and different bargaining positions, which stem from historically rooted institutions which are complexes of social practices, behaviours and accepted norms (Uphoff, 1986; Cleaver & Koning, 2015; Zwarteveen et al., 2017).

Considerable amount of research has been done in highlighting the complexities of decisions related to water allocation and distribution and produced inequities existing in the urban centres related to water service provisioning, be it related to the pricing of water (see Bakker, 2003; Pihljak, 2014) or the quantity of water (see Kooy et al., 2016, Anand, 2011, Smith & Hanson, 2003) or the quality of water (see Rusca et al., 2017; Boakye-Ansah et al., 2016; Bain et al., 2014). However, very limited empirical based research is done on how these inequities are produced with respect to the flows of water and the distribution of risks in the context of a small town. Moreover, majority of studies conducted or policies designed in relation to water risks, look at risks from a technocratic point of view, and not from the situated understanding of risks, in the sense of looking at risks from the point of view of those who are experiencing risks.

1.3. Research objective

In general, this research aims to contribute to a better understanding of what is particular about water service provision and about everyday water use practices in small towns that are constituted by the rural-urban intersection. Specifically, this research aims to contribute to the understanding of production and distribution of water related risks from the water users perspective, by studying the daily practices which are adapted by water users to deal with and mitigate risks.

1.4. Research questions

Main question: How are water related risks produced and distributed in the particular context of small towns?

Sub-Questions:

1. Which areas of the small-town are more vulnerable towards water related risks and why?
2. Which kinds of risk do water users perceive and why? What are the risk mitigation measures available to them and how do these measures affect their water use practices?
3. How does small town characteristics affect the risk distribution pattern?

CHAPTER 2

Literature Review

In this chapter a literature review is presented and it serves to review and understand the conceptual frameworks that has been used as a lens to analyze the existing scenario in the small town with respect to the research questions. The chapter is divided into two parts, the first part focuses on 'political ecology' which have been used to determine the social and power relations behind how water flows through the town, to whom and how are these flows related to the production and distribution of risks. The second part of the chapter focuses on what are risks from the global/national decision maker's standpoint, which later feeds into the data analysis section. The literature review is drawn from books, development organization documents and peer reviewed articles

2.1. Political ecology

Various researchers have referred to political ecology as an 'approach', a 'framework' or a 'perspective' (Peterson, 2000; Bryant, 1992; Kalipeni and Feder, 1999) to understand the relation between nature and society. Initially, political ecology was used as a framework to understand the complex relation of *"ecology and a broadly defined political economy. Together this encompasses the constantly shifting dialectic between society and land-based resources* [environment]*, and also within classes and groups within society itself"* (Blaikie and Brookfield, 1987, pg.: 17). During the course of its use, different adjectives such as 'third-world', 'geographical', 'urban' and 'feminist' has been used to complement the term (Bryant, 1992; Swyngedouw, 1995; Neumann, 2005; Truelove, 2011). Some definitions emphasizes on the political economy, while some incline more towards political institutions, while some stress on environmental change, but at the crux of it lies a common agenda to highlight the dynamic relation between ecology and human change, and between various societal groups and institutions at different scales (Peterson, 2000).

Political ecology criticizes the theory of existence of apolitical nature and analyses the linkages between the conditions and changes of social-environmental systems based on empirical research, with explicit consideration of power relations (Robbins, 2003). Using this concept Swyngedouw (1997) analysed water as 'hybrid' in nature, as it is a product of biochemical and physical properties along with the cultural and symbolic meanings and the social values. For instance, the Ganges in India is not only a seen as a product of biochemical and physical properties, but there is also social and spiritual beliefs about the river being 'holy' associated with it. As stated by Alley (2002) people still taking dip in the highly polluted river owing to belief that the river water has healing capacity and can wash away one's sins is not about contradicting cultural beliefs to scientific truth, but shows that how the quality of water is thoroughly a social category.

More specifically, political ecology helps study the institutional arrangement and cultural norms explaining how natural resources are distributed and its related consequences. For instance, Pelling (1999) in his study of Georgetown, Guyana used the concept of political ecology to showcase that risks related to flooding is produced not only due to physical systems, but are also a product of socio-political and economic systems. In his study he showed that decision making power is at the core of uneven distribution of vulnerability and this power is constantly [re]negotiated between institutions with different levels of agency. Population having less access to service, infrastructure, economic resources were the most vulnerable to flood risk.

"Natural or ecological conditions and processes do not operate separately from social processes, and that the actually existing socio-natural conditions are always the result of intricate transformations of pre-existing configurations that are themselves inherently natural and social" (Swyngedouw, 1999, pg.: 445). Highlighting this Swyngedouw identifies water as a 'hybrid-quasi' object which is *"partly social and partly natural, yet deeply historical".* He formulated on this notion to showcase how nature and society are historically intertwined together to produce urbanized water, as also seen in the case of Ecuador (Swyngedouw, 1997). In this research I need to focus on the water use practices and engagement of water users with water in order to understand how risks are historically produced and distributed in the small town. Political ecology thus helps as a lens to understand and assess how the social imaginaries (institutions, values and laws) are involved in temporal and spatial production of water related risks and more importantly who is at risk. The following section focuses on different traditions within the broader political ecology framework.

2.1.1. Bricolage

Bricolage is the process of tinkering by which individuals use available resources to assimilate ideas, which is *"produced as a result of articulation of socio-political, economic, bio-physical and infrastructural drivers"* (Schwartz et al., 2015, pg.: 32). Furthering this notion, there are two forms of bricolage which have been discussed in the literature: institutional and infrastructural bricolage. Both the conceptual forms will be employed in this research study. *"Institutional bricolage is a process through which people, consciously and non-consciously, assemble or reshape institutional arrangements, drawing on whatever materials and resources are available, regardless of their original purpose"* (Cleaver & Koning, 2015, pg.: 4). The concept was developed as a response to the school of 'institutional crafting' (Ostrom, 1993) in managing natural resources like land and water (Cleaver, 2002). In her study, Cleaver mentions that much of institutional bricolaging is done in the interface between bureaucratic institutions and socially embedded institutions[5]. Explaining the concept of bricolage, Funder and Marani (2015) talks about three practices which the Environmental Officers in Kenya follow to manage their water resources, namely working via personal networks (by having informal meetings), by informal agreements (unwritten rules which have local implications) and delegating work to the civil society. Talking about informal meetings and agreements, Hossain (2011) talks about the framework of 'urban informality' to explain how the population of peri-urban areas of

[5] Bureaucratic institutions are those which are based on formal arrangements, organizational structures, contracts and legal rights, generally introduced by the governments or development agencies, whereas socially embedded institutions are based on culture, social organizations and daily practices (Cleaver, 2002).

Dhaka, Bangladesh avail water supply services. Such informalities, social and political struggles around water characterize the heterogeneity of a state. In this context, water services starting from network extensions, connections to billing are socially and politically negotiated and are derived from a set of 'informal' institutions which determines who gets what.

On the other hand infrastructural bricolage is the process in which diverse infrastructural arrangements are moulded together to form the service provisioning system (Schwartz et al., 2015). Infrastructure is at the crux of water management system and various combinations and alternative arrangements are put in place together to avail the service. For instance in the case of water provisioning in Greater Maputo, Mozambique, infrastructural bricolage is characterized by the distribution network of pipes simultaneously coupled by the combination of boreholes, pumps, storage tanks (Schwartz et al., 2015). Infrastructural bricolage is closely linked to the concept of bureaucratic (formal) and socially embedded (informal) distribution system and is *"a product of the state purposive interventions"* (Hossain, 2011, pg.: 277). This type of bricolage is usually produced as a result of the state not being able to provide household connections to all areas under its jurisdiction or as a result of unreliable water supply. This can also be observed in the case of northern Jakarta, Indonesia where a major section of the population opts for alternative sources of water by the means of tankers and boreholes due to the unavailability of municipal piped water supply (Kooy, 2014) or in the case of Dhaka, Bangladesh where household owners install intermediate electric pumps to increase water availability (Hossain, 2011).

With specificity to this research study, the concept of institutional bricolage will be used to examine how the various water users (bricoleurs) avail the water services at a household level and how does the management practices fit into their livelihood networks and institutions. Also the concept of institutional bricolage allows me to assess the policies and prescribed norms of water allocation to the institutional arrangements of everyday water management practice and the related 'rules in use' adapted by the water users. The concept of infrastructural bricolage would be used to study the infrastructural risk mitigation measures in place, adopted by the water users.

2.1.2. Agency

Human beings are complex in nature and are often not rational. Here rationality is not only expressed in simple economic cost benefit analysis terms, but there is also social aspect attached to it. Individual's decisions are affected by their circumstances and social relations (Cleaver & Koning, 2015). These two factors have the potential to affect the motivation and the interests of individuals, who then would make irrational choices. Explaining this, Giddens (1984) explained agency as human actions, analytically separated from unconscious acts. However, this notion has been criticized by many on the premise that this notion reduces 'human existence to purely individual action' (Archer, 2000, 2003; Engel & Strasser, 1998). Whereas, human agency is continuously shaped and constrained by factors such as social class, race, gender and economic status which is often unconsciously embedded in an individual (Eteläpelto et al., 2013).

That being said regarding the complexity of human beings, the formation of institutions comprising of individuals is much more intricate. It is not only that individuals shape

institutions, but also the behaviour of an individual is affected by the power dynamics which prevails in an institution. With respect to institutions affecting individuals, the rules made by individuals based on their choices are continuously affected by their knowledge, societal norms, relationships and circumstances (Eteläpelto et al., 2013; Cleaver & Koning, 2015). The decision of the individual is also affected by the power dynamics of his/her position in the society. This process of changes among individual's behaviour is attributed by the term 'human agency'.

In this context, agency has been defined as 'freedom to choose' (Russell & Lamme, 2016) or as the 'power to act for a reason' (Barham, 2012) in a given environment, which is often assessed within a relational context (Ren, 2011; Arai, 2006). In the context of this research, agency is closely linked to bricolage. Bricolage is an authoritative process and different water users follow different set of institutions and with their overlapping identities, their authoritative resources vary, making them act differently (Cleaver, 2002). For instance, a water user might be of a particular religion, having a particular ethnicity, a profession and economic status. In this case all these overlapping identities would make him/her act in a particular way consciously or sub-consciously while accessing water. Taking the example of varying identities, a domestic water user who is also a farmer, in case of availability of limited water supply, would invariably tend to think about his/her water requirements for agriculture while using water for domestic activities or vice-versa. In this study, the concept of agency was used to analyse how the institutional arrangements and the environment of certain water users and stakeholders allow them to access water and also in some cases shape the flow of water affecting the distribution and production of water related risks.

2.1.3. Inequality

'Reducing inequality' is in the forefront of any policy level intervention in the water sector, with development goals specifically focusing on providing *"universal and equitable access to safe and affordable drinking water for all"* (UNDP, 2016). However, ironically recent studies have shown that the disparity between people having access to safe water and not having access, both in terms of water quantity and water quality is broadening, despite policy initiatives (Zwarteveen & Boelens, 2014). Inequalities is also highlighted in the formation of an uneven waterscape. Inequalities as a result of social and power dynamics has been showcased in various studies carried out in the developing nations (Kooy & Bakker, 2008; Rusca et al., 2017; Rodina & Harris, 2016; Anand, 2011). For instance, in case of South Africa, the national water policy promotes *"Some for all forever"* (Van der Zaag & Savenije, 2015, pg.: 12), however, in the case of Khayelitsha (Rodina & Harris, 2016) or Durban (Loftus, 2006), there are sections of the society which still do not have access to water or have access to only a minimum threshold of 25 litres per capita per day, while there are others who have the opportunity to use water as a luxury.

Inequality arising as a product of not having access to water, leads to differentiated cost or pricing regimes, with often the 'poor' ending up paying more for water supply as compared to the 'rich'. This scenario prevails, as the rich often have access to household piped water connections, while the poor who cannot afford to have in-house connections, have to depend on alternative water sources, which often results in them paying more (Bakker, 2010; Philjak, 2014).

Inequality is not only limited to water quantity or access to infrastructure, but extends to the quality of water. As seen in a recent study conducted in Malawi, people from the higher income planned settlements have better quality of water as compared to those residing in lower income unplanned settlements (Boakye-Ansah et al., 2016). Inequality, is thus not only a product of technical infrastructure availability or regular operation and maintenance, but is also produced due to the underlying socio-political and economic factors. Once on field, inequality as a concept also allowed me to be aware of the existing socio-political institutional arrangements and the power dynamics involved in how different social groups access water and how vulnerability towards water related risks is experienced differently by different users.

2.2. Water risks

The word 'risk' can have several meanings, depending on the geographic location, the scale of the event, and the time period (Adams, 2014; Johansen & Rausand, 2014, Ataoui & Ermini, 2017). The definition of risk also varies along with the perceptions of the target group (Larson et al., 2016). For this research we will be building up on the broader definition of risk as 'the possibility of loss, harm or injury', highlighting the concepts of an event and the severity of the event (Medema et al., 2003). Risk in a society at a given time is believed to be produced as the interaction between three key factors, namely, hazard, exposure and vulnerability[6] (UNISDR, 2005). With specific focus to water, risks is often conceptualized as a function of physical availability and quality of the available resource. This technocratic understanding of risk is only limited to a condition including the likelihood of an unfavourable impact and the potential harm. However, research on environmental issues, such as risks from degrading water quality or the risks from a hurricane, is not only produced and experienced as a result of natural events, but it is a product of interactions between nature and society (Seckler et al., 1999, Larson et al., 2016, Sotic and Rajic, 2015). Highlighting this notion, risks have been identified not only as a *"straightforward consequence of the dangers inherent in the physical situation. It is the product of shared beliefs and values"* (Douglas and Wildavsky, 1982, pg.: 892).

With respect to this research, the study will be focused on the risks from an interpretive sociological approach to nature, considering the fact that there exists different valid view-points in looking at the same process or object. In this case, risks perceived by the decision makers may be different from the ones that is perceived by the water users or the social scientist's point of view on risks would be different from that of a technical scientist. Embracing the interpretive approach, this research will be looking at understanding the situated knowledge of risks by emphasizing on how risks are perceived by the water users, who experience and mitigate risks related to water in their daily practices (Schramm & Lux, 2014; Birkmann, 2011). Having said that, in this section I will be reviewing literature, which identifies risks from a technocratic point of view, as defined and used by authorities at the international and national level. This later feeds into the data analysis, trying to compare and contrast risks, as perceived by the water users with the standards held up by the authorities.

[6] In this context, hazard is defined as a process or human activity that may cause adverse social, economic and physical effect on humans or degrade the environment. Exposure is defined as the state of the individual having no protection from the hazard. Vulnerability is defined as the processes (determined by the physical, socio-economic and environmental factors) which increases an individual's or a group of individual's susceptibility towards the hazard (UNISDR, 2005).

2.2.1. Risks related to water quantity

Water-related risks pose both direct impacts (e.g. health impacts, loss of life) and indirect impacts (e.g. losses in productivity and increased expenditures) for the water users. Considerable amount of research has gone into the physical health impacts of not having access to water or due to poor quality of water, but the impact of this is not only limited to the physical health, but has severe impact on the social state of the water users (Wutich, 2009). Hence, in outlining the health impacts, they will be classified under physical and social well-being of the water users, following the health definition by World Health Organization (1946).

At the global level studies indicate that, 844 million people lack access to basic drinking water services (WHO, 2017). With global initiatives such as the millennium and sustainable development goals focusing on 'universal and equitable access to safe and affordable drinking water', there are still households in the under-developed and developing nations who do not have access to water (UN Water, 2017). With respect to not having consistent access to water, unreliability of public water supply has been defined as the sporadic hours for which water runs, insufficient and irregular pressure of water in the taps either due to limited water availability at the source, human error, socio-political factors or sudden infrastructural breakdown resulting in lack of water (Zerah, 2000; Manch, 1999; Truelove, 2011; Baisa et al., 2010). Such discrepancies in the services leads the water users to depend on alternative sources. For instance in Onitsha, Nigeria and Accra, Ghana households not having municipal piped water supply have separate storage facilities to avail water from vending tanker trucks (Whittington & Donald, 1991; Porter, 1997). Unreliability of water services is not only observed in households not having access to municipal piped water supply, but among households with piped water supply as well. As seen in Jakarta, Indonesia, residents choose to store water in tanks as a response to unreliable water supply (Baisa et al., 2010). Further also in Lima, Peru and in Mexico City, Mexico, 48% and 32% of households (respectively) have limited hours of water supply, making them vulnerable to depend on alternative sources (Alcazar et al., 2002; Haggarty et al., 2002).

With respect to the impacts of unreliable and unavailability of water supply, water users often have to depend on alternative sources of water. This often makes them susceptible to physical labor, such as waiting long hours for the vendor or running after a vendor to buy water (Wutich, 2009). Also saving time and effort makes people productive in other activities (WHO, 2017). As stated by WHO (2017), having access to water increases personal safety by eliminating 'long and risky journeys' to collect water. Often as women are responsible for managing water at a household level (Ray, 2007; UNDP, 2006), these physical labor is 'embodied' by them (Truelove, 2011). Unavailability and unreliability of primary source of household water supply often forces the household members to opt for 'illegal' and/or 'informal' methods to access water, which are often punishable offence (Truelove, 2011).

Having no access to water also induces emotional distress among members of the household. Wasting time on accessing water, losing income as a consequence of not having access to water or spending more on alternative sources like storing water or treating water before consumption (Pattanayak, 2005), likely induces a feeling of worry, annoyance and anger among the water users as seen in the cases of Bolivia and India (Wutich, 2009; Truelove, 2011), which affects the mental health of the water user.

2.2.2. Risks related to water quality

"Access to safe drinking water is essential to health, a basic human right and a component of effective policy for health protection" (WHO, 2017. Pg. xv). The safety of water is expressed in the form of water quality, which is used as an index to determine its acceptability for the intended purpose, such as for drinking or farming (Johnson et al,. 1997; Diersing, 2009). The acceptable quality of water is different for different uses, water for industrial purpose will have different physical, chemical and biological characteristics as compared to that of drinking water and cannot be used for drinking. As such, the quality of water directly impacts the quantity of water available for the intended purpose (Palaniappan, 2010).

The quality of water is determined in terms of its physical, chemical and microbiological characteristics. With respect to the physical characteristics of water, it is the aesthetic quality of water (smell, taste and odour) which is the key criteria for the water users to determine whether the water is of good quality or not. As stated by WHO (2011. Pg. 219), drinking water should be *"safe and also acceptable in terms of odour, taste and appearance"*. Having 'unacceptable' aesthetic quality, would not only lead the water users to register complaints and undermine their trust in the utility but also force the water users to depend on alternative unprotected sources. With respect to the chemical characteristics, the main water quality problem globally is eutrophication as a result of high nutrient (mainly phosphorus and nitrogen) loads, which considerably impairs the beneficial uses of water. Agricultural runoff, domestic sewage and industrial effluents are one of the major sources of water contamination (UN, 2014). This contamination has relatively greater negative impacts on the lakes and reservoirs as compared to the rivers due to their longer residence period and lack of self-cleansing mechanism, as they do not flow. At a catchment level, industrial effluents as a contaminant is relatively easy to locate as compared to the other non-point discharges such as agricultural runoff and domestic sewage (USEPA, 2005).

Out of the three mentioned characteristics the microbiological characteristics is of more importance to the users, water suppliers and public health authorities, as it is the microbial pathogens present in water which is the main reason for water-borne diseases. The potential of drinking water to transmit water borne diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid etc. is well documented. Contaminated water comprises a major element of risk to human health (Huttly, 1990; MacKenzie et al., 1994; Hunter and Syed, 2001). Specifically with respect to the faecal coliforms water quality parameter the WHO guidelines for drinking water quality states that the faecal coliforms should be absent in the drinking water.

With respect to the domestic sewage, specifically in small towns where centralized sewer systems often do not exist, the most dominant sanitation facility are the on-site sanitation systems such as pit latrines and septic tanks (WSP, 2014). With such infrastructure, managing the sanitation value chain (construction of pits and septic tanks to collection and safe disposal of faecal sludge) is relatively more complex than that of a centralised sewer systems network (Furlong et al,. 2016). Thus leading to a much more vulnerable environment for the contamination of water quality. Faecal contamination of water is not only associated to water from alternative untreated sources, but often even the treated water from protected sources or piped water can be contaminated. This is often either due to leakage in the piped network or because of household storage practices. As mentioned in Section 2.2.1, risks related to water quantity is mainly associated with unavailability or unreliable supply of water, which forces

water users to contain water either in jerry cans, drums or plastic containers (Brick et al., 2004). Often the duration of water stored in such containers is adequate for the faecal contamination of water (Jensen et al., 2002). In such cases, faecal contamination is mainly due to poor hygienic water drawing practices (Brick et al., 2004). Also, apart from this stored water are often breeding sites for mosquitoes leading into dengue and malaria outbreaks (Garcia-Betancourt et al., 2015).

With respect to the agricultural sector, the main source of pollution comes from the runoffs comprising of chemical fertilizers and pesticides which are rich in phosphorus and nitrogen. Apart from the fertilizers, there is crop residue which adds on to the nutrient load in the water, deteriorating the water quality. Specifically with the non-point sources, characteristics such as dispersion and indistinctness makes it problematic to monitor (Guo et al., 2014; Villamizar & Brown, 2016).

Apart from the aforementioned reasons, there is also the lack of proper monitoring and evaluation of water supplied and the water bodies which increases the water user's vulnerability towards a risk triggered by poor water quality. In this context, water quality monitoring is defined as *"the programmed process of sampling, measurement and subsequent recording or signalling, or both, of various water characteristics, often with the aim of assessing conformity to specified objectives"* (International Organization for Standardization (ISO) as cited in Bartram & Ballance, 1996).

2.2.3. Risk management

Risk management approach has been widely promoted by the World Health Organisation (WHO) and the International Water Association (IWA) whose main agenda is to apply 'water safety plans (WSPs)' for providing safe drinking water (Omar et al., 2017). These plans are applicable throughout the networking system from collection of raw water, treatment of it and distribution to the users. The sole purpose of these plans are to *"identify the hazards, assess the risks and develop and implement improvement/risk mitigation measures"* (WHO/IWA, 2009. Pg. 1). These plans focuses on both the quality and quantity aspects of water.

These plans not only focus on risk mitigation practices, but aims to increase the capacity building of utility managers and operational staff by providing them trainings (Hrudey et al., 2006; Summerill et al., 2010). In highlighting the implementation of WSPs, Byleveld et al., (2008) and Jalba et al., (2014), mentioned the importance of having meaningful relations between the water users and the utility, which are implemented by the environmental health departments at the national level (Omar et al., 2017).

Apart from the WSPs, there are also guidelines for drinking water quality and water quantity promoted by the World Health Organisation. With respect to the water quality and quantity, below mentioned are some of the recommendations[7], which if followed would reduce the vulnerability towards risks related to water:

[7] These recommendations are very general at the global scale, which may be modified according to the specific country context.

- A minimum of 15 litres of water per day is required for the daily survival of a person including hygienic practices and cooking needs and within a distance of 500 meters from their households (WHO, 2013).
- Following hygienic practices such as washing of hand after defecation or before eating (EC, 2005)
- Properly designed and constructed on-site sanitation systems should be in place as per the national standards of design (WHO, 1992). The on-site sanitation system should be at a safe distance from any drinking water source to avoid the risk of microbial contamination[8]. However, this criteria varies from country to country. With some countries having a minimum distance of 15 meters (Bangladesh) between the sanitation system and the water source, while some have a minimum of 50-80 meters of distance between the water source and sanitation facility, as in the case of Uganda (DFID, 2009; Ugandan Ministry of Water and Environment, 2013). Also beyond the on-site sanitation infrastructure, the faecal sludge and drainage/spillage from sanitation systems should be properly managed and treated to ensure it does not affect the surface water or ground water system (EC, 2005).
- Having a proper monitoring and evaluation system in place, the World Health Organization recommends two types of monitoring for the water supply systems, namely operational and surveillance monitoring. Operational monitoring is generally carried out to check whether the measures implemented in the operations of the water supply distribution network is performing efficiently or not (WHO, 2017). This kind of monitoring is carried out throughout the system, starting from the raw intake point to the endpoints at the water user's level. Whereas the surveillance monitoring is aimed at continuous and vigilant assessment of public health and reviewing the safety and acceptability of supplied drinking water (WHO, 2017).

2.2.4. Political ecology of risks

"Decision-making power is central to the distribution of differential vulnerabilities, and is negotiated between institutions which differ in their scales of influence, access to information and resources, and legal and cultural rights and responsibilities." (Pelling, 1999. Pg. 250). Highlighting this Pelling states that understanding of risks are influenced by the cultural norms, the historical and political context. With respect to the identification of risks and the risk management strategies adopted, the question lies is how these guidelines are decided and are they effectively implemented on the ground or are they even practically feasible solutions?

Looking at the implementation of such policies, various empirically based research has shown that often such policies do not succeed in fulfilling the objectives mainly due to *"interpretation, negotiation and rearrangement by socially positioned actors at different spatial levels"* (see also Kemerink, 2015, pg.: 17; Hueso and Bell, 2013). The actions of different actors involved depends on their motivation and interests (Bressers, 2004), which is defined by their societal

[8] WHO factsheet. Accessed from http://www.who.int/water_sanitation_health/hygiene/emergencies/fs3_9.pdf on 24.09.2017

norms, relationships and circumstances. The risk management guidelines as mentioned above are implemented only if the objectives of these guidelines align with the individual actor's motivation and interests (see also Bressers, 2004; Phi et al., 2015). Moreover, there is the factor of knowledge transfer at different spatial levels. Often the ones who are working at ground level on infrastructure are not aware of such policies or practices that needs to be adopted or the 'discretion' of such actors play an important role in successful implementation of such risk mitigation measures (Bressers, 2004). For instance, a mason who is building the sanitation infrastructure might not be aware of the design guidelines to be followed or they would have their own set of practical measurements to avoid 'risks'. Talking about the practicality of such measures, specifically in small towns which lack financial and physical resources, providing basic services itself is a challenging task (Pilgrim et al, 2007) let alone having a proper monitoring and evaluation system. Also in small towns, specifically in the unplanned settlements, space is one of the biggest constraints in lack of proper service provisioning. Often the services provided by the municipality or the utility, be it provisioning of individual or public water connection or maintaining a safe distance between the sanitation infrastructure and the drinking water source could not be achieved due to lack of space (Chipeta et al., 2017).

CHAPTER 3

Methodology

In this chapter firstly I explain the philosophy adopted for this research and my epistemological viewpoint, followed by the research approach where I explain the qualitative research approach and the extended case study method. After that I summarize the data collection techniques in detail and explain how I analyzed the data in order to answer the research questions.

3.1. Epistemological considerations

Delving on the definitions of risk and risk management strategies as mentioned in section 2.2, prescriptions of what risks are supposed to be are often disconnected from lived experiences of risks. Considering this, I looked at risks, not from the positivist point of view, but rather from the interpretive viewpoint. Unlike positivist social studies, which looks at risks from relying upon known 'facts', I tried to understand risks by focusing on the empirical practices of how water users are exposed to and deal with in their daily lives. Referring to practice in this study, I looked at meaningful, regulated bodily movements, *"which are materially anchored in the bodies of water users, and artefacts and dependent on implicit knowledge"* (Bueger, 2014, pg.: 384). With respect to the knowledge produced, I believe that knowledge produced on empirical basis has to be understood as a product of situated contextual settings (Zwarteveen & Boelens, 2014). This gives seed to the question of 'what is considered as an accepted form of evidence?' Answering this question, I believe that *"evidence should also include empirical qualitative data, and local and indigenous knowledge"* (Adams and Sandbrook, 2013).

Adding to the critique on risk management options as mentioned in Section 2.2.3, I believe there is a need to contradict the standardizing conjectures about the existence of a homogeneous society, to which solutions can be consistently recommended. Some solution which might fit a particular area might not be adapted or feasible in another town or for another actor. Rather, I see 'society' as complex and heterogeneous in nature (Zwarteveen & Boelens, 2014). Considering this, in this study I would be analysing risks on the basis of the water user's perspectives and experiences, and not on the basis of globally followed norms and study how such risks are distributed in the uneven waterscape.

Scientific objectivity in research is often presented as claims, methods and results that are not, and should not be influenced by individual perspectives, values or personal interests (Reiss and Sprenger, 2017). However, my point of view is that science is always about interpretive understandings, which are often influenced by the background, worldview and life experiences of the researcher. Therefore, for me scientific objectivity should refer to methods and procedures followed, which is reproducible (Smaling, 1989). It is thus an obligation for the

researcher to make research choices explicit in terms of approach taken and the methodology followed which would give other researchers to critique and complement the research. Having this notion of epistemological understanding, the following Table 1 showcases how the concepts of objectivity is achieved in this research along with the corresponding research techniques adapted (Smaling, 1989; Babbie and Mouton, 1998).

Table 1: Epistemological Consideration

Objectivity in qualitative study	Research technique
Credibility: Credibility relates to whether the data collected and the findings presented in the study seem to be believable and trustworthy	Prolonged (3 months) engagement by residing in the place of research, proper sourcing mechanism while writing the research, clear distinction between the data collected from the interviewee and that of researcher, detailed interview narrative and observations, peer reviewed and triangulation of data between the interviews, secondary sources and other fellow researchers
Confirmability: The degree to which the research findings are directly linked to the data collected	Interview narratives with researcher remarks on the observation, field notes, recordings, data management and analysis
Transferability: This refers to the extent to which the findings from this research can be applied to other contexts or with other interviewees	Descriptive research methods, comprehensive and detailed case study with highlighted insights and conceptual data analysis.

3.2. Research approach

I have used the qualitative research approach for this study. In particular, I employed the extended case study approach, which is generally defined as an *"empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used"* (Yin, 1984, pg. 23). Specifically, I have used the instrumental case study approach, as I wanted to understand the broader issue of how the contested and dynamic environment of small towns affects the water service provisioning. The extended case study approach allowed me to have active engagement and dialogue with my research object, which in this case are the water users. Using the extended case study approach gave this research the scope to carry out an intensive investigation of what was happening specifically in the certain areas of the small town, by examining multiple actors, which in this case are mostly water users and town officials (Cooper, 990; Handel, 1991; Runyan, 1982; Yin, 1994). Under the broader purview of extended case study approach, this research is inclined more towards the 'study of event, roles and relationships', where focus was on the production of water related risks in 'real life' context (Babbie and Mouton, 1998). The approach was selected because of the research question designed to answer 'how' are water related risks produced and distributed in the context of a small town (Hancock & Algozzine, 2006; Yin, 2014). Also other studies related to

how water flows in a town (Anand, 2011) and how related risks are produced (Nastiti et al., 2017) in small towns (Bah et al., 2003) are based on case study approach, making it a relevant approach for my study. This study is based on the concept of political ecology, which emphasizes on the complexity and interrelation between society and nature over a spatial and temporal scale (Crowe et al., 2011). This is aligned with the spatial and temporal extension theme of extended case study. Social nature of human beings develop over a period of time and considering the studying of social characteristics of water users, developing their agency, in this study gives this research the temporal characteristic. With respect to spatial extension, I compare and contrast the findings from the two spatially different areas of the town to see how risks related to water are produced and distributed differently. Also, I compare the risks as perceived by the water users to that of the national and international standards.

However, the question lies in whether the learnings from this case study could be generalised for defining small town characteristics? The answer lies in the approach itself, since it is based upon theories already formulated on small towns. Extended case study compares *"...similar phenomena with a view to explaining differences"* rather than comparing *"...unlike phenomena with a view to discovering similarities"* (Burawoy, 1991, pg.: 280). The empirical findings from this research study either add on to the existing notions regarding small towns or contradict the general pattern and assumptions. Moreover, this research aims to analyse the reasons for those differences.

For this research I choose the small town of Bushenyi-Ishaka, Uganda as a case study. Located at a close proximity to the urban centre of Mbarara, Bushenyi-Ishaka was selected because it is representative of areas with mixed rural and urban characteristics. The town gives a representation of small towns which have areas served by the Ugandan National Water Sewerage Corporation and areas that are not served by them. Also the town is fairly famous for its banana plantations, thus giving the research scope to cover water users who use water both for their domestic activities as well as for agriculture. From a practical point of view, another important reason for selecting Bushenyi-Ishaka is the ease of accessing data, due to the presence of local research partners in the town who conducted preliminary studies on the social profile of residents. Also along with this study, there are parallel MSc research studies[9] conducted in the same town on technical aspects of water distribution and sanitation, which help in the broader goal of defining small town characteristics. One of the national languages of Uganda is English, which also facilitated communication between myself and the local respondents. However, wherever needed a translator was engaged, especially in the peripheral areas of the town where the common language is Nyankole.

[9] 1. Omuut, J. 2018. Analysis of Infrastructure development dynamics in water supply services for small towns. Case study: National Water and Sewerage Corporation (NWSC) Bushenyi and Kitgum operational Areas. MSc Thesis. UNESCO-IHE
2. Nyakutsikwa, B. F. 2018. Analysis of small town sanitation: An evaluation of the enabling environment in Bushenyi Ishaka and a comparison with Kampala. MSc Thesis. UNESCO-IHE
3. Nakanjako, J. 2018. Water safety plans in Uganda. Enabling factors and barriers to scaling up in the Northern and Western regions. MSc Thesis. UNESCO-IHE

3.3. Data management

The data collected was stored using Microsoft Word and Microsoft Excel. The following guidelines have been followed for data management:

i. Interview narratives after every interview was saved in Microsoft Word with specific codes given to each respondent (water users: WU01 and so on) and the locality. For instance the file name for a water user interviewed in Katungu area was saved as WU01-Katungu-20.12.2017. The file consisted of contact details of the interviewee, description of surrounding, GPS location, the interviewee's position in case of utility officials, and discussion topics and my remarks (thoughts, feeling, and observation). Similarly the data from interviewing the town officials like engineers, mayor and NWSC staff members was saved as User Code (E01)-Position Name-Date. Also, relevant quotes and important statement were highlighted in bold in the narratives.

ii. Photographs were stored in specific folders with file names corresponding to the specific area where the photo was taken.

3.4. Data collection and analysis

In this research, the following steps have been followed for collecting and analysing the data with respect to the research questions:

Sub-question 1: Which areas of the small-town are more vulnerable towards water related risks and why?

This question is intended towards identifying the specific focused areas in Bushenyi-Ishaka, which was selected for carrying out a detailed in depth study for the following sub-questions. Though the idea of this sub-question is to narrow down onto a more vulnerable and less vulnerable area towards water related risks, I could have selected any two areas in the small town owing to the different socio-natural conditions in different areas. That being said, the different social and natural setting only became more evident to me when I was carrying out an in-depth study in both the selected areas. Thus initially a selection criteria was developed in order to help select the two areas. This criteria was explorative in nature, so as to help me get a better understanding of the water flows through the town as a whole. The selection criteria was developed into two phases, first comprising of the primary selection criteria and then the secondary selection criteria.

Bushenyi-Ishaka consists of three divisions (Central, Ishaka and Nyakabirizi) and each division is divided into 15 wards and each ward is divided into cells. Thus a cell is the lowest form of administrative boundary in the town, usually spread over an area of 1-2 km^2 and consists of 100-200 households. Thus the selection criteria was used to identify two cells, ideally one most vulnerable cell and one less vulnerable cell towards water related risks. The primary selection criteria consisted of three factors: source of water supply, classification of area (urban or rural) and frequency of water borne disease. While the secondary criteria depended on socio-political factors and practical feasibility.

The primary criteria helped in assessing the areas and narrow down to the ten most potentially vulnerable areas and less vulnerable areas. Firstly, with respect to the source of water supply, the idea is to highlight the areas where people do not have the added social, economic and health benefits as a result of not having NWSC water coverage. Here it is assumed that people connected to NWSC, have a more reliable supply of water throughout the day during the different seasons. Whereas, people depending on alternative sources of water such as springs, water from wetland do not have reliable supply of water, both in terms of quantity of supply as well as quality of water. This data was collected from the NWSC water supply map and in discussion with the NWSC engineer and the Commercial Officer. Secondly, the areas were classified based on their urban and rural characteristics. Even though a municipality is considered an urban area, during the formation of Bushenyi-Ishaka Municipality in 2010 many nearby villages were added to the jurisdiction, which have relatively rural characteristics than the central parts of the town. An urban area in Bushenyi-Ishaka are usually relatively high income areas, with commerce and trade activities and easy access to the daily basic services such as water supply and electricity. On the other hand a rural area is usually far from the central part of town, lacks basic services such as road connectivity, water and electricity and settlers mainly depend on farming as a source of living. This criteria helps in identifying such areas which are deprived of the basic services and are potentially more vulnerable towards water related risks, as settlers in the rural areas have to depend on alternative sources of water. Also accessing such alternative sources would be relatively difficult, due to the poor road connectivity. The town areas were classified as urban and rural based on discussions with the Senior Town Planner and the Community Development Officer of Bushenyi-Ishaka Municipality. Thirdly, water related risks mostly is expressed in terms of physical health aspects and thus I looked into the frequency of diseases from each area. Water related diseases are either due to contamination of drinking water, access to unsafe water or due to inadequate sanitation services (WHO, 2017[10]). The most prevalent water related diseases in Uganda are generally malaria, dysentery, diarrhoea, cholera and typhoid (Muyodi et al., 2005). Out of these prevalent diseases, Malaria is the leading cause of mortality in Uganda, accounting to almost 27% of Ugandan lives (Ministry of Health, 2016[11]). However, the frequency of malaria cases in a specific area does not allow to zoom into that particular area, as the disease might be caused by mosquitoes staying in a neighbouring area. For this criteria archival records were assessed from the Bushenyi-Ishaka Municipal Health Centre and the records indicates that there has been no case of cholera in the past five years in the town and the town health centre does not have reagents to treat typhoid and thus typhoid patients are send over to the private hospitals in the town. Thus for this criteria I have looked onto the frequency of diarrhoea from each area.

For each criteria weightage marks were assigned to each area. Areas having access to pipe water supply were assigned +10 and areas not having access to pipe water supply were assigned -10. Similarly urban areas were marked +10 and rural areas were marked -10. With respect to the frequency of diseases, the actual number of cases were converted into average weighted value[12]. Finally the total marks was calculated from each area and the cells were ranked depending on the total marks. The top ten positive areas were the least vulnerable areas and the top ten

[10] WHO. Accessed from http://www.who.int/water_sanitation_health/diseases-risks/en/ on 20.11.2017

[11] Ministry of Health. Republic of Uganda. Malaria Bulletin 2016. Accessed from http://health.go.ug/content/malaria-bulletin-2016 on 20.11.2017

[12] average weighted value = [frequency of diarrhoea from that cell/total number of cases registered] * 10

negative areas were the most vulnerable areas. The detailed scoring of each area has been shown in Appendix A.

Figure 2: Discussion with the Senior Town Planner, Bushenyi-Ishaka Municipality; Archival records – Bushenyi-Ishaka Municipal Health Centre

After the areas were assessed against the primary criteria, the top ten most vulnerable and less vulnerable cells were assessed against the secondary criteria. Firstly the areas were assessed with respect to the political representation of the area. Each area in Bushenyi-Ishaka is represented in the Municipality by a local chairperson. The local chairperson of an area is responsible for mobilizing local population towards solving any issues in the community. The leadership of each area was assessed against their proactive nature in solving issues. This was done based on discussions with the NWSC staff members who are responsible for carrying out mobilization workshops in communities and is the key link between the community and NWSC. The reason behind this criteria is related to the fact that the role of a local chairperson is a voluntary job and the chairperson election in Uganda, which are supposed to happen once every five years, has not been conducted over the past fifteen years, either due to financial constraints or some other political reasons[13] (News Vision, 2017; All Africa, 2017). As stated by the NWSC staff members, this often is the reason why the local chairpersons are not active and motivated enough in solving issues in their areas.

After assessing the areas with respect to the political representation, the top three areas were selected from the most vulnerable and the least vulnerable areas. Lastly reconnaissance visits were carried out in all the six selected areas in order to have a better understanding of how people access water and thus get a first-hand impression of the areas, and also to see how the settlers of the areas perceived me as an outsider and the research topic (see Appendix A for brief description of the areas visited). In this visit apart from conducting preliminary discussions with the water users on daily water usage practices special focus was given to the water sources available in the area and also the practical feasibility in terms of road connectivity to the areas as some areas in the town were completely inaccessible during rainy season. Finally, based on the selection criteria one most vulnerable area, Masya located in the peripheral parts of the town

[13] As stated in the news reports, the local chairperson elections in 2006 was cancelled due to the opposition by Rubaramira Ruranga (retired army official and a politician), according to whom the local councils were not legal after the country shifted from one party movement system to multi-party movement system (Daily Monitor, 2017).

and one less vulnerable area, Katungu located in the central part of the town was selected which were studied in-depth to answer the second research sub-question (see Figure 4).

Figure 3: Preliminary discussions during reconnaissance visits; Road connectivity in certain parts of the town

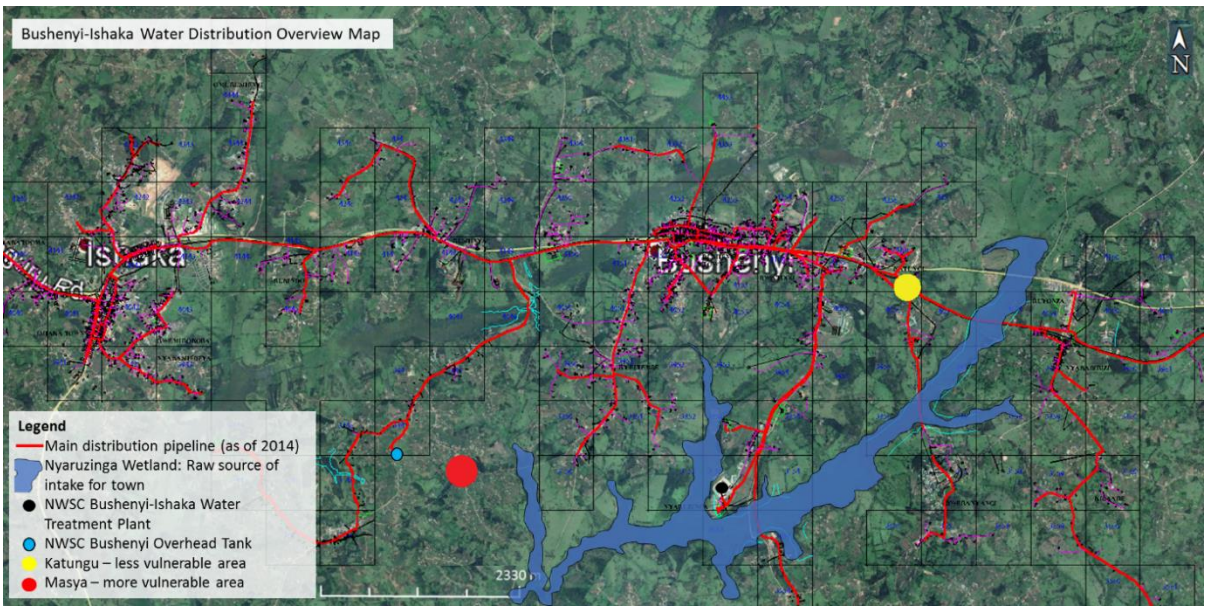

Figure 4: Bushenyi-Ishaka water distribution overview map highlighting the most vulnerable and less vulnerable area (Image Source: Water distribution – NWSC, Bushenyi-Ishaka; Overlay image source: Google Earth Pro)

Sub-question 2: Which kinds of risk do water users perceive and why? What are the risk mitigation measures available to them and how do these measures affect their water use practices?

Following methods was adopted to document what are risks, how are they produced and what are the risk mitigation measures in practice from the water user's perspective in the selected areas.

i. **In-depth individual interviews:** In-depth interviews were conducted with the water users to understand their daily water use practices both in the most vulnerable and relatively less vulnerable areas of the town, to have a spatial representativeness as well as representativeness of risk perceptions. The aim was to compare and contrast the risks from a dual perspective of vulnerable and less vulnerable areas. Initial focus was given to the most vulnerable area and later on the less vulnerable area.

   The water users were selected as such to have a mix of the different social categories such as female led households, old water users, subsistence farmers, farmers producing for the market, different income levels of water users (see Box 1) and geographical distance from the source of water. For the water user interviews, in order to have an in-depth understanding of their daily practices and to analyse the interview the same day, I targeted to conduct two in-depth interviews per day, up to a total of twenty to twenty-five water users per area. I conducted twenty five interviews in Masya, the most vulnerable area and twenty six interviews in Katungu, the less vulnerable area, as by then the data received from the interviews started showed similarity in answers.

   Box 1: Classification of households in Bushenyi-Ishaka

   For this research, following classification of households was followed to determine the economic status of a water user (classification of households based on construction material has been adapted following UBOS, 2017):

   - High income households: These households have roof tiles, brick walls and usually have more than two rooms. The households have piped water supply connection and have overhead tanks to supply water in the house. The toilet is usually connected to septic tanks. Also these households usually have a four wheel vehicle.
   - Medium income households: These households have iron sheet roof with brick wall. They are usually connected to piped water supply and usually stores water in tanks of 100-150 litres capacity. Toilets in these households are connected to pit latrine system.
   - Low income households: These households have thatched roof with earth walls and usually has only one to two rooms. Usually they depend on alternative sources of water and store it in jerry cans. The toilet is connected to a pit latrine.

   In these interviews, apart from the content of the conversation, more focus was given to the reason or the process by which the production of risks has come into being. In order

to have a better understanding of the production process, occasional 'why' questions were asked (Babbie and Mouton, 1998). This kind of interviewing technique was quite delicate and complex and keeping this in mind, such interviews were conducted within the cultural and ethical norms and depending on the context of the interview (surrounding, mood of the interviewee, schedule of the interviewee). For instance while interviewing water users I had to be very careful asking about any family disputes due to shared water use. Simultaneously, I was also taking field notes to record the discussions from the interviews.

Considering the fact that agriculture is the dominant economic activity in Bushenyi-Ishaka, focus was given on topics such as sources of water for different activities such as drinking, cooking, hygiene practices and farming and also the reason behind using that particular source, the water infrastructure in place, process for availing water supply, availability of water supply, duration of supply, tariff structure for water, water storage and treatment practices, happiness factor in terms of water services, etc. These interviews were semi-structured, but with guiding questions and list of data to be collected (refer to Appendix B for the list of guiding questions).

ii. **Observation:** Along with the interviews, I was observing the daily practices which the water users carry out regularly with respect to water. This included observations starting from accessing water from the source to using water for drinking, cooking, farming etc. The observations helped me triangulate the answers from the interviews and validate them. This also helped me have a better understanding of the conscious as well as the sub-consciously adapted risk mitigation practices by the water users. The observation also entailed observing the surroundings, from the place of collecting water to the house condition, farming practices and condition of other relevant infrastructure such as the water taps, storage facilities etc. Apart from the key focus activity of accessing water and using water, I would also be observing the attire of the interviewee, details as stated in Box 1, body language, surroundings and the duration of the interview (Kelleher, 1993). Observations were accompanied by photographs. Additionally I was taking observation notes, as cameras could not capture all the aspects of social ongoing processes (Babbie and Mouton, 1998).

iii. **Secondary sources:** Archival records on complaints related to water quantity and quality as registered by the water users of Bushenyi-Ishaka with NWSC was reviewed and analysed. Apart from this other laws, policies and guidelines from relevant ministries were reviewed. From the triangulation approach this increased the credibility of the research and added on to the water user's perspective of risks. Also data from these policies were used to analyse the production and distribution of risks in Bushenyi-Ishaka.

iv. **Data Analysis:** Thematic analysis was used to analyse the data collected in this research study. The main concept behind this kind of analysis was to identify, analyse, and report patterns or themes within the collected data (Braun and Victoria, 2006). In such kind of analysis, a theme is usually referred to as levels of patterned responses from the data collected and interpreted. The themes are linked to the research questions. The reason for selecting this method for analysis is that unlike other methods, this does not look at

only phrases and keywords (Babbie and Mouton, 1998). Rather thematic analysis goes beyond key words and phrases, as much of the data collected in qualitative interviews are often quiet long, resulting in long interview narratives. Thematic analysis, emphasizing on the perceptions of water users, their daily practices and feelings helped to capture both the implicit and explicit intricate meanings within the collected data to answer how the risks are produced and distributed.

The analysis of data collected from the water users was done in three parts. Firstly, I analysed the data with respect to the conceptual frameworks used. Specifically, I looked at how agency of the water users and bricolage was embedded in their daily water use practices, how it shaped their water usage and how are these concepts linked in determining their vulnerability towards water risks. The idea was to understand risk production from a political ecology perspective to better understand how the risks are produced and distributed. Secondly, I examined the data extracted from the interview narratives and observations made to identify the existence of any pattern among the water users regarding their experience with and perceptions on water risks and the risk mitigation factors. I specifically looked at contradicting daily water use practices. I then tried to explain the reason behind the existence of such practices, contradictions and compare and contrast the water related risks in the town. Thirdly, I compared and assessed the risks with the set national policies and standards and analysed whether there is any difference or similarity in the risks identified by the water users and the authorities, and if so, try to explain why there is a difference from the water user's perspective.

Sub-question 3: How does small town characteristics affect the risk distribution pattern?

This question tries to look at the case study from a broader perspective, which aims to understand the particularities in distribution of risks in a small town and reflect more generally on the characteristics of a small town. For this I list out the findings related to natural resource management and particularities of Bushenyi-Ishaka as a small town. Once the findings were identified, I tried to relate these characteristics to understand how the flows of water are connected in the town and finally I try to relate these characteristics to justify the production and distribution of risks in the town.

CHAPTER 4

Small-town: Bushenyi-Ishaka Municipality

In this section I first give a narrative on how the municipality has developed over the years, specifically focusing on the water and sanitation scenario. Followed by this I explain the primary sources of water available in the town to provide a common understanding of the types of water source which were observed later in the areas vulnerable towards water quality and quantity risks. Finally, I explain the key policies with respect to management of water services in Bushenyi-Ishaka Municipality.

4.1. A Town Council to Municipality

Before conversion into a Municipality, Bushenyi and Ishaka were two separate small towns with very less population, not enough to meet the criteria for forming individual municipalities. The towns were then called Bushenyi Town Council and Ishaka Town Council and *"before that it was a town board and a township before that"*- Mayor, Bushenyi-Ishaka Municipality. The Government of Uganda then decided to merge both the towns and create a municipality. The municipality was then created in 2010. Before the municipality was formed there were sub-counties as the administrative local head and there were villages as a part of a parish. Many parishes came together to form a sub-county.

Explaining the transition from a town council to a municipality Alfred, a local chairperson states that when the process was initiated to form a municipality there were stakeholder meetings organized by the parish chairpersons at village levels in order to inform the villagers on the benefits of being a part of the municipality. Few of the basic advantages of joining a municipality as promised/explained to the villagers was that they would be provided with all basic services from the municipality such as water, electricity, health centres and better sanitation facilities. However there were certain disadvantages as well. These disadvantages ranged from if it became a municipality the construction of a house became more tedious to abiding business laws. The person building the house should get his/her plan approved from the municipality abiding by the road reserve rules and other bylaws such as inclusion of a septic tank, etc., whereas if it was a sub-county the person *"could just wake up one day and start building his own house"* – in discussion with Mr. Alfred, chairperson for Ruharo Ward. Apart from this there is also the disadvantage with respect to having a business. In a sub-county if someone wants to do a business, irrespective of the kind of business, the person just needs to pay 5,000 UGX per month to the village trading centre. Whereas in case of a municipality, the person needs to get a license for his trade from the municipality and needs to pay a single time fee for the license and renew it every year. The license fees depends on the type of business the person wants to do.

Later after discussing all of these pros and cons of being a part of the municipality, it was up to the decision of the villagers and the local chairperson of the village to give their consent towards being a part of the municipality. Once they approved towards being a part of the municipality, a letter was signed by the local chairperson and the testimonies of a few villagers were noted and the application was submitted to the municipality. However if a parish did not agree to being a part of the municipality, that village was not taken under the jurisdiction of the municipality. This is how the boundaries of Bushenyi-Ishaka Municipality was demarcated (see Figure 5). However on the contrary, even now after eight years of the formation of the municipality, there are certain areas under the municipality which are deprived of the daily basic needs services such as water supply, electricity and sanitation as promised to them.

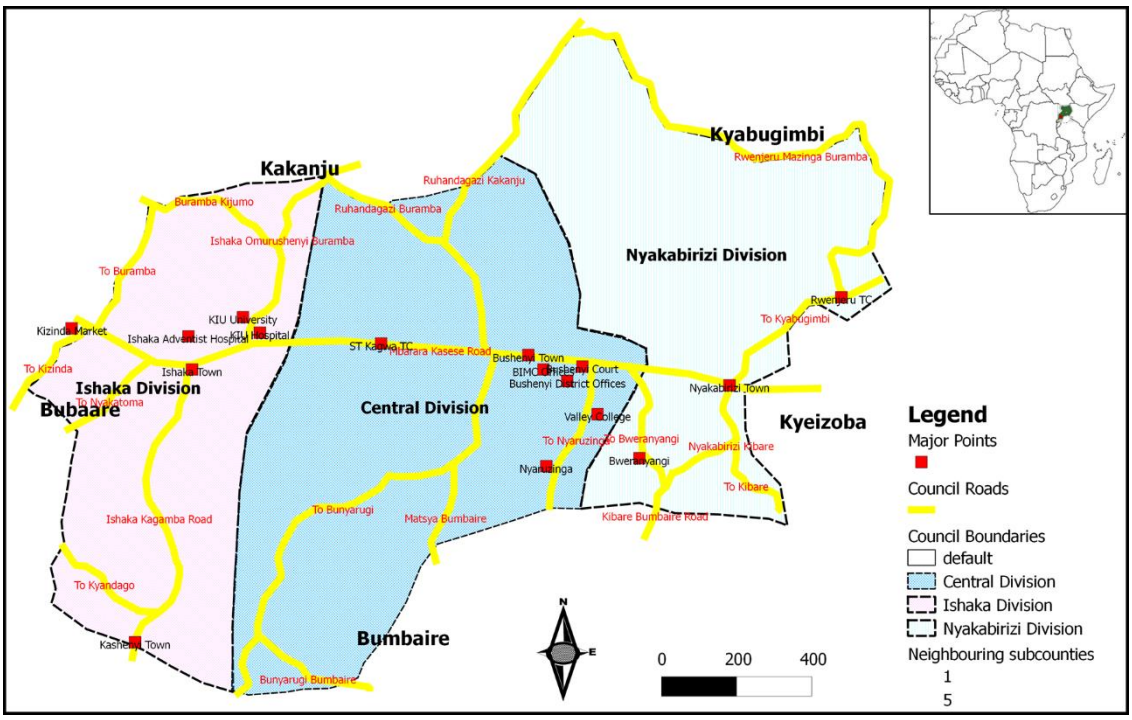

Figure 5: Bushenyi-Ishaka Municipality (Source: Municipal Development Plan 2015-2020)

As stated by the Mayor of Bushenyi-Ishaka, *"the transformation from a Town Council to a Municipality is the proof of the growing population in the town. When it was a town council, back in the 1990s - 2000s, there was hardly ten buildings in Ishaka and two buildings in Bushenyi. Most of the households then had thatched roof. Now these thatched roof households have been converted to households having iron sheets roofs, which is a sign of development"*. The Mayor has witnessed the change from a town council to a Municipality. In 2006 when the Mayor joined office in the town council, the town had a population of around 40,000 people. This has changed over time and currently the town population is of around 70,000 people. According to the Mayor this figure varies from that of the National Census which states that the Municipality has a population of 41,063 (UBOS Census Report, 2014). This is because the census data is usually collected during the vacation period when the institutions are mostly closed and the census only considers the population which has their permanent residence in the town. But in reality in Bushenyi-Ishaka a big population are the students in institutions such as Kampala International University (KIU, Western Campus) and Valley College and also during

day most of the population from the nearby villages, which are not a part of the Municipality limits travel to the town centre for work. The census does not take into consideration the floating population, which is the reason that the census population is less than the aforementioned figure, as stated by the Mayor of Bushenyi-Ishaka. This creates a problem for the Municipality in managing their resources. The Municipality reports directly to the central government and gets all financial resources from the central ministry for local government. The centre depends on the population data as per the Census while allocating financial resources. This results in the Municipality getting less financial resources. That being said the Municipality now gets a bigger amount of money relatively as compared to the amount when it was a town council.

Bushenyi is the administrative head due to the presence of all the local government offices and the district office, the National Water office and the Municipal health centres whereas Ishaka is the trading centre of the Municipality. Prior to conversion of a Municipality, Ishaka was a *"ghost town and no one used to stay there"* - Angela Kamasheza, Retired District Agricultural Officer (1975-2014). Up until the owner of Kampala International University (KIU) Western campus started the university in 2004, which brought in a lot of people and market. The first shops in Ishaka were owned by the teachers of the university. Talking about development in the town Karoro, a native of Bushenyi and a professor at the KIU states that *"the university has changed the outlook of Ishaka since its establishment"*. There are a lot of international students in Kampala International University from neighbouring countries, especially from Nigeria, Somalia and Congo. Even the teachers started putting up shops, which now has led to becoming a business centre. Even lots of Indian businessman came in and have started their shops in Ishaka. The introduction of the university also resulted in booming real estate sector. Another reason for Ishaka becoming the trading centre was its strategic location, being situated at the intersection of roads coming from three major big cities – Kasese, Kabale and Mbarara.

4.2. Changes in water and sanitation infrastructure

Bushenyi-Ishaka is 'blessed' in the sense of having natural springs and being surrounded by wetlands. People initially in Bushenyi-Ishaka used to drink water directly from the wetland and the springs. As stated by Alfred, who has been staying in Bushenyi-Ishaka for the past seventy years now states that *"during the 1930s, when Uganda was still under British colonization, the missionary schools from England, France, Italy and Canada came in to Kampala and then they sent out 'white fathers' to Masaka and Mbarara to preach about Christianity to people in other cities of Uganda. My father and grandfather were used to drinking water directly from the springs, without boiling it. During their time spring water was very clean. It was only until 1930s when the missionary schools came and the sisters (nuns) taught us about boiling water before drinking"* – Murekwa Alfred (local chairperson for Ruharo ward, 72 years old).

Explaining to me about the water supply development in the town, Angela Kamasheza, retired agricultural officer of Bushenyi-Ishaka district mentions that Bushenyi-Ishaka got its piped water supply only in the 1980s. During that time the connections were established directly by the Ministry of Water and Environment via the local governments. They started laying down the pipelines mainly in the central parts of the town. The main source of water during that period of time was the groundwater in forms of springs. These springs served as water source for piped connections and water was distributed via gravity. The government works on national budget and every year the local government office used to get request from the sub-county to place a

‘gravity system’ in their village. When the yearly budget was allocated, the district office decided to allocate water to the most crucial areas depending on the need and priority and the number of people served.

With respect to the available natural water sources, during my interviews with few of the locals of Bushenyi-Ishaka it was pointed out that there has been no degradation in the water quality. However few of the local leaders and the mayor of the municipality fear that eucalyptus tree is one of the major threats to depleting groundwater levels and disappearing springs. Explaining the growth of eucalyptus trees in the region, Appollo[14], local chairperson for Masya who has been staying in Bushenyi-Ishaka since 1943 states that *“the region has always been home to crops such as millets, banana, maize, coffee and eucalyptus. Prior to the British invasion and missionary schools, most people used to use the papyrus stems from the wetlands to construct the doors and windows. It was the missionary school nuns, who taught the locals how to use the timber from eucalyptus trees for construction and since the 1950s people started growing eucalyptus from a business perspective”*. Currently majority of land cover in Bushenyi-Ishaka is filled with either banana plantations or eucalyptus trees. Also, people are growing eucalyptus trees because of firewood as gas for cooking is expensive in Uganda. However, eucalyptus is a high water consuming tree species. In some cases the eucalyptus roots can grow up to 30 metres in depth (Jacobs, 1955) and extract water from 6 to 15 metres deep (Peck and Williamson, 1987). Case studies in Ethiopia have shown eucalyptus trees being the reason for disappearing springs (FAO, 2009).

Since 2002, the water supply and management system in Bushenyi-Ishaka is under the jurisdiction of the National Water and Sewerage Corporation and this management system will be further explained in the upcoming sections. With respect to the sanitation services in the Municipality, there is no open defecation practiced in Bushenyi-Ishaka. Majority of the households have pit latrines and only a very few people have flush toilets connected to septic tanks. Most of the pit latrines in the municipality are unlined[15] and goes up to a depth of 50 feet (see Figure 6). People started using flush toilets connected to septic tanks and soak pits only from the 1980s when the town got its piped water supply connection. Currently any new upcoming building plan needs to have the septic tank and soak pit in the blue print for the plan to be approved by the municipal engineer. The Municipality Community Development Officers also carry out capacity building workshops to create awareness amongst the people towards using flush toilets and septic tanks. Even though the municipal officials stated that currently they are using the desludging vehicle from NWSC, Mbarara to desludge their septic tanks and pits, in reality most of the pits

Figure 6: Pit latrine

[14] WU 11, Masya

[15] An unlined pit latrine is usually a pit attached to the toilet which does not have any lined material to contain the faecal matter, either made out of concrete, timber, stones or mortar separating the faecal matter from soil (Tilley et. al 2014).

and septic tanks are emptied manually. Talking about pit emptying Karoro[16], a resident of Katungu states that manual emptying is done *"firstly because the municipality does not have the vehicles and getting a vehicle from Mbarara is expensive costing around 200,000 UGX for desludging the septic tank, whereas the manual emptiers charge only 80,000-100,000 UGX for cleaning the septic tank. Also since the terrain of Bushenyi-Ishaka is hilly, most of the septic tanks are located in such areas where the vehicles could not reach"*. However the mayor of Bushenyi-Ishaka is optimistic that in the upcoming years Bushenyi-Ishaka is going to have its own lagoons for wastewater treatment and its own desludging vehicle for emptying the pits and the septic tanks.

4.3. Sources of water

Water users in Bushenyi-Ishaka mainly use water for two major purposes, primarily for the domestic activities and for agriculture. The water users of the municipality depend primarily on groundwater, piped water and the wetland. Apart from these sources, water users also depend on dug out wells, streams, ponds and lakes. However for this section I will be briefly explaining only the primary sources of water in the Municipality.

4.3.1. Wetland

Located in the Lake Edward basin, Bushenyi-Ishaka has wetland spread all across the municipal territory to such an extent that almost every household has access to wetland water. Water users use wetland water for various activities ranging from household activities like washing clothes, bathing to feeding their cattle to agriculture. However the wetland in Bushenyi-Ishaka and in Uganda in general are *"under a lot of pressure from conversion of land for industrial development, settlements, agriculture, sand and clay mining"* (Ministry of Water and Environment, Uganda). These impacts are also visible in Bushenyi-Ishaka, where the Nyaruzinga Wetland dried up entirely during the dry season extending from May to July of 2016. Talking to Angela, an environmentalist and former agricultural officer of Bushenyi Local Government (District Office) it was pointed out that in Bushenyi-Ishaka the primary reason for the degradation of wetlands is the increasing population growth leading to encroachment of wetland (see Figure 7). Angela also states that *"due to population increase and owing to the traditional form of land distribution from father to son, there is shortage of land to be allocated amongst the new generation leading to people encroaching the wetland to carry out their agricultural activities. The average family size in Bushenyi-Ishaka is 6-7 per family and every family does not have the capacity to distribute land amongst the children. Eventually if someone does not have enough land, he/she goes and plants in the wetlands even at night"*.

[16] WU 26, Katungu

Figure 7: Image highlighting encroachment of Nyaruzinga Wetland over the period 2008-2016

4.3.2. Piped water supply

The municipality gets its piped water service operated and maintained by National Water and Sewerage Corporation (NWSC). NWSC intakes water from the Nyaruzinga Wetlands and the water treatment plant is located in the south-eastern part of the municipality. Currently the water treatment plant has a capacity of 2,000 m^3 per day and supplies water via 2,601 domestic, 885 commercial, 131 institutional, 17 local authorities, 13 ministry and 73 public stand posts[17] connections (data as of July 2017 – NWSC Bushenyi-Ishaka). However as mentioned earlier the wetland dried up completely during the dry season of 2016 which led to NWSC signing a memorandum of understanding with PIBID[18] to supply water to NWSC during the dry seasons. PIBID which gets its water supply from a farther wetland (Katonya Wetland) supplies 1,000 m^3 of water to NWSC per day at 560 UGX per m^3. Currently NWSC is in the process of commissioning a new water treatment plant at Kitagata with a treatment capacity of 3,150 m^3 per day, which would be then sufficient for meeting the water demand of the municipality.

4.3.3. Groundwater

The water users of Bushenyi-Ishaka have predominantly been depending upon groundwater either in the form of protected springs or unprotected springs. Owing to the undulated topography of Bushenyi-Ishaka, springs are generally located in the valleys where the groundwater level is higher than the terrain surface level. When this phenomenon happens the accumulated water above the surface area is referred to as the 'eye' (Ministry of Water and Environment). These eye(s) serve as source of water for the surrounding water users. As these are open sources of water they are prone to pollution either from agricultural contamination, wastewater disposal, livestock contamination (cattle feeding from the same water source), etc.

[17] Public stand posts are provided for water users who do not have any direct connection to their premises.

[18] PIBID stands for Presidential initiative on Banana Industrial Development. PIBID is a government project to enable the rural farmers of western Uganda to have access to the local, regional and international market for their banana products. PIBID has its own banana plantations and a production factory in Bushenyi. Apart from producing banana products from its own plantations, PIBID also buys raw banana from the local farmers and train them on banana value addition.

and are hence termed as 'unprotected spring'[19]. Often these unprotected springs which have high yield (between 4-8 litres/minute) are converted into protected springs having a retaining wall, a covered water tank and gravels for primary filtration to supply potable water to the users as shown in Figure 8.

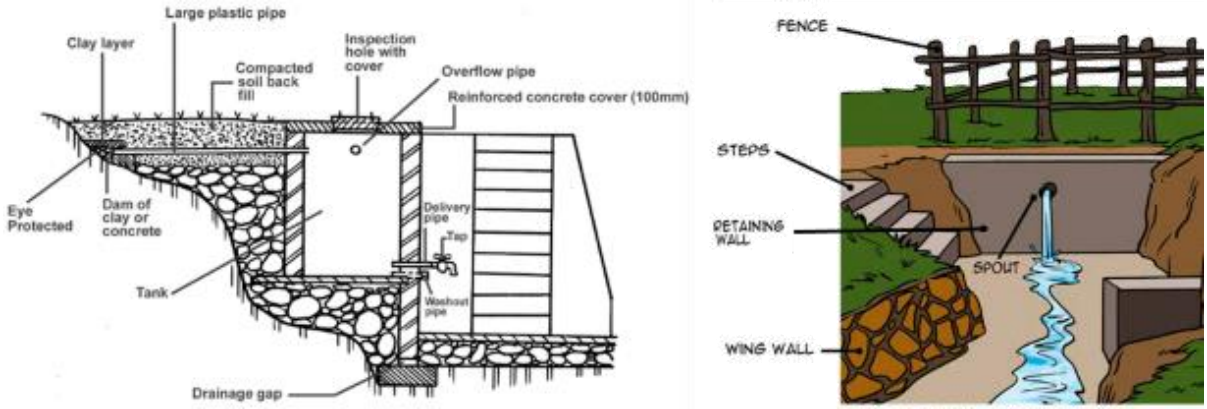

Figure 8: Protected Spring (adapted from Ministry of Water and Environment, Uganda)

4.4. Water sector policy and legal frameworks

"To promote and ensure the rational and sustainable utilization, development and effective management of water and environment resources for socio-economic development of the country" – Ministry of Water and Environment Uganda. With this as the mission statement, the Ministry of Water and Environment is responsible for effectively and sustainably managing the water and environmental resources of the country. The Ministry does so by its three wings, namely DWD (Directorate of Water Development), DWRM (Directorate of Water Resource Management) and DEA (Directorate of Environmental Affairs). Under the purview of the Ministry, the water sector is mainly managed using the following policy and legal framework.

4.4.1. The Water Act 1995

This is the principle water sector law and its related regulations provide the use, protection and management of water resources and supply; the constitution of water and sewerage authorities and; the dissolution of water and sewerage undertakings. This law gives the government absolute rights as the custodian of water through which other users can inherit rights of use, construction or operation and pollution through the issuance of time bound permits to abstract, discharge wastewater or construct hydraulic works.

The objectives of this water statute are:

- To promote the rational management and use of waters of Uganda;
- To promote the provision of a clean, safe and sufficient supply of water for domestic purposes to all persons;

[19] Also, in Bushenyi-Ishaka, often it is seen that springs are created by people in their own private property just by digging earth to a few feet.

- To allow for the orderly development and use of water resources for animals, irrigation, industrial, commercial and mining uses, energy, navigation, fisheries, preservation of flora and fauna and recreation in ways which minimize harmful effects to the environment; and
- To control pollution and to promote the safe storage treatment, discharge and disposal of waste which may pollute water or otherwise harm the environment and human health.

This Act makes the National Water Policy operative through the issuance of surface water and ground water abstraction, wastewater discharge permits which are permanent functions of the central government executed through the Directorate of Water Development (DWD), The Directorate of Water Resources Management (DWRM) and in consultation with the National Environment Management Authority (NEMA) and District Local Governments (DLGs).

4.4.2. The National Water and Sewerage Corporation Act 1995

Under the Water Act 1995 and the National Water and Sewerage Corporation Decree 1972, the corporation is deemed to be the sole authority of water and sewerage in any area it is supposed to provide its services. The NWSC is a public company and has performance contracts signed with the Government of Uganda represented by the Ministry of Water and Environment. As per the performance contract signed and the National Water and Sewerage Corporation Act, NWSC is responsible for managing all water resources of Bushenyi-Ishaka in ways which are most beneficial to the people. Apart from this under the NWSC Act, the corporation is also responsible for providing water supply for domestic, stock, horticultural, industrial, commercial, recreational, environmental and other beneficial use of the public. In the areas under jurisdiction of NWSC, it is supposed to provide for sewerage services as well. All these services should be provided efficiently and economically.

The NWSC Act enables the corporation to exercise its powers in accordance with the national action plan adopted under the Water Act. The Water Act, 1995 defines water resources as the *"water flowing or situated upon the surface of any land, water flowing or contained in any river stream, lake, pan, swamp, marsh or spring (whether or not it has been altered or artificially improved) or any other form of water which the Minister of Water and Natural Resources may from time to time declare to be water"*. In Bushenyi-Ishaka, people mostly depend on piped water supply, wetland and springs for its water resource. According to the NWSC Act all water resources should be managed by the corporation, however while talking to the manager[20] of NWSC, Bushenyi-Ishaka, he was of the opinion that the springs located in the valleys are managed by the communities and they fall under the purview of the local governments. Further he stated that *"it is the local governments who constructed the protected springs and it is them who are supposed to rehabilitate it whenever and wherever required. We as NWSC are not responsible for maintaining the springs"* – Branch Manager, NWSC.

According to the NWSC Bushenyi-Ishaka Manager, who has been associated with NWSC for over ten years, the corporation has two main objectives, primarily to provide piped water supply to the residents under its jurisdiction and secondarily to generate revenue in order to sustain the

[20] NWSC 4

corporation. In case of maintaining the springs located in communities, the manager[21] states that the *"water quality from the protected springs does not match the WHO guidelines standards, especially in the densely populated area, as most of them are contaminated by the toilets nearby"*. Also springs do not generate revenue for the corporation as they are public properties and are of free access to the people, until they are gazetted and undertaken by the corporation. In such cases the spring serves as a water source (just like the Nyaruzinga Wetland – piped water supply source for Bushenyi-Ishaka) for the piped water supply and then the spring is a NWSC property and fenced.

4.4.3. The Local Government Act 1997

Ugandan Government functions in a decentralized approach to manage the country's natural resources. Under this the central government gives power to the local governments (district office in case of rural areas and the municipality in case of urban centres) to manage the local resources. With respect to this the National Water Policy states that the water resources should be managed at the lowest appropriate levels in a participatory and demand driven approach aiming towards the country's overall development. Following this the Local Government Act of 1997 gives power to the local governments to manage the water sources. According to the act, a municipality, as in the case of Bushenyi-Ishaka is termed as the 'local government' functioning under the Ministry of Local Government, Uganda.

The administrative boundary in Bushenyi-Ishaka Municipality is further divided into three divisions (Central, Ishaka and Nyakabirizi divisions) and the divisions are divided into wards. Each ward is further divided into cells, which are the lowest form of administrative boundaries in a municipality. Each administrative boundary has a local chairperson (LC), representing that particular area in the municipality. The local chairpersons are responsible for maintaining law, order and security in its area and resolve problems identified at the local level and also monitor the delivery of government services including daily basic services such as water supply and sanitation. The local chairpersons hold office for a period of four years, however, in Uganda the LC1 elections have not been held in the past fifteen years, due to unavailability of financial resources.

Table 2: Local Government administrative structure

Sl. No.	Administrative Boundary	Local Chairperson
1	Municipality	Mayor
2	Division	LC3
3	Ward	LC2
4	Cell	LC1

With respect to managing water resources in Bushenyi-Ishaka Municipality, the authority managing it has changed over the past years. Bushenyi-Ishaka before becoming a municipality, the water managing authority was under the jurisdiction of the Bushenyi district office, while it was still a rural centre. The district office is responsible for managing all natural resources in a

[21] NWSC 4

rural area. Once the area is converted into a municipality, all powers with respect to managing the government activities is shifted from the district office to the municipality. In this sense, all the water resources in Bushenyi-Ishaka are supposed to be managed by the municipal office, since 2010 when Bushenyi-Ishaka got converted into a Municipality from a town council. However, with respect to managing the water resources, the Local Government Act also states that the local government is not responsible for managing the water resources in the areas which comes under the jurisdiction of the National Water and Sewerage Corporation. Bushenyi-Ishaka Municipality was handed over to NWSC in 2002 (Muhairwe, 2009) and since then all the water resources are managed by NWSC and the local government has no role to play in managing the water resources. Until 2002, the district office was responsible for provisioning of water services to the citizens of Bushenyi-Ishaka. Along with the protection and maintenance of local water resources, the district was also responsible for construction and maintenance of protected springs.

Confirming this the Bushenyi District Water Officer stated that the main challenge lies in the fact that the *"district water office cannot operate in areas which has been taken over by the NWSC, even if there are certain parts of the area in which the NWSC has not yet been able to provide piped water supply. These unserved areas are either dependent on unprotected or protected springs, which were constructed by the district water office, before NWSC took over. Following the law, the district water office can no longer monitor the protected springs nor rehabilitate the broken springs, leaving the locals to suffer, who are neither served by the NWSC nor by the district office."*

That being said, during my conversation with the Mayor, who is the chairperson of the local government (Bushenyi-Ishaka Municipality) since the past 12 years now, it was pointed out that the Bushenyi-Ishaka Municipality is responsible for maintaining all the protected springs. The Municipality gets all its funding from the central government and since NWSC is the respective authority to provide water supply in areas under its jurisdiction, the amount of fund the municipality receives under the water management slab is negligible. Also the mayor is of the opinion that every citizen of Bushenyi-Ishaka should be dependent on piped water supply and is optimistic towards the vision of National Development Plan, which states that *"NWSC is expected to increase water coverage to 100% and sewerage coverage to 30% by 2020 in the service areas of its jurisdiction."* He expects that within the next two years, people will only depend on the springs for water for their livestock and for agriculture.

4.4.4. The National Water Policy 1999

Due to the existence of so many sector stakeholders and regulatory frameworks, the National Water Policy promotes an integrated approach to manage water resources in Uganda. Along with promoting provision of clean safe water within easy reach and good hygienic sanitation practices and sustainable way of managing water for agricultural practices the policy also promotes improvement of co-ordination and collaboration among the sector stakeholders. From an institutional point of view, the policy promotes cross-sectoral coordination mechanism, with Directorate of Water Development as the lead agency.

In terms of technical recommendations for water supply the policy promotes protected springs, hand pumps or boreholes and gravity-fed piped schemes for rural and sparsely populated peri-

urban communities. Whereas urban areas having trained operations and maintenance staff and regular power supply should normally use motor or engine driven pumps for piped water supply. The policy states that in urban areas (as in the case of Bushenyi-Ishaka) the minimum water availability for people is 20-25 litres per capita per day, within a maximum walking distance of 200 meters. With respect to the public stand pipes, the water point should not serve more than 300 persons. In the rural areas, the minimum quantity of water available to the people is between 20-25 litres per capita per day from a public water point (protected springs, hand pumps, etc.) within a minimum distance of 1,500 meters from all households.

The policy identifies protected springs and boreholes as the technologies which are and will be dominating technical preferences in the rural communities. However, in Bushenyi-Ishaka as seen from the in-depth study conducted in Masya and Katungu, water users in both the areas are dependent on both protected and unprotected springs, irrespective of the rural or urban nature of the area. Even though the policy states the minimum volume of water to be allocated to each person per day, in practicality, especially in the areas where water users are dependent on springs, maintaining and monitoring such specific standards is not feasible.

Prioritizing the operations and maintenance of such infrastructure, the policy states that community based maintenance systems approach should be followed. As per this, there should be a water source committee, with at least two caretakers and minimum half women members for maintaining the water source. This committee is responsible for collecting maintenance funds and carrying out all related activities with support from local chairpersons. However, as seen in Masya and Katungu, often the springs do not have a functioning water source committee in charge of maintaining the springs. The management system of protected and unprotected springs have been detailed out in the following Chapter 5 and Chapter 6.

CHAPTER 5

Masya: Most Vulnerable Area

I start by introducing the water users of Masya, their ethnic background and then I move on to explain the land management system and how water related risks are affecting the agricultural practices in the area. Then I explain the different sources of water available in the area and the management practices of such systems. Finally I end by showing how risks related to water quantity and quality are embedded in the daily water use practices of the users.

5.1. Who are the water users?

Masya, an area located in the south-western peripheral part of Bushenyi-Ishaka is currently home to almost 700 people staying in roughly 100 households (see Figure 9). The initial people who settled down in Masya were originally from Mpororo village located in Kabale, a city located 100 kms from Bushenyi-Ishaka. One among such people was the local chairperson Appollo's[22] grandfather who shifted to Masya in 1870. As stated by Appollo, the migration pattern was then initiated by the Baganda people, who are the ethnic people of Kampala which was then called Buganda. During 1870s, when Uganda was invaded by the British Empire lots of Baganda people were working under the British people and were traveling around the country on work delegated by the British Empire. When the Baganda people saw Kabale getting over-populated and people striving to get food, they suggested the people of Kabale to spread across to other places, where there was vacant land available for agriculture. While some migrated to other parts of the country, a group of people from Kabale shifted to an area in the Ankole region (which is now Masya, Bushenyi-Ishaka), which was then an empty vacant land. The primary reason for selecting this particular piece of land (Masya) was its close proximity to the Ankole Kingdom capital, now called Mbarara. During that period, the natives of Kykoba, an area in the Central Division of Bushenyi-Ishaka, started calling the newly moved people as 'Basya' meaning newly moved people in the local language Nyankole. The word Basya is for a group of people, whereas for a single person it is 'Masya' and hence the name Masya for the area. Followed by this there were a lot of people who shifted to Masya in the 1900s, mostly from the nearby areas of Kyetembe, Bumbeire and Bunyarigi.

[22] WU 11

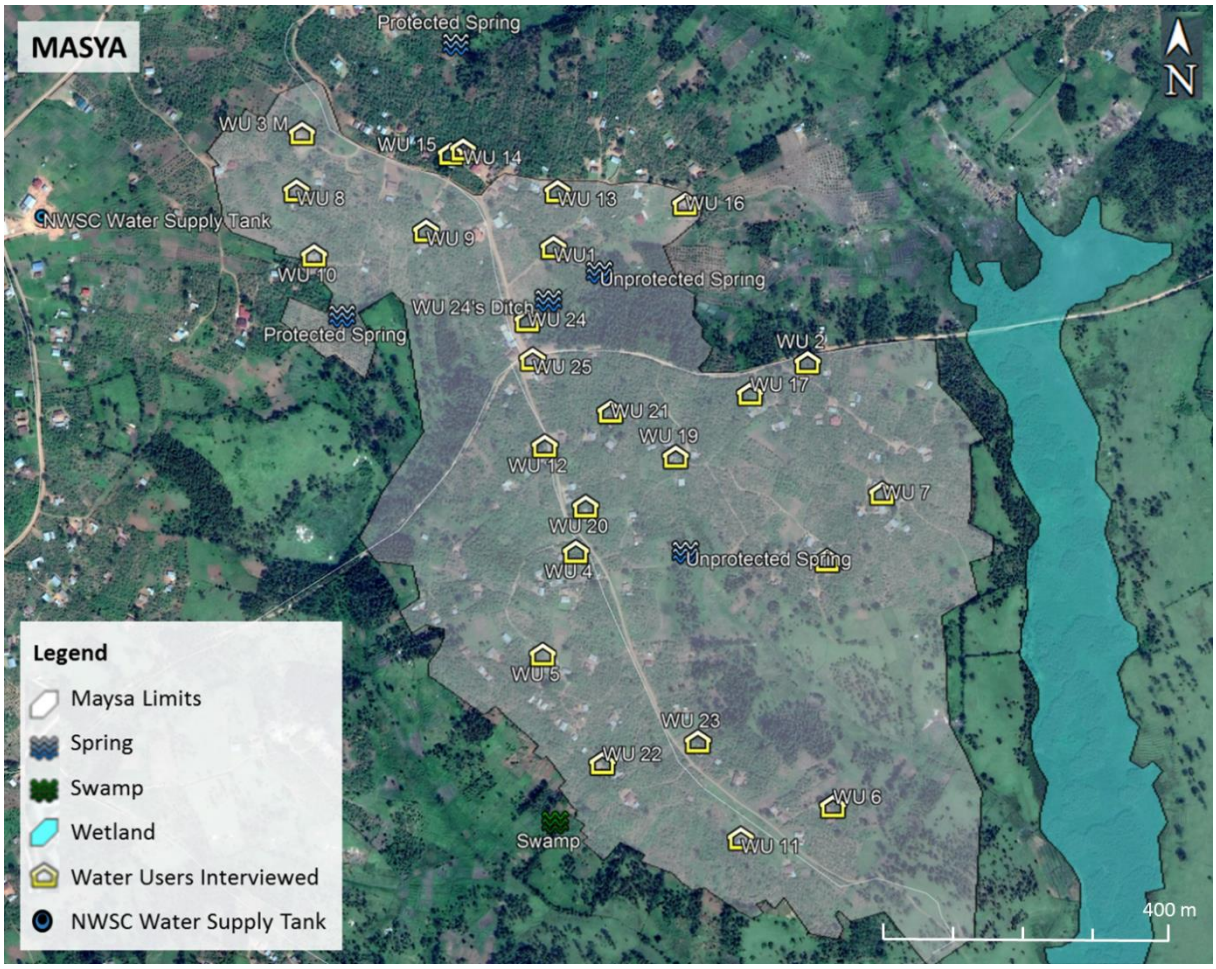

Figure 9: Overview of Masya, Bushenyi-Ishaka, including the location of households of which water users have been interviewed[23] (Source: Google Earth)

5.2. Land management system

Spread across an area of 0.50 km^2, Masya is located at an average altitude of 1617 meters above sea level and the water sources are located at an average altitude of 1603 meters above sea level, in the valleys of Masya. With a soil type of acric ferralsols, the soil in Masya and Bushenyi-Ishaka in general has a moderate fertility rate with humus-rich surface horizon (Kaizzi et al., 2012). This type of soil, located in the tropics is particularly good for banana plantations intercropped with maize (Eswaran et al., 1989). The same can be observed in Masya, with the common crops harvested are banana (matooke), maize, millet, potatoes, cassava and beans, which are the staple foods of Bushenyi-Ishaka, and the western region of Uganda in general. Apart from this one can also observe passion fruits, avocado, eucalyptus and coffee plantations in Masya. As stated by Appollo[24], people started growing eucalyptus from a business perspective only from the 1950s. The market for eucalyptus developed primarily for supplying timber to people, which was used in house construction purposes. Until then people in Masya

[23] Total Interviews Conducted: 25 Water Users; Male: 11; Female: 14.
[24] WU 11

and Bushenyi-Ishaka in general used to dry the papyrus stems from the wetlands to make window and door frames.

All water users interviewed in Masya practice agriculture, either subsistence or are producing for the market. Subsistence farming is mostly practiced by families[25] in which either one of the members is working in the town centre and has a steady income to support the household expenses and the kid's tuition fees, whereas families[26] producing for the market typically depend only on the agricultural income for meeting the household expenses. However, that being said, it cannot be easily differentiated between someone who is only practicing subsistence farming or is producing for the market. There are also families which generally use their harvest only for sustaining their daily meals, but in a good season, if there is surplus production, these families also sell it in the market. Most of the water users interviewed owns at least an acre of land, either inherited from the previous generation or they rent the land for farming.

Figure 10: A person holding the Omugorora plant

With respect to land allocation, it is a common custom in Masya, that the father divides his land among his sons, either when they are of 18 years old or when they get married. Explaining this patriarchal system of land allocation the chairperson of the Masya states that *"the land allocation is either done equally amongst all the sons or the eldest son gets the first priority to select the piece of land he wants and then allocation priority is given to sons based on their age. However this practice varies from family to family. In my family I have distributed my land equally among my sons. I also have two daughters, but usually we do not give them land because once they get married they belong to her husband's family. Instead we usually give a cattle when they are getting married"* – WU 11, Local Chairperson. For land demarcation they usually use a locally available plant called *'omugorora'* (dracaena) (as shown in Figure 10). The land area is divided with mutual consent of the family members. Though often there are disputes among the family members regarding the land boundaries. The usage of a plant to set the boundaries of a property allows some people to uproot the plant overnight and place it somewhere else extending their property, resulting in disputes between the people. These disputes are then taken to the Local Chairperson for resolution. The chairperson then sets a date and calls all the members of the land committee on that particular date. He also summons some of the neighbours of the ones having the dispute. The committee members are the judge on resolving the issue. Highlighting this form of resolution mechanism, the chairperson states that the committee gives their judgement depending on the behaviour of the actors involved and on how the actors involved are delivering their arguments. The chairperson states that *"we have been staying here for a long period and*

[25] WU 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 23, 25
[26] WU 6, 7, 16, 21, 22, 24

we are aware of the villager's character". Here we see how the institutional arrangement shapes the agency of the committee members involved, making them the decision making authority and also how the personal relationship of the actors involved to the committee members help them negotiate in the process of land allocation (Schnegg and Linke, 2015 as cited in Cleaver and Koning, 2015).

This form of customary ownership, even though is acknowledged by the Land Act of Uganda, the act suggests that each ward should have a land committee presided over by the chairperson and the committee should overlook the allocation process and should prescribe an ownership certificate indicating the land area. However, in practice the patriarchal line of land allocation system makes the male head of the family, the father in this case the sole authority to distribute land among his sons. In Masya it was observed that the land committee is not involved in the whole process and the chairperson is only involved in case of a dispute. Due to no involvement of the committee, in practice no certificate proving the ownership of land is given and it is only the 'word of mouth' of the families involved and the omugorora markings which are used as tools for land allocation. Here we can see how the social circumstance of patriarchal system of land management is perceived legitimate by the residents of Masya and thus the family members involved are reworking the existing institutional arrangement prescribed by the Act in allocating land (Cleaver and Koning, 2015).

With respect to the renting of land, there are a few families, who do not have an extra piece of land for farming. These families end up renting a piece of land, usually done on a seasonal basis (a season comprises of three months). The usual renting fees in Masya is 30,000 UGX[27] per season for a land area of 50 sq. m[28]. Such cases are observed mostly in families which got only a small portion of land from their previous generation and the land available is not sufficient for agriculture. Also mostly in such families one or more person are working in the town centre and are earning an extra living, which they can spend on renting the land. Those usually sub-letting their portion of land are the ones who either got extra piece of land during the allocation process, more than that was required to build a house and practice subsistence farming or does not have enough money to buy extra seedlings for sowing in their field[29]. Also often the families sub-letting the land usually do not have the required labour resource to cultivate in the land.

5.3. Agriculture and water related risks

In most of the families farming is practiced by one of the female member[30] of the family and usually the male head of the family is either working in the town centre or are working in the neighbouring small towns and visits home only during holidays. Apart from coffee, which is solely produced for market, banana is the most commonly sold crop in Masya (see Figure 11). Most of the households sell bananas to the vendors who visits each household once every two weeks. While these vendors buy bananas for 15,000 UGX a branch[31], there are three families in Masya who sell their banana to PIBID (Presidential Initiative on Banana Industrial

[27] 1 USD = 3665.90 UGX; 1 EUR = 4410.15 UGX (as obtained from http://www.xe.com , accessed on 06.01.2018)
[28] WU 17, 20
[29] WU 11
[30] It was usually observed that the wife of the male head is the one practicing farming, while the daughters were either working or studying.
[31] WU 3, 5, 6

Development), which pays 18,000 UGX per branch[32]. PIBID conducted an initial survey in Masya to select the families which can produce a minimum of ten bunches of banana every month and it continues to buy bananas only from these families. With respect to the coffee plantations, most of the households produce it at a small scale (average production of 6-8 basins, each of 16 litres capacity per year), sell the coffee beans to the vendors moving around on a bicycle. On the other hand, households[33] cultivating coffee at a relatively larger scale (bags of 50-100 kilograms per month), sell it to the Banyankole Kweterana Cooperative Union[34]. Speaking to Katwire[35], who sells his coffee to the cooperative, he states that *"the only criteria required to sell coffee at the cooperative is that the person should have a valid coffee trading license. I got mine from the municipality trade division office. I need to pay 20,000 UGX per year for renewing the license. I prefer selling coffee to the cooperative firstly because the cooperative pays me 20,000 UGX per basin instead of 16,000 UGX which the bicycle vendors pay in Masya. Secondly, the cooperative also organizes workshops where they train the farmers on how to better manage their crops and have a better yield. I specifically learned about the minimum spacing between the plants from the training, so that the plants can have adequate amount of sunlight and water"*.

Figure 11: Banana plantations; Farmer with his coffee harvest; Maize (from left to right)

While most of the water users are of the opinion that *"how can we irrigate our crops with extra water, when we are struggling to get drinking water"*[36], and depend on rainwater as the main source of water for meeting their agricultural demand, there are also a few households which uses water from the protected springs, unprotected springs and wetland for irrigating their crops. Though most families practicing subsistence farming stated that rainwater is sufficient for producing harvest such that they can sustain their family's food requirement, there are certain families who need to buy extra food from the market. Mostly it was observed that people have to buy 'posho' (maize product) from the market. This pattern was observed especially during

[32] WU 7
[33] WU 11, 24
[34] The cooperative consists of farmer societies in ten districts of Ankole region, including Bushenyi. The cooperative's main activities are related to processing and marketing of coffee products. The cooperative also carries out advisory services such as trainings and exposure visits.
[35] WU 24
[36] WU 8, 23

the dry seasons among households[37] having more than six members usually located on the extreme ends of the area and are far from water source.

Usage of water for irrigation is mainly prevalent among households which grows coffee[38], passion fruits[39] and cabbage[40] and are located near the water sources. While for coffee and passion fruit farmers have to irrigate their crops throughout the year, for cabbage extra water is required only during the dry seasons, which usually lasts from June to September. Water usage for coffee plantations varies from 15 jerry cans, each of 20 litres capacity per day during the rainy season to up to 30 jerry cans per day during the dry season for an acre of agricultural land[41]. With respect to passion fruits the water required is around 5 jerry cans per 30-50 m^2 of area, each of 20 litres capacity once in three days[42] and usually the households use one jerry can of water for cabbage per 10-20 m^2 of area, once a week in the dry seasons[43].

Figure 12: Katwire's agricultural water source; Spray pump for spraying water to his trees (from left to right)

Water users who sell their coffee to the cooperative water their plants as they are taught about the crop water requirements of coffee. On the other hand there are other water users who just water their plants only if they visually feel that the plants are getting affected by too little water. However, in both cases irrigation is practiced because the crops are a source of income. Talking to Katwire[44], one of the water users in Masya selling his coffee to the cooperative states that *"I am lucky to have water within my property".* He sprays water on his coffee plantations every day, because of his knowledge on the crop water requirements in order to have a productive yield. Katwire attended a workshop hosted by the cooperative in the town centre on techniques to grow coffee. Adding to his knowledge, he also has the availability of water in his own land premises, which makes it easy for him to water his plants. Katwire has a shallow ditch dug in his land, just 2-3 minutes walking distance from his house, from which he uses the water for agriculture (see Figure 12). As his land is close to one of the open springs, he figured that there must be shallow groundwater on his land as well. And just by digging for a few feet he gets water on his own land. The ditch is generally 8 feet deep in the dry seasons, and he reduces the

[37] WU 5, 6, 19, 25
[38] WU 24
[39] WU 21, 22
[40] WU 9
[41] WU 21, 24
[42] WU 21, 22
[43] WU 9
[44] WU 24

depth to 4 feet in the rainy season, as he does not want too much water to get accumulated and destroy his crops. The water is very dirty (*'muddy in colour'*), but it is good for his crops, and since the ditch is on his own land, nobody restricts him from accessing the water. Also since the ditch is on his private land, and there is no alternate path to the ditch, the water is only used by him. Katwire uses a jerry can of 20 litres capacity to fetch water from the ditch, pours it into his sprayer pump and waters his coffee plants.

While Katwire has the luxury of accessing water on his land, there are other users like Eva, Joana, Denese and Medias, who have to walk for almost 30 minutes to fetch water for their crops[45]. Eva[46], mother of three, spends almost about two hours on fetching water from the wetland for watering her passion fruits. Eva states that, *"I fetch 5 jerry cans of water from the nearby wetland, each of 20 litres capacity once in every three days. After spending much time on fetching water and agriculture, I hardly get time to take care of my children and manage the household activities".* Apart from issues related to long walking distance, there is also the risk due to the steep climb. The unprotected spring is located in the valley, and the road to the unprotected spring is muddy and very steep. Bringing up water filled jerry cans is very difficult and tiresome for her, also resulting in hip pain. The condition gets worse in the rainy seasons, when the road to the spring gets slippery. Often in the rainy seasons maintaining balance is difficult for her on the way back, and the heavy jerry cans, filled with water fall and they break. Eventually Eva has to buy a new jerry can, which costs her nearly 6,000-8,000 UGX.

Here we can see how risks are differently perceived by different users. While for the water users practicing subsistence farming depending only on rainwater, the risk is in terms of food security especially during the dry season, the risks experienced by Eva was completely different. Thus we can see that how risks are the produced as a result of the water user's geographic location. Also in the case of Katwire, his vulnerability towards risks is relatively less not only because of his geographic location, being able to access water from within his property, but also as a result of his knowledge on crop water requirements from the trainings attended. Here we can see that how availability of water affects his monthly coffee harvest and provides him the financial capability to renew his trade licence and is thus closely intertwined with him being able to maintain his socio-economic status. Analysing this scenario, it can be noted that how factors such as gender, socio-economic status, geographic location continuously shapes ones agency (Etelapelto et al., 2013), making them vulnerable towards water related risks.

5.4. Sources of water

"I can see the water tank from my place, but I do not see the water" – WU 4 pointing towards the NWSC water tank. Even though being within a distance of less than a kilometre to the NWSC water tank (see Figure 9), people in Masya do not have access to the NWSC piped water. While talking to the engineer[47] at NWSC Bushenyi-Ishaka, it was noted that in general an area is connected to the main pipe network on a priority basis depending on factors such as the geographic location of the area in terms of elevation and distance from the main pipeline,

[45] WU 9, 16, 21, 22
[46] WU 22
[47] NWSC 5

availability of a public stand post and the number of residents to be served. However, talking to the NWSC staff[48] (mobilizer) responsible for mobilizing community members in the process of a new connection it was pointed out that in practice usually an area is connected to the pipe network only when a local chairperson of the area visits the NWSC office and registers a request for pipeline extension to that area. However, as mentioned by the NWSC mobilizer the *"chairperson of Masya is very old and is not very proactive and have never approached NWSC for getting piped connection to the area"*. Thus with respect to the water usage for household activities, the water users in Masya depends mainly on protected and unprotected springs. These water sources are primarily identified by the name of the land owner on which it is located.

5.4.1. Unprotected spring – Fred's land

Located in the centre of Masya, this spring is the primary source of water for domestic purposes for most people who are located near the spring. The spring is located in a valley, covered by eucalyptus trees, which is accessible by a narrow steep muddy path. There is a shallow ditch which needs to be crossed in order to access the spring. The crossing over the ditch is made of two wooden logs, which are unstable and slippery when wet. One has to have a good balance in order to manoeuvre their way to the spring (as shown in Figure 13). While this is main way to the spring for majority of people, there is another access path to spring from Fred's[49] property, which is used mostly by his family members. Situated under the canopy of eucalyptus trees and grasses, the water in the spring is mostly green due to the leaves falling into it and also due to the presence of algae in the water. The eutrophication process is also indicative of high nutrient content in the spring.

Accessed mostly by the kids (see Figure 13), who are the principle carriers of water in the area, neighbours[50] claim that the water of this spring is polluted as kids play in the water, especially in the summer season. Often the kids also urinate in the spring or wash their hands in the water after defecating around the spring, which contaminates the water. Kids often put their legs inside the spring, while fetching water from the spring, disturbing the clay situated at the bottom of the spring, making the water dirty and muddy. Often when kids are fetching water, they tend to fight to be the first one to get water and end up pushing someone in the open spring[51]. This is also the reason why water users[52] who do not have kids at home to fetch water prefer collecting water from the spring, early morning at around 5-6 am, when the water is undisturbed. Also for these water users fetching water in the early mornings is convenient as they get ample time during the day to carry out their agricultural and household activities.

Concerned with kids contaminating the water source, Fred, the owner of the property sometimes chases off the kids while he is around. Fred works in Kasese, a nearby town and is not always

[48] NWSC 2
[49] WU 1
[50] WU 1, 2, 5, 12, 16, 17, 21, 24.
[51] WU 5, 16
[52] WU 5, 12, 18, 19

around. Also Rossette, Fred's wife, indicates that *"fencing the spring is not an option, as the kids would climb up the fence, and I cannot keep an eye over the spring always, as I have my farm to maintain and also carry out my daily household chores. Moreover often there are people who abuses me or argues with me if I try stopping them from washing their clothes near the spring"* (WU1). However, while talking to a kid who was fetching water, regarding whether they go inside the spring to collect water, he stated that *"the owner won't let us take water again, if he sees us getting inside the spring" (WU 19)*. Moreover, during my observation of the spring for a duration of nearly three weeks during the rainy season, I did not see any kid getting inside the spring nor anyone washing their clothes in the spring water. However, this might not be the case in the dry seasons when the water level in the spring drops and the children cannot fetch water just by standing on the stone platform near the spring outlet.

Figure 13: Kids fetching water from the spring; Water user fetching water – crossing over the wooden logs (from left to right)

Water users fetching water from this spring also often specifically in the rainy season claim the water to be dirty due to rain water washing down the cow dung and goat faeces from the nearby areas into the spring[53]. Additionally talking to water users residing near the spring, it was noted that there are certain families who washes their dirty clothes near the spring, and after washing the wastewater is discharged near the spring, contaminating the water in the spring[54]. Though during the interviews it was pointed out that there are water users in the area who do their laundry near the spring, it was unclear that who these users are. However, during my field observations and interviews in Masya of over a month, I never saw any water user washing their laundry near the spring. These observations were made during the rainy season, which could translate to either that people usually do not wash their clothes near the spring or they just do not do it during the rainy season, as they can use rain water for washing the clothes. However, it was during this same period I did observe water users washing their clothes near

[53] WU 5, 21, 25
[54] WU 1, 12, 21

other springs, but not this one, indicating that water users do not wash their clothes near this spring.

With respect to the maintenance, the spring is usually cleaned by Fred, but since Fred works in a hotel in Kasese, a hill station located 100 km away from Bushenyi, he visits home only once every two months, and it is his wife who is responsible for maintaining the spring. Though water users[55] accessing water from the spring claim that there exist a committee which is responsible for cleaning the spring, Rossette states that whenever the committee members mutually decides on particular date and time for cleaning the spring hardly anyone shows up, or even if they do they come late. This eventually results in Fred cleaning the spring by himself. During the maintenance activity usually all the water from the spring is taken out to clean it. This activity is mostly done in the rainy season, as it takes almost a full day for the spring to recharge itself and if it is in the summers, the recharge duration is even longer and people need to travel to distant places to fetch water, which is troublesome. In the rainy season, they clean it once every two months, when there are a lot of leaves accumulated in the spring, turning the colour of water to green and also the water in the spring starts stinking[56].

5.4.2. Unprotected spring – Boaz's land

This spring was earlier a protected spring (see Figure 14), which was later broken and modified to an unprotected spring last year, when there was no water available in the spring. In 2016, the summer was excessively hot and the spring stopped yielding water. While few water users wanted to break it open in order to see what was wrong with the spring, or why there was no water coming, others were of the opinion that they should complain to the local government who constructed the spring to repair it. This created a dispute among the neighbours and the issue was taken to the local chairperson. Talking to the chairperson[57] about this, he stated *"I then forwarded the concern to the local chairperson at the ward level, however no action was taken, as there was no fund at the municipality for rehabilitation of springs. Eventually we ended up breaking up the spring catchment ourselves, to solve the issue. The problem was not with the spring, but due to the dry summer, the groundwater dried up and there was no water".*

[55] WU 11, 12, 21, 24
[56] WU 24
[57] WU 11

Figure 14: Water user on his way to fetch water; Kid fetching water from the spring (converted protected to unprotected spring) (from left to right)

With respect to the maintenance of the spring, the spring is usually maintained by the neighbours, as Boaz and his family does not stay in Masya. The spring does not have any dedicated group or caretaker looking after the spring. This is mainly because *"the spring is located in a valley and there is no house at the entrance of the road to the spring, so no one is permanently there to monitor the spring"* (WU 23). Often the spring is cleaned as a result of voluntary initiatives taken by water users accessing water from the spring. Some family randomly takes initiative and they spread the word among other families about the date and the time of cleaning. People who want to participate, just voluntarily participates. Cleaning activity mainly includes taking out the water completely and cleaning out the trench[58]. As observed from the interviews[59], there are about ten families which take part in cleaning the spring, which is done mostly in the rainy season, so as to maintain the daily recharge levels of the spring. In rainy season, it takes a day for the spring to recharge itself, however in the summers recharging takes longer than a day. This is the primary reason why the spring is cleaned only in the rainy season, so as to avoid inconvenience to water users depending on the spring.

5.4.3. Protected spring – Prosper's land

The spring (as shown in Figure 15) is located in the northern part of Masya. Even though being a protected spring only a limited number of people uses the spring, usually the water users residing in the close proximity of the spring. It is quiet ambiguous to exactly identify who are these water users as often even some users staying within close proximity to the spring prefer fetching water from the farther springs, main reason being the low water pressure in the spring as compared to the others as shown in Table 3. Though this comparative observation was made only in the dry season of December, the data reflects the water users concern of low water pressure throughout the year. Water users have to wait for almost 15-20 minutes to fill up their 20 litres jerry can. The low water pressure often results in formation of long queues especially

[58] As the spring is usually located in a valley surrounded by agricultural land, where cattle graze, there is the possibility of rain water washing down animal faecal matter into the spring water. In order to prevent the surface runoff from entering the spring and contaminating it, there is a trench dug on the surroundings of the spring.
[59] WU 4, 19, 23

in the mornings (7-8 am) and evenings (4-5 pm), during the peak hours. During the peak hours one might even end up spending an hour or two standing in a queue of 10 to 20 people[60]. Due to this reason water users often prefer going to a farther water source in order to save time. Talking to one such user, Felix[61] states that *"for me saving time is more important than saving my physical energy. Sometimes the time which I save from fetching water, I can take my cow for grazing and go to the church to attend bible readings"*.

Table 3: Comparison of spring discharge

Sl. No.	Spring	Discharge (litres/sec)
1	Unprotected spring – Boaz's land	0.05
2	Protected spring – Prosper's land	0.03
3	Protected spring – Karufiire's land	0.30

With respect to the maintenance of the spring, there is no dedicated group to look after the spring. As observed from interviewing the nearby water users[62], it is mostly the teenage neighbourhood boys, who clean the spring only when they are around, during their school vacations. They clean it once or twice a year, mostly during November, when they have their school holidays. Cleaning activity is mainly removing the piled-up mud from the base of the spring, which gets accumulated as a result of the rain water runoff. This accumulated mud makes it difficult for the water users to place their jerry cans properly under the spring outlet and collect water.

Figure 15: Kids fetching water from the protected spring

[60] WU 3, 8, 9, 10
[61] WU 8
[62] WU 3, 10

5.4.4. Protected spring – Karufiire's land

Constructed in 1984, the spring (as shown in Figure 16) is located in the neighbouring area Kayojo, but is one of the most popular destination for water users, not only in Masya and Kayojo, but also people from the central parts of the town often come to fetch water from here.

Talking about the spring Jenina[63], whose house is located at the entrance path to the spring states that *"prior to its construction, it was just an empty land, where water used to get accumulated. Seeing the volume of water available, not only in the rainy season but also in the summers, we* (the neighbours) *informed our chairperson about this and then the protected spring was constructed by the government"*. During the construction phase the neighbours[64] had to contribute towards the construction, by providing labour and clay for making the embankment of the spring. Even though the spring is located on the private land of Karufiire, who is a resident of Ruhandagazi (a place in the town centre), the spring is a public property and can be accessed by anyone. Highlighting the issue of land ownership in the process of protected spring construction, the District Water Officer states that since the spring is located on a private land, a letter is signed by the land owner in the presence of the local chairperson and is given to the district office as a no-objection certificate towards the construction of protected spring. Once the letter is submitted by the land owner, the land becomes a public property. Since the portion of land for protected spring is very small, there is no land title or compensation given to the land owner. Even though being a public property, it was observed from the interview narratives of water users in Masya often the water users are restricted from fetching water from the spring if in case they do not participate in cleaning the spring.

[63] WU 14

[64] Here by neighbors I mean only the immediate neighbors of the spring. During my interviews, it was observed that these water users were relatively much more active in maintaining the spring. All actions required for the proper maintenance of the spring were initiated by them (WU 14, WU 15)

Figure 16: Protected Spring on Karufiire's land

With respect to the maintenance of the spring, there are two caretakers appointed as the person responsible for maintaining the spring. The position of the caretaker is a voluntary position and is taken by two men, staying on either side of the valley, from where the spring can be accessed. Talking to me while we were sitting nearby the spring, Richard[65] explained about his role and experiences as the caretaker of the protected spring located on Karufiire's land (see Box 2).

Box 2: Conversation with Richard, the spring caretaker

"I have been taking care of the spring since the past ten years now. Earlier myself and some of my friends used to clean the spring, once in a while and seeing this the community people [immediate neighbours of the spring] *appointed me as the caretaker of the spring. Now everyone accessing the springs identifies me as the caretaker. As the spring is located in a valley and has access only from two sides of the valley, there is one person appointed from either sides of the valley to have a better 'control' over the people accessing the spring. As I also work near the wetland making bricks and am not always around, it helps in having an old person as the caretaker from the other side of the valley, who is always there to monitor the spring.*

[65] WU 15

"As caretakers, it is our responsibility to clean the spring, mainly clean the trenches on the perimeter of the spring, which brings in a lot of mud into the outlet of the spring, making it difficult for the people to place their jerry cans properly and fetch water. We also cut the grass and keep the area clean. These activities are done once every week in the rainy seasons and whenever required in the summers. It is not only us, who cleans the spring, but we manage people to help us in cleaning the spring, either by physically participating or providing us with little money for cleaning the spring. During summers when there are a lot of people coming to collect water from different neighbourhoods, we collect small money from them [500-1,000 UGX] *towards cleaning the spring. There is no fixed amount to be collected from the water users. We just tell them what kind of maintenance activity we would be doing and it is up to the water user's discretion on how much money they want to donate. It is a voluntary donation. We collect money mostly from the outsiders as often during summers, people come from nearby schools, hospitals and organizations with 20-50 jerry cans in their pick up vans".*

Even though Richard states that he is the first caretaker and that the caretaker of the spring is a voluntary position, during my discussion with the District Water Officer of Bushenyi it was pointed out that there is a designated water and sanitation committee for each protected spring and a designated caretaker who is responsible for managing the spring. Under the implementation of water and sanitation infrastructure project, the Ministry of Water and Environment (2012) states that post construction of a protected water source the local government should initiate the formation of the water and sanitation committee comprising of residents from the area, headed by the local chairperson. One member of this committee is assigned the role of caretaker, whose responsibility is to carry out the preventive maintenance of the spring. However, here we can see that Richard even though not being appointed by the local government, is given the position of the caretaker by his community people and thus we can see how the introduced rules by the Ministry for maintaining the spring is modified through the neighbour's daily practices.

Also here we can see how imposed rules are rearranged and blended with other practices in such a way that the role of the caretaker in practice exceeds what it originally was designed for. Even though the original purpose of the caretaker was to maintain the spring, his position in the society as a caretaker also enhances his agency to collect money from water users. This money collected usually serves as a daily income for the caretakers since they leave their daily job and spend time in maintaining the spring. However, during my interviews it was observed that not all people accessing water from the spring are asked for extra money towards maintaining the spring. Thus here Richard's agency to act on collecting tariffs is dependent on factors such as his personal relationship to the water user or even the background of the water user in terms of their belonging to the area, whether they are considered as an outsider or not.

"We make announcements regarding cleaning the spring in the church gatherings on Sundays or make a note saying the date and time and stick it in the shops located near the trading centre in Kayojo. However, mostly we gather people by word of mouth. We keep on saying people, whenever we meet them about the date and time of cleaning. Water users usually send their children for helping them clean the spring…

…Apart from this we also oversee that people do not damage the spring. As there are a lot of water users who do their laundry and take shower near the spring, we tell them not to do it near the spring or on top of it. They are supposed to take their clothes or water to a few meters away and then do their laundry or take shower. Additionally, we are also responsible for informing the chairperson in case of any repairs that requires extra money. The chairperson then arranges for the money, either by donating it himself or by informing the municipality.

However, it is not possible for me or the other caretaker to oversee the spring always. It would be ideal to have a female person taking care of the spring, who could always be there to look after the spring as women are usually either taking care of household activities or are farming in the nearby field. However, that has its own challenges, the lady caretaker would not be able to manage the people coming and no one would contribute towards cleaning of the spring, as they would not take her words seriously. Me being a male, people often refuse to give me money and if the caretaker were to be a lady, even the ones paying would not pay. It also happens that often people become enemies if I restrict them or ask for money".

Being the spring caretaker comes with its own set of challenges. It is not always that the water users respect the caretaker's demands. For Richard, it is more difficult managing people from his own community. It is his 'own' people who often violates the rules, and wash their clothes on the platform. If Richard tries to stop them, they end up having arguments and thus it is relatively easier for Richard to tell outsiders who come from different areas. Here we can see how the social position of the caretaker allows him to exercise his own perception of how a community is defined. Even though as per the local government the springs are treated as a public property and anyone can access it without any restriction, in practice though here the right to access the spring is affected by the perceived water user's belonging to the area. Moreover, here we can also see how the presence of the patriarchal social structure is not only limited to the land allocation system, but is also seen in managing the protected springs, where the position of caretaker is gendered.

5.4.5. Rainwater Harvesting

Apart from the above mentioned four sources of water in Masya, people also depend on rainwater for their household activities. All the water users interviewed in Masya practice rainwater harvesting. The roof of all households are attached to a gutter which is used to collect the rainwater. The water from the gutter is either collected in a plastic bucket or a jerry can. The water is directed into the collecting vessel either by connecting a wooden stick between the gutter and the vessel, or the collecting vessel is just placed underneath the outlet of the gutter (as shown in Figure 17).

Figure 17: Rainwater harvesting practices in Masya

5.5. Daily water use practices and related risks

During my interviews in Masya, it was observed that most water users[66] depend only on a single water source and only during dry seasons depend on alternative farther sources due to low levels of water. However, often water users[67] also simultaneously depend on different sources of water for different activities. This is mainly because of the different quality of water available in different sources. For instance the water users[68] located in the centre of the area, who have relatively easy access to both the nearby wetlands and the unprotected spring located on Fred's land depend on the wetland water for washing clothes while for cooking food or for bathing depend on water from the unprotected spring. Whereas the same water users travel farther distances, to the protected spring located on Karufiire's land to collect drinking water. While talking to one such user, Caroline[69] states that for her washing clothes every day is very important, firstly because she has a new born and secondly because her husband is a boda (motorcycle) driver in the town centre and needs to wear fresh clothes every day. However, for washing clothes she does not need fresh water and thus depends on the nearby wetland, which is just five minutes walking distance from her place. However, she does not use the wetland water for cooking or bathing. She thinks that the wetland water is 'dirty' for making food or for bathing, and also her neighbour once got skin rashes from using wetland water while bathing. While with respect to her drinking water requirements she travels thrice every week to Karufiire's protected spring. Irrespective of the distance, Caroline travels to the protected spring as she thinks the water there is of 'good quality' judging by the transparent colour of water and no foul smell from the water. Here we see how the choice of source of water is not only dependent on the quality or the quantity of water, but is also affected by the geographic location of the water user as well as their socio-economic background.

[66] WU 3, 8, 10, 11, 13, 16, 18, 22
[67] WU 2, 9, 17, 21, 23, 24
[68] WU 2, 17, 24, 21
[69] WU 17

Concerned about walking for long distances to fetch water, sometimes even walking for an hour, especially for water users staying on the peripheral parts of the area, fatigue is one of key risks the water users in Masya are exposed to. The condition is even worse on their way back to their homes, when they have to carry a weight of almost 20 kg for a 20 litres capacity jerry can filled with water. The sense of fatigue is more common amongst kids and old people. The kids being the primary carriers of water in Masya, are mostly students. The school timings for the kids is generally from 7.30 in the morning until 4 in the evening. Due to the school timings they have to wake up very early every day (at around 5 am) and go fetch water before going to school. Talking to a Joana[70] who is the mother of two states that fetching two jerry cans of water in the morning makes her kids tired and affects their studies, but she cannot go herself as she has pain in her hips. However, when asked the kid about fetching water, for him it is a fun activity. With respect to the old water users[71], old people do not have the energy to walk for an hour to fetch water. However due to the necessity of water, and having no other alternative, they are bound to walk for long distances to fetch water.

Figure 18: "I am too old to fetch water every day" – Water User 12; A kid manoeuvring his way to the spring (from left to right)

Moreover since most of springs are located in valleys, the access roads to the springs are muddy, very narrow and steep. These muddy roads become slippery in the rainy season, making the climb back even more difficult for water users, especially with their water filled jerry cans. There were also incidents, when the water users fell down, hurting their hips or getting injured[72]. However, the vulnerability of water users towards the physical embodying of risks also depends

[70] WU 16
[71] WU 3, 4, 12, 18
[72] WU 3, 4, 6, 10, 13, 22

on the economic status of the water users. While some have to walk to the spring, the economically stable families[73] often hires a boda-boda (motorcycle) rider or they pay the nearby kids 500-600 UGX per jerry can (each of 20 litres capacity) of water. Some of the female water users[74] also expressed their fear of getting attacked by men on their way to fetch water. *"A teenage girl should not travel alone after 6 pm"* – a water user[75] while talking about her daughter fetching water. Though such incidents has never happened in Masya, the female water users fear that there is a possibility of people attacking them and raping them.

With respect to the quality of water, while all the unprotected springs indicated high rates of faecal contamination, the contamination level in the protected springs were relatively less (see Table 4). Most of the users reported of getting sick (flu, typhoid, cough, skin diseases among other sickness were the most common) if they consumed un-boiled water. Boiling water in order to kill germs is a common tradition and the only form of risk mitigation measure adopted by water users in Masya[76]. Talking about the practice of boiling water, the local chairperson[77] of the area, who have been staying in Masya for the past seventy years states that this practice was introduced by the missionary school nuns during the 1950s. Since then this norm of boiling water, is either culturally passed on to the water users by their parents or some heard about it from health inspectors or from radio commercials (radio is one of the most common source of entertainment for users in Masya). While for the kids, they are taught about the advantages of boiling water in their school.

Table 4: Faecal Coliform count of water sources in Masya[78]

Sl. No.	Spring	Faecal Coliform (CFU/100 ml)	WHO and Ugandan Standards (CFU/100 ml)
1	Unprotected spring – Fred's land	48	0
2	Unprotected spring – Boaz's land	20	
3	Protected spring – Prosper's land	5	
4	Protected spring – Karufiire's land	2	

Another risk mitigation measure water users[79] practice to treat the water is the use of a tea strainer or a piece of cloth to filter out the dirt from water before drinking. Filtration is a usually

[73] WU 3, 22, 23, 24
[74] WU 3, 5, 25
[75] WU 5
[76] WU 2, 3, 8, 11, 12, 14, 16, 18, 19, 20, 21, 22, 25
[77] WU 11
[78] The faecal coliform bacteria test was carried out in the NWSC Bushenyi-Ishaka water treatment plant with assistance from the Water Quality Officer following the NWSC Water Quality procedure. The test was carried out in the dry season in January.
[79] WU 4, 6, 7, 10, 13

a secondary form of treatment after boiling the water. The practice of filtration was observed commonly among people who shifted to Masya from different villages, mostly after marriage. Also there were certain users[80] who used sedimentation as a form of treatment. It was observed that after boiling and filtering the water, the water users usually keep the water undisturbed in a fresh jerry can for a while and drink water only from the top part of the container. It was reported that the water from the bottom of the jerry can smells 'funny' and tastes bad. While these form of mitigation measures were observed in most of the households, these measures are also related to the socio-economic status of the water user. While there were also some users, especially the economically poorer section, who do not boil the water before drinking as they do not have extra firewood for boiling the water[81].

Mostly it is observed that water users in Masya differentiate between water for a particular activity by keeping it in different places (see Figure 19). While the water from the open spring for cooking and washing in the kitchen, whereas the water from the protected spring for drinking or the boiled water is kept in a fresh covered bucket in the bedroom or the living room. Alternatively, there are also water users who uses different storage practices in terms of the type of jerry can. For instance Molly[82] stores the boiled water for drinking in a jerry can with a plastic cap, whereas for the jerry cans containing water for other uses, she uses the pointed top of a banana flower as the cap.

Figure 19: Water for cooking and washing stored in the kitchen; Water from the open spring stored in a jerry can capped with banana flower; Boiled drinking water stored in a bucket in the bedroom (from left to right)

Risks related to water are not only physical in nature, but also affects the social status of a water user. Often when the water users goes to fetch water from the springs, they encounter standing in a long queue waiting for their turn to access water from the springs, sometimes even placing their jerry cans in the queue, holding their position. It often happens that someone else takes their spot, replacing their jerry cans, leading to quarrel and argument among the water users[83]. Water users who do not contribute towards maintaining the spring either by physical participation or paying for the maintenance are often humiliated by the spring caretaker. Talking

[80] WU 1, 3, 8, 11
[81] WU 1, 5, 9
[82] WU 5
[83] WU 3, 11,16, 23, 24

to one such water user[84], even after getting humiliated by the caretaker and the surrounding neighbours of the spring, not having any other alternative he went there again the next day hoping that the neighbours and the caretaker would allow him this time. Sometimes if he is lucky, the neighbours allow him to fetch water either considering the long distance he has walked to fetch water or he thinks that they might just have forgiven him for not contributing.

Apart from the above mentioned direct risks related to water quantity and quality, there are also the indirect risks in terms of opportunity cost of accessing water from the springs. Especially during the dry seasons there is a huge rush near Karufiire's protected spring. In this period, people often chase away small children while fetching water, not allowing them to fetch first and *"on some days the kids end up waiting for over three hours"* – WU 24. Highlighting on this Arnold[85] who is a boda driver in the town centre, states that in order to save time and get water for lunch and dinner he ends up fetching water himself, instead of working and earning extra cash. Here we can see that even if the water user do not pay for the fetching water from the spring, the time lost in accessing water from spring affects his monthly income.

[84] WU 23
[85] WU 23

CHAPTER 6

Katungu – Area less vulnerable towards water risks

In this chapter I start by introducing the water users of Katungu and their social background. Followed by which I explain how water users in Katungu access piped water supply and the associated risks related to water quantity and water quality of piped water supply. I also talk about the risk mitigation strategies adopted by the water users at the household level. Finally I focus on how the piped water supply has positively impacted the daily water use practices in Katungu.

6.1. Who are the water users?

Katungu, an area located in the Nyakabirizi division is *"one of the core urban areas of the municipality"* (Town Planner, Bushenyi-Ishaka Municipality). Spread over an area of 1.81 km^2, Katungu has a population of almost 500 inhabitants, with an average household size of five[86]. Located at an average elevation of 1,618 meters above the sea level, the area is situated in an undulated terrain, with the springs located in the valleys. Katungu is located just within a kilometre distance from the local government administrative offices of the municipality (see Figure 20). With respect to the ethnicity of native residents of Katungu, Professor Emmanuel Karoro[87], a resident of Katungu and a professor of Kampala International University, Western Campus states that the native residents of Katungu are called 'Bairiu' meaning cultivators. Typically all residents of Bushenyi-Ishaka belong to the Banyankole tribe who are identified by the common local language Nyankole. Banyankole people are classified either as Bairiu (cultivators) or Bahima (cattle keepers). Initially the Bairius were settled in Bushenyi and the Bahima were settled in Mbarara, which was then the capital of Ankole kingdom.

Sharing the history of development in Bushenyi, Angela Kamasheza, who is a retired Bushenyi district agricultural officer, states that *"the development in the administrative part of the town, and specifically in Katungu can be basically attributed to two major factors, presence of administrative offices and education background of residents*". After the colonial period, when the Ugandan constitution was formed in 1962, initially the western region of Uganda was called the Ankole region based on the Ankole kingdom. The region then consisted of different counties, Bushenyi being one of them. The first 'Massaza' (County Chief) office was located 200 meters away from Katungu. Later in 1974 when the administrative terminology was changed from Ankole to Western region, the region was divided into several districts. Along with the formation of Bushenyi district then, the district offices such as the local government office, courts and health centre were all set up near the existing Massaza Office. During 1970s

[86] Calculated from a sample size of 26 water users who were interviewed.
[87] WU 26

"these were the only concrete building in entire Bushenyi-Ishaka" (Mayor, Bushenyi-Ishaka). According to the Mayor, this office culture brought in the first forms of development in the central parts of Bushenyi, introducing good hotels which could be afforded only by the government officers. Based on self-observation even until now if one visits such hotels, one could mostly see either the government officials or the international development agency staff having food there and one could rarely spot any locals, owing to the high food prices.

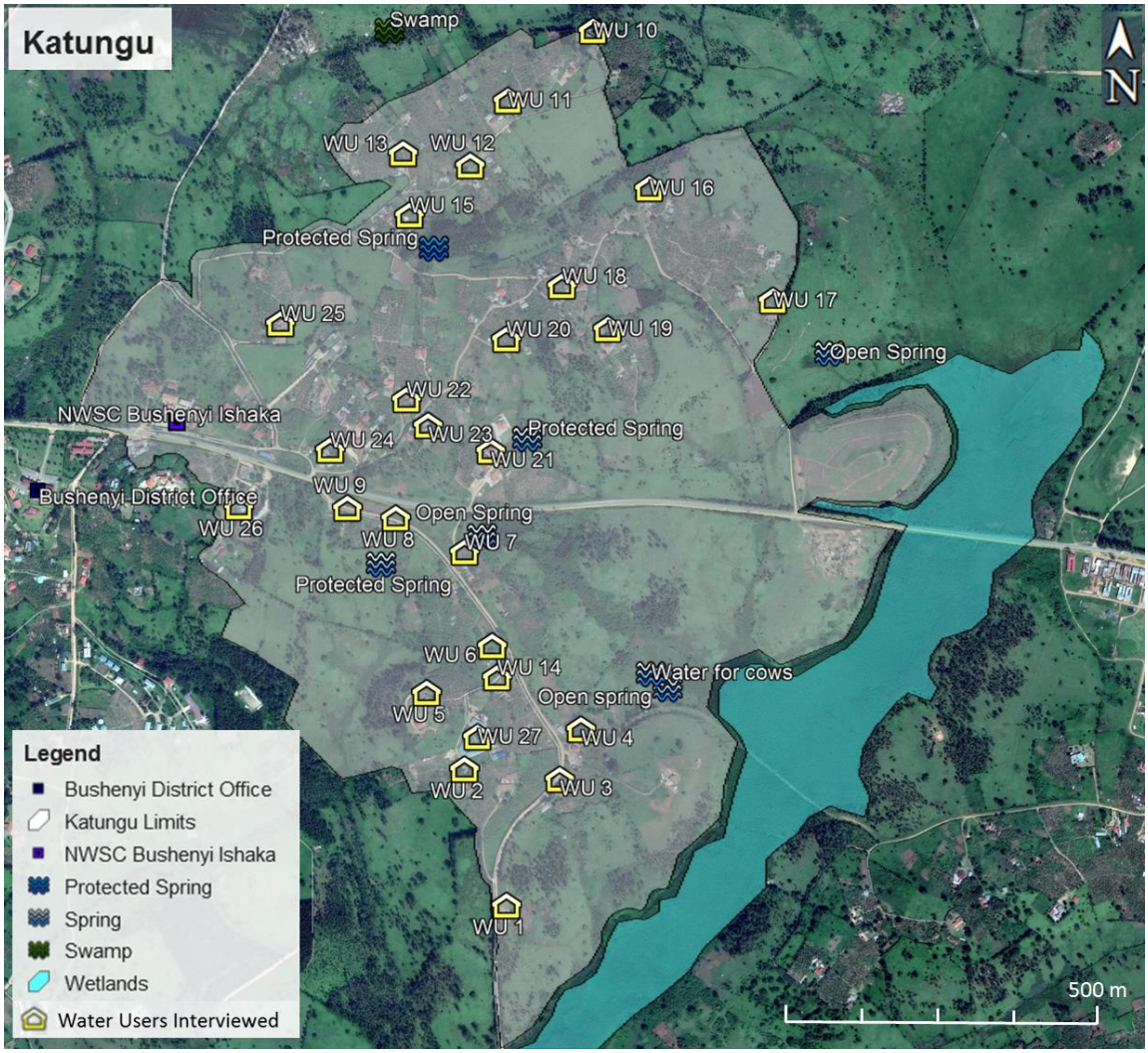

Figure 20: Overview of Katungu showing the water users interviewed and the water sources (Source: Google Earth)

Secondly, as also pointed out by Professor Karoro[88] that *"people in Bushenyi-Ishaka and specifically in Katungu are very serious about education. People would do anything to get their kids educated".* The primary reason for this is the decreasing agricultural land availability. As explained in Section 5.2, it is a common tradition in Bushenyi-Ishaka for the father to distribute his land among his sons, either when they are of 18 years old or when they get married. However due to the rapid population growth and development in the town, there is only limited amount of agricultural land left for allocation among the next of generation and hence over the years families depending solely on subsistence farming for survival is reducing. This is one of the

[88] WU 26

reasons why education has become a priority among the residents of Bushenyi-Ishaka, so that even if they would not have land for practicing agriculture, one could at least work in a different profession for sustaining the family. Highlighting this Sarah[89], a local government leader hailing from Katungu mentions that *"people in Katungu come from an upbringing where a person holding a degree is considered more 'glorified' as compared to the ones having a job. It is not necessary for someone to have a job as long as he/she has a degree".* This is also a reason that irrespective of families in Katungu owning acres of land are still well educated. As observed during my interviews often in most of the families[90] of Katungu the younger generation are settled outside Bushenyi either working or pursuing higher education.

This also suggests that most of the families in Katungu are economically stable either having a continuous flow of income or having surplus amount of land for subsistence farming or both. However, such a theory is mostly limited to the native residents of Katungu as there are also families who are not educated or are relatively less economically stable or are staying in rental homes in Katungu. From an ethnographic point of view the difference in socio-economic status of water users of Katungu was more evident to me from the livestock of the families, their lifestyle, household characteristics and particularly their water use practices. In the following sections I will be focusing more on the water use practices of water users of Katungu.

6.2. Piped water supply: the primary water source

Speaking to Angelina[91], who is the local chairperson of Katungu, about how piped water supply was introduced in the area, she mentioned that Katungu got its first piped water connection in 2004. Being the chairperson of the area for the past fifteen years, Angelina is one of the primary links between NWSC and the residents of Katungu in terms of mobilization of the entire process of introducing piped water supply. During the initial expansion of the water network in the town, connections were given in groups of families. There was one connection allocated for 10-20 families. Although the service delivery resembled that of a public stand post in terms of the tap being situated in a courtyard and not delivering water to each doorstep, the billing pattern for this system was different from that of a public stand post. Unlike the public stand posts, where there is a specific person appointed to operate the stand post and collect 50 UGX per jerry can, each of 20 litres capacity of water, in this case the billing pattern followed that of the individual household connection. There was a meter connected to the tap and the total monthly bill would be based on 3,305 UGX per m^3 of water consumed as per the meter readings. The monthly bill was then equally shared amongst all families using the tap irrespective of the volume of water consumed by them.

Among the 10-20 families benefiting from the service, there was one water user mutually identified by the families, on whose land the pipe would be installed. This person would be responsible for taking care of the pipe and the application process including the deposit money (100,000 UGX) to be submitted[92]. The other families availing water supply from this pipe would only share the monthly bill. Such kind of connections in the area was promoted on a first come

[89] WU 17
[90] WU 2, 3, 5, 9, 10, 17, 23, 25, 26
[91] WU 14
[92] In this system of water supply, the arrangement was such that later on when NWSC increased its coverage to other water users, the existing connection would then be treated solely as a private household connection by the family which did the application process and on whose land the tap was placed and who paid for the deposit fees.

first serve basis[93]. Criticizing this form of water supply Angelina states that *"even though this was a temporary arrangement while NWSC increased its coverage of individual household connections, the model was not successful as there were a lot of issues within the first few months itself"*. Often the person responsible for taking care of the tap would lock it[94] and go away, which would lead to other water users not being able to access water from the tap. This would lead to disagreements among the water users. According to Angelina, *"the disagreements were not only related to the locking of taps, but also because of the equal splitting of the monthly bills. Not every family used the same quantity of water, and some families would end up paying more as compared to the volume consumed by them"*. Such struggles amongst the families have encouraged them to get their own private connection.

Within this context it can be understood how such disagreements arise due to interactions between water users possessing different levels of agency. With respect to the water user responsible for maintaining the tap, who was mutually selected by all the 10-20 families, even though the selection process was done with mutual consent, it was also affected by the water user's socio-economic status and his/her ability to pay the initial deposit sum of 100,000 UGX[95]. Here we can see how the economic status of the water user accompanied by his personal relation with the other families and his social background[96] enhances his agency as compared to the water users from other families. The water user maintaining the piped connection had the freedom to lock the tap whenever he wanted to go out or unlock it depending on his water usage requirements and did not have to depend on anyone. While for others, they had to depend on him to access water. In this sense the water user having the key to the tap exercise a higher level of agency or 'freedom to choose' than other water users.

Currently, for getting a new NWSC piped water connection, the water user should get the application form signed by the local chairperson. Along with national identity card, the application form and the deposit amount the applicant is also supposed to get a letter from the chairperson confirming his/her land ownership status. In case the land does not belong to the user, he or she should get an approval letter from the actual land owner and then the chairperson co-signs that letter. Often there are disputes amongst neighbours[97] regarding the approval for digging of trenches for laying the pipeline, especially if the pipeline is passing through one's banana plantations. The major concern of a water user in that case is *"what if the pipe breaks and the water spoils all my banana"* (interview with WU 17). This issue of permission for trenches is observed mainly amongst relatives as in most cases it is them who are neighbours due to the customary land allocation system (refer to section 5.2). In such case then it becomes

[93] Katungu has a committee representing the decentralized form of local government administration. This committee consists of the Chairperson, Vice Chairperson, General Secretary, Publicity Secretary, Production Secretary, Treasurer, Defense Secretary, Youth Secretary, Disabled Secretary and the Women Secretary. During the initial phase of water supply connections it was this committee who decided on which group of families would be the first to get the water connection. This was decided on whichever group of families were the first to come up with the deposit fees and hence the 'first come first serve basis'.

[94] Locking of taps is related to protecting it from theft. Since the taps are made up of brass and placed in the open, they are often stolen and in order to prevent such mishaps water users often lock their taps and meters, especially the ones which are located in open courtyards.

[95] WU 26

[96] By social background here I am referring to the fact that in Katungu the residents owning acres of land and educated are seen as respectable and 'glorified' person (Also mentioned earlier; see section 6.1).

[97] WU 8, 10, 16, 17

the chairperson's responsibility to help negotiate the issue and involve the NWSC mobilizer[98] and the engineer to explain the water user on the solution for the worst case scenario of leaking pipe in the banana plantations. In such cases it becomes a negotiation skill between the parties involved. Speaking to the NWSC Bushenyi-Ishaka mobilizer[99] regarding this, he states that *"in such negotiations lots of factors play an important role like people's respect towards their local leader, their personal relation to their neighbours, their respect towards us and more importantly their trust in National Water"*.

With respect to new connections the chairperson also needs to vouch for the social nature of the person, testifying for the personal behaviour of the applicant identifying whether the person is 'well behaved' or not. However in this case well behaviour of an applicant is a debatable characteristic. The main question lies is 'what' are the criteria to define someone as a well behaved person? 'Who' defines someone as a well behaved person? In this scenario it is on the sole discretion of the chairperson to certify someone as a well behaved person or not, which is mostly dependent on the applicant's personal relation with the chairperson or the money the applicant pays the chairperson, usually termed as 'Kyamushana' (money for lunch or tea). 'Kyamushana' in Uganda is seen as cultural form of 'token of respect' and is not only limited to availing water services. People pay anywhere between 1,000-5,000 UGX to their local leaders. It is a voluntary payment and talking to the chairperson[100] regarding this she stated that *"being the chairperson, I am doing a voluntary job, without any formal payment from the municipality. As chairpersons we are doing God's work by serving the community people. Kyamushana is the only small money that we receive from the residents when they visit us regarding any official work or for getting anything approved"* (interview with Angelina, Local Chairperson - Katungu). This form of institutionalized practice directly affects the existing power dynamics between the chairperson and the water users involved. In this case the chairperson by the virtue of her signing authority de facto demonstrates a higher form of agency as compared to that of applicant who needs to have good personal network with the chairperson and get endorsed by her. This practice of 'well behaved character certification' is primarily done so as to satisfy the NWSC staff that the applicant can be trusted with the pipe works and that NWSC property (the pipes) are safe in the user's land. Water service delivery in Bushenyi-Ishaka context is thus to a large extent implemented as a result of continuous blending of formal requirements as stated in the application form and cultural norms or rules-in-use which are followed in order to accomplish the organizational requirements. In doing so the applicants become bricoleurs by drawing onto the institutional arrangement of offering Kyamushana to the chairperson in order to avail their 'well-behaviour' certificate.

With respect to the tariff of domestic piped water supply NWSC follows a flat rate of 3,305 UGX per m^3 of water used and the monthly bill is charged based on meter readings. During my interactions with the water users[101] in Katungu many raised the issue of high water tariffs. This is also a reason for the lower income household water users opting out of the connection system.

[98] NWSC branch offices have a designated post as the 'mobilizer', whose main responsibility is to create awareness among the people and tell them about the benefits of piped water supply and how it could benefit their livelihoods. It is a standard protocol followed by the NWSC employees to carry out 'sensitization workshops' in areas before they introduce piped water supply so as the locals do not oppose to any kind of trenching activity. Talking to NWSC engineer regarding this he stated that these workshops started as a response to avoid residents demanding for compensation fees for digging trenches.
[99] NWSC 2
[100] WU 14
[101] WU 11, 12, 16, 23, 24

Talking about high water tariffs, Eve[102] a water user whose connection was disconnected once last year due to her not paying the bill within the due date, she stated that "*the water bill is very high and I needed to make a choice between either paying my son's tuition fees or pay the water bill. I decided to pay for my kid's school fees. Later on when I had enough money from selling matooke* (banana) *I paid the water bill. The water bill is exactly like the airtime in my mobile. I have no idea how the bill is so high even if I do not use that much of water".* Explaining the reason behind people's approach towards paying piped water bill Elineo[103], the NWSC Mobilizer states that *"when people have financial stress at home, they would prefer to have free water from the springs rather than paying for tap water. Also because people in Katungu and in Bushenyi-Ishaka are used to being dependent on spring water, even before piped water supply was introduced in the town".* As also highlighted in the National Water Development Report of Uganda (UN Water, 2006) *"one of the major management challenges towards implementation and sustainability of water sector activities is… sensitisation of the public may not immediately translate into behavioural change and change in people's attitude".*

Analysing the tariff structure in Bushenyi-Ishaka, the rates are same as that of other urban centres in the country. However, according to the Design Guidelines for Water Supply Infrastructure (Ministry of Water and Environment, 2013), the cost of water should be calculated on the basis of 'dynamic prime cost approach' considering the capital investments and operations and maintenance cost. That being said the unit cost of water should also abide by the affordability levels of water users. The guidelines assumes that a household expense related to water and sanitation should not exceed 5% of the monthly household income. Out of this 5%, assuming that sanitation is often more expensive in the long run, 3% of the threshold has been allocated towards sanitation while the water supply bill should be within the affordability level of 2% of the monthly household income. The average monthly household income in the South-Western region of Uganda is 212,000 UGX (UBOS, 2013) and according to the water design guidelines, the monthly household water tariff should be less than 4,240 UGX. However the data received from the commercial department of NWSC Bushenyi-Ishaka states that currently water users in the town are paying an average monthly bill of 29,745 UGX[104] which is seven times the design guidelines value.

6.2.1. Hydraulically connected water users

In Katungu and other parts of Bushenyi-Ishaka, family members often stay nearby, meaning that in most of the cases the neighbour of a water user would be one of his relative. This is because of the traditional form of land allocation from father to son (refer to section 5.2)[105], eventually resulting in brothers settled in the same area. Even though being family members,

[102] WU 11
[103] NWSC 2
[104] The average household consumption in Bushenyi-Ishaka is 9 m^3 per month, which relates to a total bill of 29,745 UGX per month at the rate of 3,305 UGX per m^3 of water consumed.
[105] However in Katungu it was observed that during the land distribution from the father to the next generation, a portion of the land was also allocated to the daughter of the family. In Katungu this was observed only amongst the families which were well educated. Emphasizing on this Professor Karoro (WU 26) states that *"only the most progressive families in Katungu give land to their daughters".*

the residents consider themselves as separate households. While talking to water users[106], by separate households they mean having separate income source and separate kitchen for food. Though being separate households, there are families[107] in Katungu which are hydraulically connected, in the sense that they share the same piped water connection. The underlying reason is either these families consider the entire process of applying for a new water connection tedious or the initial deposit fees too expensive.

Based on the interviews with water users who are hydraulically connected to their neighbours often it was noted that the monthly water bill usually is either paid by the eldest brother or by the father[108], whoever applied for the connection. In places where the water bill is usually paid by the eldest son or the father, the key to the tap lock is usually kept by them. The family members usually have a mutually decided fixed time in the morning and in the evening when all the family members fetch water from the tap and store it in jerry cans. Apart from this, whenever someone has to take water from the tap, they go and ask the key from the respective person. If in case he goes outside, he hands over the key to one of his family members. Though during my interviews the water users described to have a good relation with their neighbours, it is still unclear to me about the arrangements of accessing water from the tap when two or more family members were having a disagreement. The issue need not be related to water but in my opinion such disagreements could potentially affect the daily practices of water users accessing water from the tap.

Katungu as an area also has water users who stay as tenants and it is observed that often these users[109] use a common water tap (see Figure 21) provided by the landlord. In such cases the bill is equally shared by all tenants, collected by the landlord, who then pays the bill to NWSC. In cases of hydraulically connected water users, be it with relatives or tenants, it is observed that the piped water supply tap is mostly located in the courtyard shared by the families fetching water. The water users make sure that their families are the only ones using the particular connection by locking the tap and the meter using a tin box. With respect to the hydraulically related families renting out a place, the key to the box is *"usually kept with one of the tenants, preferably kept with the relatively old women, who are mostly around home or in the worst case scenario would be farming in the nearby field"* (in conversation with Erin[110] who shifted to Katungu seven years ago). Erin shifted to Katungu to be near to the Katungu primary school, where she is a teacher. Erin's landlord stays in Kampala and the water bill is collected by Erin's neighbour who has been staying as a tenant over the past fifteen years now.

[106] WU 11, 12, 16, 18, 21
[107] WU 8, 11, 12, 15, 16, 18, 21
[108] WU 8, 16, 18, 21
[109] WU 2, 4, 6, 8
[110] WU 6

Figure 21: Tap shared by families in Katungu

6.2.2. Unreliable water supply and associated risks

As observed from the field study currently most of the water users[111] in Katungu have access to piped water supply from NWSC. While talking to the water users in Katungu it was noted that the piped water supply is not reliable in terms of continuity of supply. It is a common recurring incident, at least once or twice a month when the piped water supply is cut off, usually for a few hours varying from an hour to even six hours in some cases[112]. The cut off frequency is much higher during the dry season when the Nyaruzinga Wetlands dries up. With respect to the water users located on higher elevations they face this issue throughout the year irrespective of the season[113]. Emphasizing on this unreliable characteristic of water, Enoke[114] a retired army official and an active member of the village committee states that *"one never knows when there will be water in the tap and when it will be gone"*. This characteristic of piped water supply leads the water users to either depend on alternate sources of water or take measures such that the piped water is still made available to them even when the distribution supply is cut off. In Katungu piped water supply is not only made available to water users by the means of distribution mains and pumps installed by NWSC but also by storage devices at household level. Storage devices such as overhead tanks, tin drums and jerry cans are at the crux of connecting water users to the piped water supply.

Often it is seen that the high income households[115] have the piped water supply connected to overhead tanks. The water from these overhead tanks is then supplied across to all water usage

[111] WU 1, 2, 3, 6, 7, 8, 9, 10, 12, 14, 15, 16, 18, 19, 22, 23, 24, 25, 26
[112] WU 1, 2, 3, 8, 9, 11, 14, 15, 16, 18, 19, 22, 23, 24
[113] WU 2, 5, 19
[114] WU 5
[115] High income households have been defined in the methodology section. Kindly refer to Box 1.

points like in the bathroom, kitchen and washing areas. While speaking to water users[116] having overhead tanks it was observed that overhead tanks is a mitigation strategy adapted by the users to avail continuous piped water supply. Usually overhead tanks are common amongst families having multiple source of income. Mostly these water users belong to families with the male head of the family is either working in the town centre or in Kampala and often the female counterpart is found managing household activities and practicing agriculture. While the high income users use overhead tanks as a risk mitigation strategy, the storage practices change as we move down the economic status of water users. The middle income users[117] of Katungu are seen storing water in tin drums of 120 litres capacity (see Figure 22), whereas the low income users[118] store water in jerry cans as mitigation strategy to deal with unreliable water supply from the piped network.

Figure 22: Overhead tank (high income household); 100 litres capacity tank (medium income household)

The water users claim to clean the overhead tanks once every six months or once every year[119]. However, while talking to the NWSC plumbers and the manager, it was pointed out that often the water users do not clean the storage tanks for more than one or two years. This results in the water users receiving brown or 'dirty' water. Often it happens that the water users[120] relate brown piped water to NWSC's inefficiency. Responding to this the branch manager[121] of NWSC, Bushenyi-Ishaka states that *"it is not the corporation's duty to clean the tanks. Our job is limited only to the household meter connection and the pipeline until the household premises. After that it is the customer's duty to manage water in their house. But often we receive complaints that the water supplied is dirty and we are blamed for it. On inspection it is found out that mostly the water is dirty because of the storage tanks and not because of rusted distribution lines* (which are present in certain areas of the town). *From our side we carry out*

[116] WU 2, 3, 5, 25, 26
[117] WU 1, 9, 10, 17, 23
[118] WU 5, 6, 7, 8, 11, 12, 14, 15, 16, 18, 19, 20, 21, 24
[119] WU 1, 2, 3, 22, 25, 26
[120] WU 2, 3, 5, 9, 22, 23
[121] NWSC 4

radio campaigns informing the customers that they should clean their storage tanks once every six months, but eventually it is up to them to clean their tanks".

With respect to the unreliable water supply, also the data collected from NWSC call centre located in Kampala, which receives customer complaints via a toll free number indicates that 22% of the complaints registered (N = 217) over the last year (Nov, 2016 – Oct, 2017) are related to unavailability of water in Bushenyi-Ishaka. Owing to this unreliable characteristic of piped water supply, analysing the complaints often it is observed that the water is not there for hours and during the summers the duration can extend up to days. Such interruption in piped water supply forces water users to rely on alternative sources and makes them vulnerable to risks associated with these sources, but the question remains is "are all water users vulnerable to such risks?" To answer this I will compare and contrast on narratives of water users coming from different socio-economic background in Katungu.

Talking to Florence[122], a school teacher who practices farming, while her husband practices carpentry in the town centre has been using piped water supply for the past ten years now. During interrupted piped water supply she uses her car to fetch water from the borehole located near Bweranyangi Secondary School in the neighbouring area. If she is lucky she would not find a long queue near the borehole. However, mostly she needs to wait for more than 30 minutes. Managing time for her own school in the morning and farming in the afternoon, usually Florence is unable to spare much time waiting in the queue. As an alternative Florence usually drives her car to a farther located spring in Nyakabirizi division or just buys a 20 litres bottled water for 11,000 UGX. Florence explains that she only drives up to Nyakabirizi spring or buy a bottled water only when there is no water at home and she is in a hurry to go to school. Usually Florence's family has a housemaid who helps with all the household activities such as mopping, washing dishes and also fetching water from the borehole. However, at times the housemaid also helps in her husband's carpentry shop and it is only then when Florence is forced to fetch water by herself. Though Florence claims that the borehole water is better than the piped water supply owing to the colour of water, a recent study done in Bushenyi-Ishaka on water quality suggests differently. According to L. Muhangane et al. (2017) states that the faecal coliforms present in the water sample of Bweranyangi school borehole is 16.83 CFU/100 ml. Comparing it with the WHO drinking water quality standards (WHO, 2017), which states that potable water should not have any faecal coliforms present in it, water users in Katungu *"drinking such* (from the borehole) *untreated water are at a risk of waterborne diseases"* (L. Muhangane et al. 2017, pg.: 1006). In this instance Florence as a water user depending on borehole water is not only exposing herself to the vulnerability of waterborne diseases, but at times depending on bottled water also increases her financial burden.

Even though water users such as Florence, belonging to high income households are vulnerable towards water related risks such as waterborne diseases, they can often avoid the hassle in accessing the alternative sources. From the water users interviewed, it was observed that all high income households have housemaids[123] who are the ones fetching water from the nearby protected springs. This enables the water users in saving time which they can utilize for other activities, as in the case of Florence for schooling and farming. While alternatively speaking to

[122] WU 3

[123] Families having housemaids usually pay them 80,000 – 100,000 UGX per month along with their food and stay.

Ire[124], who is a single mother of four children and depends only on subsistence farming as a source of living, she explains that the *"world was coming to an end during the dry season of last year. There was no water in the taps and very limited water in the springs. The spring water is very slow and I had to wake up at 4 in the morning to avoid standing in the queue to fetch water. Sometimes when I am not well or have to work on my farm I call my son who stays just next door and ask him to fetch water from the Kazurugo Lake located in the centre of the municipality. He takes his boda-boda and fetches water for me. This does not only happen in the dry seasons, even throughout the year the tap water at times suddenly vanishes in my courtyard. I have to walk down to my neighbour's place, downhill from my place to fetch water from their tap"*. Ire also explains that earlier while she owned a small restaurant in the town often there were times when she could just pay 500 UGX to a boda-boda driver who could fetch a jerry can of water for her. But now that her mother got sick and could not work on the farm anymore, Ire had to close her restaurant to take over farming and look after her mother and her kids. Now she cannot afford to spend 500 UGX every time to fetch water from the spring and has to depend either on her personal relation with her neighbours for accessing water or fetch it by herself.

Like Ire there are other water users in Katungu who opted for piped water supply so that they could save on time and utilize those extra hours either for farming[125] or for other household activities or to avoid their children wasting time on fetching water, so that they could focus on school[126]. However the unreliable water supply forces the water users to fetch water from alternative sources such as protected and unprotected springs. While for the kids who are the most common carriers of water in Katungu, even though there is the distance involved and physical stress embodied by them, fetching water is a 'fun activity' for them. Speaking to few such kids[127], they state that they are very excited every evening while walking down to the spring along with their friends.

With respect to the water users who are also farmers by profession or working in the town centre are more concerned on the time lost in fetching water which they could have utilized to work. The condition is worse during the peak hours (mornings and the evenings) of dry season, when there is a long queue for collecting water. Talking to Juliet[128], who is a single mother of two and a farmer, she says that she cannot send her kids to fetch water from the spring during the dry season because *"often there are people coming to collect water for their business purpose. They sell each jerry can of water for 500 UGX. During this time they chase off the kids and do not give them a chance to fetch water. Moreover, often there are quarrel among water users regarding their position, as they book their position in the queue by placing their jerry cans and often there are misunderstanding and argument among the users. Eventually I have to leave farming and go there to fetch water"*. In this scenario the risk is in terms of opportunity cost for the water users to fetch water from alternative sources. The risk here is not only limited to the physical fatigue the water users experience or the emotional stress they are exposed to while engaging in an argument, but it is also about the time a water user is spending

[124] WU 19
[125] WU 1, 2, 8, 9, 10, 15
[126] WU 12, 16
[127] In conversation with WU 16's kid and his friends
[128] WU 22

to fetch water and losing out on generating income. Highlighting this Nabos[129], who is a boda driver in the town explains that every time he goes to fetch water from the spring he losses almost three to four trips per day. Even though Nabos does not need to pay any tariff for a jerry can of water from the spring, sometimes he spends almost an hour fetching water. In that hour Nabos could have facilitated at least four customers and even more if lucky. Based on experience during my field research typically a boda ride in the town would cost about 1,000 UGX. Usually Nabos fetches two jerry cans of water from the spring and in that sense he is giving up more than 2,000 UGX for a jerry can which he could have earned from the trips.

Along with the above mentioned risks which water users in Katungu irrespective of their socio-economic status are exposed to, there is also the risk related to poor quality of water. Water samples taken from a protected and an unprotected spring in Katungu (see Figure 23) indicates presence of faecal coliforms in it. Faecal coliform bacteria are one of the main reason for waterborne diseases such as diarrhoea and typhoid (L. Muhangane et al. 2017). Water quality samples from a protected spring in Katungu indicated faecal contamination level of 3 CFU/100 ml and the unprotected spring had coliform counts of 7 CFU/100 ml[130]. The presence of faecal coliforms in the water is beyond the WHO (2017) and Ugandan standards (UNBS, 2008), which states that there should be no faecal coliforms present in drinking water, suggests that the spring water is unfit for potable consumption. The underlying reason behind such poor quality of spring water can be mainly attributed to the improper sanitation facilities in the area. In discussion with the Bushenyi District Water Officer it was noted that most of the pit latrines in Katungu and in general in the entire town are unlined pit systems with direct possibility of the faecal matter contaminating the ground water. Also in discussion with one of the water users[131] in Katungu it was observed that once a pit is filled, manual emptiers are called to empty the pits. These emptiers usually dig a pit near by the existing pit latrine and empty the faecal matter from the pit latrine into the newly dug pit. This pit is then covered up with soil so as to increase the fertility of the land. However, as per the national guidelines on protection of water source for point water supply system, there should not be any pit latrines, septic tanks or soakaways within 80 meters distance of the spring (Ministry of Water and Environment, 2013). Along with faecal contamination from the pits, with respect to the unprotected springs, these springs are mostly located near open farmland where often cattle grazes. Contamination from cattle manure, especially as a result of runoff during the rainy season is also a factor contributing to the pollution of unprotected springs.

[129] WU 13
[130] These sample tests were carried out during dry period under the supervision of NWSC Bushenyi-Ishaka Water Quality Officer and followed the standard procedure as prescribed by the NWSC Quality Control Department.
[131] WU 26

Figure 23: Protected spring and an unprotected spring

However that being said, it is evident from the narratives that the distribution of risks is not proportionate amongst the water users from high income households and other users of Katungu. While high income households by the virtue of their economic status can afford to have a housemaid and avoid the hassle involved in accessing water from alternate sources, be it saving on time and utilizing it for some other activity or embodying the physical risks involved in fetching water. Also looking at it from the perspective of risk mitigation strategies, the high income households can afford to have overhead tanks. This enables them to sustain themselves from risks related to depending on alternative sources, relatively for a longer duration as compared to the water users depending on drums and jerry cans for storing water.

6.2.3. Quality of piped water supply and associated risks

Talking about drinking water source in Katungu, even though majority of water users interviewed have access to piped water supply, a percentage of them replied that *"we do not use the tap water for drinking purposes"*[132], even after boiling. Water users in Katungu are used to drinking water from the spring before piped water supply was introduced in the area and often are noticed to have the perception that tap water is bad for health. Water users[133] also claim to get sick once they consume tap water, either getting flu, mouth ulcers or diarrhoea. In this sense the risk of getting exposed to such diseases is produced as a role of the water user's perspective towards using tap water, while in reality there might be various other reasons leading to such symptoms. For instance, while talking to a water user[134] she pointed out that she suffered from flu, headache and had ulcer in her mouth when she initially started drinking tap water. Though she did not visit any doctor she associated the disease to water as the disease stopped when she stopped drinking the tap water. Similarly in Baron[135]'s family everyone

[132] WU 3, 9, 25, 26
[133] WU 18, 25, 26, 21
[134] WU 21
[135] WU 18

including his son's family depends on the nearby protected spring for drinking water. Baron argues that *"I stopped drinking tap water, as I got dizzy and was not feeling well* (he used to get allergy and flu) *in the initial days after getting the connection. After that I stopped drinking tap water and also told my sons not to drink water from the tap".* In such cases, the perception of 'tap water is bad for health' is passed on to the next generation and often the younger generation end up not knowing the reason why they are not drinking tap water.

While such reasoning was observed in most of the families not using tap water for drinking, there were others[136] who stated that the reason for them not drinking tap water is because of the physical characteristics of water such as colour, taste and smell. Water users identify piped water as mostly brown in colour, specifically if compared to water from the protected springs or rainwater. Water users[137] also stated that the tap water forms a brown layer of froth when boiled. Concerned with the colour of the water, a professor[138] of Kampala International University, Bushenyi-Ishaka does not use the tap water to wash his white shirts. With respect to the 'weird' taste of the water, water users[139] avoid making 'chai' (tea – which is a common drink in Uganda) with tap water as it spoils their tea.

Figure 24: Water from a protected spring (left most) vs tap water (right cup and in the bath tub)

While talking to the Water Quality Officer[140] and plumbers of Bushenyi-Ishaka, he pointed out that the quality control department in Bushenyi-Ishaka does conduct monthly tests on the colour quality of the treated water and the apparent colour of the water is 0 Pt-Co at the outlet of the treatment plant. However according to the water quality officer, the brown colour (see Figure 24) of water in some places is attributed to the rusting in the distribution lines. These places are mostly where the pipelines were installed in 1980s by the Ministry of Water and Environment, before NWSC took over and they are old and rusted. However, mostly in the areas where the connection is relatively new and plastic pipes have been used, the brown colour of water is attributed mainly due to the quality of the storage devices. With respect to the smell and the taste of the water, even though the quality control department of NWSC does suggest to carry

[136] WU 3, 5, 12, 23, 25, 26
[137] WU 3, 5, 9, 23, 25, 26
[138] WU 26
[139] WU 9, 10, 19, 25, 26
[140] NWSC 5

out ‘smell’ (via threshold odour number) and ‘taste’ (via taste-rating test) tests on the final water supply sample, no such tests are being carried out in the Bushenyi-Ishaka water treatment plant[141]. Moreover, the water treatment process and the water quality parameters assessed are replica models from big towns like Kampala and Mbarara to the small towns such as in Bushenyi-Ishaka. Ideally this should be context specific and depend on the quality and source of the raw intake water. For instance in Kampala, Lake Victoria is the source of water supply, whereas in Bushenyi-Ishaka the raw water source is the Nyaruzinga Wetland. The water from a fresh water lake is different from that of water from wetlands. Wetlands are usually warm and moist environments which are ideal for algae, bacteria and fungus and moreover the decaying vegetation adds onto the nitrogen and phosphorus content of the water quality, which in turn reduces the dissolved oxygen resulting in the smell of water. Even though these aesthetic parameters do not pose any public health threat, from the interviews it is evident that these are one of the most essential parameters for customer satisfaction. However, these parameters are not measured in Bushenyi-Ishaka water treatment plant and thus the water quality monitoring is not contextualized.

With respect to the chemical and biological parameters of piped water, even though the data[142] from the NWSC Bushenyi-Ishaka water quality department suggest that the water quality at the treatment plant outlet is within the national and international prescribed standards, there have been research studies carried out in Bushenyi-Ishaka which indicates that often in areas even the tap water is contaminated. The presence of faecal coliforms in tap water is mostly attributed to the leakage of pipelines as often the pipelines in certain parts of the town are corroded or leak due to low density polyethylene plastic (L. Muhangane et al. 2017). Furthermore this is also attributed as a result on lower free residual chlorine in the tap water (L. Muhangane et al. 2017). As also explained in section 6.2.2, presence of faecal coliform in potable water makes water users vulnerable to waterborne diseases. In Katungu as observed from interviews, all water users adopt to boiling the water before drinking as a risk mitigation strategy, be it from the tap or from protected or unprotected spring. While boiling was a common practice among water users, filtration by tea strainer as a practice was also observed among water users[143]. Filtration was carried out mostly to remove the ash particles from firewood which is usually used to boil water.

6.2.4. Piped water supply – a blessing

Even though most of the water users complain about the unreliable water supply and the quality of water being poor, in overall the water users of Katungu perceive piped water supply as a ‘blessing’. As a female water user[144] explains *“prior to having piped water supply everyone in Katungu had to travel for long distances to fetch water from the springs and unprotected springs. At least now we have water at our door step and we save a lot of time. I can spend much time on farming and my kids can go freely to school without spending any time on fetching water. Now my kids are going to boarding school”*. The piped water supply is mostly used by water users for their domestic uses be it for washing clothes, cooking or bathing. However the major difference which piped water supply has brought in the lives of water users of Katungu

[141] NWSC 5
[142] As of daily data captured during the month of November and December, 2017.
[143] WU 2, 10, 17, 22, 23, 25, 26
[144] WU 12

can be seen in their sanitation and hygienic practices. Speaking to a native resident[145] who has been staying in Katungu for the past sixty years states that before 2004, all water users in the area were using squatting toilets connected to a pit. With the introduction of piped water supply water users[146] have now shifted towards using flush toilets connected to septic tanks.

Along with this improvement the introduction of piped water supply has also been of monetary benefit for certain water users. During my field research in Katungu it was observed that majority of the water users interviewed apart from the ones staying as tenants[147] in the area practice farming. While in most cases the water users practicing subsistence farming depend on rain water, often the water users[148] producing for the market, especially during dry season depend on additional water either from the nearby wetland or the tap water.

However, the use of tap water for agriculture was predominantly seen among the female led households who are primarily producing for the market. Talking to one such water user, Genelas[149] a mother of four kids, uses the tap water for growing mushrooms (see Figure 25), she explains: *"I am the only person in Katungu growing mushroom. My husband works in the army and stays in Mbarara. The army officials often organize workshops for the wives of the officer. Generally these workshops are oriented towards having a better lifestyle and how to increase the family income. I learned about mushroom harvesting in one such workshop. Growing mushrooms are way more profitable than growing cabbage or tomatoes. I can sell a kilogram of mushroom for 100,000 UGX. The only requirements for growing mushroom is mushroom seeds, cotton, a dark room and daily supply of water. I need to water the cotton and the seeds twice every day and I need almost 2 litres of water for every 500 grams of mushroom. However since I stay alone I do not have the time to travel to the wetland for collecting water and simultaneously take out time for farming, taking care of my children, cook and carry out daily household chores. I prefer using water from the tap located in my courtyard for growing my mushrooms"*. Another such water user Juliet[150], whose husband passed away six years ago uses the tap water for cultivating her banana plantations spread over an area of more than an acre. She states that *"the tap water is very convenient for watering my plants. I am in no position to fetch jerry cans of water from the springs to water my plants. I add extra water to my plants mostly in the dry season. During the rainy season the rain water is sufficient for my plants. Earlier when my husband was alive, he used to use the spring water for irrigating the plants. He fetched it himself or sometimes hire people to fetch it for him. Currently I am paying a monthly water bill ranging between 100,000-120,000 UGX per month. It is high but I do not have any issue in paying the bill. I can pay it from selling my matooke* (banana). *This is the only source of income I have and I am able to pay my kids school fees by this and also run my family"*.

[145] WU 26
[146] WU 1, 2, 3, 9, 10, 22, 23, 25, 26
[147] WU 4, 6
[148] WU 5, 7, 8, 15, 22, 25, 26
[149] WU 7
[150] WU 22

Figure 25: Harvesting mushrooms using tap water

The above narratives reinforces the water users positive outlook towards piped water supply and this is also a reason that even though if there is water shortage in the pipe or the water is muddy in colour, very few people register complaints with the NWSC office. However, the ones who register a complaint with the office, the complaint follows the procedural path to be resolved from the front desk office receptionist to the engineer to the technical people on the ground. For instance it took NWSC almost a month to fix a broken tap, which resulted in increased bill for the water user[151] as water was continuously leaking from the tap. On the other hand, there are also instances when complaints get resolved due to personal relationships between the water users and the NWSC staff members. If the water user knows a certain employee or the water user is a local leader the complaints do not follow the designated route of passing by the front desk and getting registered in the complaints diary. The staff directly then guides the complaint to the technical staff on ground (plumbers) and the problem gets fixed just within one or two hours[152]. Thus here we see how often the formal official procedures and 'informal' rules in use are interlinked and how issues related to water service is delivered as a result of personal connections and informal network between the NWSC staff members and the water users.

[151] WU 12
[152] WU 14

CHAPTER 7

Discussion and Conclusion

In this chapter I draw a comparative analysis of water related risks as identified in Masya (Chapter 5) and Katungu (Chapter 6). I specifically focus on how risks are produced and distributed in Masya, the most vulnerable area and then I attempt to show how the flows of water are closely connected in town. On this basis I explore how the small town characteristics affects the risk distribution among different actors. I conclude by discussing how both 'rural' and 'urban' dynamics related to water management coexist in Bushenyi-Ishaka. Lastly, I end this chapter with my reflections on this research.

In this research study I used political ecology to study how risks are produced and distributed in the context of a small town, focusing mainly on the connection between society and natural resource, in particular water. Political ecology allowed me to engage with the water users in Bushenyi-Ishaka to understand their personal histories and daily water use practices and arrangements through which they consciously or unconsciously are exposed to water risks. Specifically in Bushenyi-Ishaka the study was carried out in Masya, a 'rural' area located in the peripheral parts of the town which is not connected to the piped water supply, and in Katungu, an 'urban' area located in the central part of the town having access to piped water supply.

Comparing both the areas of study it can be seen that water users of Masya are vulnerable to water related risks which is mainly produced as a result of not having piped water supply. The water users in Masya are currently depending on protected springs, unprotected springs and sometimes directly consuming water from the wetlands. While this is the case in Masya, generally in Katungu the vulnerability of water users towards water related risks is relatively less (for detailed description of water risks see Chapter 5 and Chapter 6). Thus this indicates that access to piped water supply affects the risk distribution between different localities. From the discussions with NWSC staff it was observed that the geographic location of a place is one of the important factors determining the area's connectivity to the main water line. However, the irony remains in the fact that, even though Masya being located only a few hundred meters away from the NWSC main water supply tank (see Figure 4), conveniently at a lower elevation which would make water supply to this area relatively simple, it is not connected to the piped water network. Thus based on the empirical data collected, here I seek to draw attention to how decisions are made in allocation of piped water service and how does it affect the vulnerability of water users in Masya?

Changing from a town council to a municipality, Bushenyi-Ishaka saw an expansion of piped network from 5 kilometres in 2002, when NWSC took over water management in the town, to currently 128 kilometres of piped network distributing water. However, much of this development has been focused in the central parts of the town where the administrative offices and the town market is located, Katungu being an example of such an area. As seen in Chapter 5, there is a discrepancy between the NWSC policy on paper and practice in determining which

neighbourhood gets connected to the piped system. In large cities of Uganda (Kampala and Mbarara) which were initially taken up by NWSC, followed a supply-driven approach irrespective of whether there was a demand from the residents. However, to achieve the national target of providing areas with safe water and simultaneously sustaining the water service provisioning especially with respect to the operations and maintenance of water services was a challenge. In order to overcome this challenge, the Ministry of Water and Environment in 1990 introduced the overall paradigm shift from supply-driven to demand-driven approach (DWD 2001; 2004; 2011 as cited in Naiga et al, 2012). Following this shift currently NWSC in Bushenyi-Ishaka is following the demand-driven approach where demand is promoted among the residents by campaigns and via support from local leaders. Water connections are provided mainly based on requests of neighbourhoods wanting to be connected to piped system. The demand driven approach is also followed to ensure *"community mobilization and stakeholder participation"* (NWSC, 2015; pg. 1). Thus in this approach the chairperson of the neighbourhood plays a crucial role in the process of getting connected to the piped water supply, either by the virtue of the chairperson signing for a new application or for creating awareness among the residents on the benefits of using piped water. Though this relationship between the chairperson and the NWSC staff is very crucial in getting connected to the piped system, the approach is differently applied in different areas. For instance the local chairperson of Katungu is offered 'Kyamushana' (small money for lunch or tea) as a token of respect by a National Water staff. In contrast the local chairperson of Masya is seen as 'dormant leader' by the NWSC staff. Also from my conversation with the NWSC staff members who are responsible for generating awareness among residents of Bushenyi-Ishaka and mobilizing them, the residents of Masya are perceived as irresponsible and are claimed to be alcoholic. While the water authorities relate the residents of Masya as unreliable, the local government representative for the ward under which Masya is administered, considers residents of Masya (and people in general who depend only on agriculture without any educational background) as 'common people' and people with educational background (beyond primary school) as 'elite people'. Though the perception of the local leader does not directly provide a link to why the residents of Masya are deprived of the basic services, it does relate to how people are discriminated on the basis of their perceived social background. Also a few inhabitants of Masya feel that they are deprived of the water service since they are considered 'outsiders' and are neglected, thus questioning how this is a result of ethnic discrimination in which they are considered as a lower category of citizens in the town than others. This perception of being outsiders is also evident from the origin of the name 'Masya' meaning newcomers in the local language, which was given to them by the natives of Bushenyi. Even though being identified as newcomers, this is an arbitrary characterization considering that the residents of Masya migrated to Bushenyi-Ishaka in 1870s. Thus here we can see how the 'hydraulic citizenship' of the settlers of Masya (see also Anand, 2011) and hence the distribution of risks is influenced by the perception of NWSC staff in key positions and the local chairperson. By drawing attention to the social background of water users, I try to show that risks in Masya are not only produced as a result of the geographic location or the bio-chemical properties of water, but rather is also a product of the socio-political configurations.

Even though the water users from Masya are exposed to risks related to water, the degree of exposure is different for different users. For instance, often the water users who are educated on crop water requirements and have easy access to the water source are observed using water for irrigation, thus maintaining their socio-economic status as compared to other users who are

often exposed to food insecurity as a result of shortage of water for subsistence farming, especially during the dry season (for more details see Chapter 5). Also, mostly it was observed that boiling water is the only risk mitigation option available for treatment of spring water. However, this only is practiced by those who have the financial capability to buy firewood. Such inequity at household level was not only observed within Masya, but also exists in Katungu, where the economically advantaged water users, due to the availability of either overhead tanks, cars for transport, money to buy bottled water or having the economic ability to afford housemaids, are relatively less exposed to water risks as compared to other water users (for more details see Chapter 6). Comparing and contrasting both areas, it can be stated that the socio-economic position of water users also influences the risk mitigation strategies adopted by them.

Risks related to water in Masya as a result of water users depending on protected and unprotected springs are also influenced by the policy structures in place and how these structures affect the interactions between society and nature. For example, in the case of protected springs or unprotected springs, the Land Act delineates any 'natural spring' as a government property and the Ministry of Water and Environment prescribes a strategy for the protection of such sources, specifically for the protected springs. Firstly, the question lies in defining the term 'natural spring' which are to be treated as a Government property. Here it can be questioned what is considered as natural or what is considered as artificial and what are the implications for ownership if people create a spring? Secondly, even though the land act allocates the springs as a public property, the surrounding land still belongs to a private owner[153]. As such following the protection guidelines the owner can carry out any activity as long as it is not polluting the water source. Owing to this regulation even though in case of the springs located in Masya the land owner is not practicing any contaminating activity, but often the springs are surrounded either by eucalyptus or banana plantations. Eucalyptus in many African countries have been identified as a potential risk for reducing groundwater level (FAO, 2009). While some of the residents in Masya are aware of this, most of the water users are not aware. This is also due to the fact that groundwater is not visible to the water users. Since aquifers are connected in often unknown ways, until a detailed study is carried out, the impact of eucalyptus plantations cannot be directly spatially associated with reducing groundwater levels. That being said, even if an action is supposed to be taken on applying a risk mitigation strategy for this, the question lies is who is going to be responsible for implementing such strategy? Is it the NWSC's responsibility who says that *"springs are not under their mandate"* or is it the Bushenyi District Office's responsibility who are of the opinion that *"even though we have built it, since NWSC has taken over the town, managing its water resources is no longer our job"* or is the Municipality responsible for it, who states that *"since NWSC is present in the area, we do not get enough fund from the central government to manage our water resources"* or is it the responsibility of water users themselves who often do not have the fund or a dedicated group to maintain the spring.

In the above paragraphs, I showed how water users in Masya are vulnerable towards water related risks, which is produced not only because of geographic factors or for depending on alternative sources but also due to socio-political factors. I also showed how inequities in

[153] Even though the surrounding land is a private property, during my field visits it was seen that mostly water users do not face any issue in accessing the spring via the common path which is usually followed by the water users even if the path crosses someone's private land.

distribution of risks are differently experienced at household levels. However, at the town level it is not only in Masya, where the scenario is like this. Looking at the piped water supply network of Bushenyi-Ishaka as shown in Figure 4, it can be seen that it is mostly the peripheral parts of the town which are not connected to the piped water network. These areas are particularly dependent on alternative sources such as protected and unprotected springs and even the wetlands. With rapid population growth, urbanization and presence of agriculture in Bushenyi-Ishaka, findings from Masya just highlights a portion of the complex scenario of competition for water resources. With the typical characteristic of this small town in terms of its close proximity between the residential areas and the Nyaruzinga Wetlands, which is the raw water source for the town water supply, makes it even more important to understand how the flows of water in the town are connected. Highlighting on this, now I will attempt to show how the small town characteristics, specifically rapid urbanization, natural resource management system are interlinked with the agricultural practices and finally emphasize on how these are affecting the production and distribution of risks.

Analysing the field data, it can be concluded that it is not only the rapid population growth and urbanization that makes this small town particular, but it has also to do with how this associated process of urbanization merges with the rural dynamics of the area and how historically natural resources have been managed. Over the past ten years, the population growth rate of Bushenyi-Ishaka is 7.5 % which is almost double the annual growth rate of the capital city of Kampala. Even though the rapidly growing population could be attributed as a characteristic particular to this small town, there are also other large towns in Uganda such as Mbarara, Mukono, Hoima and Massindi (UBOS, 2014) which share similar annual growth rate percentages. Despite this rapid urbanization, agriculture which is often associated to be a typical rural form of livelihood (Bah et al., 2003; Cleophelia and Carlo, 2014) is still very widely present in Bushenyi-Ishaka, be it in Masya located in the peripheral parts of the town or be it in Katungu located in the centre of the town. The farming practices is continuously affected by the ongoing transactions between Bushenyi-Ishaka and the nearby urban centres such as Mbarara (50 kilometres away) and Kampala (300 kilometres away). Highlighting the growing agriculture sector, as a small town Bushenyi-Ishaka can be characterized by the linkage between the existing rural characteristics and the ongoing urbanization process.

With respect to the land management system, even though by definition a municipality is considered an urban area (UBOS, 2013), in Bushenyi-Ishaka a mix of both rural and urban ways of land allocation co-exists. While the statutory form of land allocation is only practiced to a certain extent in the central parts of the town, residents in the peripheral parts of the town are still practicing the customary form of land allocation. The customary system of land allocation practice (refer to section 5.2 for details) coupled with the rapid population growth has led to shortage of land to be allocated among the new generation. This often forces the residents to practice farming in the wetlands to sustain their family's food needs. Also because of the close proximity of the wetlands and easy unrestricted access, water users in Masya and to less extent in Katungu often use water from the wetlands either for grazing their cattle or even sometimes for daily household activities. The ongoing encroachment of wetland is also visible in Figure 7, which shows how certain peripheral parts of the wetlands have changed over the past years. Such activities resulting into encroachment of the wetlands are claimed to be more commonly practiced by residents whose only source of livelihood is subsistence farming. While this encroachment is an ongoing activity, it is one of the major factors contributing towards the

drying up of Nyaruzinga Wetland, which is the raw water source for the town. While this may not affect the water users depending on protected or unprotected springs, it has a direct impact on the water users depending on piped water supply. Thus the land use pattern across the wetland area affects the flow of piped water supply. The better-off water users in the centre of the town being exposed to risks related to unavailability of piped water supply is thus produced at least in the lower socio-economic class areas of Bushenyi-Ishaka which are often not connected to the piped water system and mainly reside in the edges of the town. However, that being said, it is not only the lower socio-economic areas of Bushenyi-Ishaka producing such risks. As seen in the case of Katungu, certain water users producing for the market also depend on the nearby wetland for accessing water for irrigation, especially during the dry season. Often the water users are unaware about how the encroachment of wetlands is affecting the water level in the wetlands and thus affecting the distribution of piped water supply in the town. Understanding how the flows of water are affected, here this study shows how piped water supply is accessed not only as a result of various socio-technical arrangements made by the stakeholders involved, but also depends on the actions of actors who are not involved in the water supply system, and are knowingly or unknowingly affecting the water supply distribution. This also emphasizes on how excluding neighbourhoods like Masya from the piped system can no longer be ignored and needs to be connected to the piped water system as it affects other parts of the town too.

With the development from being a town council to a municipality, Bushenyi-Ishaka is continuously shifting from being a rural area to an urban centre. In this transition phase, here I would like to emphasize on how, Bushenyi-Ishaka as a small town is neither completely rural nor completely urban, rather lies at the rural-urban intersection, where both the rural and urban dynamics co-exist, specifically in terms of water management. I will do this by focusing both on the water infrastructure and the management of such infrastructure.

According to the National Water Policy currently residents of Bushenyi-Ishaka access water by a combination of 'urban' (piped water systems) and 'rural' (spring system) water supply technologies (see section 4.4.4). The protected springs in the town were mostly implemented by the Bushenyi District Water Office and by NGOs and other donor agencies. The ones implemented by the district office were done under the Rural Water Grant scheme before the town was taken under the jurisdiction of NWSC in 2002. Once under the jurisdiction of NWSC the town saw an expansion[154] of piped water supply throughout, same as that practiced in other urban areas such as in Kampala or Mbarara. Also during my conversation with the Mayor, representing the local government in the town and the Manager of NWSC, it was stated that the town is aiming towards the direction of having piped water supply for all its citizens and springs should only be used for non-potable uses.

This shift in technology from 'rural' to 'urban' systems for water supply also affects the management approach. For instance, in Masya, water users depending on springs are expected to follow the more conventional 'rural' approach with committees relying on collective action to maintain their water source. This 'rural' approach is assumed to be based on and enhancing stronger ties between people. As result of the rapid urbanization these water users experience a

[154] The initial 400 connections in the town were metered and currently NWSC is serving piped water supply to 3,700 connections in the town, with an average growth rate of more than 300 connections per year (2014-2017).

relatively dynamic membership involved in the use and maintenance of the collective source, as new people mostly settling down in the peripheral parts of the town. Whereas in Katungu, due to the 'urban' management strategies based on private water supply connections water users face relatively less impact of increasing population and are relatively less dependent on other water users of the area. But the main questions are does the 'rural' approach work in the urbanizing context of Masya and what are the implications for social cohesion when the 'urban' approach is followed in a still quite rural context of a small town?

These questions highlight the complex nature of water management in this small town. With respect to adapting to an urban system in the context of a rural area, the piped water supply system in Bushenyi-Ishaka to a certain extent is a replica model of water management systems in other urban centres of the country and have not been contextualized. For example, in terms of water tariffs, the rates structure followed in Bushenyi-Ishaka is seven times the affordability rates as prescribed by the design guidelines of Ministry of Water and Environment (for details refer to Chapter 6). Additionally, it is also seen that how the high water tariffs charged for the piped water in the town forces certain water users in Katungu to opt for alternative sources of water, exposing themselves to the risks associated with them. Thus if water users in the central parts of the town, often with better socio-economic status cannot afford to have piped water supply, will the water users in Masya manage to pay for getting connected to the piped water network?

It is thus important to move beyond the binary assumption of depending solely on alternative sources or on piped water supply and to highlight on the paradox between demand-driven extension of the water supply system and the desire to get rid of the communal springs. The active drive from NWSC towards abolishing alternative sources, even though the sources are instrumental in risk mitigation of residents connected to the water supply system, is closely related to the business model of NWSC. For NWSC efficiency is measured not only in terms of quality of service delivery, but much attention is given towards the revenue generation[155]. In this business strategy followed springs are a source of free water for the water users, and thus is a competition for NWSC in 'creating' demand and generating revenue from in-house connections. In order to ensure water related risks are manageable for water users, either alternative sources need to remain available or services and costs related to piped water supply needs to be improved and contextualized to the small town dynamics of Bushenyi-Ishaka.

7.1. Reflections

Just like small towns being a transitional entity between 'rural' and 'urban' centres, I am also in the transition phase of becoming an interdisciplinary scientist from an engineer. Coming from an engineering background, the sole purpose of joining the Water Management and Governance programme here at UNESCO-IHE was to develop a more rigorous understanding towards the social science perspective on water management. Foraying into this new territory, initially it was a challenge to understand and apply concepts which go beyond the structured engineering approach and to adapt an understanding of how every issue is interlinked with other and how different actors are influenced and motivated. This would not have been possible

[155] As observed from the regular branch meetings and discussions with branch managers within the Greater Bushenyi Area.

without the continuous guidance and support from my mentor who is both a water engineer and a social scientist and could relate to my initial struggles.

Specifically, with respect to the concepts of 'agency' and 'bricolage' used in this research, during the proposal phase it was difficult for me to picturize how I would be using the concepts to study the daily water use practices. I knew the concepts, what it meant and have studied case studies on how and where they have been used, but only once I was on the field and started collecting and analysing my data it became clear to me on how agency of different actors are involved in the allocation and distribution of water or how bricolage as a process is ingrained in the daily water use practices. The use of concepts thus served the purpose of a lens to understand and make sense of what is happening in the field and why.

With respect to data collection and field research, the semi-structured interviews was relatively easy. Me being an outsider in Bushenyi-Ishaka, was perceived differently by different people. While for some I was just a foreigner who wanted to study about water management issues in the town and help improve NWSC's service delivery, for others I was a white guy with money. Also often during my interviews, especially ones with old water users me being an Indian helped start a conversation as either the water user or someone in the family was working in an Indian company or working with Indians during the British colonial period. However, the challenging part of conducting interviews was when it came to topics related to family disputes over water or any other issue, as I was worried of entering into the water user's personal space with too many 'why' questions related to his/her family and offend the water user. I faced similar challenge also while asking water users about the families who were polluting the unprotected springs. For instance, often water users were hesitant to answer questions related to which families were washing their clothes near the springs and polluting the water.

Delving on the selection of the most vulnerable area and the least vulnerable area, as also mentioned earlier in Section 3.4, even though I could have selected any two areas owing to the different socio-natural settings of particular areas, the selection criteria helped me get a preliminary understanding of how water is distributed in the town and how different people access and use water. Specifically with respect to the selection criteria of political representation and the social background of water users, it was initially done on the basis of perceptions of a few NWSC staff members. However, my experience during the four weeks of engagement with the residents of Masya does not adhere to the perceptions of the NWSC staff members. While the NWSC staff members perceived the residents of Masya as alcoholic and the local chairperson is 'dormant' in the sense of solving local issues and representing the area in the Municipality, during my engagement with the water users, the people of Masya were very knowledgeable on water and keen to advance water provision in their area. Most of the water users have a steady job, either it is farming or working in the town centre and were very supportive in sharing information with me, especially with me being an outsider. With respect to the local chairperson, he was very helpful in introducing me to the residents of Masya and was well aware about the geographic and historical background of the area. Thus my initial approach using the NWSC staff member's viewpoint was only helpful as an anchor point to locate the study areas. However, once I got introduced to the water issues from the water users perspective it helped me broaden my outlook towards the understanding of water stress in the area. This helped me develop the research study by being cognizant of the perspectives of different actors involved.

Finally, in hindsight, from this research ‘water risks’ as a concept has been useful to study both issues related to water quality and quantity and how these issues are differently perceived and distributed among various actors. Moreover, looking at water related risks served as an entry point to map out the interdependent flows of water and the associated governance processes. However, the same issues could also have been studied by looking at the daily water use practices of water users. In other words, the concept of risk was not a necessity to understand the issues water users face in the small town of Bushenyi-Ishaka.

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Appendices

Appendix A **Selection of areas – Matrix and Secondary Criteria**

Division	Wards	Cells	Type of connection	Weightage Points	Classification of areas	Weightage Points	Disease Count 2016 (Diarrhea)	Weightage Points	Total	Cells	Total Points	Ranking
Nyakabirizi	Ward 1	Katungu	NWSC	10	Urban	10	17	0.7424	20.74	Kashekye	-20.00	1
		Nyakabirizi	NWSC	10		10	6	0.2620	20.26	Kyakagina	-20.00	2
		Nshozi	NWSC	10		10	0	0.0000	20.00	Ryanshama II	-20.00	3
	Mazinga	Nyakahita A.	NWSC	10	Rural	-10	5	0.2183	0.22	Nombe	-19.96	4
		Irembezi	NWSC	10		-10	0	0.0000	0.00	Ihoza	-19.96	5
		Mazinga	NWSC	10		-10	8	0.3493	0.35	Ryashana I	-19.96	6
		Nyakahita B	NWSC	10		-10	5	0.2183	0.22	Masya	-19.91	7
		Nyamiko	NWSC	10		-10	11	0.4803	0.48	Kyandago	-19.91	8
		Rwakanyonyi	NWSC	10		-10	5	0.2183	0.22	Kyabumbaire	-19.56	9
		Igorora	NWSC	10		-10	1	0.0437	0.04	Irembezi	0.00	10
	Kibaare	Kibaare A	NWSC	10	Rural	-10	9	0.3930	0.39	Matyazo	0.00	
		Kibaare C	NWSC	10		-10	9	0.3930	0.39	Kamira	0.00	
		Bweranyangi A	NWSC	10		-10	8	0.3493	0.35	Kayojo	0.00	
		Bweranyangi B	NWSC	10		-10	8	0.3493	0.35	Kichwamba	0.00	
	Rwenjeru	Kyanamira	NWSC	10	Rural	-10	2	0.0873	0.09	Mabaare	0.00	
		Matyazo	NWSC	10		-10	0	0.0000	0.00	Rwandaro	0.00	
		Muhire A	NWSC	10		-10	1	0.0437	0.04	Bunyarigi	0.00	
		Muhire B	NWSC	10		-10	1	0.0437	0.04	Rurayo	0.00	
		Nshenga	NWSC	10		-10	2	0.0873	0.09	Twengoma	0.00	
		Nshenga B	NWSC	10		-10	2	0.0873	0.09	Ntaza I	0.00	
		Rwenjeru C.	NWSC	10		-10	2	0.0873	0.09	Ntaza II	0.00	
		Rwenjeru T/C	NWSC	10		-10	2	0.0873	0.09	Buhuma I	0.00	

Central	Central Ward	Central	NWSC	10	Urban	10	0	0.0000	20.00	Buhuma II	0.00
		Bwatongo	NWSC	10		10	2	0.0873	20.09	Igorora	0.04
		Rwemigogora	NWSC	10		10	0	0.0000	20.00	Muhire A	0.04
	Ward 11	Nyabicerere	NWSC	10		10	5	0.2183	20.22	Muhire B	0.04
		Ruhandagazi	NWSC	10		10	4	0.1747	20.17	Buramba I	0.04
		Rushinya	NWSC	10		10	1	0.0437	20.04	Buramba II	0.04
		Nyarwanya	NWSC	10		10	0	0.0000	20.00	Kyanamira	0.09
	Kyeitembe	Kyeitembe W.	NWSC	10		10	10	0.4367	20.44	Nshenga	0.09
		Kyeitembe E.	NWSC	10		10	10	0.4367	20.44	Nshenga B	0.09
		Tank Hill	NWSC	10		10	2	0.0873	20.09	Rwenjeru C.	0.09
Central	Ruharo	Kamira	NWSC	10	Rural	-10	0	0.0000	0.00	Rwenjeru T/C	0.09
		Kayojo	NWSC	10		-10	0	0.0000	0.00	Ruharo Central	0.09
		Kichwamba	NWSC	10		-10	0	0.0000	0.00	Rweibaare	0.17
		Kikuba	NWSC	10		-10	7	0.3057	0.31	Nyakahita A.	0.22
		Kyabumbaire	Alternative	-10		-10	10	0.4367	-19.56	Nyakahita B	0.22
		Mabaare	NWSC	10		-10	0	0.0000	0.00	Rwakanyonyi	0.22
		Masya	Alternative	-10		-10	2	0.0873	-19.91	Kashenyi I	0.22
		Ruharo Central	NWSC	10		-10	2	0.0873	0.09	Kashenyi II	0.22
		Nombe	Alternative	-10		-10	1	0.0437	-19.96	Barambah III	0.22
		Rwandaro	NWSC	10		-10	0	0.0000	0.00	Kikuba	0.31
	Bunyarigi	Bunyarigi	NWSC	10		-10	0	0.0000	0.00	Mazinga	0.35
		Rweibaare	NWSC	10		-10	4	0.1747	0.17	Bweranyangi A	0.35
		Kashekye	Alternative	-10		-10	0	0.0000	-20.00	Bweranyangi B	0.35
		Kyakagina	Alternative	-10		-10	0	0.0000	-20.00	Kibaare A	0.39
		Rurayo	NWSC	10		-10	0	0.0000	0.00	Kibaare C	0.39
		Twengoma	NWSC	10		-10	0	0.0000	0.00	Nyamiko	0.48
	Ryamabengwa	Gabikye	NWSC	10		10	0	0.0000	20.00	Nshozi	20.00
		Katungu	NWSC	10		10	0	0.0000	20.00	Central	20.00
		Mutojo	NWSC	10		10	1	0.0437	20.04	Rwemigogora	20.00
		Nyabicerere	NWSC	10		10	5	0.2183	20.22	Nyarwanya	20.00
		Rwibaare	NWSC	10		10	0	0.0000	20.00	Gabikye	20.00
		Ryamabengwa	NWSC	10		10	3	0.1310	20.13	Katungu	20.00

Ishaka	Ward III	Katungu	NWSC	10	Urban	10	0	0.0000	20.00	Rwibaare	20.00	
		Bugomora	NWSC	10		10	1	0.0437	20.04	Katungu	20.00	
	Ward IV	Cell C	NWSC	10		10	0	0.0000	20.00	Cell C	20.00	
		Cell D	NWSC	10		10	0	0.0000	20.00	Cell D	20.00	
		Bwegiragye	NWSC	10		10	0	0.0000	20.00	Bwegiragye	20.00	
	Town Ward	Cell A	NWSC	10		10	0	0.0000	20.00	Cell A	20.00	
		Cell B	NWSC	10		10	0	0.0000	20.00	Cell B	20.00	
	Kashenyi	Kyandago	Alternative	-10	Rural	-10	2	0.0873	-19.91	Rushinya	20.04	
		Ihoza	Alternative	-10		-10	1	0.0437	-19.96	Mutojo	20.04	
		Kashenyi I	NWSC	10		-10	5	0.2183	0.22	Bugomora	20.04	
		Kashenyi II	NWSC	10		-10	5	0.2183	0.22	Bwatongo	20.09	10
		Ntaza I	NWSC	10		-10	0	0.0000	0.00	Tank Hill	20.09	9
		Ntaza II	NWSC	10		-10	0	0.0000	0.00	Ryamabengwa	20.13	8
		Ryanshama II	Alternative	-10		-10	0	0.0000	-20.00	Ruhandagazi	20.17	7
		Ryashana I	Alternative	-10		-10	1	0.0437	-19.96	Nyabicerere	20.22	6
	Buramba	Buhuma I	NWSC	10		-10	0	0.0000	0.00	Nyabicerere	20.22	5
		Buhuma II	NWSC	10		-10	0	0.0000	0.00	Nyakabirizi	20.26	4
		Buramba I	NWSC	10		-10	1	0.0437	0.04	Kyeitembe W.	20.44	3
		Buramba II	NWSC	10		-10	1	0.0437	0.04	Kyeitembe E.	20.44	2
		Barambah III	NWSC	10		-10	5	0.2183	0.22	Katungu	20.74	1

Secondary Selection Criteria:

The selected ten most vulnerable and relatively less vulnerable areas towards water risks were assessed with respect to the political factors and observations from reconnaissance visits, in order to shortlist one most vulnerable and less vulnerable area. With respect to the criteria of political representation as stated by the NWSC staff member who is responsible for conducting mobilization workshops in the communities mentions that *"not all the local chairperson are proactive in supporting their people. There are certain chairpersons who are dormant. Out of the ten most vulnerable cells, the chairpersons of Kyabumbaire, Masya and Nombe (belonging to Ruharo ward) are dormant. Also some of these chairpersons are drunkards or are way too old to carry out any responsibility".* During my observations with NWSC staff members it was also noted that with respect to the less vulnerable areas, people are financially more stable than people from the neighbouring cells. In such cells, apart from the local chairperson they also have elderly wise people, often well educated, guiding the community towards better development. Such people are also referred to as 'opinion leaders'. Along with the chairperson, these opinion leaders are also voice of the common people. There words are taken very seriously, and respective actions are carried out promptly, be it availing a new household connection or fixing a repair. Based on discussions with NWSC, Bushenyi-Ishaka, it was noted that LC1s of Katungu, Ruhandagazi and Kyeitembe were most supportive and thus were selected for reconnaissance visits.

All the six areas were visited in order to have a better understanding of how people access water and thus get a first-hand impression of the cells, which would help in narrowing down to a particular area. Area wise specifics have been mentioned below:

Most Vulnerable Areas:

- **Nombe:** Located in the central division of the municipality, Nombe is at a distance of approximately 10 kms from the town centre and takes almost half an hour to travel, due to the poor road conditions. On a rainy day, the area is quiet inaccessible by a two wheeler. Nombe, as a cell roughly consists of 60-70 households and every one of them depends on a single source of water. The water source serving the households of Nombe is a protected spring located in the centre of the cell. Even though water at the spring is available throughout the day, heavy traffic is generally observed during the morning and evening hours. People use the spring water for all activities starting from drinking, cooking, washing and even for irrigating their crops. People usually collect water from the springs in 20 litres jerry cans and they usually store the water in a bigger tank, from which they use water for all activities. Apart from the spring water, they also depend on rainwater. People mostly practice subsistence farming and mostly cultivate banana, tomatoes, cabbage and beans. The major problem that the people face is accessing the spring as it is located in a valley and people have to climb down a steep mountain slope in order to access water. Also for some people staying on the periphery of the cell, they have to travel for almost an hour to access water.

- **Kyabumbaire:** The area is located at a distance of 6-7 kms from the town centre and falls under the central division. Even though this cell is located in the hills, the area is quiet easily accessible with relatively better unpaved roads. The cell consists of 40-50 households and mostly all the families practice subsistence farming. All the families in the cell depend on two protected spring, which is located in the valley. Water users usually use jerry cans of 20 litres capacity to fetch water. They use the water for all their household practices and some even use the same source for irrigating their crops and feeding the cattle. Some of the families have to travel for almost close to three hours to fetch water from the spring. The condition even gets worse, during the summers when people from the cell have to depend on water source from the neighbouring cells, as the spring dries up.

- **Masya:** This area is situated 6-7 kms from the town centre, located in the central division. The area consists of approximately 100 households with most of the families depending on subsistence agriculture**.** They generally grow banana, potatoes and millets**.** Unlike the other two areas mentioned above, people in this area collects their water from a local unprotected spring. People use the unprotected spring water for all their household activities starting from drinking, cooking, washing clothes, feeding cattle and for irrigation. Even though the water users have continuous access to the spring water, most of them complained about getting flu due to using the water from the spring. During summers, the spring dries up and the people have to travel to the nearby areas for collecting water, which often takes them hours to collect water. Often water users have to walk for almost an hour to fetch water, which is an issue for the elderly people of the area, who cannot walk for such distances. Also while talking to some of the water users, it was noted that mostly children go to fetch water, for which they need to wake up really early and fetch water before going to school and sometimes they often miss their schools if there is a long queue in the mornings.

From the visits in the three areas, it was seen that in all the three areas people use water for similar kind of activities. However, in Masya people depend on unprotected springs as compared to the protected springs in the other two cells. Also for Masya, the place is easily accessible even on rainy days and looking at the practical feasibility, I selected Masya as the most vulnerable place for in-depth study of water related risks.

Less Vulnerable Areas:

- **Kyeitembe:** Kyeitembe is located in the central division of the town is located just 4-5 kms away from the town centre. Kyeitembe was one of the first areas in the town to get access to NWSC water supply in 2002. Most houses in this area were quiet big and well built, with lawn areas in front of their houses and proper fencing. While most of the households in the area are connected to the piped water supply, there are a few households on the extreme parts of the cell who depend on protected spring water. There are two – three protected springs in the cell. Also while having discussion with the households which are connected to piped water supply, it was noted that the water supplied was often brown in colour. People are of the opinion that the *"quality of water supplied by NWSC is bad*

and spring water is of better quality". Whenever the piped water is brown in colour, they depend on the spring water for potable purposes and use the piped water supply for other domestic purposes. Apart from the spring water and piped water supply, rainwater collection is also a common practice observed in the area.

- **Ruhandagazi:** This area was located very near the town centre, almost at a distance of 2-3 km away from the town centre. People are mostly self-employed in this area, depending on agriculture. People usually grows matooke and potatoes, which does not require much water. Some of the houses in the area, were well built with proper fencing and gardens present. Some houses had overhead tanks to store water and use it later, especially during the dry season. Also most of the people in the locality spoke English and their kids were mostly settled in Kampala. People also had livestock in their premises. People mostly depend on piped water supplied by NWSC. However, there are some instances, when the water supplied by NWSC is dirty and brown in colour. It is then when the local people depend on the nearby spring water for all activities. While this was observed in some households, some were very satisfied with the service provided by the NWSC. All the piped water supplies were attached to water meters and generally a household of 6-7 usually paid a monthly bill of 12, 000 UGX.

- **Katungu:** This area is located 4-5 kms from the town centre and comes under the Nyakabirizi division. The cell has a mix of people with different socio-economic background. There are some who are well educated and can speak English. The young people in such households are based in Kampala. This portion of the population in the area mostly depend on farming and livestock, with some people having 4-5 acres of land and up to 10 – 20 cows, pigs and goats. Some of them are also teachers, retired army veterans and businessman. These people mostly depend on piped water supply and have tanks in their homes, for storing water during summer season. Some of these people also have huge tanks (some even with capacity of 20,000 litres) to store rainwater. During the rainy seasons, people mostly depend on rainwater for potable purposes and use the piped water supply only for other household activities.

  Also there are some people who even being connected to the piped water supply, do not use the same due to poor water quality. At times the piped water supplied by NWSC is dirty or it doesn't come all time. It is then these people depend on the nearby spring for availing water for daily household activities and for feeding their livestock. Some of them even fetch 20 jerry cans of water per day.

  While this is the condition with major portion of the population in the cell, there are certain households (5-6 households) who cannot afford the NWSC piped water and depend on the unprotected spring water for household activities and depend on the nearby protected spring for potable purposes. The springs are located in a valley, and bringing water from the spring at times is quiet difficult, especially during the rainy seasons.

Depending on the observation from the three less vulnerable areas, Katungu as an area had people using four different sources of water (piped water supply, protected springs, unprotected springs and rain water). Also people with different standards of living makes Katungu interesting for an in-depth study. Moreover, Katungu is under Nyakabirizi, a different division in the Municipality than that of Masya (which is in the central division). This also makes the research spatially distributed. Also people in Katungu were more welcoming and willing to discuss about the problems faced due to water quality and quantity, as compared to the people in Kyeitembe and Ruhandagazi. All these points from the reconnaissance visit, helped me select Katungu as the less vulnerable area for conducting an in-depth study.

Appendix B **Water user interview guidelines**

Personal

- What is your name?
- How many family members do you have?
- How many kids do you have?
- What is your educational background?
- Does your kids go to school?
- From when have you been residing in Masya?
- Before Masya where did you stay? Why did you shift to Masya?

Profession

- What do you do? What does your family members do?
- If farming then which crops do you grow? Who farms? How much area do you have?
- Did you get the areas as inheritance?
- Do you farm only for your family or even for the market?
- Do you have cattle? Who takes them for grazing?
- Who does the household activity? Who is in-charge of earning money?

Water usage

- Where do you get water from?
- How did you apply for the water supply? Explain the whole process.
- Did you face any challenge during availing piped water supply?
- Where do you store the water?
- Did you ever register any complaint with the NWSC? If yes, then about what?
- How much do you pay for water? Do you have troubles with payment of water?
- Is there any rule for accessing water?
- Do you restrict towards putting of NWSC pipelines?

- Who goes to fetch water? If kids, then what kinds of problems does the kid faces? Does the kid go to school?
- How many times do you get water? At what time of the day?
- What is the advantage of using swamp water over the NWSC water?
- How many jerry cans do you use per day? *(Observe the cleanliness of Jerry Can)*
- Do you store the water? Where do you store the water before use? (*Observe the cleanliness of the storage devices)*
- How do you differentiate the water storage practices for different sources?

- What activities do you use the water for?
  - Cooking/Drinking – Do you cook the water before use? Why? Who taught you to cook before using water? If for bad quality – what do you mean by bad quality? *(Observe the dishes used to store cooked water)*
  - Irrigation – How many JCs/buckets do you use for irrigation? For which crops?
- Do you have any problems in accessing water?
- What do you do in dry seasons? Both for household activities and irrigation? What alternatives do you have?
- Do you face any tension regarding water or not having water? If yes, then what kind of tension?
- Do you have some kinds of water related diseases?
- During rainy season or at night are there any physical accidents while fetching water? Female/Kids security?
- What did you do with respect to water to overcome such problems?
- What problems do you face while using the alternative source of water?
- Why don't you gather a community and build a spring?
- You are using free water now? Why don't you pay for the water provided by NWSC?
- Do you know what contaminates the swamp water? Who contaminates (faecal matter, cattle, and people)? Did you do anything to prevent the contamination?
- Is the swamp in someone's land? Whose are the neighbouring lands? Are there any runoff/ contamination from the neighbouring lands?
- What kind of service do you avail from the NWSC/Municipality? How? When?
- Is the rainwater always sufficient for your crops? What is the yield?
- Do you use water for agriculture? Where do you get that water from? How much water do you use for agriculture?
- Is the water sufficient for your agriculture? What do you do if you need extra water?
- Where does the wastewater go? Disposal site? Faecal Sludge?
- Do you use fertilizers? Which kind of fertilizers?

Appendix C **MSc Thesis Supervision Agreement**

Water Management & Governance Programme, UNESCO-IHE **Academic Year 2016 - 2018**

I. General Information

Programme MSc in Water Quality Management

Student name Ramkrishna Paul

Student Number 1019424

E-mail paul14@un-ihe.org

Mentor *(program)* Dr. Jeltsje Kemerink-Seyoum

Professor *(program)* Dr. Margreet Zwarteveen

II. General description and time-scale for the thesis

• Subject:	Water governance in small towns at the rural-urban intersection: the case of Bushenyi-Ishaka, Uganda
• Planned starting date of the fieldwork:	2.11.2017
• Special circumstances concerning planning	-
• Planned completion date of the thesis	April, 2018
• If this thesis is part of a larger project: Visa, flights, accommodation, translator, local travel and other miscellaneous costs related to thesis during the field visit.	

• The thesis supervision is part of a MSc research cluster coordinated by: Dr. Giuliana Ferrero	
• Identify the fellowship scheme of the student, if relevant to MSc research (funding, fellowship requirements) – Not applicable	
• Specify the allocation of supervision hours between the mentor and the Professor (total allocation of 80 hours)	15 hours – Professor; 65 hours - Mentor

Time-scale of different activities:

Sl. No.	Activity	October, 17				November, 17				December, 17				January, 18				February, 18				March, 18				April, 18		
		W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3
1	Thesis Proposal																											
2	Field Work Preparation																											
2.1	Preparation of Interview Questions																											
2.2	Skype with local partners																											
2.3	Incorporation of comments/feedback																											
2.4	Logistical support (identification of translator, visa, tickets, accommodation)																											
3	Travel to Kampala, Uganda																											
4	Data collection and analysis: Bushenyi-Ishaka																											
4.1	Settle down in Bushenyi																											
4.2	Preliminary meetings with local partners, town council officials, translator																											
4.3	Identification and mapping of flows																											
4.3.1	Initial interviews																											
4.3.2	Reconnaissance visit																											
4.3.3	Interviews																											
4.4	Identification of areas vulnerable to risks																											
4.5	Data collection (In-depth individual interviews and observations)																											
4.6	Data collection (secondary sources)																											
4.7	Data sorting																											
4.8	Initial analysis																											
5	Travel to Delft, Netherlands																											
6	Final Data Analysis																											
7	Thesis Writing																											
8	Thesis Defence																											

Delft based Uganda based Christmas holidays

III. Agreements regarding format and schedule for supervision meetings

Student and mentor will have weekly meetings to discuss progress and give feedback on draft documents, supervisor will attend approximately every six weeks. If needed, more frequent meetings with mentor and/or supervisor can be organized, either on request of the mentor or the student. The student will submit draft documents to be discussed at meetings at least two working days before the meetings.

During fieldwork student will contact mentor at least once every week, either by email, telephone or skype, to inform on progress, share data and preliminary findings, and discuss possible changes in research. Student will write detailed interview narratives in English of each interview conducted and share these with mentor during the fieldwork period.

Mentor will respond and provide feedback to student as soon as possible but at least within five working days, unless mentor is traveling or on leave, which will be communicated to the student timely.

Student will start submitting drafts of chapters of final thesis from early February onwards, accumulating in a first full draft of the thesis on 20 February.

IV. Agreements regarding ownership and use of the research data: The mentor and supervisor agree that the student has ownership over the research data collected as part of their MSc thesis. Any publication of the data will be done with the permission of the student, and authorship of any publication will follow the IHE-Delft rules for authorship of manuscripts as written down in UNESCO-IHE Policy Note PN/01/2012 of March 7, 2012.

Signing the agreement

26.03.2018	
Date	*Signature (Student)*
Date	*Signature (Thesis Mentor)*
Date	*Signature (Thesis Supervisor)*

Thesis marking Guidelines

Criterion 1	9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
	Excellent	**Very Good**	**Good**	**Sufficient**	**Fail**
Knowledge and understanding of the subject and answers to questions	An excellent and informative introduction , well-researched, with appropriate and key references. Evidence of critical thinking. Clear aims and objectives, within an overall context, which identifies knowledge gaps. Sets the scene for the research succinctly and elegantly.	Good project background, with reference to key literature. A logical framework that identifies the research objectives, but may lack some thoroughness, or comprise a limited series of research questions. It might be competent but a little mundane. .	Covers the main areas, but has minor flaws in logic or omissions of important detail, or minor flaws in structure. Aims and objectives comprehensible, but maybe slightly over or under ambitious, and/or lacking in clarity or precision. Objectives may be unrealisitc.	Generally lacks some coherence; may be poorly referenced, but includes at least some points relevant to the research. Aims and objectives no more than adequate.	Poorly structured, with significant omissions of key background literature. No logical progression. Fails to set the context of the project. Research question not developed into appropriate or testable hypotheses

Criterion 2		9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
		Excellent	**Very Good**	**Good**	**Sufficient**	**Fail**
Originality, analysis and interpretation	Methods	Well-chosen and entirely appropriate and often novel methods identified clearly. Clear and easy to follow procedures and techniques. Where appropriate, good site description, with informative maps, diagrams etc.	Appropriate actions and methods identified and detailed. Where appropriate, setting of research well described with relevant maps etc	Methodology generally sound but with some lapses in detail of methods, and/or proposed analysis. Maps or diagrams may be poorly produced, or not clear in the context of the research	Significant gaps in methods, or methods not always appropriate to the research questions, or very difficult to comprehend. Lapses in detail in parts of methodology. Maps may be absent or poorly produced.	Methodology vague and poorly detailed. No obvious understanding of methodology relevant to research theme. Maps etc may be poorly produced or absent.
	Results	These are well analysed and presented with clarity, with clear and comprehensive relationship to the the research questions.	Results reported well and with clarity . Some minor lapses in summary of findings. Shows ability to address methodological short-comings	Results comprehensible, generally linking with the research questions. Figures and tables convey adequate meaning, providing a summary of at least some of the key findings.	Some obvious flaws in analysis, but the general essence of the key findings conveyed.	Difficult to follow the results and, analysis. Presentation careless and poor summary of the key findings
	Discussion	Elegant and well structured, placing the results in the context of the international literature and demonstrating a clear understanding of their significance, and/or shortcomings. Show some new ideas and novel interpretation.	Identifies the key finding and relevance of these to some key literature. A well ordered sequence to the chapter to produce a logical framework.	Recognises some interesting findings, but may be limited in placing these into a wider context. At lease some use of key literature. There will likely to be some repetition with the results section.	Largely a repetition of the results section, with minimal context to wider understanding and relevant literature.	Fails to identify key findings and/or their wider significance . Little logical framework and lacking any individual ideas or intepretation.

Criterion 3	9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
	Excellent	**Very Good**	**Good**	**Sufficient**	**Fail**
Organisation, style, presentation and communication	Writing elegant and succinct. Uses precise language and correct terminology throughout. Figs and Tables well laid out to a publishable quality with accurate and succinct legends.	A clear and well-written report that is technically proficient.	A generally well-written report that is understandable. Uses appropriate terminology. Occasional spelling or grammatical errors. Presentation generally neat	Language generally clear and uses correct terminology, but with some misunderstandings and lapses in grammar or spelling. Presentation and use of tables and figures may be sloppy.	Sentences and/or paragraphs poorly constructed. Language inexact or ambiguous. Contains numerous grammatical and spelling mistakes.

Criterion 4	9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
	Excellent	**Very Good**	**Good**	**Sufficient**	**Fail**
Creativity, independence, work planning and critical attitude	Student self-motivated and independent. Engages in intelligent discussion and responds well to suggestions.	Significant help may be given, but students show ability to learn from suggestions and develop ideas and research approaches accordingly.	Needs clear guidance and support, but gradually develops the required competencies.	A need to repeat instructions a number of times. Generally finds taking initiative difficult, and limited self-reliance.	Lacks motivation, or much ability to develop competencies. Shows little self reliance or interest in the topic.

Appendix D **Research Ethics**

Personal Declaration of Responsibility

I declare that I am cognizant of the goals of the "AISSR Ethical Procedure and Questions" that aim to make me think through and make explicit how my research plans will lead to good research, not only in a methodological sense but also in the ethical sense.

I subscribe to the principles of:

- voluntary participation in research, implying that the participants might withdraw from the research at any time.
- informed consent, meaning that research participants must at all times be fully informed about the research process and purposes, and must give consent to their participation in the research.
- safety in participation, meaning that the human respondents should not be placed at risk or harm of any kind e.g. research with young children.
- privacy, meaning that the confidentiality and anonymity of human respondents should be protected at all times.
- trust, which implies that human respondents will not be respondent to any acts of deception or betrayal in the research process or its published outcomes.

Date and student's signature

26.03.2018