



WATER SUPPLY AND DEMAND IN BUKOBA, TANZANIA

*Implications for
Local Economic Development*

MSc Thesis
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Preface and Acknowledgments

This thesis is the final part of my MSc degree in International Development Studies at Utrecht University. Between February and May 2010, as part of my programme, I did research in Bukoba, Tanzania on water supply and local economic development (LED). The topic was an assignment from SNV, Netherlands Development Organisation, who is responsible for the LED component of Lake Victoria Water and Sanitation Programme (LWATSAN). This initiative is run by United Nations Human Settlements Programme (UN-HABITAT) in more than a dozen of towns surrounding Lake Victoria. It seeks to maximise the impact of improved water and sanitation infrastructure investments, so that economic benefits accrue for the Millennium Development Goals (MDG) target group.¹

The cross-cutting topic suggested by my host organisation is challenging, as it combines such different themes as urban development and water supply with local economic development and microfinance; all embedded in the contemporary discussion on pro-poor interventions and the role of private sector in service delivery. The themes of water supply and LED do not *per se* occur together in academic literature and this combination is also rather new for development projects. There has been a big discussion on public-private (water) partnerships and the role of small-scale water providers, but usually in the context of opportunities they create for improved water supply – not for local economic development. Instead, my research looks at the two-way relationship between the water sector and LED. It is argued that there are two sides of the same coin: as people gain access to improved water sources and demand for improved water rises, opportunities for water supply and the involvement for private sector expand. This in turn affects the economic development of the whole area. Such a new perspective provokes to start thinking about water supply and LED in an unconventional way, which has been strived for in the presented thesis.

Also, the current shift from supply- to demand-driven solutions in water service delivery is reflected in my research. Aside from water supply in Bukoba, water demand has been covered extensively. This focus is especially justified in view of the LED aspect imposed on my research. It has been acknowledged that without proper demand, supply-driven interventions will not work. Translating this into the current discourse on water supply solutions, only services that people want and are therefore willing to pay for should be designed and provided. One of the consequences of this focus is the use of extensive quantitative methods. Measuring and assessing demand requires a considerable number of respondents and a certain degree of statistical sophistication; these in order to be able to draw any meaningful conclusions. This in turn results in the lengthy processes of data collection, data entry and data analysis; all counted in dozens of weeks. Therefore, such studies are usually undertaken by more than one researcher, but the fate of a student is that he/she (usually) operates with minimal resources.

Yet, although it has been a very tedious work, requiring a great deal of determination and self-discipline, I can now look back at a tremendous experience. It started during my field work in Tanzania and ended months after my return with ‘squeezing’ every useful piece of information out of the data collected. I grasped every opportunity to learn out of this process which wouldn’t have been possible without the help of numerous people. Acknowledgments are certainly in place for:

- SNV in Mwanza who facilitated my research, especially for Rinus van Klinken and Kumbulani Ndlovu for their direct support and inspiration. I would like to thank all the other staff members for their kindness and warm welcome.

¹ I.e. people without sustainable access to safe drinking water and hygienic sanitation.

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Last but not least, a huge thank you goes to all the people back home in Poland and in the Netherlands who supported me throughout the whole period – from the start of my field research in Tanzania to the very last page written in this thesis.

Asante sana.

Dominika Arseniuk

Abstract

A usual market system is the interaction between supply and demand set in a certain (preferably enabling) environment in which different market players take part. There are various market sectors providing products and services, ranging from manufactured goods to tourism. However, water sector does not follow standard market game rules, because traditionally it was regarded as a social good subject to natural monopoly and under the control of public utilities. This view began to change in last decades, and it was, not without discussion, acknowledged that water should be recognised as an economic good, as agreed in the Dublin Principles in 1992. Together with this gradual shift in thinking, demand-driven approach to water started to take the place of supply-driven solutions. This approach to water sector has been applied in this study of water supply and demand in Bukoba, Tanzania, which has recently profited from the construction of improved water infrastructure under Lake Victoria Water and Sanitation Programme run by UN-HABITAT. The project aims at maximising the economic opportunities arising from the provision of water infrastructure and seeks to spur economic development in the project towns. This thesis seeks to identify necessary interventions for this to become the reality in Bukoba.

Key words: water supply, water demand, local economic development

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Acronyms and Abbreviations

BMC	Bukoba Municipal Council
BUWASA	Bukoba Urban Water and Sewerage Authority
HBS	Household Budget Survey
HH	household
MR	multiple response question
IWRM	Integrated Water Resources Management
KADETFU	Kagera Development and Credit Revolving Fund
LED	local economic development
LGA	local government authority
LVWATSAN	Lake Victoria Water and Sanitation Programme
MDG	Millennium Development Goal
MFI	microfinance institution
MSE	micro and small enterprise
NGO	non-governmental organisation
O&M	operations and maintenance
PPP	public-private partnership
SACCO	Savings and Credit Cooperative Organisation
SME	small and medium enterprise
SNV	Netherlands Development Organisation
TSh	Tanzanian Shilling (1422 TSh = 1\$ ²)
UN-HABITAT	United Nations Human Settlements Programme
WSS	water supply and sanitation

² As of 30 March 2010, <http://www.exchangerates.org.uk/USD-TZS-exchange-rate-history.html>

Without knowledge action is useless and knowledge without action is futile.

Abu Bakr

(adopted after Yusto Muchuruza, Executive Director of KADETFU)



To my dearest Grandma

Introduction

In the world more than one billion people lack access to safe drinking water. Water supply is particularly important for Africa, a rapidly urbanising continent with the worst water service coverage in the world. It is estimated that 40 billion hours a year are spent collecting water in Sub-Saharan Africa, which is a year's labour for the entire workforce in France. It is often women and children who bear the burden of fetching water and are therefore deprived of time which could be used for income-generating or other activities. There is also great inequality in access to water, for example in rural Tanzania people use 10 litres per day while in rich urban settlements 170 litres.

Providing people with improved water supply systems would mean providing them with such economic benefits as time and money savings as well as better health, all factors that have been found to contribute to the economic development. However, according to the present water paradigms, such benefits are likely to accrue only if people are presented with water supply options that they want and are willing to pay for. Matching demand with supply appropriately is all the more important from the economic perspective, as too long public utilities have been providing services below operating costs and requiring large subsidies. This led to inefficiency, low service coverage of the population and as a consequence low willingness to pay of the customers. Private participation in water service delivery has been offered as a panacea for weak public providers, but large water companies would not engage in areas with small economies of scale.

In urban areas, where piped network does not reach people, especially the poor, small-scale providers or else 'the other private sector', such as water vendors or kiosk operators, fill the gap. Small-scale providers in Sub-Saharan Africa provide up to 50% of water in cities and these numbers are even higher for secondary towns. Small-scale providers are often micro entrepreneurs for whom water delivery forms an income-generating activity. However, they often lack the capacity, finance and infrastructure to expand their business and potential micro entrepreneurs lack the above to start up an economic activity in the water sector.

Improved access to water could on the one hand provide people with services they want, and on the other hand provide an investment opportunity for the existing as well as potential micro enterprises in the water sector; the opportunity being the engagement in providing the services that the population is willing to pay for. This all is likely to happen only if the environment is conducive for supporting micro and small enterprises (MSEs) and the regulations of the water sector and water providers are set right. Lastly, thorough analysis of the local demand for water is crucial, as it tends to be location-specific and without people's willingness to pay any supply-driven solutions will fail.

Lake Victoria Region Water and Sanitation Initiative (LWATSAN), run by United Nations Human Settlements Programme (UN-HABITAT), seeks to provide such improved access to water. It provided new water infrastructure in a number of towns surrounding Lake Victoria and it now aims at using the potential and existing opportunities arising from access to water for economic development. This research undertaken in one of the beneficiary towns, Bukoba in Tanzania, during the period February-May 2010 aimed at assessing the sought opportunities for local economic development (LED). In the presented thesis, which is the result of the field research and secondary data analysis, after a thorough analysis of water supply and water demand recommendations will be given for interventions in the water sector with the objective of economic development of Bukoba.

1. Theoretical Framework

The opening chapter of this thesis aims at drawing theoretical-thematic boundaries set for this thesis. As already indicated, the subject cuts across various themes and current development debates; therefore the chapter was kept as concise as possible and is rather an overview of the framework and refers the reader to sources which cover respective topics in a more comprehensive manner.

1.1. Improved water sources

First of all, it is important to define a basic notion which appears throughout the whole thesis: improved water sources/water supply. International statistics draw a distinction between ‘improved’ and ‘unimproved’ access to water.

Improved access comprises three aspects of water security: its quality, proximity and quantity. People are deemed to have proper access to water if they have available at least 20 litres per day of clean water from a source less than 1 kilometre from their home. Water to be considered improved has to meet technological criteria. In-house connections, standpipes,

pumps and protected wells are considered improved. Water acquired from vendors and water trucks, along with water drawn from streams or unprotected wells, is not (Table 1-1; UNDP, 2006).

Table 1-1. Definition of improved water supply

Improved	Unimproved
Piped water into dwelling, plot or yard	Unprotected well
Public tap/ standpipe	Unprotected spring
Tubewell/ borehole	Cart with small tank/ drum
Protected well	Tanker truck
Protected spring	Bottled water
Rainwater	Surface water (river, lake, stream, canal)

Source: Hutton et al., 2007, p.4

This distinction is convenient for international reporting purposes, however it does not reflect the real situation. Millions of the poor combine daily the use of improved and unimproved water. Patterns of water use are far more complex and dynamic than the picture presented in international reporting systems. Beneath, there are great inequalities based on wealth and location which structure water markets. Nevertheless, being poor dramatically increases the likeliness of using unimproved water sources – 70% of people lacking access to improved water live on less than 2 dollars a day. Income is a strong factor in determining access to (un)improved water and the type of technology used to collect water (*Ibid.*).

1.2. Changing water paradigms

The common water sector problems in developing countries have existed for decades. These include increasing relative water scarcity, deterioration of its quality, inappropriate pricing of water, excessive government involvement, out-dated institutional arrangements and poor water administration. To overcome these problems various approaches have been used to water resources management with every decade bringing new paradigms (Seppala, 2002).

Prior to the 1980s water planners focused on supply-side solutions: construction of more physical infrastructure in order to meet growing demand caused by enormous population growth in the twentieth century. Technical aspects and technology transfer were among the key factors to tackle

problems in this sector. The benefits of these investments are invaluable, but they came at a high cost requiring enormous economic and environmental resources (Gleick, 2000).

The twentieth century water development paradigm, driven by constant growth, has gradually been shifting as social values, political and economic conditions changed. Basic human needs for water remain unmet. More than one billion people lack access to safe drinking water and nearly three billion live without access to adequate sanitation. An estimated 14 to 30 thousand people, mostly young children and the elderly, die every day from water-related diseases. Additionally, half of the people in the developing world suffer from diseases caused by drinking contaminated water or eating contaminated food (UNCSD, 1997).

Table 1-2. Major paradigmatic changes in water

Old thinking	New thinking
Water development	Water allocation
Emphasis on water quantity	Emphasis on water quality or quality-quantity
Water as a social good	Water as an economic good
Centralised management and administration	Decentralised management and administration
Government provision	Government facilitation
Administrative domain	Service domain
Supply-driven approach	Demand-driven approach
Water supply	Water services
Production orientation	Customer orientation
Hardware projects	Software projects
Water as a basic human need	Water as a basic human right

Source: Seppala, 2002, p.372

Therefore, starting from the nineties ‘changing water paradigm’ has been taking place (Table 1-2). It comprises many components: a shift away from reliance on finding new sources of supply to address new demands, growing emphasis on environmental aspects in water policy, a re-emphasis on meeting basic human needs for water services, demand-driven approach, privatisation, public-private partnerships and fostering community ownership (Gleick, 2000 & Seppala, 2002). The change was enhanced by high costs of construction, tight budgets and innovative alternative approaches to water management. Solely physical solutions to water problems face increasing opposition – new methods are developed to meet the demands of growing populations without requiring major new constructions. On the other hand, efficiency improvements, managing demand and reallocating water among users are sought to face future and current water needs. Unconventional supply approaches are receiving more attention (Gleick, 2000). Involvement of all stakeholders including non-governmental organisations, communities and independent research organisations in water management decisions is among key principles of the new approach.

1.2.1. Integrated Water Resources Management

Integrated Water Resources Management is the current major and alternative approach to water which can be considered a new paradigm. Population growth, changes in consumption patterns, and

economic growth are some factors contributing to the increased demand for water resources. In addition, depletion of ground water, overexploiting soil and forestry resources as well as effects of climate change will stress the availability and quality of water resources. Managing them is complex since many different demands are competing around this increasingly scarce resource. Integrated Water Resources Management (IWRM) is one of the most promising concepts for managing water resources, as it maximises the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000).

The Dublin Principles, formulated through an international consultative process culminating in the International Conference on Water and the Environment in Dublin in 1992, have found universal support amongst the international community as the guiding principles underpinning IWRM:

- I. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- II. Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
- III. Women play a central part in the provision, management and safeguarding of water.
- IV. Water has an economic value in all its competing uses and should be recognised as an economic good.

Water as an economic good

Particularly the third and fourth principle is of interest to this research. First, special attention should be given to the subject of water as an economic good. Inappropriate pricing policies and economic subsidies encourage wasteful use of water and inhibit efficiency and conservation programmes. Therefore, there are growing efforts to treat water as an economic good. Although there is disagreement about how to define 'economic good' and how to apply the concept, it is acknowledged that in the past widespread subsidies encouraged rapid development of supply systems and hindered water efficiency efforts. Moreover, in many countries water use is not measured or 'metered' which leads to overuse of water and provides no incentive for efficiency. Where water metering is applied, there is a problem of inappropriate design of rate structures which leads to misuse of water as well. Finally, even with the new emphasis on water as an economic good contributing to a more efficient use, it cannot adequately protect the natural ecosystems that also depend on water (Gleick, 2000).

Gender-water relationship

The gender-water relationship is acknowledged by the Dublin principle III as cited above. The statement calls for recognition of the contributions of women as providers and users of water and guardians of the living environment in institutional arrangements for the development and management of water resources (ITFGW, 2004).

One of the biggest benefits of improved access to water is in the saving of time for women and girls and in the expansion of their choices. Water collection is part of a gender division of labour reflecting gender inequality within households. Women spend several times longer than men in fetching water. A 2002 UNICEF study of rural household in 23 Sub-Saharan African countries found that a quarter of them spent 30 minutes to an hour each day collecting and carrying water, and 19% spent an hour or more (*ibid.*).

The burden of fetching water leads to exhaustion reduces the time available for rest, child care and income generation as well as limits the scope for women to take advantage of market opportunities

(UNDP, 2006). For example, reducing water collection to one hour a day by women involved in a microcredit project in Gujarat (India) would enable women to earn an additional 100 dollars a year depending on the enterprise (James, 2002).

1.2.2. Demand-driven approach to water supply

Another major shift in water paradigms is demand-driven approach to water supply instead of supply-driven solutions. Already two decades ago World Bank Water Demand Research Team (WBWDRT, 1993) argued that project failure and lack of maintenance could be directly caused by supply-side issues and a lack of understanding of demand for water. This led to large subsidies in the sector which helped the rich and not the poor, hurt the financial viability of utilities, low reliability of services, and as a consequence low users' willingness to pay.

In turn, demand-driven approach postulates for matching supply with demand needs understood in terms of quantity, price and preferred service options. These need to be assessed by studies involving the measurement of willingness and ability to pay in every potential area of service, as such studies tend to be very location-specific. Hence, the new approach is about providing services that people want and are therefore willing to pay for (Gulyani, 2001; Gulyani *et al.*, 2005; Whittington *et al.*, 1991 & 2000). The central points of the new approach include user fees which help reduce wasteful consumption and curtail excessive demand that arises when a valued good is provided for free. In turn, utilities have adequate revenues to improve the level of services. Then, metering is necessary for levying appropriate user charges according to a tariff structure which guarantees full recovery of O&M costs (Gulyani, 2001).

One of the cited drawbacks of the new approach is its lack of attention to institutional factors. Gulyani (2001) argues that the demand-driven approach rather simplistically assumes that appropriate charges are the key problem of water supply ('getting the prices right' in the water sector). Yet, it is not just prices or user charges that have been 'incorrect', but also the institutional capacity and mismanagement of the government and related actors were and still are inappropriate.

1.2.3. Private participation in water service delivery

Among other major changes in water paradigms is the fact that water no longer has to be provided by public entities. The acknowledgment of water as an economic good in Dublin Principles is often extended to justify cost recovery and from 1990s private sector participation was actively promoted, either in the form of public-private partnerships or under a full privatisation of water supply (Loftus, 2008; Lewis & Miller, 1987). It was an answer to failing public utilities which showed weak performance and left vast areas not covered with water supply services, particularly peri-urban and rural areas. These 'neoliberal reforms' in the water sector were driven by multilateral financial institutions and other, also bilateral, donor agencies (Budds & McGranahan, 2003).

The range of forms in which the private sector can be involved in water service delivery is multiple. Table 1-3 depicts the ones when governments physically transfer assets to private hands or contracts the private sector to provide goods or services previously supplied by public bodies. The range of options is wide and the degree to which assets, responsibilities and functions are transferred varies considerably (Rees, 1998; Loftus, 2008).

It is however important to note that simply converting a public monopoly into a private one does not provide competitive incentives for the utilities to operate efficiently, to make appropriate investments or respond to consumer demands. It is in fact the introduction of competition that has a more

significant effect on performance than a change of ownership, especially if privatised bodies continue to come under detailed regulation (Batley, 2001). It is therefore necessary for the governments to tackle such underlying problems as uneconomic water pricing policies, political interventions or over-manning (Rees, 1998). As water supply has characteristics of natural monopoly, the scale of necessary investments is huge and it has ‘merit goods’ nature, it leads to the case for government involvement at least in ensuring and regulating provision (Batley, 2001).

Table 1-3. Forms of private sector involvement

Form	Description
Full divestiture	Full transfer of assets to private sector through asset sales, share sales or management buyouts. Private sector responsible for all capital investment, maintenance, operations and revenue collection.
Partial divestiture	Government sells a proportion of shares in a ‘corporatised’ enterprise or creates a new joint venture company with the private sector.
Concession	Government lets a long-term contract, usually over 25 years, to a private company, which is responsible for all capital investment, operations and maintenance. The assets themselves remain public sector property.
Lease	Long-term contract (usually 10–20 years but can be longer). Private sector responsible for operations and maintenance and sometimes for asset renewals. Assets remain in public sector and major capital investment is a public responsibility.
BOT (Build-Operate-Transfer) BOO (Build-Operate-Own)	Contracts are issued for the construction of specific items of infrastructure, such as a bulk supply reservoir or treatment plant. Normally, the private sector is responsible for all capital investment and owns the assets until transferred to the public sector, but in BOO schemes, private ownership is retained.
Management contract	Short-term contracts, typically five years. Private firm only responsible for operations and maintenance.
Service contract	Single function contracts to perform a specific service for a fee, e.g. install meters.

Source: Rees, 1998, p.15

Despite the wide popularisation of private participation, it remains limited in the water sector. Only about 5% of the world’s population is served by the formal private sector (not counting ‘the other private sector’ – small-scale water providers; covered in the next section). With the exception of South Africa, there are almost no investment contracts in Sub-Saharan Africa. Virtually, all investment is still coming from the public sector and international development assistance. Private participation is concentrated in countries with larger economies and higher urbanisation level, as the key consideration for the private sector is scale. Thus, smaller urban centres are unlikely to be attractive (Budds & McGranahan, 2003).

1.2.4. Role of small-scale water providers

As already mentioned above, during the 1990s privatisation was widely advocated as a solution to the failures of public provision. Private utilities were supposed to create efficiency gains, generate new

flows of finance and provide greater accountability. However, the results were mixed and private provision did not turn out to be the panacea for greater and better water service delivery. It is often the case for both major public and private providers that low-cost water is delivered to high income groups and low quality service or no service to the poor (UNDP, 2006).

Most of those un-served or inadequately served by official systems of provision in urban areas of developing countries rely on small-scale providers for part or all of the water they use. Their form differs greatly: from household vendors of water to cooperatives. Sometimes they are primary suppliers, and sometimes they complement the formal provider (World Bank, 2004). They are private sector too – the ‘other’ private sector (Solo, 1999, p.118).

A study in ten African nations highlighted the variety of providers. The main examples include (UN-HABITAT, 2003):

- hand-pushed carts,
- horse- or donkey-pulled carts,
- water truckers,
- various types of water re-sellers operating from fixed points of sale, including standpipe vendors, water kiosks, mini-piped networks or households themselves.

These forms of water provision are important for several reasons (UN-HABITAT, 2003; Solo, 1999; Njiru, 2005; Snell, 1998):

1. Small-scale providers deliver water to a very large proportion of low-income urban households – without them water service delivery coverage would be much worse. In most cities of the developing world the urban population is rising much faster (5-9% p.a.) than the rate at which infrastructure services are extended. In Sub-Saharan Africa small-scale providers are far more important than large-scale private water companies – the figures rise to 50% for water and 85% for sanitation. These percentages appear to rise even more in secondary cities and towns.
2. They serve people who are difficult to reach with conventional water distribution and drainage networks, especially informal settlements at the peri-urban fringe. There will always be gaps in service provision until poverty recedes.
3. Small-scale providers deliver services with no subsidy unlike most major water providers. However, there are mixed opinions on the price of their service. UN-HABITAT (2003) claims that their prices compare favourably with those of official providers, otherwise they would not be able to operate. They suggest that in many locations small-scale providers can be a cheaper and more effective way of improving and extending water provision than public sector provision or private utilities. A review by the World Bank Water and Sanitation Program found that private provider charges varied between one-tenth and eight times those of public providers. Cases have been reported where charges range to over 60 times the public charges but, as most public water companies’ prices are subsidised, the actual price is paid through other taxes.
4. They have virtually no unaccounted for water, while in both developed and developing countries large losses occur in the poorly designed and maintained distribution systems, faulty or old equipment of big utilities (Gleick, 2000).
5. The private providers are not simply stop-gap businesses. They tend to transform their operations and find new markets when public services are extended. Under the study of Solo (1999) the water entrepreneurs have moved into the production and sale of ice, soda water, flavoured waters and

other related products. Their knowledge of markets (consumer habits) and their production systems give them an advantage in discovering and developing new products.

6. They are therefore demand responsive. They increase their service delivery as demand grows, not in response to injections of outside capital. On the other hand, the demand for their service creates local employment opportunities that keep cash within the local economy.

It is also necessary to note that the effectiveness and range of small-scale providers' operation largely depends on the environment in which they operate. Effective, accountable local government structures, policies and strategies should encourage and support effective local action and innovation, for example in the form of partnerships with utilities (Njiru, 2005). Providers also depend on the scale and nature of demand, the competition from official large providers and community initiatives. They are also likely to be influenced by local innovations and technologies (UN-HABITAT, 2003).

Despite their great importance in the developing world, so far little has been done to understand or develop the capacity of small-scale providers. The main reason for this is the fact that state-owned water and sanitation utilities usually have a monopoly right to serve customers in their jurisdictions. Other providers are considered either illegal or irregular. Other constraints stemming from the hostile regulatory environment include (Njiru, 2005 & Solo, 1999):

- Credit constraints: Providers don't qualify for loans from donor agencies or banks which traditionally have focused on municipal water companies with monopoly rights or don't recognise them as legitimate business.
- Lack of provision, restrictions or bans on their access to good quality water sources (from water utility or elsewhere);
- Business regulations that hinder their operation and investment;
- Weak technical skills and capacity related to transportation;
- Social discrimination against vendors who are often among the poorest members of the community.

Interventions in the operation of small-scale providers should build upon business incentives and market opportunities available in a given location. Njiru & Albu (2004; cited in Njiru, 2005) point out that these enterprises are likely to benefit from the following interventions:

- ✓ Political recognition as significant contributors to service provision, especially in informal urban settlements;
- ✓ Enabling water regulation policy recognising them as a stakeholder;
- ✓ Enabling private sector participation policy;
- ✓ Access to microcredit;
- ✓ Provision or rental of secure premises for storing equipment, leasing of improved equipment & security provision in informal urban settlements.

1.3. Economic impact of water supply

While billions of dollars are spent on water infrastructure across the world by various donor agencies, only rarely are these projects subject to serious economic analysis and studies of economic viability. It is widely recognised by most donors that water and sanitation projects have been among the most poorly performing investments in their portfolio from an economic perspective (Whittington & Hanemann, 2006). It is believed by many that water is the right of all people and should not be subject to the usual economic criteria. Then, the problem with economic analyses is their great deal of

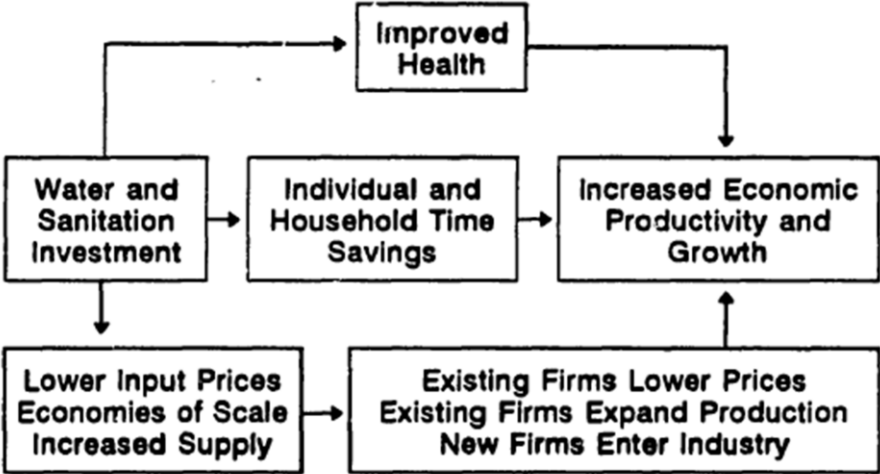
uncertainty and estimation of benefits which would occur in the future. In fact, cost-benefit studies are subject to a great variation in results depending on the estimates of chosen parameters (Whittington *et al.*, 2004). Although the size of benefits is difficult to predict, the nature of expected economic benefits can be singled out.

1.3.1. Economic benefits from improved water supply

The introduction of a water supply system may spur economic activity, i.e. new businesses, jobs created, increased agricultural production etc. However, this is usually the result of economic benefits which accrue in the first place (Figure 1-1).

An economic benefit is the monetary value placed on a good and is usually measured by willingness to pay. This is mostly based on costs which would not have to be incurred after the installation of the improved water supply system. The types of cost savings are calories (i.e. food expenditure), time and money (Whittington & Choe, 1992). In global

Figure 1-1. Economic benefits from improved water supply



Source: Schwartz & Johnson, 2002, p.5

cost-benefit analyses of water supply interventions time savings were contributing at least 80% to overall economic benefits. However, it has to be noted that these not necessarily lead to more income-generating activities (Hutton *et al.*, 2007).

For the enterprise benefits to appear it is however crucial that the real price of water is reduced and/or quality of the water supply improves as a result of the new system (Whittington & Choe, 1992). The cost of water to existing firms must fall in order to provide them with an incentive to expand production. This corresponds to the lowest level of Figure 1-1 and is labelled by economists as ‘induced demand’. If the investment does not have to be covered by domestic sources, but an external donor, no costs are incurred on the part of domestic economy and as a result, the production possibilities curve shifts outward (Schwartz & Johnson, 1992).

However, the lower cost of water rarely results from new infrastructure projects. What is more, economic benefits to micro and small enterprises may be limited. Davis *et al.* (2001) found that improved water services are less important to MSEs and they are not willing to pay as much for these services as are households. They tended to prefer cheaper water kiosks to prohibitively expensive private connections, because they also used small amounts of water. MSEs would first invest in a private connection in their own house or use that one for their economic activities, as homes are usually the base for their work.

Therefore, in general the most significant impact of water interventions is in terms of improved water quality positively affecting health, contributing in turn to economic growth through gains in labour

supply and productivity, school attendance and human capital formation (the upper levels in Figure 1-1; Paul and Mauskopf, 1991; cited in Schwartz & Johnson, 1992).³ Bloom *et al.* (2004) prove in their study that good health has a positive, sizable and statistically significant effect on aggregate output. This indicates that increased expenditures on improving health may be justified purely on the grounds of their impact on labour productivity, apart from the direct effect they have on improved health and welfare. In turn, the global study of Haller *et al.* (2007) indicates that increasing access to piped water supply was the intervention that had the largest health impact across all sub-regions of the world. What is interesting, household water treatment was found to be the most cost-effective intervention (instead of piped water supplies).

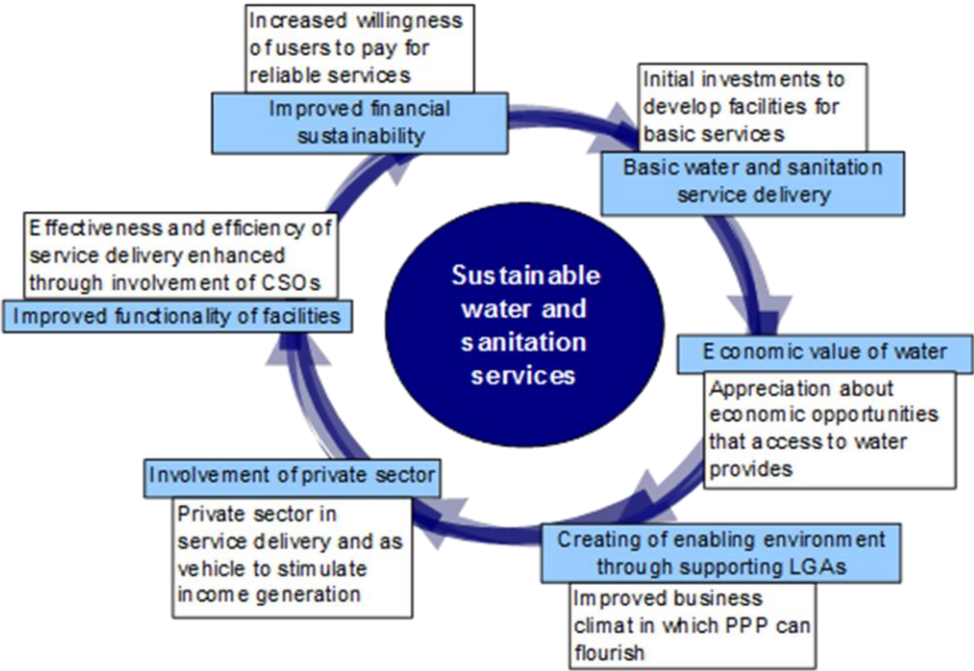
Moreover, the economic benefits of water supply improvements are likely to be high wherever water vending is extensive, as vendors tend to charge much higher prices than the existing piped network. Introducing piped networks to squatter settlements and other new communities on the periphery of rapidly growing cities in developing countries is thus the most likely to yield the highest economic benefits (Schwartz & Johnson, 1992).

1.3.2. Willingness to pay for water supply

As we have seen, willingness to pay plays a pivotal role in the demand-driven approach to water supply as well as in measuring economic benefits arising from the provision of an improved water system. Willingness to pay, and economic benefits as a result, have proven to vary substantially from one location to another (Gulyani, 2001). However, the patterns are universal and depend on four factors (WBWDRT, 1993):

- ✓ Socioeconomic and demographic characteristics;
- ✓ Characteristics of existing sources of water;

Figure 1-2. Sustainable water services incline LED



Source: UNESCO-IHE et al. (2008), p.37

³ A comprehensive list of benefits to the society of water and sanitation interventions (including the economic ones) is attached as Appendix A.

- ✓ Characteristics of improved water supply;
- ✓ Attitude towards government policy in the water sector.

A great number of such contingent valuation studies show that households are willing to pay considerable amounts of money for improved water supplies (Gulyani *et al*, 2005; Whittington & Choe, 1992). This also counts for low-income people, as these studies show that currently high levels of non-payment for existing public service provision by low-income groups can be associated with the fact that the services are poor rather than the prices are high (Budds & MsGranahan, 2003).

The crucial role of reliable water supply and resulting willingness to pay is presented in Figure 1-2 presenting the framework for local economic development (LED) in the water sector. This serves as a link to the subject of LED covered extensively in the following section.

1.4. Local economic development

Local economic development (LED) is “a process in which partnerships between local governments, community-based groups and the private sector are established to manage existing resources, to create jobs and stimulate the economy of a well-defined territory” (Helmsing, 2006, p.199).⁴ It emphasises local control, using the potential of local human, institutional, physical and natural resources. It examines the role of the local environment in the behaviour of economic agents as well as public, collective and individual actions undertaken by these agents to make this environment more conducive to economic development. LED initiatives require a minimum level of ‘institutional thickness’ – a degree of political and financial autonomy of public, private and civil society actors (Helmsing, 2003; Helmsing, 2006).

Originally, until 1990s local and regional economic development was in the competence of national government only. It relied on state-owned companies and consisted of hard infrastructure investments (**Table 1-4**). The idea behind was that public investment created jobs and provided taxes. This top-down, public-driven approach was mostly unresponsive to local priorities and conditions. Therefore, the approach was gradually becoming ‘more local’ and starting from the 1990s evolved to the provision of soft infrastructure, enabling environment and the creation of multi-stakeholder (especially public-private) partnerships (UN-HABITAT, 2005a).

The concept of local economic development has existed in developed countries for decades, but it is rather new for developing countries. It came together with decentralisation policies, when the promotion of economic development has been delegated to provincial and/or local governments. It has become increasingly popular and is especially enforced through the support of donor agencies. Major LED approaches pursued in these countries are based on experiences in industrialised ones. These approaches are among others: strategic planning for LED, focus on the creation of LED agencies, cluster promotion policies and a bottom-up action-oriented method (Meyer-Stamer, 2003).

As shown in the table and described above, local economic development is a broad concept and tackles many aspects at multiple levels. Swinburn (2006) writes that with globalisation new opportunities for local businesses occurred, and even small towns and surrounding rural regions can find niches and build on their existing and potential economic advantages. Then, at the national level, macroeconomic, fiscal and monetary policies affect local communities. Local business climate is

⁴ The definition of LED provided by the World Bank (Swinburn, 2006) and UN-HABITAT (2005a) are very similar to the one cited.

Table 1-4. Evolution of LED

Focus	Tools
<i>1960s to early 1980s (public sector only)</i>	
<ul style="list-style-type: none"> ▪ Mobile investment attraction from outside local area ▪ Big firm level subsidies ▪ Making hard infrastructure investments 	<ul style="list-style-type: none"> ▪ Large grants, tax breaks, subsidised loans for manufacturing investors ▪ Subsidised hard infrastructure investment ▪ Focus on lowering production costs through techniques such as recruitment of cheap labour
<i>1980s to mid-1990s (public sector driven)</i>	
<ul style="list-style-type: none"> ▪ Retention and growing of existing local businesses ▪ Continued emphasis on inward investment attraction but usually more targeted to specific sectors or from certain geographic areas 	<ul style="list-style-type: none"> ▪ Direct payments to individual businesses ▪ Business incubators/workspace ▪ Technical advice, support and training for small-medium scale enterprises ▪ Hard and soft infrastructure investment
<i>Late 1990s onwards (public sector-led, usually)</i>	
<ul style="list-style-type: none"> ▪ Making whole business environments favourable ▪ 'Soft' infrastructure investments ▪ Public-private partnerships ▪ Leveraging private sector investments for public good ▪ Improving quality of life and security for communities and potential investors ▪ Highly targeted inward investment attraction, building on local area comparative advantage 	<ul style="list-style-type: none"> ▪ Integrated strategy providing a facilitative local business environment ▪ Stimulating local firm growth ▪ Developing collaborative business relationships ▪ Supporting quality of life improvements ▪ Focus on service sector as well as manufacturing ▪ Initiating regional and local economic development programs.

Source: Swinburn, 2006, p.6

dependent on regulatory and other rules set nation-wide. Finally, it is at the local level that a comparative advantage originates and hard as well as soft infrastructure factors are its key determinants.

As for the wide extent of the LED concept, some authors distinguish three main categories of local economic development initiatives (Blakely & Green, 2010; Helmsing, 2006). These are enterprise development, locality development and community-based economic development. Blakely & Green (2010) also identify human resource development, but it is in fact a component in all three categories listed above. In contrast, Meyer-Stamer (2003) sees community development as part of social development and stresses that local *economic* development is about enterprises and remedying market

failure. However, this artificial distinction between purely social and purely economic is not the reality for MSEs being the majority of enterprises in Africa (see the section below and Helmsing, 2006 for full argument).

Following Helmsing (2003, 2005, 2006), enterprise development involves initiatives directly targeted at enterprises, though differently for small, medium and large ones. It mainly concerns developing the local economic base of an area, in order to export products and services outside the area. It includes firms and clusters that specialise in their activity. Such clusters in Africa are comparatively underdeveloped (Helmsing, 2003). Due to the nature of water sector in Bukoba, the type of LED as defined above is not of direct interest to this research.

Then, locality development refers to overall planning and management of economic and physical development of an area (Blakely & Green, 2010). It encompasses physical planning and development controls, urban planning and design, provision of infrastructure and basic services as well as socio-economic overhead capital. It also has an important institutional dimension. Locality development is necessary for the process of developing the economic base of an area (i.e. enterprise development) – without social overhead capital and basic services production and transaction costs are high and area's competitiveness remains low (Helmsing, 2003). It also seeks to improve the local quality of life, for example through household services, which makes the locality more attractive to external investment, companies and people. One of the basic services to provide is water supply. These, as Helmsing (2005) points out and as we have seen in previous sections, can be supplied through a variety of forms ranging from solely public to completely private. The element of basic services provision contributing to LED is of direct importance for this research, as it shows that investments in improved water supplies indirectly influence it.

1.4.1. Community-based development, MSEs and poverty

As mentioned before, globalisation can be an opportunity for economic growth of an area. However, to second Esteva & Prakash (1997; cited in Binns & Nel, 1999), the real lives of most people on Earth are far from being 'globalised', but are clearly marginalised. They point out that instead of globalisation it is local economic development and its local equivalents that appear to be one of the few realistic development options for 'the poorest of the poor'. The most pertinent kind of LED for those people has been labelled 'community-based development' (Helmsing, 2006).⁵

Africa, the world's poorest continent, is in the great majority outside of the global economy, and its inhabitants rely more and more on local production systems, knowledge and livelihoods, thus contributing to the emergence of non-Western forms of LED. According to Binns & Nel (1999), local economic development has been defined and interpreted in terms of Western economic concepts, while in poorer countries LED takes much simpler forms inadequate for its definition. LED in most of Africa should be understood as a survivalist strategy, lacking the 'big business', investment and infrastructure of the North. Internal problems coupled with negative effects of global trade and structural adjustment packages forced many local communities to look inward at their own resources and skills. This is happening aside from limited interventions run by donors and non-governmental organisations.

The reality found there has been recently acknowledged and incorporated into theoretical constructs. Community-based economic development is distinguished because many small enterprises,

⁵ The term 'community' may be somewhat misleading here, but it is meant to comprise the micro-level as outlined further below.

particularly in Africa, do not conform to the archetype of an enterprise (Helmsing, 2006). Asset vulnerability makes households adopt livelihood strategies with diversified set of activities. Moreover, non-economic and social factors play a crucial role in such LED processes, for example through community collective action both market and production upgrading can occur. Survival-based micro enterprise activity falls under this category. The great majority are part time micro enterprises and many local entrepreneurs run several enterprises at the same time and/or rotate frequently in and out of specific activities. Women face a triple burden, alongside their reproductive roles and care for children, their responsibility as head of the household places also the burden of income generation on them. They have to combine income generation with other tasks, while facing considerable constraints on mobility (Helmsing, 2003).

In fact, the ILO/UNDP (2000; cited in Kessy & Temu, 2010) reported MSEs as players of almost indispensable developmental role through income and employment generation and the contribution to general society and local economies. In many economies, Tanzanian comprised, there are only few large enterprises, followed by a larger number of medium enterprises, whereas small businesses dominate the economic landscape. They are many and engage a significant proportion of the population from both rural and urban areas, and produce affordable goods and services for local populations (Kessy & Temu, 2010).

Despite their roles, MSEs are concentrated in the informal sector. They have very limited access to financial services from formal financial institutions in particular credits to meet their working and investment capital needs. They are little protected and should be therefore supported. Components of community economic programmes address these needs and generally include (Helmsing, 2003):

- Creating (financial, physical etc.) local safety nets for shocks of any kind. For example financial safety nets against income emergencies can be created through savings and credit groups;
- Housing improvement and settlement upgrading, including space for basic services, such as water, sanitation, roads, facilities for health and education as well as settlement upgrading allowing for home based economic activities and/or small enterprise plots;
- Basic service delivery and its optional (partial) privatisation and formation of partnerships to achieve efficiency;
- Stimulating community economy. Households act in the local economy in three ways: as consumers, micro entrepreneurs and workers. However, poor people are weak market parties, usually with low productivity, operating in informal economy due to limited resource base. The barriers arising from these constraints should be minimised. Therefore, tailored micro enterprise programmes could constitute the core of community-based economic development, consisting of credit, training, technical assistance and marketing. A special category of training concerns training of micro and small enterprises as contractors of basic public services. Local governments more and more often tend to contract out public services to MSEs and community enterprises. One of the key sectors is the construction and maintenance industry which is labour intensive. There already exist examples of projects combining basic service delivery with stimulation of the community economy.

Finally, it has to be noted that local economic development also requires investment opportunities. These depend on access to information and risk level. One economic actor is also dependent on investments of other actors and opportunities and constraints of the whole industry. Moreover, there are two other crucial elements to LED – institutions and physical infrastructures. Institutional development encompasses rules and practices concerning market exchanges and business support organisations enabling actors an effective market interaction. Without basic infrastructure productivity

enhancing innovations cannot be adopted and production as well as transaction costs remain high. These elements have the economic characteristics of public goods, and therefore market failure occurs. Hence, LED also requires collective and public action. The actors involved in the design of LED-related interventions include the enabling government which creates appropriate legal, administrative, financial and planning frameworks. It also involves community-based as well as non-governmental organisations which serve as intermediary support (Helmsing, 2003; Helmsing, 2006).

1.5. Microfinance

Secondary urban centres often rely on some level of micro-finance to support business enterprise. In some cases, forms of micro-finance may be applicable for the water sector. Using grants or concessional loans, donors or NGOs, in collaboration with central government, may be able to create incentives and an enabling environment for micro-finance institutions to penetrate this 'new' market. In many countries local governance agencies and water boards are now allowed to enter into contracts with water service providers (whether public sector providers, community based organisations or private small service providers). This provides an opportunity for many actors who cannot otherwise afford to expand, rehabilitate, or improve their water service delivery capacity to engage in partnerships to meet their needs (UN-HABITAT, 2006). On the demand side, microcredits can help the poor to gain access to water services (Fonseca, 2006).

Microfinance is the provision of a broad range of financial services such as deposits, loans, payment services, money transfers, and insurance to poor and low-income households as well as their micro enterprises (ADB, 2000). The interest in microfinance started in 1980s and boomed in 1990s when more and more large-scale development projects turned out costly and flawed (Kevane & Wydick, 2001). It has rapidly emerged as a new tool for alleviating poverty applied by multilateral lending agencies, bilateral donor agencies, developing and developed country governments and NGOs. Also, a variety of private banking institutions joined this group, increasing the volume of microfinance services and consequently granting access to financial services which would otherwise be unavailable to masses of poor people (ADB, 2000).

Providing poor people with microfinance is believed to be important for a variety of reasons. It enables the poor to increase their consumption to a more subsistent level (which increases their productivity), to manage their risks better and gradually build assets, to develop micro enterprises, which all contributes to an improved quality of life (Robinson, 1996). Robinson (1996) argues that if they were widely available, institutional commercial microfinance could improve the economic activities and the quality of life of hundreds of millions of people in the developing world.

Nevertheless, it is worth mentioning that the majority of the poor still lack access to financial services. It is estimated that institutional finance is unavailable to over 80% of all households in developing countries (*Ibid.*). Moreover, researchers and practitioners generally agree that the poorest of the poor are yet to benefit from microfinance programmes in most countries partly because most MFIs do not offer products and services that are attractive to this category (Holme & Mosley, 1996). Also, self-selected groups for peer monitoring have not been inclusive of the poorest people. Group members choose people who are, according to their knowledge, the most likely to timely repay loan instalments, opting out the poorest (Johnson & Rogaly, 1997).

Besides, it is not the availability of a loan but the investments made with borrowed capital that earns additional income and may pull the poor out of poverty. The environment in which micro credit

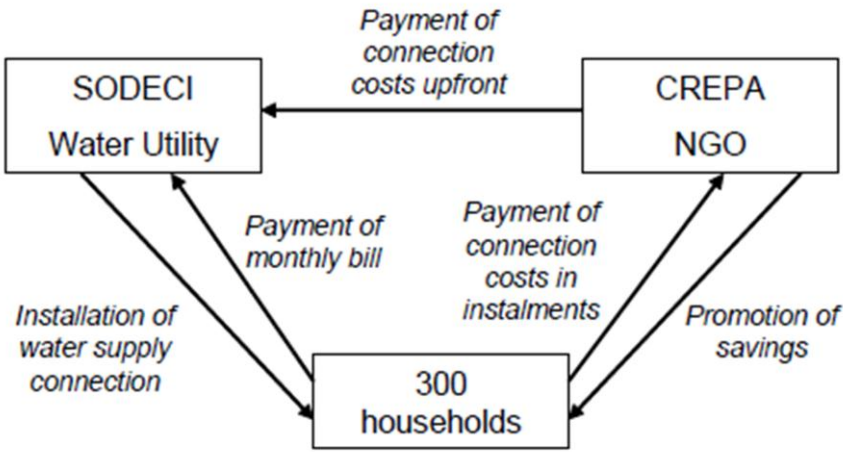
operates determines to a large degree the investment opportunities and thus the success in reducing poverty (Van Oosterhout, 2006).

It should also be noted that MFIs don't only bring loans to the poor, but often add to their existing lending options. The poor households might already have multiple financial linkages with institutions and individuals both on the deposit side and on the lending side. The services of MFIs should be superior and have value-added if they want to replace and/or compete with informal lending sources. Finally, as noted above, not all poor people are or will become successful entrepreneurs when they have access to loans (Van Oosterhout, 2006).

1.5.1. Microcredits in the water sector

As far as microcredits for the water sector are concerned, two main product segments can be distinguished (Mehta, 2008). The first one (on the demand side) are retail loans for household water – these are loans for water facilities or connections to the piped network. Even though a few of them achieved a significant scale, they are still small and few in comparison with other kinds of microcredits. The other one (on the supply side) are small and medium enterprise loans for small water supply investments. Most of them are in pilot stage, though there is room for potential scaling-up together with the development of business development services (BDS).

Figure 1-3. Microcredits for water



Source: Agbenorheri & Fonesca, 2005, p.11

Originally, microfinance focused on other sectors (e.g. trade, small-scale production of goods). Water and sanitation sectors were not perceived attractive enough, and on the demand side microcredits would not directly contribute to income generation. On the other hand, such organisations as CREPA (2003) argue that it is caused by lack of awareness of the

business case for water supply projects and helps households cover connection costs to the piped water through microcredits (Figure 1-3).

1.5.2. Women as the target for microfinance

According to UNDP, women constitute 70% of the 1.3 billion people living on less than 1 dollar per day (UNDP, 1996). Therefore, it is not surprising that the majority of borrowers from microfinance institutions are female. For example, female entrepreneurs comprised 93% of the Grameen Bank's client base in 2001, an increase from 39% in the early 1980s. (Kevane & Wydick, 2001).

There are a few important reasons for the considerable increase in credit targeted at female entrepreneurs in developing countries. More and more women are involved in entrepreneurial activity, in the majority in informal sector. The latter is caused by the limited absorptive capacity and difficulty

of entry into the formal sector for women, macroeconomic dislocation and adjustment as well as changes in household gender norms (Berger, 1989). Furthermore, the MFIs use microfinance as a tool to address issues of women's empowerment in developing countries (e.g. ADB, 2000; Kevane & Wydick, 2001). Microfinance interventions may lead to empowerment for women by increasing their income and their control over that income, enhancing their knowledge and skills in production and trade as well as increasing their participation in household decision-making. As a result, social attitudes and perceptions may change, and women's status in the household and community may be enhanced (Johnson & Rogaly, 1997). However, it has to be born in mind that economic empowerment is not a straightforward process, as gendered power relations within the household affect the distribution and use of money which questions women's capacity to control the loan (Goetz & Gupta, 1996).

The biggest achievement of microfinance is bringing financial stability to (female) micro-entrepreneurs, but one mustn't forget that it is not a tool for generating high growth rates. In fact, levels of poverty in Bangladesh, where microfinance is widely spread, remain unchanged since 1970s (Hossain). Microfinance brings about moderate increases in employment generation and household income, but it is often not enough to 'graduate' to the formal sector (financing). However, it may be a feasible goal for the children of microfinance programmes beneficiaries to reach more substantial increases in welfare (Kevane & Wydick, 2001). Despite its flaws, microfinance too often remains the only chance for giving perspectives to the world's poor (women).

2. Methodology

All the conceptual, methodological and technical details of this research are presented in the following chapter. A one-page overview is presented in Table 2-1 on the following pages where research questions and sub-questions have been juxtaposed with corresponding hypotheses and methods. A mix of qualitative and quantitative methods was applied throughout the research. This Q-squared approach provides benefits in terms of data quality and in-depth analysis (Hulme, 2007). It also serves best different objectives set for this research.

2.1. Research objectives, questions and hypotheses

My research was originally coupled with the implementation of the Lake Victoria Water and Sanitation Programme (LVWATSAN) of UN-HABITAT. My host organisation, SNV, is responsible for the implementation of the component on local economic development. LED is sought to derive from the provision of new water infrastructure and from the implementation of capacity building interventions for the water sector. This research was supposed to help SNV in designing such LED-related interventions. The objective was set as follows:

Supporting design of local economic development interventions for water service delivery in Bukoba, Tanzania on the basis of opportunities arising from improved access to water provided by LVWATSAN.

This objective was set from the development practitioner's perspective with certain assumptions already incorporated in it. One assumption is the fact that improved access to water is an opportunity for local economic development and that LED can result from the provision of this access (after the implementation of designed interventions, but new water infrastructure is the starting point). Another assumption is that this improved access to water has *de facto* been provided by LVWATSAN. Yet, an independent researcher has to first seek answer to the question if these assumptions are indeed true. Below I will first outline the boundaries of the research in the context of theoretical findings presented in the previous chapter, to finally recapitulate all objectives necessary to realise the one stated above.

First of all, as outlined in the theoretical framework LED can result from both the supply and demand side of water service delivery. On the one hand, economic activities can be stimulated among water service providers by the provision of new water infrastructure, and on the other hand water can become a cheaper, closer and better quality resource for households and individuals as well as other non-water enterprises. For the economic benefits to accrue for non-water enterprises, we have seen that the improved supply system provided has to mean lowering prices of water. This has not happened as a result of LVWATSAN and therefore the impact on large and medium enterprises is deemed low and will not be part of this research. On the other hand, it was noted that the impact on micro and small enterprises may be low too. However, as home is often the base of their activities, investments made in water facilities are shared between the enterprise and the household. Household water demand is the largest of all and studied the most often, in the form of willingness to pay studies presented in the theoretical framework too. Therefore, the findings for households may also be relevant for home-based activities in the micro sector.

Then, it is important to note that the term 'water sector' is preferred to water service delivery throughout the thesis, as this term reflects a wide interpretation of water supply as well as the

economic connotation sought for this research. Provided that the final objective is to seek LED opportunities for water service delivery, it is desirable to also look beyond the sheer act of supplying water. It is acknowledged here and in literature that the potential opportunities can lie in providing various water-related products ensuring hygiene and safe water consumption as well as in related services such as plumbing. Water sector thus consists of water supply and water-related products and services.

However, as we have seen earlier, it cannot be neglected that the water sector is part of basic service delivery and thus, is not driven by rules specific for other market sectors. The infrastructure necessary for

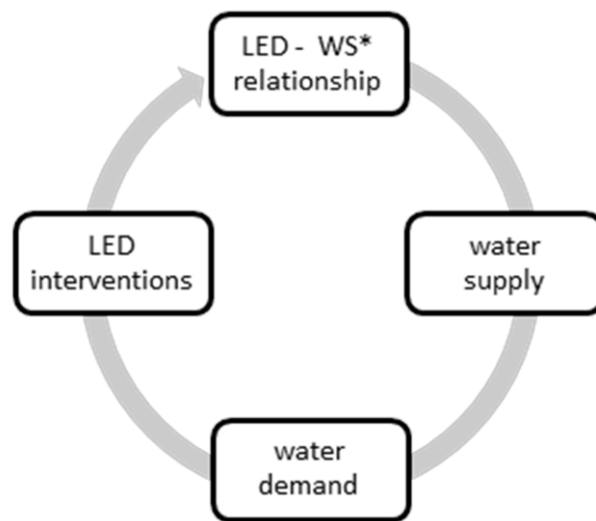
water supply is considered a public good, and water – the provided ‘product’ – has long been and still often is considered a social good, and therefore market failure occurs.

Considering the general background sketched above, it is foremost desirable to look at the relationship between water service delivery and local economic development, as this relationship is academically central for the practical objective set by my host organisation. Then, suggestions for LED interventions can only result from a thorough analysis of the water market in Bukoba which would reveal needs on the supply and demand side. As a result, after assessing the scope for local economic development arising from water supply and demand analysis, the relationship between the water sector and LED is revealed (Figure 2-1).

To recapitulate, the following research objectives have been considered necessary before realising the one primarily assigned:

- ✓ ***To bring closer the relationship between water service delivery and local economic development.***
This incorporates how strong the relationship is and how important are the two elements for each other. As there are numerous other factors to take into account, it is acknowledged from the start that fully dismantling the relationship is impossible.
- ✓ ***To discover the system of water supply in Bukoba.***
As part of this objective, it is also crucial to assess the impact of LVWATSAN on the local water supply. Apart from that, it was shown in the theoretical framework that the role of small-scale water providers is very important in (secondary) towns of Africa. Acknowledging the fact that they are a big part of the private sector and can play a considerable role in both water service delivery and LED, especially they will be put under scrutiny. Finally, the crucial role of the environment has also been pointed out and will be analysed too.
- ✓ ***To assess the demand for water and water-related services in Bukoba.***
Analysing water demand is especially important for this study, as it has become a big issue of concern in the contemporary water debate and has never been measured in Bukoba. It is

Figure 2-1. Followed research process



*WS – water sector

Table 2-1. Research questions with corresponding hypotheses and methods used

Question	Hypothesis	Method / Operationalization
What is the relationship between water service delivery and local economic development?	There exists a two-way relationship between water service delivery and LED.	✓ Generalisation of all research findings acquired through the methods mentioned below
1) How is the water supply in Bukoba?		
a) How has water supply been influenced by LVWATSAN?	LVWATSAN has substantially contributed to the improvement of access to safe and clean water sources.	✓ Semi-structured interviews with people involved in LVWATSAN ✓ Secondary data analysis of project documents ✓ Targeted questions in the general questionnaire*
b) What is the role of small-scale water providers?	The role of small-scale water providers is very important in meeting the local need for water.	✓ Semi-structured interviews with relevant stakeholders in the water sector ✓ Questionnaires for small-scale water providers ✓ Targeted questions in the general questionnaire
c) What is the environment in which the water sector operates?	The environment in which the water sector operates is not optimal for the best provision of water services and should be improved.	✓ Semi-structured interviews with relevant stakeholders in the water sector ✓ Secondary data analysis
2) What is the water demand in Bukoba?		
a) What are the existing patterns of water use?	People mostly use unimproved water sources and do not use enough water for their daily activities.	✓ General questionnaire ✓ Data from other available studies
b) What is the willingness to change and pay for improved water sources?	There is considerable willingness to pay for improved, reliable water sources.	✓ Targeted questions in the general questionnaire
c) What is the demand for water-related products and services?	There is a low demand for water-related products, as people are not sensitised on the importance of hygienic water use.	✓ Targeted questions in the general questionnaire
d) Is there demand for microcredits for improving one's water sources?	As it is hypothesised that the willingness to pay for improved water sources is considerable, there is also some demand for 'water microcredits'.	✓ Targeted questions in the general questionnaire
3) What interventions are desired in the water sector to meet the demand and foster LED?	Answering the abovementioned questions will allow designing potential interventions.	✓ Deduction from the findings acquired through the abovementioned methods

* The general questionnaire is targeted at the population of Bukoba and covers the topics of water supply quality and water demand.

nowadays very common to measure willingness to pay for improved water sources in developing countries. The issue is especially relevant for the people of Bukoba, so that they are able to reap full benefits from the water infrastructure provided through LVWATSAN. It has also been acknowledged that there will be no real benefit from improved access to water without adequate hygiene. Therefore, demand for water-related products (e.g. such point-of-use solutions as water filters and the like) has been measured as well. Finally, it is highly plausible that numerous people lack financial resources to take profit from arising opportunities of improving their water use. A microcredit scheme could be the solution to this problem (thus, a potential intervention), as was similarly assumed by the local host organisation, KADETFU, who provides microcredit for improving sanitation. The demand for ‘water microcredits’ has been assessed too.

These objectives correspond to research questions which have been presented in the table above (Table 2-1). Also, according to the existing knowledge presented in the theoretical framework, matching hypotheses have been made. The relating concepts and methods used will follow in the sections below.

2.2. Conceptual model and operationalization

The conceptual model presented in Figure 2-2 visualises the general idea behind the research. This multidimensional model shows different relationships and impacts of actors, processes and concepts identified as crucial. First, I will shortly explain how to read the model and then I will discuss in detail all the included entities together with their operationalization or research context (where relevant).

There are three levels of contexts or environments which are important for this research: international, national and local. The key actors are assigned to each level together with corresponding processes or impacts that they have on water service delivery and local economic development, the fundamental concepts of this research. These impacts can be combined together and in total they come down to demand- and supply-side factors influencing the water sector and LED. Within the water sector it is important to single out the process of (water) demand and supply affecting each other. This has an impact on local economic development and *vice versa*.

The concepts presented in the model are based on theory and local context which have all been discussed in the theoretical and national framework. A general overview of all the entities included is the following:

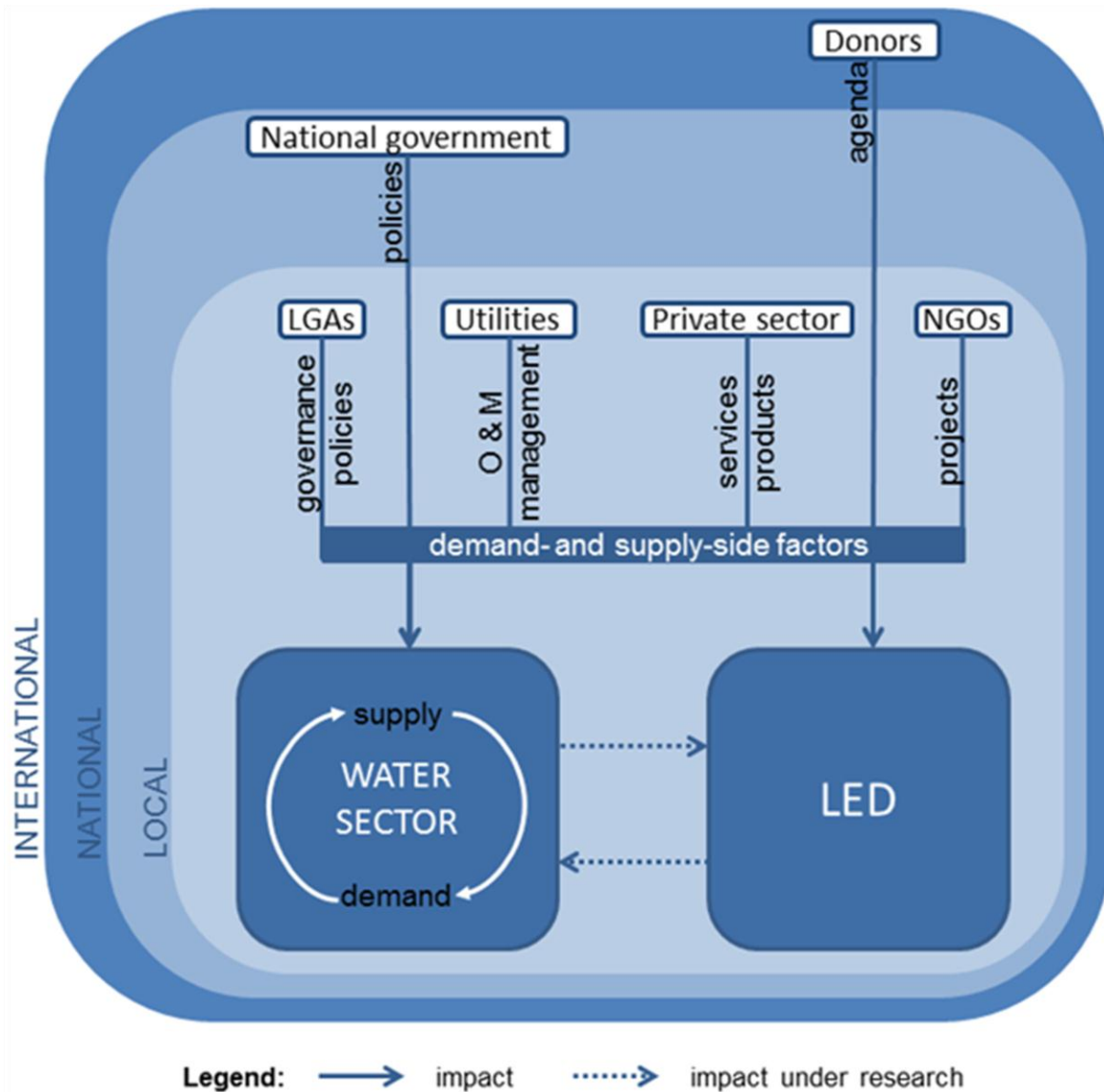
Water sector /supply, demand. The water sector, similarly to other segments of the economy, is driven by the interaction between supply and demand (shown in the model). Both need to be thoroughly analysed in order to discover any opportunities for interventions whose outcome would be the economic development of an area.

Operationalization: Water supply – identification of providers, state and type of water infrastructure, quality, quantity and price of water provided by respective providers, impact of the environment measured by factors stated further below. // Water demand – quantity and cost of water used by the population, perception of quality, willingness and ability to pay for improved water sources as well as water-related products and services.

LED. As we have seen earlier local economic development is fostered with the stimulation of local economy, creation of jobs and making the environment conducive. On the one hand, water sector is

one of the numerous elements influencing LED, and on the other hand LED fosters the development of the water sector, as it fosters other sectors too.

Figure 2-2. Conceptual model



Operationalization: Identification of existing economic activities related to the water sector, search for potential activities and interventions in the water sector on the basis of the analysis of water supply and demand; analysis of the environment measured by factors stated further below.

Demand- and supply-side factors. All the activities and processes led by the actors provided in the model add up to demand- and supply-side factors which have an impact on the water sector and local economic development. In order to keep the model concise, the key factors have been singled out while the general formulation comprises also all other minor factors not included by name.

Operationalization: Analysis of the following activities and processes led by relevant actors:

- ✓ ***Donors /agenda.*** Donors have a considerable impact on both LED and the water sector in developing countries, especially in Africa. A lot depends on their agenda and current paradigms. Every major donor agency has a toolkit on strategic planning for local economic development

which is in the spotlight for a little more than one decade. Sponsoring water infrastructure happens already for a longer time, but it is the donor's agenda that decides where the resources are allocated.

Research context: UN-HABITAT /LVWATSAN.

- ✓ **National government /policies.** Every national government caters for general and macro-economic environment in which different sectors and the economy as a whole operate. The general rules are set in national policies which have to be followed at the local level. This general formulation also comprises different agencies and activities founded by the government for the good functioning of specific sectors.

Research context: the Government of the United Republic of Tanzania, the Energy and Water Utilities Regulatory Authority /National Water Policy, Small and Medium Enterprise Development Policy, National Microfinance Policy, sector strategies.

- ✓ **LGAs /governance, policies.** Local government is one of the major actors at the local level. Its role is all the more important, if decentralisation policies are in place. It is mainly charged with regulation and supervision of the functioning of other actors and processes.

Research context: Bukoba Municipal Council

- ✓ **Utilities /O&M, management.** Water utilities are responsible for water supply. Their operations & maintenance as well as the way in which they are managed are crucial for the efficiency, quality and price of water supply. The discussion on the form of ownership and operations has been covered in the theoretical framework. If private sector is involved in it, it is of direct importance for local economic development (supply side). Otherwise it can indirectly influence LED (demand side), as water can be an input for enterprises as well as one of the factors influencing workers' health (translated into productivity) and time (translated into hauling cost). The cost and quality of water provided by water utilities can thus be a multiple factor.

Research context: Bukoba Urban Water and Sewerage Authority (BUWASA)

- ✓ **Private sector /services, products.** Private sector is similarly of importance on the supply and demand side. It can be directly involved in water supply, as is the case for small-scale water providers, or can benefit from water as an input in its activities. The link between the supply of services and demand for them has to be emphasised. Currently private sector provision of urban services, cost recovery from service recipients and demand-driven service provision are in the spotlight. Since private sector provision of urban services is a new approach in many places, it is important to demonstrate to the private sector that there is a real demand and willingness to pay. Then the private sector may be convinced that investment risks are acceptable (Cointreau-Levine *et al.*, 2000). The same 'demand logic' counts for introducing new products and services on the market. This all has an impact on local economic development.

Research context: small-scale water providers, all enterprises making use of water

- ✓ **NGOs /projects.** The impact exercised by non-governmental organisations is largely coupled with the impact of donor agencies, but NGOs operate locally. Many of them are either contracted to implement (components of) developmental projects or are directly sponsored by donors from Western countries. Their activities have a direct impact on water sector (in case of water-related projects) and local economic development (in case of LED-related projects). Their projects

incorporate such important aspects as microcredit schemes, upgrading technologies or social marketing.

Research context: SNV, KADETFU

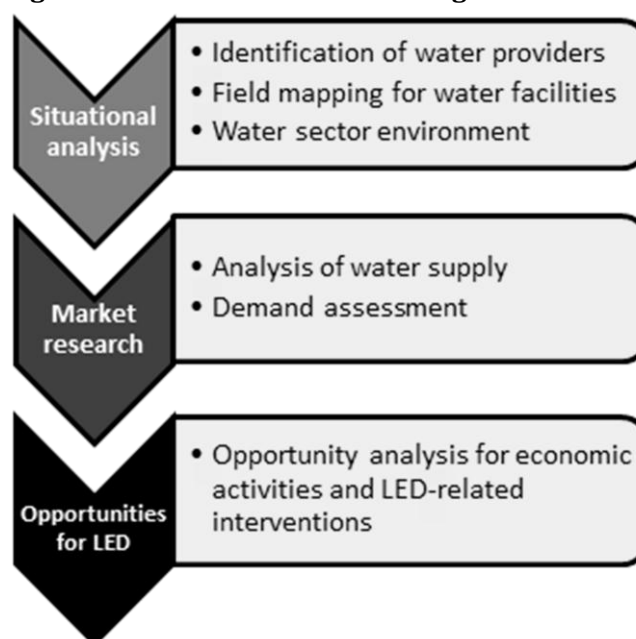
These concepts have been put in research questions and after operationalization measured with various research methods outlined below.

2.3. Research methods

Q-squared approach has been applied throughout the whole research. Methods corresponding with particular research questions were presented in Table 2-1. In general, the followed research process can be divided into three stages (Figure 2-3).

First, a situational analysis was carried out in order to get insight in the local situation, particularly in the water sector. When this phase was accomplished, it served as a basis for designing tools for the second phase: local water market research. This consisted of analysing the supply and demand side. The analysis of all acquired information facilitated the discovery of opportunities for local economic development. The methods used throughout each stage are presented below.

Figure 2-3. Research activities at a glance



I. Situational analysis

- analysis of secondary data on the local context; documents acquired through interviewed stakeholders and at the Kagera Office of the National Bureau of Statistics;
- transect walk with BUWASA for the identification of water infrastructure (water kiosks, water intakes);
- updating existing maps on the location of water infrastructure facilitated by BUWASA;
- semi-structured interviews with the key representatives of BUWASA, UN-HABITAT representative in Bukoba, representatives of the Multi-Stakeholder Forum and Bukoba Municipal Council as well as with an NGO working for women's rights and with a local journalist.

II. Local water market research

a) Supply side

- It was identified in the first stage that water kiosk operators are the only small-scale water providers in Bukoba and that there are also some water vendors, but only in chosen areas and their importance in water supply is marginal. Therefore, questionnaires were specifically designed for water kiosk operators. 11 were interviewed out of 26 operating within the boundaries of Bukoba

Urban (see details on the sampling procedure in the next section). A copy of the questionnaire is attached at the end as Appendix B.

- Secondary data analysis of documents on water supply in Bukoba.

b) Demand side

- Quantitative methods:

A separate questionnaire on water supply (further referred as the ‘general questionnaire’) has been designed for the population of Bukoba with the purpose of assessing existing demand for water and improved water sources. 355 households were interviewed from all urban wards of Bukoba. Sampling details are to find in the next section. A copy of the general questionnaire is attached as Appendix C.

It was an all-in-one type of questionnaire in order to meet respective objectives set for this research. It has the characteristics of Citizen Report Card, demand assessment and willingness to pay surveys. Citizen Report Card is an international best practice tool for improving service delivery. It collects feedback through sample surveys on aspects of quality and adequacy of (public) services (ADB, 2007).

Then, demand assessment and willingness to pay surveys measure ‘effective demand’ for water services. Effective demand, also called economic demand, refers to ‘demand for goods and services which is backed up with the resources to pay for it’ (White, 1997; cited in Wedgwood & Sansom, 2003, p.5). The desire of a water supply user for certain improved water services must be backed up by his ability to pay the contribution. In proper willingness to pay surveys users are presented a few hypothetical water supply options with different prices to pay for them. This technique is based on stated preferences and includes contingent valuation methodology, as opposed to revealed preferences techniques in which user prices or expenditures are directly observed through various methods (Wedgwood & Sansom, 2003).

The presentation of hypothetical options with concrete prices requires a thorough training of enumerators, a large sample (to indicate various prices to different groups) and a very good knowledge of local market prices. Due to time and budget constraints as well as an already extensive scope of topics included in the questionnaire, a simpler version of such surveys was adopted. The primary objective was to measure initial demand without giving exact price options (cf. Cointreau-Levine *et al.*, 2000; Wedgwood & Sansom, 2003). The difference between a sheer desire for improved services and that desire backed up by the ability to pay has been reflected in two separate questions on ‘willingness to access services’ and ‘willingness to access these services offered at an affordable price’ (question 15 and 16 respectively; Appendix C).

Besides, to further reflect the LED aspect of the research as well as the search for potential LED-related interventions, additional questions on household economic characteristics and demand for microcredits for water and water-related products and services have been included.

- Qualitative methods:

The enumerators were also guided to allow people to give details on their certain answers which was noted down and taken into account as qualitative data. Often, it turned out helpful in understanding the reasons behind particular answers. The consequence was, however, that a single interview took up to one hour.

In addition, five focus group discussions with various groups in Bukoba took place. They tackled the state of water supply and took place under the initiative of a Tanzanian organisation. The results served as a supplement to the data collected under this study.

III. Opportunity analysis

In this part I mainly deduct from the findings acquired through the methods described above and refer to the experience of existing LED-related interventions elsewhere. It is also a bridge to the conclusion in which the main research question is answered.

2.3.1. Sampling for the questionnaires

This section will provide details on the sampling procedure followed for choosing respondents of the general questionnaire. The same procedure was followed for the water kiosk questionnaire with the exception of the final stage of choosing households which is not relevant for water kiosks (see details below).

Population surveyed

Bukoba Municipality consists of 14 wards – 8 rural and 6 urban, and each ward is divided in smaller entities called *mitaa*⁶. The six urban wards called together Bukoba Urban fall under research (see map in Appendix D). The rationale behind is that in theory urban and rural water supply vary considerably and LVWATSAN is an urban-based initiative. On the other hand, water kiosks have also been constructed in the wards marked ‘rural’ and water supplied by BUWASA reaches some of these wards too. Yet, comparably difficult access to the population widely scattered around rural wards as well as budget and time constraints have been the factor which overweighed the decision on limiting the study to the urban wards. The total population of Bukoba is more than 80,000, but Bukoba Urban comprises a little less than 60,000 according to the 2002 Population and Housing Census (NBS, 2002a).

Unit of analysis

Households will be the unit targeted by the general questionnaire, as it is generally assumed that they are the best units for measuring the quality of water supply and willingness to pay for service delivery. The household uses water collectively (washing, cooking etc.) and pays one water bill.

Subgroups in the population

Such subgroups as male/female, with water kiosk in the area/without water kiosk in the area and low income/high income should be distinguished. The sample was deemed large enough to get sufficient respondents from each group, so there were no strata specified. According to the census data (NBS, 2002a) 35% of households in Bukoba are female-headed. Then, approximately half of all the *mitaa* have a water kiosk within their boundaries, so there would always be clusters included with and without a water kiosk. These assumptions were confirmed in the final selection of clusters (Table 2-2).

Sample size

Usually such types of surveys (Citizen Report Cards, demand assessment surveys) involve a sample of 300-350 households, although in case of willingness to pay surveys it can go up to 1000. The final sample size for this research is 355.

⁶ *Mtaa* (from Swahili) is the singular- and *mitaa* is the plural form. There is no pertinent translation; it means parts of town, neighbourhoods and/or streets.

Sampling frame

The census data for Bukoba was according to the Municipal Council unavailable. The Kagera Office of the National Bureau of Statistics was only in possession of a ready report presenting the general profile of the town. Alternatively, each office of Ward Executive Officer has a register of the population of its *mitaa* together with number of households, mostly from 2010. Each office was therefore visited and the numbers copied. Nevertheless, they for sure only represent a rough approximation of the real number of households, as people living in informal settlements are not likely to be included.

Table 2-2. Sampled units

No.	Ward	Mtaa	Sample of households	Sample of kiosks
1.	BAKOBA	Buyekera	27	
		Mtono	27	
2.	BILELE	Jamhuri		1
		Uhuru	27	2
3.	HAMUGEMBE	Kashabo	31	1
		Omukishenye	34	1
4.	KASHAI	Kashai Halisi	27	1
		Kashenye	30	
		Kilimahewa	28	1
		Kisindi	27	
		Mafumbo	16	1
		NHC-Kashai	27	
5.	MIEMBENI	Pepsi	27	
6.	RWAMISHENYE	NHC	27	3
Total		13	355	11

Sampling method

The sampling method is a combination of multistage cluster sampling and probability proportional to size sampling. Due to time and budget constraints wards were divided in clusters and a number of them was included in the sample. Clusters were *mitaa*, the sub-divisions of six urban wards. In total 10 out of 30 were randomly selected. Because they vary in size considerably (from 50 to 1200 households) probability proportional to size method was used. In short, it means that the bigger the size of a *mitaa*, the bigger is its chance of entering the sample. In result, different sizes can be approximated in the following way: one *mitaa* of small wards entered the sample, two *mitaa* of medium wards and three of big ones. Technical details of the method followed are attached in Appendix E.

An exception to this logic is the biggest ward, Kashai. In the process of interviewing it turned out that the selected *mitaa* were mostly high-income areas. Including three other, low-income areas was suggested by the Ward Executive Officer. There was also supposed to be more water-related problems, as the suggested areas mostly lie in hills in comparison with the ones initially chosen. Taking into account the pro-poor focus of LVWATSAN, it was finally decided to include the three extra suggested *mitaa* in the sample.

Then, the second stage of multistage cluster sampling involved choosing a sample of households to be interviewed in each cluster. It was initially decided to interview 27 households from each cluster resulting in 270 interviewed households in total and 351 households after the inclusion of three additional clusters. The final numbers are to find in the table above.

The intentional method for choosing 27 households from each cluster was a random walk. While in the field, we would begin from a random starting point and wanted to count each *n*-th house to be

interviewed. However, because sometimes the *n* was very high (e.g. every 44th household to be interviewed) it was difficult to count as well as distinguish proper numbers of households from each other. In this case it was rather a rough approximation of the *n* in the field and the walk continued until a number of 27 was achieved in the given cluster. Therefore, there is no case of ‘no response’. These aspects make the second sampling stage similar to the characteristics of a quota sample. Although everything possible has been done to keep the walk as random as possible, it has to be stressed that each household within respective clusters did not have an equal chance of being chosen.

After the sampling procedure was completed, a few pilot surveys were conducted for quality control of the questionnaires. As a result, final adjustments were made and data collection started. It took in total several weeks and was in the greatest part done by two enumerators.

2.3.2. Quantitative data analysis

The quantitative data – from general and water kiosk questionnaires – has been analysed with the programme SPSS 19. Univariate, bivariate as well as multivariate analysis has been done.

As for multivariate analysis a model of multinomial logistic regression has been created for the variable ‘willingness to access improved water sources at an affordable price’. One of the basic approaches to estimating household water-demand function in developing countries is discrete analysis of source choice. Multinomial logit (MNL) models are among the most frequent specifications for such source choice models. The idea behind is the desire to reveal the most important factors behind the household choice of a particular water source. Usually these are the level of water consumption, water price, cost of water collection, quality of water service and household socioeconomic characteristics (Nauges & Whittington, 2010).

To contextualise it for this research, the preferences of the inhabitants of Bukoba for particular water sources will be revealed together with the factors behind them. This will enable matching local water demand with the existing and potential water supply options. This process will in turn guide us to the desired interventions in the water sector, potentially LED-related, as various improved water source options are included backed up with the user willingness to pay for them. The private sector, such as small-scale water providers, can be potentially involved in the provision of such improved water.

The specifications of the multinomial logistic regression model are as follows:

Dependent variable

Choice of water source offered at an affordable price. The initial choices were between seven different supply options available locally: (a) an in-house connection, (b) a yard tap, (c) yard tap shared with a few households, (d) a water kiosk, (e) neighbour's private connection, (f) a rainwater harvesting tank and (g) a protected spring. However, few people chose options c, d, e, g, all having the characteristics of shared water sources. Therefore, they have been combined into one option, so that a meaningful analysis could also take place for this category (Table 2-3). A rainwater harvesting tank was chosen by only 25 respondents, however because its characteristics are much different than for other sources it stayed

Table 2-3. Dependent variable

	Frequency	Valid Percent
In-house connection	77	24,8
Yard tap	107	34,5
Shared yard tap/water kiosk/protected spring	43	13,9
Rainwater tank	25	8,1
None	58	18,7
Total	310	100,0

as an independent choice. It was also decided to include it in the model, because considerable interest was shown in it during qualitative parts of the research. The final form of the dependent variable is presented in Table 2-3.

Independent variables

Due to the sample size there is a limited number of variables which are advised to put in the model. Based on previous water source choice models, analysis of the dataset as well as specific characteristics of Bukoba six variables were entered into the model. Four of them specify characteristics of household current sources of water and two socioeconomic characteristics.

Characteristics of household current water sources

Number of sources used (scale) & private connection, collective sources or free sources used (all dummy). These variables are especially important in Bukoba where water sources are abundant and households often combine the use of many sources as well as more types of users can be discerned (than the usual division between connected and not connected households). Therefore, their influence on household's willingness to pay for improved water sources is likely to be high (Gulyani *et al.*, 2005; Nauges & Strand, 2007; WBWDRT, 1993).

Socioeconomic characteristics

Level of education & household monthly income (both dummy). The pre-model analysis showed that there are differences in choices between respondents who completed primary school or less (up to 7 years of education) and those who continued their education as well as between households with incomes equal or lower than 200,000 TSh and those with higher incomes. Better educated and higher income households are expected to prefer private connections (Briand *et al.*, 2009; Larson *et al.*, 2006; Nauges & Strand, 2007; Persson, 2002; for overview see Nauges & Whittington, 2010).

2.4. Limitations

This research similarly to other ones is also prone to some bias and limitations outlined below.

The first one is the bias carried with the colour of skin. Being a white person often caused certain prejudice among the respondents. In Bukoba there are a lot of donors and white people are generally associated with the provision of free aid (probably based on past experience). Even though an independent researcher, I was often treated as if I could bring money to help the people. I acknowledge that especially answers to questions related to money may be biased by the respondent's hope for profit/help.

Another limitation is the language barrier. A few words in Swahili or Haya (local tribal language) turned helpful in gaining positive attitude of respondents, however I had to rely on the quality of translation by my research assistants for non-English speakers. The benefit of direct interaction is then lost.

As for the quantitative part of the research, it was already mentioned in this chapter that there was a number of choices to be made due to time and budget constraints. Covering only part of Bukoba wards⁷ as well as the necessity of choosing clusters within them are the major ones. It turned out that the clusters – *mitaa* – were very heterogeneous in terms of income and water sources, so some groups may be under- or overrepresented in the sample.

⁷ See the section on sampling for detailed argument.

It has also been acknowledged earlier that due to technical reasons each household did not have an equal chance of being chosen in the random walk method. Due to these reasons, the final stage of the sampling procedure resembled a quota sample belonging to the category of the non-random samples. Yet, this method is in widespread use in market research and is on the average considered reliable. It produces findings as precise (and sometimes even more precise) as probability samples (Barisione & Mannheimer, 1999; cited in Gobo, 2006).

Furthermore, Gobo (2006) points out that there are two kinds of generalisations – one aiming at the estimation of distribution in a population and the other about the nature of a process. Representativeness of samples should not be confused with the generalizability of findings understood as observed characteristics. It was strived for a representative sample in the quantitative part of this research and meanwhile it can be doubted if it was achieved, the findings certainly reveal certain characteristics of the population of Bukoba. The socioeconomic data are largely compatible with other studies deemed representative, so the argument for randomness of the sample is stronger.

However, a word of caution needs to be said about the reliability and predictive power of the statistical model. It is supposed to help guiding future water supply options driven by the demand for them, but the characteristics of demand revealed by predictor variables included cannot be treated as the only factors. The number of variables is limited by the sample size which was desired to be double for the full reliability of the results. Roughly half of the cells understood as the combinations of the independent variable by all levels of dependent variables were empty. In other words, there was no data for all the combinations of data. It is generally advised to keep empty cells to the minimum, however it is rarely achieved due to large samples required (Field, 2009). The sample size of many other water demand studies are similar to the one achieved here with a comparable number of variables entering the model (for the overview see Nauges & Whittington, 2010). Many of these results are deemed generalizable for the population, however the author holds the view that the model included here reveals certain useful characteristics, but the numbers included should not be generalised beyond the sample.

Then, it has to be noted that the estimates of income size are prone to seasonal variability, especially among the poor. Unless households are revisited on a seasonal basis, declared income might not reflect a true mean throughout the year. This makes comparisons with other studies, which face similar difficulties, more arbitrary than desired (Deaton, 1998).

Finally, there are a few comments to be made on the surveys based on stated preferences. In some cultures it is common to provide an ambivalent rather than a negative response. Ready *et al.* (2001) found that respondents presented with a discrete choice in a contingent valuation survey say ‘yes’ to values they are unsure of. This problem was dealt with in the way that gradation of possible answers was included in the questionnaire ranging from ‘strong yes’ and ‘yes’ through ‘unsure’ to ‘no’. However, it cannot be predicted how many and which respondents are prone to say ‘yes’ to every proposition.

3. Regional Framework

As outlined in the conceptual model, multiple levels are relevant for this research. Its findings are started to be analysed in this chapter by means of presenting the national and local environments for the water sector as well as for economic development. Lastly, details of the LVWATSAN project will be given.

3.1. National context

Tanzania, an East African country with a population of 41 million, is in the bottom 10% of the world's economies in terms of *per capita* income. It is in the top 30 countries with the highest death and infant mortality rates as well as with the shortest levels of life expectancy amounting to 52 years. Tanzania gained independence from Great Britain in the early 1960s and formed one country from the territories of Tanganyika and Zanzibar. The main occupation of its population is agriculture employing 80% of the work force and accounting for 45% of the country's GDP (CIA, 2009). In recent years it has been ranked as one of Africa's better performers (EIU, 2005).

3.1.1. Water sector

As far as water sector is concerned, Tanzania, similarly to other countries in the East African region, is currently undertaking reforms at both policy and strategy levels. Water sector used to be governed by the 1991 National Water Policy which was amended by the new 2002 National Water Policy. In 1991 the central government was given the mandate to be the sole investor, implementer and manager of projects, in rural as well as in urban areas. This changed with the 2002 policy which has an objective of developing a framework for beneficiary participation in planning, construction, operation, maintenance and management (Arvidson & Nordstrom, 2006).

The 2002 National Water Policy tackles urban and rural water supply separately. The key challenges of urban water supply were identified as (URT, 2002a):

- Inadequate supply both in quantity and quality;
- Poor billing and revenue collection;
- Lack of an enabling environment for private sector participation;
- Belief that water is a God given resource for which no price can be attached resulting in low willingness to pay.

Private sector participation has been stressed for small urban centres which were encouraged to form private liability companies or any other autonomous legal commercial arrangement. 'Local private sector institutions shall be promoted and strengthened. Their access to credit facilities will be enhanced' (URT, 2002a). Additionally, small-scale water supply service providers were recognised officially, however it has been acknowledged that low-income groups collect water from them at a cost higher than that of the house connections. Even though needs of local groups were specifically stated and access to water services as the right of every Tanzanian was declared, enhancing an efficient and effective system of income generation from sale of water were among the main objectives for urban water supply. Moreover, a framework for sustainable development and management of water resources has been integrated into the new policy. The policy states that 'integrated water resources management approaches are instituted', mainly by means of demand

management. This comprises proper tariff setting at an economic cost, metering, leakage control and mass education on water use (URT, 2002a; Arvidson & Nordstrom, 2006).

The current institutional framework for water in Tanzania is based on the National Water Sector Development Strategy of 2006 which sets out the strategy for implementing the National Water Policy. Urban Water Supply and Sewerage Authorities (UWSA) are designated by the Minister of Water Irrigation in the areas of municipal councils and district headquarters throughout the country. There are three categories dependent on their ability to meet all or part of their operations and maintenance (O&M) costs, and are all accountable to the Ministry. They are financially autonomous organisations depending on the commercial viability of providing water and sewerage services. They may enter in varying contractual agreements with service providers (if not providing the service themselves); the agreements such as service, management or lease contracts where it is efficient and cost effective to do so. The providers may be from the private sector, NGOs or local authorities (LGAs). Furthermore, Energy and Water Utilities Regulatory Authority (EWURA) has been established to licence and regulate the Water Supply Authorities. Finally, low-income groups would be identified and provided with appropriate services, however they are also expected to contribute to the cost of provision along with their ability to pay. The utilities are charged with taking into account their needs and the groups would be identified with the help of local authorities (URT, 2006).

As for the reality on the ground, in 1971 the Government set a 20-year target to secure safe and adequate water no more than 400 metres from every household. In 2002 this unmet target was incorporated into the 2025 Development Vision. In 2004 only 53% of the rural population and 73% of the urban population have achieved the set target (IRC, 2005). Moreover, an extensive study Drawers of Water II (Thompson *et al.*, 2001) comparing water supplies between 1967 and 1997 in East African urban centres, among them Tanzanian, showed that water supplies had deteriorated. Many sites received less piped water in litres per day and had unreliable supplies, as well as the average time spent on collecting water for households without piped supplies tripled. Also, one of the most notable changes was a much greater importance of private water vending through kiosks or vendors. Even though Tanzania has been going through continuous reforms and since 1999 an additional 2 million people have gained access to water, this process is uneven with the worst coverage in the southeast of the country amounting to less than 10% in some districts. The disparities in water use in litres per day can differ up to 8 times between rich settlements of Dar es Salaam and rural areas in the country (UNDP, 2006). Moreover, donors still play a significant role in the local water sector and the importance of non-governmental as well as community-based organisations is growing (Seppala, 2002). As for gender aspects, in Tanzania as well as in many other developing countries time spent collecting water represents a heavy burden on women. School attendance levels are 12% higher for girls in homes 15 minutes or less from a water source than in homes an hour or more away. Attendance rates for boys are far less sensitive to distance to water sources (UNDP, 2006).

To conclude, even though private participation is promoted along with the new reforms, it will still take years to realise. Water – previously a free source – was the sole responsibility of the government. The local private sector has no or little experience in water service delivery, while many of the schemes are likely to be too small to attract international private sector. The rise of the local private sector would have to entail a great deal of capacity and entrepreneurship rarely available in Tanzania.

3.1.2. Economic development, business climate and SMEs

In recent years, the economic development and business climate in Tanzania have been gradually improving, as various reforms have taken place. Economic Reform Programmes implemented by the

government seek the private sector to take the lead in creating incomes, employment and growth. However, the country is continuously struggling with bureaucracy, corruption, poor physical infrastructure, slow judiciary system and the like (Table 3-1).

Small and Medium Enterprises (SMEs) are deemed the base for private sector-led growth and play a crucial role in employment creation and income generation in Tanzania. About a third of Tanzanian GDP originated from the SME sector. Micro enterprises, in the majority operating in the informal sector, consisted of more than 1.7 million businesses and employed 3 million people (about 20% of Tanzanian labour force). SMEs tend to be more effective in utilising local resources as well as simple and affordable technologies. Their development is closely associated with poverty alleviation, as they absorb the majority of new entrants into the labour market. However, the full potential of SMEs in Tanzania has yet to be revealed – constraints for their development encompass (URT, 2002b; Bekefi, 2006):

- Unfavourable legal and regulatory framework which is still cumbersome, bureaucratic, costly and centralised;
- Unfavourable tax regime (many and high rates);
- Undeveloped infrastructure (roads, electricity, water, IT) which makes it easier to procure goods internationally than locally, for example it is often cheaper and easier to get goods to Dar es Salaam from Dubai than from Mwanza (second largest city);
- Poor business development services;
- Limited access to finance – banks are discouraged and not willing to lend to SMEs;
- Ineffective and poorly coordinated institutional support framework;
- Culture not recognising the value of entrepreneurial initiative as well as lack of trust between the state and SMEs.

These constraints keep the majority of SMEs in the informal sector: ‘While the current regulatory environment is difficult for medium and large enterprises, it is largely inappropriate and irrelevant to micro and small informal businesses (...). It is virtually impossible for small businesses to operate legally (...) The current environment encourages businesses to remain small and informal (...).’ (ILO *et al.*, 2002; cited in Bekefi, 2006, p.19).

Finally, in recent years NGOs supporting the promotion of SMEs started to mushroom and provide such services as credit, training, consultancy and the like. However, they are considered rather weak, fragmented and uncoordinated. There is no umbrella association for SMEs and lack of clear guidance for the development of the sector. The Small and Medium Enterprise Development Policy from 2002 was supposed to change that and various bodies have been established (see Bekefi, 2006 for details). For example, as part of enterprise development and the implementation of Vocational Education and Training Act, 630 centres in the country offer training in more than 30 different sectors, in Kagera Region as well (see local context).

Table 3-1. Various indices for Tanzania

Measure (2009)	Ranking
TI Corruption Index	126/180
Heritage Economic Freedom	58.3/100
World Bank Doing Business	131/183
MCC Government Effectiveness	82/100
MCC Rule of Law	92/100
MCC Control of Corruption	73/100
MCC Fiscal Policy	29/100
MCC Trade Policy	68/100
MCC Regulatory Quality	71/100
MCC Business Start Up	66/100

Source: US DoS (2010)

3.1.3. Microfinance sector

In Tanzania the state dominates the microfinance sector and emphasises its role for poverty alleviation; the role initiated by various non-governmental organisations running microfinance projects next to the operations of the state. NGOs continue to depend on donor funds for their operations instead of building their own internal capacity. The majority are small and/or new and require a great deal of capacity building. They operate under different laws, which makes it difficult to monitor and develop common standards. Moreover, interest rates are not set by themselves and are usually too low to cover operational costs (URT, 2000).

One of the oldest and most common microfinance institutions in East Africa are Savings and Credit Cooperative Organisations (SACCOs). They date back to 1970s and grew out of old farming cooperatives which were widely present in cash crop areas, particularly coffee-producing zones (one of which is Bukoba). In Tanzania SACCOs are autonomous but closely linked to farming cooperatives which are their origins; recently they started operating in other sectors too. These organisations used to be promoted as the model in government policies, but were afterwards replaced by other institutions and since 1970s never regained the previous popularity (Chao-Beroff *et al.*, 2000). Operational problems with respect to SACCOs include poor administrative systems and weak financial control (URT, 2000). Furthermore, they reach mainly middle-income households, as there are no SACCOs in staple crops or semi-arid areas; they also fail to reach women as only 20% of members are female. Finally, the employees lack training and the financial products offered are not diversified to attract different kinds of members (Chao-Beroff *et al.*, 2000).

From 2000 on the microfinance sector is regulated by the National Microfinance Policy. Herein it is acknowledged that savings services are among the most beneficial financial services for low-income people, as they protect them against periods of low income, emergencies and large expenses to come. Only after that, it is acknowledged that credit services can perform some of the same services as savings. These are important for enterprises for short-term working capital and longer term investment capital. Households use them for consumption needs and housing improvements. ‘They are primarily facilitators rather than creators of the underlying economic opportunities. (...) they can contribute to the reduction of poverty and improvement of income distribution’ (URT, 2000, p.6).

It is interesting to recall a recent study of micro and small enterprises in Tanzania examining differences in business performance between the enterprises whose owners have received business and entrepreneurship training against those who had not. It showed that the former perform better in the way that they have higher level of assets and sales revenue compared to enterprise owned by non-recipients of training. Implications from the study is that training in business skills for Tanzanian micro and small entrepreneurs is vital for firms performance, growth and improved owners living standards in addition to credit access. To achieve greater impact from microfinance services and poverty alleviation, microcredit providers should therefore consider extending their products or work closely with training providers (Kessy & Temu, 2010).

To sum up, the sector has been evolving for years now, but is in the majority influenced by local environments rather than by different approaches and increased competition between MFIs. Total outreach is estimated at less than 1% of the population and fails to reach the very poor (Chao-Beroff *et al.*, 2000).

3.2. Regional and local context

Lake Victoria is the second largest fresh water lake in the world and the largest lake in Africa. The Lake catchment provides the livelihood of about one third of the combined populations in the three countries or about 30 million people. However, it is estimated that more than 50% of the Lake basin population lives below the poverty line. The rapidly growing urban centres in the Lake Victoria basin are playing an increasingly important role in the economic development of the region. Most of these towns are experiencing unplanned growth and this is negatively affecting basic infrastructure, living conditions, the environment and the fragile ecosystem of the lake (UN-HABITAT, 2009b).

Bukoba is the capital of Kagera Region situated in the north-west of Tanzania on the shore of Lake Victoria. According to government statistics Kagera Region is one of the most deprived regions of all Tanzania. Bukoba is a small urban centre, second largest port on the lake after Mwanza, with a population of 81,221 (according to the latest census, 2002) which is expected to rise to 125,000 by 2015. A substantial area of Bukoba is fully utilised for subsistence farming and animal husbandry. Fishing is another major economic activity together with small scale industries playing a significant role in the town economy. Due to its strategic location it is an important node in the regional transportation network (UN-HABITAT, 2009a & SNV, 2009a).

Image 3-1. Location of Bukoba



Source: www.circleofblue.org

According to Household Budget Survey (NBS, 2002b) almost 50% of the local population live below poverty line. The following factors were considered as the reasons (BMC, 2008):

- Concentration of activities in subsistence farming and lack of alternative to coffee cash crops (see Huisman, 2005 for details of socio-economic consequences of the collapse in international coffee prices for the local population);
- Lack of industries and other employment opportunities;
- Lack of access to land, especially for women;
- High fertility rates (with the population growth of 4% annually);
- Lack of access to safe drinking water, education and health facilities.

Another impoverishing factor is the geographical allocation of investments in Tanzania which tended to marginalise regions not commercially active, lacking economic infrastructure and social amenities. Kagera accounts for 0.9% of investment projects carried out in Tanzania and this percentage has not changed since 1990s. Also, among major constraints to the economic development of the area are low entrepreneurial skills and lack of aggressiveness demonstrated by inability to take advantage of

investment opportunities and absence of customised services. It is argued that entrepreneurship requires hard work; this mind-set is still unfolding in Kagera, particularly among the male population (Mashindano *et al.*, 2008; Klinkers, 2006 for a comprehensive assessment of poverty in Bukoba District).

3.2.1. Economic environment

Since decentralisation in 1997, Bukoba Municipal Council is the local decision-making and managing body. It is responsible for planning and allocation of financial means for Bukoba District. There are ten divisions within the council comprising, among others, water and construction, finance and trade as well as planning. The division for water is mainly responsible for rural areas, as urban water supply is the competence of Bukoba Urban Water and Sewerage Authority (BUWASA) directly accountable to the Ministry of Water and Irrigation, similarly to other utilities in urban centres in Tanzania (field research, 2010). The Municipal Council is deemed to have too few employees with too low levels of education for the number of tasks (especially multiplied after decentralisation) it is responsible for as well as available information on the local area is incomplete. Therefore, implementation of policies at the local level is hampered and entrepreneurs lack pro-active support (Klinkers, 2006).

Furthermore, tax regime is considered too complex, not transparent and costly in terms of time and money. Therefore, a great number of people work illegally. However, recent years have shown some improvement, as the number and amount paid for levies, duties and other fees decreased. As for the financial sector, even though in the past two decades banking services developed considerably, the conditions to open a bank account or take a loan are considered complicated and difficult to meet, especially for micro and small enterprises (MSEs). The majority of respondents in the research of Klinkers (2006) obtained their investment capital through their social network instead of formal institutions. Besides, there is a total of 34 SACCOs offering saving services to its members as well as a number of NGOs offering microcredit services which somewhat improves the picture of the financial market in Bukoba (BMC, 2008).

Finally, the creation of Kagera Business Council can be named among the recent positive steps towards the promotion of local enterprise development. Moreover, Kagera Vocational Training Centre offers four kinds of trainings in different sectors of the economy, so as to help train (potential) entrepreneurs. Similar centres in Tanzania offer a course on 'plumbing and drainage' which is the only one relevant for the water sector, however it is not offered in Kagera Centre.

3.2.2. Introduction to the water sector

Water services in Bukoba are provided by Bukoba Urban Water and Sewerage Authority (BUWASA; covered extensively in the next chapter). The main water sources are Lake Victoria, rivers, gravity and water springs. Bukoba is a bimodal rainfall region – there is a long rainy season from March to May and a short rainy season from October to December. Thanks to this, the annual average rainfall is high: from 1500 to 2000 mm. Dry season lasts from June-July to September (BUWASA, 2008). The climate is thus conducive for rainwater harvesting. Besides, Lake Victoria water is not of potable quality. The water intake is in proximity of the discharge of all storm water and sullage from the town. Also, raw sewage is discharged into the lake since there does not exist an off-site sanitation. It is estimated that about two thirds of residents of Bukoba have access to clean and safe water within a distance of 400

meters and that water demand oscillated around 80%. However, there is a high (over 50%) percentage of unaccounted for water, mostly due to the age of the distribution system (UN-HABITAT, 2009a).⁸

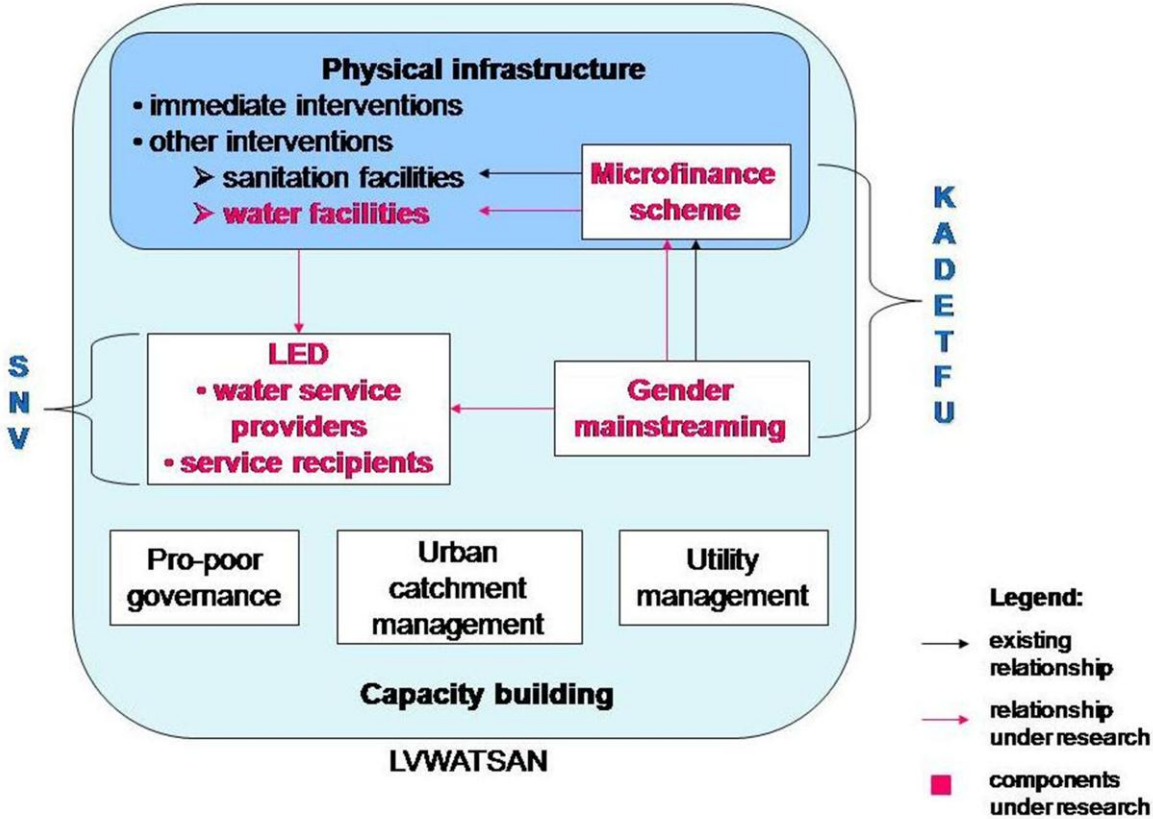
A major role in water infrastructure construction is played by donor agencies. Currently, there are four large donors involved in the water sector in Bukoba: Agence Française de Développement (French), Millennium Challenge Corporation (American), UN-HABITAT (through the programme described in next section) and World Bank (under Water Sector Development Programme).

3.3. Host organisations and project details

SNV is the Dutch Development Organisation working in 32 countries in the world. It focuses on increasing people’s income and employment opportunities in specific productive sectors, as well as improving their access to basic services including water and sanitation, education and renewable energy. SNV emphasises working on capacity building by supporting national and local actors within government, civil society and the private sector to find and implement local solutions to social and economic development problems (SNV website).

In Tanzania, apart from the head office in Dar es Salaam, SNV operates also through its Lake Zone office in Mwanza. One of the local capacity builders in the region working in cooperation with SNV is a non-governmental organisation KADETFU, Kagera Development and Credit Revolving Fund,

Figure 3-1. Positioning of the research within LVWATSAN



Source: own figure on the basis of project literature

⁸ Cf. later findings. There are a number of statistics for water access in Bukoba and an approximation is cited instead of exact percentages.

located in Bukoba town. KADETFU focuses on poverty reduction and environmental sustainability in Kagera Region. They promote poverty reduction programmes in which they provide microcredits to the community for economic activity base as well as they promote environmental management programmes in which they focus on conserving Lake Victoria environment (KADETFU website).

SNV is partner to the Lake Victoria Region Water and Sanitation Initiative (LVWATSAN) launched by UN-HABITAT in association with the Governments of Kenya, Tanzania and Uganda in 2004. The programme aims to address water and sanitation needs of the population, particularly the poor, in the secondary urban centres around Lake Victoria. It is aimed at 25 small towns situated around the Lake in all bordering countries, one of the towns being Bukoba. It supports participating governments in achieving the Millennium Development Goals for water supply and sanitation, with emphasis on innovative and pro-poor solutions as well as speedy delivery (UN-HABITAT, 2009b). It combines approaches to physical infrastructure with investments in capacity building. Among the guiding principles of the initiative are innovation, community involvement, rehabilitation, private sector participation, pro-poor focus and sustainability (SNV, 2009b).

The capacity building component of LVWATSAN comprises five thematic areas: pro-poor governance, local economic development, utility management, urban catchment management as well as gender mainstreaming. SNV is specifically involved in the local economic development component, and also supports the area of pro-poor governance. The key component for this research is LED, but the other elements marked in are of direct or indirect interest to this research too. The general objective for the LED component is 'to maximise the impact of the investments so that economic benefits will accrue for the MDG target group' (UNESCO-IHE *et al.*, 2008, p.36).

All physical immediate interventions under the project have been finished in Bukoba and the improved water supply network of the town was officially inaugurated by the vice President in March 2009. The physical interventions included:

- ✓ Rehabilitation of water intake at the Lake Victoria (which was approx. 40 years old). The level of the lake has been dropping and as a consequence the system of pipes had to be extended with the pumps reaching deeper. This has been done together with the installation of five new water pumps (Image 3-2).
- ✓ Rehabilitation of storage tanks;
- ✓ Construction of 26 water kiosks;
- ✓ Installation of 3 bulk meters and over two thousand customer water meters.

Other interventions included assisting female headed households through a microcredit scheme in construction of low-cost sanitation facilities (see Box 3-1). Currently UN-HABITAT is preparing with its partners for the long term interventions (SNV, 2009a).

Furthermore, to encourage ownership at local level, Multi-stakeholder Forums bringing together representatives of municipal authorities, service providers, local private sector, NGOs and CBOs have been formed in the project towns.

The fora are supposed to facilitate participation of various groups in the design and implementation of programme interventions. However, the one in Bukoba is dormant due to lack of funds. Apparently, the Municipal Council failed to provide the right account number and apart from first initial meetings

Image 3-2. Water infrastructure built under LVWATSAN



in 2008 and 2009 it has never been convened again. Moreover, there is a problem of recognising the forum as a meaningful body. There is no interest on the side of BUWASA and Municipal Council to revive it and the other stakeholders are not empowered to do so (field research, 2010).

Box 3-1. Sanitation microcredits

UN-HABITAT has entered into agreement with KADETFU on the implementation of a revolving credit fund for sanitation facilities. It is aimed at female-headed households, as it has been acknowledged that sanitation poses a serious problem especially for women. They form groups and collectively take a microcredit for the construction of an improved toilet; the revolving fund continues until all members have constructed a toilet. As of August 2010 336 toilets have been constructed in Bukoba with the final target of 500.

This new approach of giving microcredits for housing improvement is a result of numerous failed grants worldwide through which toilets were built and subsequently hardly used due to lack of demand and maintenance. The driving force of the new strategy is the concept of **social marketing** that creates 'social demand for services'. First, people are sensitised on the importance of hygiene and sanitation through the use of various media with the aim of changing people's behaviours and creating demand for the service. Social marketing has been successfully used in many sectors, however it is pioneer in sanitation. Low-cost technologies are sought together with the client's contribution in resources (e.g. building materials), in order to keep the costs as low as possible.

The investment is also considered an economic opportunity for local artisans who are specially trained for the construction of toilets. With potential demand rising in the future, it can turn into a sustainable income-generating activity.

Similar microcredits may turn out successful for water facilities in order to improve people's access to improved water which will be one of the results of this research.

Source: materials of KADETFU

4. Results: Water Supply

After the initial introduction to the water sector has been given in the previous section on local context, this chapter will focus on the actual water providers in Bukoba. The main water provider is Bukoba Urban Water and Sewerage Authority (BUWASA) which is legally charged with the delivery of water supply to the residents of Bukoba Municipality. According to nation-wide reforms, it shifted from being public utilities and started to be an autonomous and commercial entity. It operates somewhere along the continuum between public and private operations. No change of ownership to private hands has taken place, but it has been separated from the public sector and is responsible itself for operations and maintenance (O&M) costs. It is however bound by rules set by the government and depends on the licence from Energy and Water Utilities Regulatory Authority (EWURA). BUWASA provides people with piped water by means of private connections and yard taps. Additionally, in accordance with its competences, it contracted out the delivery of water from water kiosks to independent operators. These are charged with operations and maintenance, but have no freedom in setting tariffs. These two main categories of providers are presented further in the following sections. The impact of other providers is marginal, which will be shown in the next chapter.

4.1. Water utilities

Bukoba Urban Water and Sewerage Authority (BUWASA)⁹ is an agency established in 1998 and took over business functions previously performed by the Urban Water Supply and Sewerage Department of the Ministry of Water and Livestock Development. It is an autonomous entity with full operational, managerial and financial powers. It was initially classified as ‘category C’ utilities which entitled it to financial support from the government. However, in 2003 it was upgraded to ‘category B’ which means that it has to meet operations and maintenance (O&M) costs alone. It still shares only energy costs with the government (NWSC, 2007).

4.1.1. Operating aspects

The utilities are managed by the Executive Board of Directors. As part of the shift to self-sustainable entity a business manager has been employed in recent years. He is the only staff member with business background, as all other key employees are civil engineers. There are hardly any motivation strategies and staff morale is deemed low, probably due to low salaries. There is no fixed staff training programme, however staff members attend event-driven trainings (for example sponsored by donor agencies; *Ibid.*).

Image 4-1. New water meters



⁹ Together with the implementation of the Water and Sanitation Act of 2009, all authorities were renamed for Water Supply and Sanitation Authorities, but the original name has been kept throughout this thesis.

BUWASA disposes of 80 km of water mains and 11 pumps. The main water intake is located at the shore of Lake Victoria. Additionally, there is one intake at Kitera River and water is also pumped from five springs located within the boundaries of Bukoba. As of December 2009, BUWASA supplied water to 72.8% of the population of Bukoba, either through private connections or water kiosks. Water supply was at the level of 79% against demand of currently connected users, which means that water rationing took place in some areas of Bukoba. Average service per day amounted to 22 hours, however in the biggest part of Bukoba Urban water

Table 4-1. BUWASA tariff structure

Category	Previous tariff (TSh/m ³)	Consumption (m ³)	Current tariff (TSh/m ³)
Domestic	475	0-5	545
	-	>5-10	554
	-	>10	577
Institution	550	0-5	629
	-	>5-10	643
	-	>10	671
Commercial	550	0-5	639
	-	>5-10	648
	-	>10	676
Industrial	600	0-5	704
	-	>5-10	714
	-	>10	732
Kiosk	350	0-5	376
	-	>5-10	-
	-	>10	-

Source: materials obtained from BUWASA

was delivered round-the-clock unlike in Bukoba Rural. The numbers for 2009 are the same as for the years before; therefore no improvement can be concluded.

Customer base continued to expand and 83 new connections were made in the last quarter of 2009, making up a total of 6081 connections. 90.7% of connections are domestic and the remaining percentage is divided between institutional, commercial and industrial connections as well as 39 water kiosks (BUWASA, 2009). Especially the number of private connections has been rising substantially throughout last years, as in 2003 the total number amounted to 2628 – around 40% of the contemporary number.

In the recent past BUWASA charged a flat rate from its customers, but in the meantime more and more customer water meters were being installed and in 2009 92.6% of users were metered. BUWASA introduced increasing block tariffs coupled with a price increase starting from 2008 (Table 4-1). Domestic users faced a 15% increase, while water kiosk users 7%.

4.1.2. Financial performance

As of the end of 2009 customers owed roughly 136,421 \$ out of which more than half was owed by domestic users. It is a regular procedure to disconnect customers who don't pay their bills – in 2008 nearly 9% of customers were disconnected. It is possible to reconnect to the network after having paid the bill together with a reconnection fee. These arrears adversely affect the ability of BUWASA to meet their O&M costs. The situation is aggravated by illegal connections and numerous leakages contributing to the high level of unaccounted for water. Yet, since BUWASA became an autonomous entity it happened in two financial years that expenditures were higher than revenues – in 2004/05 for the last time. Since then, the financial situation appears to be stable. Table 4-2 shows the expansion of sources of revenue for two consecutive financial years. The latter is the one after the construction and rehabilitation of water infrastructure under LVWATSAN. The number of new private connections and

Table 4-2. Sources of revenue of BUWASA (2007/08-2008/09)

Source of revenue	Description	Amount collected (TSh)		% total revenue	
		2007/08	2008/09	2007/08	2008/09
Water sales	Domestic	273,274,813	385,705,902	51,2	54,6
	Commercial	65,809,974	72,167,818	12,3	10,2
	Institution	118,042,560	144,900,294	22,1	20,5
	Industrial	6,580,550	2,804,996	1,2	0,4
	Kiosk	645,600	1,556,921	0,1	0,2
Penalties	Against such offences as illegal connections	1,142,647	2,522,800	0,2	0,4
New connection & supervision agency fees	Initial fees to enter in contract with BUWASA	5,595,000	6,897,500	1,0	1,0
Meter rent & service charge	Paid by customers with water meters	51,875,700	77,313,347	9,7	11,0
Reconnection fees	For customers who did not pay bills on time	7,425,000	6,555,000	1,4	0,9
Other income		3,277,036	5,498,850	0,6	0,8
TOTAL		533,668,880	705,923,428	100	

Source: BUWASA, 2008 & 2009, own calculations

26 new water kiosks is reflected in the considerable rise of revenues from these categories. Besides, more than half of revenues come from domestic users.

Even though the revenues have been rising, they correspond to rising expenditures; thus there is no upward or downward trend in the working ratio¹⁰ of BUWASA which oscillated around 1 in the past years (BUWASA, 2009). Due to this fact as well as due to debts from the years before (mostly for electricity), the level of investment is low. Most of the infrastructure is provided by a number of donors as indicated in the section on local context.

4.1.3. Customer service

BUWASA has a customer service charter which stipulates rights and responsibilities of customers and the provider. Radio, television, newspapers and cars with loudspeakers (driving around Bukoba) are used to advertise, sensitise and educate customers on various issues related to service delivery. The messages usually concern the importance of paying bills, bargains for reconnections or information

¹⁰ Working ratio is a measure of a company's ability to recover its operating expenses from its gross income in a given year. It is calculated by taking the company's total expenses, except for depreciation and debt service, and dividing them by its gross income. A ratio under 1 indicates that the company is recovering its expenses and therefore has a certain amount of financial health, while a ratio over 1 indicates the opposite. Source: <http://financial-dictionary.thefreedictionary.com>

about various venues (BUWASA, 2009). There is also a complaint procedure a customer can run. A total of 927 complaints were received during the financial year 2007/08; that is a few per day. Almost half of them concerned lack of water or low pressure of water, while the rest concerned water quality and leakages (BUWASA, 2008). These numbers changed substantially in 2009, as the number of complaints fell almost double and the majority of them concerned leakages (BUWASA, 2009). Finally, it is considered that the complaint system does not have a proper feedback mechanism in place, as customers either do not hear back about their complaint or they have to wait for a long time before the complaint has been dealt with (NWSC, 2007).

Since 2007 BUWASA started implementing the water policy prescriptions of providing the urban poor with 20 litres per day of free water from water kiosks. So far 15 people have been identified and given monthly coupons for water as compared to 11 in 2007 (BUWASA, 2007 & 2009). The beneficiaries are supposed to be suggested by Ward and Mtaa Executive Officers, however a few of the latter stated that they have never been approached on this matter. In turn, BUWASA indicated that it is a difficult task to grant the right people with free water, as many people cheat about their true level of income. In 2007/08 discussions were in place on how to properly identify beneficiaries, however since then their number continued to be the same (15).

4.1.4. Challenges

There are a number of challenges that BUWASA has been facing for a longer time, but many problems are gradually improving. First, there is unmet demand for water from its current customers (21% is not met as indicated above). BUWASA also faces rampant leakages of water pipes and there is no proactive programme for leak identification. BUWASA depends on reports from field staff and its customers. Many leakages are thought to be caused by the fact that pipes are laid shallow in the ground, as rocky surface makes excavation difficult. Another reason is the age of pipes – roughly one third was laid a few decades ago. BUWASA lacks capital for the rehabilitation of mains as well as for any other major infrastructure investments. Furthermore, various tests for water quality showed that the level of water pollution is unacceptable (EWURA, 2009). Water treatment process is done manually by dosing Calcium Hypochlorite, 1 kg per day regardless of the water flow which is not recommended (NWSC, 2007).

Another big problem is the amount of unaccounted for water. Unaccounted for water is the amount of water produced minus the amount sold to customers presented as a percentage of water produced. The recommended value is less than 20% (EWURA, 2009). In the last quarter of 2009 unaccounted for water amounted to 52% in Bukoba. This high percentage is attributed to the aging distribution infrastructure, many leakages, illegal connections, inadequate pressure in pipes as well as poor level of revenue collection. In fact, 26.3% of bills which were issued in the last quarter of 2009 were not paid (BUWASA, 2009). This percentage is however better than for previous years (about 30% for 2006-08).

Additionally, BUWASA has been struggling with the problem of too many employees. The recommended number of staff per 1000 connections is 10 (EWURA, 2009). In 2006 the number amounted to 13, however due to plummeting numbers of new connections the ratio has been gradually decreasing and at the end of 2009 amounted to 10.6 (BUWASA, 2009).

Furthermore, some areas for improvement have been identified by an external consultant engaged in the formulation of the Strategic Plan for BUWASA for the years 2005/06 to 2009/10 (BUWASA, 2005). It was recommended to carry out a market research and stakeholder analysis in order to

understand the customers and stakeholders in terms of demographic characteristics as well as willingness and ability to pay. It was also stated that BUWASA is in short of partnerships: it has only outsources office security and cleaning in the spirit of public-private partnerships.

To sum up, as compared to other utilities in Tanzania BUWASA can be ranked somewhere in the middle. It has a comparably high percentage of met demand, metered customers and supply hours. On the other hand, the level of unaccounted for water is one of the highest, billing efficiency is low and no sewerage service is offered (URT, 2009). As BUWASA has a good management framework, it can be further enhanced by focused capacity building in order to provide more efficient services (NWSC, 2007).

4.2. Water kiosks

Similarly to many other urban centres in Africa, one of the alternatives to private connection to water in Bukoba are water kiosks. Presently, there are 39 of them in Bukoba District and 27 are situated in Bukoba Urban. Water kiosks were introduced here by BUWASA in 1998 when the authority sponsored the construction of 13 kiosks. The rest was built in 2008 together with other water infrastructure sponsored by the Lake Victoria Water and Sanitation Programme. The construction was supposed to facilitate pro-poor water service delivery. Water kiosk operators perform their duties on the basis of a management contract (cf. Table 1-3).

Unlike now, there used to be no criteria for choosing the operators of water kiosk so the people whom BUWASA accepted signed a contract for water sales. The operators used to be allowed to sell water only, as it was forbidden to offer any other services. At the course of time some kiosks built by BUWASA stopped working, most probably due to lack of profit and rising unpaid water bills. In 2007 as many as 5 out of 13 kiosks were disconnected due to spiralling debts and as a result the operators decided to leave. At the time of the research 6 out of 39 water kiosks did not work, but in the meantime it was declared that the number diminished to 3.

In 2008, as part of the implementation of LVWATSAN programme and its pro-poor guidelines, UN-HABITAT sponsored the construction of 26 new water kiosks in Bukoba. It set new guidelines for choosing water kiosk operators who, from now on, were preferred to be female (preferably from a female-headed household), poor, honest and willing to provide land for the kiosk (if possible). Local leaders would select operators on the basis of received applications. The operators also started to be allowed to provide other services next to selling water. However, it was stated by a number of respondents that some water kiosk operators were not chosen according to the official guidelines. There are cases that the operator was chosen directly by a Ward Executive Officer or that the operator does not come from a poor household.

Image 4-2. Abandoned water kiosk



As part of the research all water kiosk operators from the sampled *mitaa* were interviewed (11 out of 27 falling to Bukoba Urban) and asked for details of their operation by means of a questionnaire (see Appendix B). The results are presented below.

In the first place, socioeconomic profile of the operators will be given. Seven out of eleven water kiosk operators were female, three of which were from a female-headed households. The age of operators ranged from 29 to 60 with the average of 42. Most of the operators completed primary school and four of them secondary school. They came from households with on average four members. Seven operators’ households had another income-generating activity aside running the kiosk, while for four it was a sole economic activity. The majority of households were poor, while two of them were in a comparably very good economic situation which confirms that pro-poor guidelines for choosing the operator were not always followed (Table 4-3).

Half of the kiosks interviewed were built by UN-HABITAT and the other half by BUWASA. Seven kiosks provide services aside from selling water. In five cases it is a small shop with basic products, in one case only a mobile recharge and in one – selling firewood. The remaining four operators said that they would like to start providing services, but the reason for not providing them is that they do not have the capital to start up a shop (in three cases) and that there is not enough room (one case). The kiosk of the operator who does not have enough room for providing services aside was built by BUWASA. These are considerably smaller (an estimate of 3 m²) than the ones built by UN-HABITAT (approx. 5-6 m²; see images on the right). However, the operators of kiosks built by UN-HABITAT also wished that the kiosk was bigger. For example, one female operator said that she would like to put a sewing machine inside, so that she could also offer tailor services (there is plenty of time to use in the meantime that there are no customers), but there is no space for it.

The opening times of the kiosks range from 10 (from 8 am to 6 pm) to 16 hours (from 6 am to 10 pm). One of the operators said that it would be desirable to have electricity in the kiosk in the evening when it is dark, so that it was easier

Table 4-3. Monthly income of the operator's household

		Frequency
Valid	0-30,000 TSh	6
	30,001-60,000 TSh	1
	60,001-100,000 TSh	1
	More than 200,000 TSh	2
	Total	10
Missing	Don't know	1
	Total	11

Image 4-3. Water kiosk built by UN-HABITAT



Image 4-4. Water kiosk built by BUWASA



Table 4-5. Profit in wet and dry season

		Sold buckets in wet season	Sold buckets in dry season	Monthly profit from selling water in wet season	Monthly profit from selling water in dry season
N	Valid	11	11	10	10
	Missing	0	0	1	1
Mean		27,55	75,45	4,250 TSh	7,435 TSh
Median		20,00	50,00	1,275 TSh	4,075 TSh
Minimum		0	15	0 TSh	0 TSh
Maximum		100	300	18,000 TSh	25,000 TSh

to perform different activities. Apparently, getting electricity in the kiosk from TANESCO, the electricity supplier, is exorbitantly expensive.

The number of 20-litre buckets sold per day varies widely across different kiosks and across seasons (Table 4-5). In wet season, when other water sources such as rainwater are available, the number of buckets sold daily varies between 0 and 100. In contrast to this, in dry season the span is between 15 and 300. Consequently, the monthly profit made on selling water also differs substantially across seasons, but in general is very low. The monthly profit made on operating the kiosk together with accompanying services varies between 30,000 TSh (21\$) and 70,000 TSh (49 \$; both valid for seven operators). This indicates that the profit made on solely selling water is none or very meagre in the majority of cases and the money that keeps the kiosk running comes from the services provided. Also, if the kiosk is located in an area with low demand for its water, the profit is even lower. Hence, the kiosks which don't provide services are in heavy economic situation; the majority of them built by BUWASA. If the declared values reflect the real situation and the kiosk is be the only source of income for these operators, the ones that don't provide services live below the national poverty line.¹¹

As for the customers who fetch water from kiosks, the operators judged that they are either low-income (6 responses) or middle-income (also 6 responses). The majority of them fetch water for household purposes, however it also happens that businesses stock up on water at kiosks (10 and 4 responses respectively). Also, the majority of operators get complaints from its customers; the most often about the unreliable or low-quality water supplied (Table 4-4).

Table 4-4. Customer complaints

	Count
Opening times are too short	1
It is often closed	1
It is expensive	2
Not reliable water supply	6
Bad quality of water supplied	3

To conclude, the livelihood of water kiosk operators largely depends on the provision of additional services as well as on the location of the kiosk itself. The profit made on sole selling water is so low that it pushes the deprived operators below the poverty line. Further implications of this state will be discussed in the chapter on LED-related implications.

¹¹ Food poverty line is set at 5,607 TSh (3.94\$) and basic needs poverty line at 7,680 TSh (5.40\$), both equivalent for 28 days. Basic needs poverty line is the one widely referred to as the 'national poverty line' and the percentage of all Tanzanians living below it is 35.7%. It is interesting to compare these numbers with international statistics: 88.5% of the population of Tanzania lives on less than 1.25\$ a day and 96.6% on less than 2\$ a day (UNDP, 2008). This confirms large inconsistencies between the standards for poverty indices set nationally and internationally.

5. Results: Water Demand

After the analysis of water providers in Bukoba, the following chapter will present a thorough analysis of water demand. General patterns of water use will be presented together with a water source choice model which will give an idea about the population's willingness to pay for various improved water sources. Finally, options for financing the existing demand will be presented. The tables and charts included in this chapter are selective in order not to disturb the text flow. For all the tables on which the contents of the following sections are based appendices – from Appendix F to Appendix J – should be consulted.

5.1. Household and respondent's socioeconomic profile

In this section an overview of respondent's as well as household's profile will be given. In general, the data largely corresponds with existing socioeconomic studies such as the 2002 Population and Housing Census as well as the 2000/01 Tanzanian Household Budget Survey (HBS). This fact strengthens the argument for randomness of the sample.

5.1.1. Missing Value Analysis

Even though there was no case of 'no response' to the questionnaire as a whole, it did occur that some respondents failed to respond to certain questions. The Missing Value Analysis (MVA)¹² revealed that there was a pattern of no response to questions related to income. 12.7, 13.8 and 15.5% of respondents failed to state the number of income earners in the household, household income and the level of savings respectively. These values tended to miss together, as indicated in Table 5-1. Further analysis showed that households categorised as 'slum' by the enumerators tended to misreport income. Missing data for income appeared in 9.7% of 'non-slum' households and in 21.9% of 'slum' households. The significance value of an appropriate test was less than 0.05, so it can be concluded that these data are not missing completely at random. The important implication for further analysis is the fact that the income level in the sample should in fact be lower than shown by measures of central tendency.¹³ The number of missing values for other questions is minor and appears to be missing completely at random.

Table 5-1. Tabulated patterns in MVA

Number of Cases	Missing Patterns ^a			Complete if ... ^b
	no. of income earners	income	savings	
279				279
5			X	284
24		X	X	308
24	X	X	X	353
18	X			297

Patterns with less than 1% cases are not displayed.

a. Variables are sorted on missing patterns.

b. Number of complete cases if variables missing in that pattern (marked with X) are not used.

Little's MCAR test: Chi-Square = 20,721,

DF = 7, Sig. = ,004

¹² MVA is an add-on module to SPSS 19 which facilitates uncovering missing data patterns.

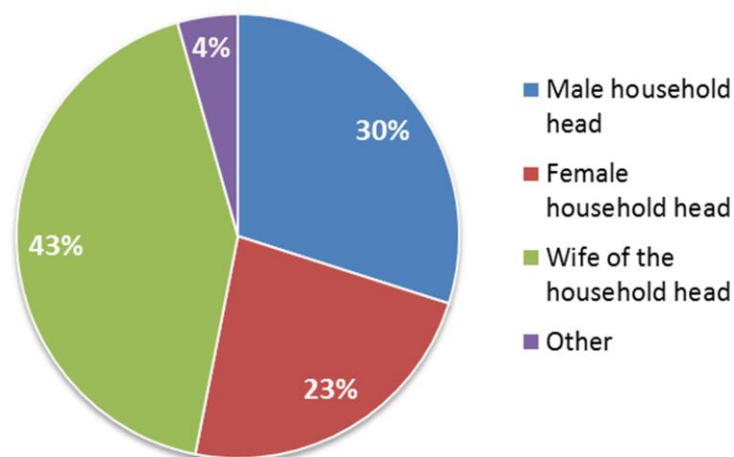
¹³ I.e. mean, median etc. Of course this is true if it is assumed that the enumerators correctly classified the type of settlement of respective households.

5.1.2. Socioeconomic profile

As for respondent's profile, two thirds were female and one third male, probably due to the fact that many households were interviewed during working hours. Roughly one fourth represented female-headed households as opposed to 35% according to 2002 census data for Bukoba Urban (Chart 5-1; NBS, 2002a).

The most common occupation of respondents was a trader (25.4%) and a government employee (18.6%). Housewives, farmers and employees of private companies constituted one tenth each. 5.9% reported unemployment which is similar to 3.9% of the census data. Besides, an average respondent was aged 39 and half belonged to the age range 30-45 (Table 5-2). About half of the interviewees completed primary school and one third completed secondary school.

Chart 5-1. Respondent's position in the household



As for household characteristics, an average household size was 4.4 (compared to 3.9 according to the census) and ranged from 1 to 12. Half of households had two income earners while more than one third only one earner. Roughly one fourth of settlements were identified as 'slum', while the rest as 'non-slum'.¹⁴ A third of the settlements were apart from residential also business premises. Then, two thirds of all were owned and one third rented.

An average income *per capita* amounted to 39,319 TSh as opposed to 30,426 TSh reported for urban areas (excluding Dar es Salaam) in the 2000/2001 Household Budget Survey¹⁵. This supports the findings of the previous section which reveals that some households categorised as 'slum' misreported

Table 5-2. Statistics for scale variables characterising the respondent and his household

		Age	Education level (number of years)	Number of household inhabitants	Number of income earners	Monthly income per capita
N	Valid	352	355	350	310	304
Mean		39	9	4.4	1.6	39,319 TSh
Median		38	8	4	2	25,000 TSh
Minimum		18	4	1	0	0 TSh
Maximum		84	20	12	5	200,000 TSh
Percentiles	25	30	7	3	1	11,250 TSh
	50	38	8	4	2	25,000 TSh
	75	45	11	5	2	58,333 TSh

¹⁴ This proportion may not totally reflect the reality, as the classification was subject to the enumerator's judgment (even though based on guidelines).

¹⁵ Income in Bukoba is likely to be lower than that, as Kagera is one of the poorest regions in Tanzania.

income and consequently the sample average income is higher than should be. Another explanation is the fact that HBS was conducted ten years ago and an average income is today higher just like the one reported in 2000/01 HBS as contrasted with the one in 1991/92 HBS (NBS, 2002b). Income is positively skewed with 12.5% people living below the national food poverty line and 15.8% living below (higher) basic needs poverty line. These numbers are 13.2% and 25.8% respectively in the 2000/01 HBS.¹⁶ There is also a significant relationship between the respondent's level of income and education as well as *mtaa* in which the respondent lives. The monthly *per capita* income means ranged from 21,482 TSh (for Kisindi) to 57,114 TSh (for NHC). This proves that the surveyed clusters were very heterogeneous as stated in the methodological chapter.

Table 5-3. Problems faced by households (MR - multiple response)

	the most serious problem	2nd most serious problem	major problem	minor problem	no problem
Row Responses %					
Unreliable electricity supply	22,5%	3,4%	3,9%	9,0%	61,1%
Difficult access to (drinking) water	18,3%	14,6%	20,8%	18,0%	28,2%
Poor quality of (drinking) water	8,2%	15,8%	45,9%	22,3%	7,9%
Poor access for motor vehicles	7,9%	12,7%	23,4%	25,9%	30,1%
No means of transport	17,5%	18,3%	27,3%	20,0%	16,9%
No sewerage service	66,8%	13,2%	7,3%	8,2%	4,5%
No/inadequate solid waste collection service	69,0%	13,0%	9,3%	5,9%	2,8%
Lack of (good-quality) toilets	33,4%	16,3%	19,8%	11,9%	18,6%

A vast majority of respondents identified no or inadequate solid waste collection as well as no sewerage service as the most serious problem faced by their household (Table 5-3). These findings are not surprising, as Bukoba lacks a centralised sewerage system as well as a drainage system for storm water. Also, the solid waste services managed by the Municipal Council have the capacity to serve less than one third of the population (BMC, 2008).

Furthermore, half fewer respondents, but still one third, stated that lack of proper sanitation was the most serious problem. Water-related problems seem to be somewhere in the middle of problem priorities in the household. Difficult access to water is more or less evenly spread between possible answers unlike poor quality of water. This one is concentrated in the category 'major problem' indicating that households don't see it as a priority in comparison with other problems, but it still is an important issue (Table 5-3).

These percentages vary considerably across clusters, which goes in hand with wide differences in wealth. The highest percentages of difficult access to water identified as the most serious problem fall for the two poorest *mitaa* – 59.3% for Kisindi and 44.1% for Omukishenye. This in turn reflects very low or no coverage of piped water network in these areas. Finally, the level of income turned out to be significantly correlated with (one's perception of) household problems. The lower the income, the more serious was the problem with electricity, access to water and toilets.

¹⁶ See footnote in the section on water kiosks in previous chapter for details on the national poverty line.

Finally, the last point of this section before starting to analyse water supply of the surveyed population in detail is the use of water for income-generating activities. Just a marginal percentage stated that they use it for productive purposes and these were mostly farmers working in Bukoba Rural.

5.2. Current patterns of water use

According to international standards people have proper access to water if they have available at least 20 litres per day of clean water from an improved source less than 1 kilometre from their home (UNDP, 2006). An average household in Bukoba has such proper access, however such generalisation is misleading. There is a great deal of variation between different households, especially the ones with lower income which will be elaborated in the following sections.

5.2.1. General patterns of water use

The majority of households have multiple water sources available in the area ranging from 1 to 6 (or 2 to 7 if counting rainwater). In wet season an average household has 4 sources available and uses 3, while in dry season it has 3 sources available and uses 2. The patterns of water source choice don't generally change across seasons apart from the fact that in dry season there is no rainwater widely used in wet season (81.4% claim to use it, Table 5-4). Instead, in dry season more water is used from other sources already used in wet season.

As regards the use of rainwater, it has to be noted that the quality of rainwater harvesting tanks varies considerably. Rich households have solid capacious tanks while poorer households make use of any vessels available to harvest water. These tend to fill up fast and overflow during sudden downpours occurring in Bukoba in wet season.

Table 5-4. Household's water sources in wet and dry season (MR)

Household's water sources	Wet season			Dry season		
	Count	Valid N %	Responses %	Count	Valid N %	Responses %
In-house connection	104	29,4%	11,4%	106	29,9%	17,7%
Yard tap	132	37,3%	14,5%	129	36,4%	21,6%
Shared yard tap	13	3,7%	1,4%	15	4,2%	2,5%
Water kiosk	78	22,0%	8,6%	68	19,2%	11,4%
Neighbour's private connection	53	15,0%	5,8%	48	13,6%	8,0%
Rainwater	288	81,4%	31,6%	0	,0%	,0%
Water vendors	10	2,8%	1,1%	11	3,1%	1,8%
Protected spring	44	12,4%	4,8%	49	13,8%	8,2%
Unprotected spring	56	15,8%	6,1%	50	14,1%	8,4%
River/stream	133	37,6%	14,6%	122	34,5%	20,4%
Lake water	0	,0%	,0%	0	,0%	,0%

Furthermore, 45% of households have a private connection – either an in-house connection (about 30%) or/and a yard tap (about 37%). Water kiosks, neighbour's connections and protected springs are among other improved water sources used (from 22 to 12.4% respectively). The interesting

phenomenon of using neighbours' private connections is the fact that officially it is not allowed to resell water, however it is believed not to be sanctioned.

Besides, a third of households use surface water and 15% use unprotected springs – both unimproved water sources. Yet, many households combine the use of improved and unimproved water sources. A marginal number also makes use of water vendors. A few people said to be using 'vendors' or else, people fetching water from distant sources such as springs. Water vendors are thought to appear especially during breakdowns of the piped water network. Then, they charge up to 1,000 TSh for a bucket (20 litres), whereas such a bucket at a spring costs up to 200 TSh and at a water kiosk 7.5 TSh.

Finally, it is important to note that the use of particular water sources is significantly correlated with monthly income of the household. The higher the income of the household, the more often it happens to have a private connection. The lower the income the more it happens to use collective – purchased or free – water sources.

Thus, in total 78.1% and 69.4% of households make use of improved water sources in wet and dry season respectively.¹⁷ This largely corresponds with the 2002 census data (NBS, 2002a) as well as with data used for Urban Inequities Survey (UN-HABITAT, 2007 & 2009a). However, it is important to note that the same household often combines the use of improved and unimproved sources, which undermines the adequacy of this and similar statistics of the use of improved and unimproved sources (UNDP, 2006).

As for daily water consumption *per capita* it amounts to 29 litres on average, but it ranges from 4 to 267 litres (Table 5-5). The consumption of one third of households does not exceed 20 litres and of two thirds 30 litres. The amount of water use is significantly negatively correlated with the number of people living in the household. The more people there are, the more water has to be fetched and/or to be paid for, so it rather happens at the cost of *per capita* use. There is also a weak significant relationship between the amount of water used and the use of private connection. Piped water users

Table 5-5. Statistics for scale variables characterising household (HH) water supply

	Daily water consumption per capita (in litres)	Distance to water sources with piped HHs (in minutes)	Distance to water sources without piped HHs (in minutes)	Monthly expenditure on water in wet season	Monthly expenditure on water in dry season
Mean	29,1	9,2	12	3,653 TSh	4,970 TSh
Median	26,7	5	6	3,000 TSh	4,000 TSh
Std. Deviation	20,3	13,3	14,1	3,753 TSh	5,160 TSh
Minimum	4	0	1	0 TSh	0 TSh
Maximum	267	90	90	25,000 TSh	36,000 TSh
Percentiles 25	20	2	5	600 TSh	1,000 TSh
50	26,7	5	6	3,000 TSh	4,000 TSh
75	33,3	10	15	5,000 TSh	7,000 TSh

tend to consume more water than other users. The relationship should in fact be stronger (than weak), but it is highly possible that piped water users understate the real amount of water used, as it 'just'

¹⁷ The explanation for the difference is the use of rainwater in wet season which is considered an improved water source.

flows from the tap. This fact has been acknowledged by numerous studies (see Nauges & Whittington, 2010).

As regards distance to water sources, these are located within on average 9 to 12 minutes from the household. Half of the households’ members have to walk less than 5 to 6 minutes, but 15% walk more than 15 minutes. These numbers are practically the same as in the data used for Urban Inequities Survey (UN-HABITAT, 2007). Many respondents considered the water coming from springs as the cleanest water there is and even though they are located further away (up to 90 minutes) and are often expensive (300 TSh per bucket as compared to 7.5TSh from a water kiosk) people prefer walking longer distances to get water from them. This water is considered by many as safe to drink and does not require boiling unlike water from other sources.

When asked about difficulties in accessing enough water for daily activities, only half of the respondents answered that they didn’t face any. 31.2% of responses concerned problems with sufficient water for drinking and cooking, 21.7% for washing and cleaning, while only 5.3% of water problems concerned sanitation. The fact of facing or not facing difficulties in accessing water for daily activities is strongly correlated with the type of water sources used, as private connection users faced substantially fewer difficulties than other users.

As far as monthly expenditure on water is concerned, in dry season households spend about one fourth more than in wet season, because such free sources as rainwater are not available. 18.9% of households spend nothing on water, while the majority of households spend between 4 to 6% of their monthly income on water bills (Table 5-5). A little more than one tenth of households spends between 10 and 50%.

There is a significant positive relationship between the levels of monthly expenditure on water and the use of private connection. This can be explained twofold. On the one hand, tap water is less ‘under control’ of the user, as it is piped directly to the dwelling. Other purchased water has to be fetched which requires extra time and strength. On the other hand, this is the natural consequence of the tariff structure applied by BUWASA in which private connection users are charged a higher rate than for example water kiosk users. Similarly, there is a significant positive relationship between the distance to water sources and the use of non-private water sources.

Finally, as for fetching water, women are the most often charged with it, although the responsibility is usually also passed on to the children (the gender of the child does not matter; Table 5-6). In many households fetching water is often shared between these three groups, while adult males rarely participate in this activity. Certain women explained that it is part of their culture that men don’t fetch water. It is worth noting that children who do it are most probably over the age of 14, as in the Urban Inequities Survey, the percentages for children (defined as being under 15) fetching water are marginal (UN-HABITAT, 2007).

Table 5-6. Responsibility for fetching water (MR)

	Count	Valid N %	Responses %
Adult woman	108	53,2%	30,2%
Adult man	26	12,8%	7,3%
Female child	104	51,2%	29,1%
Male child	107	52,7%	29,9%
Vendor	10	4,9%	2,8%
Housemaid	3	1,5%	,8%

5.2.2. Perceptions of the quality and accessibility of water and water supply

Approximately half of water sources used by households are considered good or very good in terms of their availability and quality (Table 5-7). The level of satisfaction somewhat falls in dry season which is the consequence of less sources being available. Around one fifth of sources were considered poor in terms of availability and especially some areas were prone to drastic water shortages. The perceptions of queuing for water vary more substantially across seasons. Households don't have to queue for water at the vast majority of water sources in wet season. However, in dry season there is always or often a queue already at a third of water sources.

Table 5-7. Perception of water availability, quality and queuing

		poor	medium	good	very good
		Row Responses %			
Water availability	wet	20,3%	19,3%	40,1%	20,3%
	dry	18,2%	30,4%	42,3%	9,1%
Water quality	wet	18,2%	31,8%	42,7%	7,3%
	dry	16,4%	28,3%	44,7%	10,6%
Queuing for water		always	often	sometimes	never
	wet	1,6%	3,0%	17,5%	77,8%
	dry	20,4%	12,6%	27,3%	39,7%

Moreover, there is a significant relationship between the perceptions of water availability, quality and queuing for water, and the type of sources used by households. The users of private connections were more satisfied with these aspects in contrast to the users of other water sources, either purchased or free. Free water users are mostly dissatisfied with

their sources in wet season. Many of them complained about liquid and solid waste flowing into the water sources together with heavy rains of wet season. This is caused by no sewerage and drainage system in Bukoba as well as no or inadequate solid waste collection. In addition, it was complained about visible microorganisms in water from springs, however there was a considerable difference of opinions across different springs as these were also often considered the cleanest source. This shows that the quality of free water cannot be generalised due to the large variation in opinions.

As far as comparing current state of water supply with a few years ago is concerned, the large majority admitted that it improved, either substantially (23.2%) or moderately (50.8%). Roughly one fifth thought it was the same and only about 5% stated that it deteriorated. This certainly reflects all the water interventions provided through LVWATSAN such as the renovation of the main water intake, new tanks and a substantial number of new water kiosks.

Table 5-8. Comparison of water supply with a few years ago

	Monthly income per capita		% of HH income spent on water (wet season)		% of HH income spent on water (dry season)	
	Mean	Median	Mean	Median	Mean	Median
It improved substantially	44,003 TSh	31,250 TSh	5,7	2,9	7,6	3,8
It improved moderately	42,660 TSh	27,917 TSh	3,4	1,2	5,4	1,6
It is the same	27,484 TSh	15,000 TSh	3,6	,0	4,7	,0
It deteriorated	23,297 TSh	10,000 TSh	6,3	8,3	8,5	11,7
Correlation	$\rho = -,222 ; p = .01$		$\rho = -,233 ; p = .01$		$\rho = -,212 ; p = .01$	

Yet, an important remark to make is that in general high-income households were more satisfied with water supply than low-income ones (Table 5-8). Also, households which spent a bigger percentage of their income on water are less satisfied than households which spent a small percentage. Another significant relationship to mention is that again private connection users are in general more satisfied than the users of water kiosks, springs or surface water.

Satisfaction from piped water

From the abovementioned, it seems that there are comparably more positive aspects of having a private connection than other water sources. However, 61.9% of households stated that they cannot afford having piped water at home. The high price of a private connection is twofold. First, it costs on average more than 100,000 TSh (nearly 70\$) to purchase the necessary fittings and pay for labour costs. Then, there is also a new connection fee charged by BUWASA which amounts to 15,000 TSh. One person claimed to be obliged to pay 400,000 TSh in total and stated that “No one knows how much he/she is required to pay for water connection costs and if it tallies the services provided”. It was believed by a large number of respondents that prohibitive connection costs are one of the major bottlenecks for people to legally connect to the network. Hence, many people are thought to be connecting illegally.

In addition, even after a private connection is installed, many people are not able to pay their bills. One cubic metre is one third more expensive than at water kiosks. Additionally, as outlined before, people tend to use more water when they have a private connection than when they have to fetch water themselves. Therefore, if people decide to install a private connection, there are a number of financial challenges they have to face and which are already faced by current water users. It has been acknowledged by BUWASA that this poses a serious problem and financial burden due to spiralling unpaid water bills. On the other hand, people complain about unfair charges they are presented with to pay. Water meters, the majority of which were provided under LVWATSAN, are not believed to function properly and the water meter reading is deemed unfair. The billing system is considered inconsistent, as people using a minimum amount of water end up paying more than 20,000 TSh, while there are accusations of people enjoying piped water for free.

The second most frequently named reason for not having a private connection is the fact that there is no supply in the area. Nearly 30% of households don't have a private connection because it is simply not available. BUWASA is gradually extending the length of its piped network, but it involves a big outlay, especially if pipes have to be laid up the hills surrounding Bukoba. Even though there are a lot of potential customers willing to pay the necessary money, the demand for piped water is not met. This can be seen as a vicious circle: because BUWASA does not have the money to properly extend their network, customers who are willing to pay for the service, and thus provide the money to BUWASA (even though spread in years), are not able to do it, as there is no piped network.

Finally, 15% of households stated that they don't have a private connection because the water supply is not reliable, the quality of water supply is low or that they have access to sufficient water from other sources. It has to be noted that even though the perceptions of private connection users are more positive than of other users, the reliability and quality of water supplied by BUWASA is also subject to numerous complaints. One third of households in Bukoba (urban and rural) complained about water disruption during most days of the week – half of them take several hours and 40% take more than a day. Then, half of the households faced occasional disruptions (UN-HABITAT, 2007). This data dates back to the pre-intervention state of water supply and as shown by the general level of satisfaction compared to a few years ago, these disruptions should be nowadays less frequent.

As for water quality it has been complained about its bad smell, brownish colour (mixed with dirt or sand) and about its high degree of chlorine. As noted earlier, the main water intake is located at the shore of Lake Victoria where domestic waste is disposed of. Therefore, the water pumped from there is more polluted.

Image 5-1. Water from a kiosk



As small-scale water providers are one of the focuses of this thesis, a few separate questions concerned the quality of the use of water kiosks. The large majority of households acknowledge the benefit brought by the construction of water kiosks. Roughly 80% stated that the creation of a water kiosk has been beneficial to their household (12.1% said ‘strong yes’ and 65.2% ‘yes’). However, almost all of them faced some kind of problem related to their use (Table 5-9). One fourth of responses concerned a too high price charged for water, while roughly a fifth concerned frequent closure of the kiosk. About 15% complained that the kiosk is too far and the same percentage that the water supplied is not reliable.

It could be somewhat surprising that people complained the most commonly about the price of water charged by water kiosks. As we already know, this price is two thirds of the price one has to pay for the same amount from an in-house connection or a yard tap. However, there is a technical detail behind. One bucket of water officially costs 7.5 TSh (half a cent \$), but the smallest denomination of a coin in Tanzanian Shillings is 20 TSh. Therefore, as people stated, they often end up paying 20 TSh for a bucket of water and some claimed to pay even 50 TSh. The operators of the kiosks would argue that this is the result of filling up a container which exceeds the agreed number of 20 litres.

As for other complaints, the ones about the reliability of water supply reflect the same reasons as for

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Table 5-9. Problems faced by water kiosk users / Reasons for non-use (MR)

	Water kiosk users			Non-water kiosk users		
	Count	Valid N %	Responses %	Count	Valid N %	Responses %
The kiosk is too far	16	20,5%	15,1%	34	12,9%	12,0%
Opening times are too short	10	12,8%	9,4%	6	2,3%	2,1%
It is often closed	20	25,6%	18,9%	4	1,5%	1,4%
It is expensive	27	34,6%	25,5%	24	9,1%	8,5%
Not reliable water supply	15	19,2%	14,2%	4	1,5%	1,4%
Bad quality of water supplied	12	15,4%	11,3%	3	1,1%	1,1%
I prefer other sources of water	5	6,4%	4,7%	8	3,0%	2,8%
No problem	1	1,3%	0,9%	-	-	-
I have a private connection to piped water	-	-	-	115	43,7%	40,5%
No water kiosk in the area	-	-	-	86	32,7%	30,3%

piped water users (see above) – water piped to private dwellings is the same as the one piped to water kiosks.

Households which do not use the service of water kiosks were also asked for the reasons why. Nearly 44% of respondents stated that they don't use water kiosks, because they have a private connection (which is almost the same as the percentage of respondents who in fact have a private connection). Some households said that they use them in case of emergency with their own connection. Another common reason, given by one third of households, is the fact that there is no kiosk in the area where the respondent lives. This percentage is the same as for the people who stated that they don't have a private connection because there is no supply in the area. As noticed above, if there is no supply of piped water in the area, water kiosks cannot exist there either. This shows that there is a potential demand for water kiosks, but it is not met due to supply constraints, similarly to the demand for private connections.

Satisfaction from plumbing services

Plumbing services are water-related services considered as part of the water sector. Higher demand for piped water automatically creates higher demand for plumbers. Creation of jobs is one of the aspects of local economic development and therefore it has been considered important to assess the demand and satisfaction from plumbing services in Bukoba.

Almost 40% of piped water users never use plumbing services and a little more than that use them once a year or more rarely. Only nearly 13% use them once a month or more often. There are two kinds of plumbers in Bukoba – private and from BUWASA. BUWASA hires 13 of them and they are responsible for the maintenance of the piped network. Private plumbers also fix in-house leakages and can install new connections. They operate independently; there is no association or plumbing company in Bukoba. The level of satisfaction from plumbing services is similar for both categories – about 60% of respondents were satisfied.

Table 5-10. Satisfaction from plumbing services (MR)

	BUWASA plumbers		Private plumbers	
	Count	Valid N %	Count	Valid N%
They don't come on time	27	60,0%	11	23.4%
They have unfair charges	18	40,0%	25	53.2%
Other reason	4	8,9%	11	23.4%

The reasons of dissatisfaction are outlined in Table 5-10.

People generally complain that they have to wait for a long time before a BUWASA plumber comes and that it happens that they have to pay a small bribe for getting things fixed, especially if it concerns the installation of new connections. Not fair pricing of plumbing products and services counts for both categories. As a result, some people decide to purchase the necessary equipment on their own.

As the last point of the section on the quality of water supply, it is important to note that people believe that they don't have any form of redress for their complaints and problems related to water supply. The complaint procedure possible through BUWASA is considered ineffective and almost 100% of respondents stated that there are no water-related initiatives in the area where they live. Only one person took part in a water seminar which was part of LVWATSAN activities. Water committees which would protect the interests of users are believed to exist in rural areas only.

Users' recommendations

A number of users expressed recommendations on how to improve the quality of water supply. These include:

- ✓ Extending the piped network to a number of *mitaa* in the ward of Kashai, specifically Kisindi;
- ✓ Increasing the number of taps near emerging settlements to redress high connection costs;
- ✓ Organising regular meetings of BUWASA with its customers in order to find solutions to the problems;
- ✓ Increasing transparency of the billing and metering process of BUWASA as well as lowering the cost of water;
- ✓ Providing round-the-clock and good-quality water;
- ✓ Providing an alternative to piped water in the form of rainwater harvesting systems;
- ✓ Launching an awareness campaign on water services.

5.3. Health and water treatment

Most of the respondents feel that they have sufficient knowledge of health problems related to poor-quality water, while only one sixth feels they don't. The following section will look into this issue in practice, and later on help in assessing potential demand for water-related products.

A vast majority of respondents treats water for household consumption. Roughly one tenth does it sometimes and the same proportion never. There are several reasons for not treating water. The one stated the most often (by nearly half of respondents) is that they don't think it is necessary. The other half of the responses varied between the fact that households cannot afford treating water, that they only drink bottled water (households with higher incomes) and that they don't know how to treat water in an effective way (households with lower incomes).

The fact of treating water or not is significantly correlated with the type of sources used as well as with the level of education and household income (Table 5-11). Households using piped water treat water more often than households using other sources, either free or purchased. As income is significantly correlated with the type of water use, it is not surprising that higher-income households also treat water more often than lower-income households. Finally, higher educated respondents tend to treat water more often than the lower educated ones.

Table 5-11. Significant relationships of the 'water treatment' variable

Spearman's rho	Private connection users	Non-private water users	Free water users	Education level	HH monthly income
Correlation Coefficient	,244**	-,114*	-,195**	,198**	,259**
Sig. (1-tailed)	,000	,016	,000	,000	,000
N	355	355	355	355	306

** . Correlation is significant at the 0.01 level (1-tailed). * . Correlation is significant at the 0.05 level (1-

Table 5-12. Water treatment methods

	Monthly income per capita		Education level	
	Mean	Median	Mean	Median
I boil it	40,715 TSh	26,667 TSh	10	11
I sieve it through cloth	49,300 TSh	42,857 TSh	10	11
I let it stand and settle	21,924 TSh	13,000 TSh	8	7
I use water filter	43,869 TSh	30,625 TSh	10	11

The most widely used water treatment method is its boiling (used by nearly 90.4% of respondents). About one third of households (also) sieve water through cloth and 13% use a water filter. The least common

method, used by 7.6% is letting water stand and settle. These households are among the poorest ones (Table 5-12). According to the data of the Urban Inequities Survey 97.9% boil water in Bukoba (urban and rural) and the other percentages are marginal. The difference between the two studies could be due to the fact that more high-income people live in the city (to whom the two other most popular methods are attributed, as indicated above).

In particular, it is important to look at the pattern of diseases in Bukoba which is of direct influence resulting from the pattern of household's water use and consumption. According to the Municipal Health Department Report (BMC, 2008), malaria followed by diarrhoea are the leading diseases in terms of local death rate. In this study, indeed malaria is the prime disease with more than half of the households suffering from it in the last months. Half of respondents also named such water-borne diseases as diarrhoea (9.6%), typhoid (17.7%) and intestinal worms (19.7%). The percentage for diarrhoea might in reality be higher, as it is considered a rather intimate issue. Lastly, one fifth of respondents stated that there were no diseases in his/her household in the past months.

Only roughly 14% of respondents acknowledge that any disease mentioned could be the result of using unsafe water, while 26% are unsure and 60% deny it. What is more, the majority of households' members suffer from these diseases once a few months only. The rest suffers from them once a month, once in two weeks or once a week.

Yet, what is interesting is that the people who suffer from diarrhoea tend to do it more often in comparison with other diseases as well as they tend to associate it more often with an unsafe use of water. What is more, diarrhoea and intestinal worms are slightly significantly correlated with income. The higher the income *per capita*, the fewer households' members suffer from these diseases.

Subsequently, households were asked if they would be interested in a low-cost water treatment method. However, acknowledging the fact that it could pose a serious financial burden they were presented with an option of taking a microcredit. The results are presented in the following section together with the analysis of other questions related to microcredits.

5.4. Demand for water sources

In previous sections we have seen the patterns of current water and water sources use. This section aims at assessing demand for improving one's access to water sources and presents potential options for making these changes possible.

Firstly, it turned out that when households were asked about their willingness to gain access to various water sources the most popular option to choose was a shared yard tap followed by an in-house connection (Table 5-13). Gaining access to a (private) yard tap and a water kiosk

were also high on the list. However, when asked about gaining access to water sources which would be offered at an affordable price (thus with a financial aspect brought up), these percentages changed sometimes considerably. Less people opted for an in-house connection, but chose for a cheaper, but also private, yard tap. The percentages for collective water sources such as a shared yard tap or a water kiosk dropped substantially. In turn, the percentage of households which opted for no new water sources tripled. Finally, more people expressed interest in having a rainwater harvesting tank.

Table 5-13. Willingness to gain access and pay for access to water sources

	Willingness to gain access to water sources			Willingness to pay for access to water sources		
	Count	Valid N %	Responses %	Count	Valid N %	Responses %
In-house connection	139	39,3%	22,6%	107	30,4%	27,3%
Yard tap	121	34,2%	19,7%	139	39,5%	35,5%
Shared yard tap	166	46,9%	27,0%	18	5,1%	4,6%
Water kiosk	123	34,7%	20,0%	19	5,4%	4,8%
Neighbour's private connection	2	0,6%	0,3%	6	1,7%	1,5%
Rainwater tank	12	3,4%	2,0%	29	8,2%	7,4%
Water vendors	0	0,0%	0,0%	0	0,0%	0,0%
Protected spring	29	8,2%	4,7%	16	4,5%	4,1%
Unprotected spring	1	0,3%	0,2%	0	0,0%	0,0%
River/stream	2	0,6%	0,3%	0	0,0%	0,0%
None	19	5,4%	3,1%	58	16,5%	14,8%

These results prove that a large majority of households are interested in improving their water supply options. What is more, they are willing to pay for improving them; thus, there is effective demand for water (Wedgwood & Sansom, 2003). This in turn shows that there are plenty of investment opportunities for water providers.

5.4.1. Water source choice model

It is a common practice in water studies to estimate demand and model household choice of water sources in order to discover what characteristics stand behind households opting for a given water source. The results are supposed to guide the development of potential water supply options and a similar goal will try to be attained with the model presented in this section.

The variables which entered the model together with supporting rationales were outlined in the methodological chapter. Table 5-14 summarises the overall fit of the model which is highly significant. The log-likelihood statistic considerably fell with the six variables in the model as compared to intercept only. The model predicted 56.3% of responses correctly and 54 to 57% of variations in the outcome variable are explained by predictor variables, as indicated by the pseudo R-square statistics (Table 5-15). Finally, all the assumptions for logistic regression have been met; these are linearity, independence of errors and lack of multicollinearity (Field, 2009; results of respective tests are attached in Appendix I).

Table 5-14. Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	505,870			
Final	265,621	240,249	24	,000
Effect				
Intercept	265,621	,000	0	.
Number of sources used	299,953	34,332	4	,000
Private connection used	302,735	37,114	4	,000
Collective sources used	282,097	16,476	4	,002
Free sources used	274,254	8,632	4	,071
Primary education or less	275,265	9,644	4	,047
Less than 200,000 TSh income	275,288	9,666	4	,046

The influence of respective variables is as follows (Table 5-15):

- *In-house connection*

The number of sources used by the household and the use of collective as well as free water sources significantly predict the choice for an in-house connection as compared to no choice. In logistic regression the odds ratio (Exp(B)) is a common measure of the size of an effect and tells us that as the variable increases, the odds of making a particular choice as compared to no choice, increase (if Exp(B) is higher than 1) or decrease (if Exp(B) is lower than 1). So as the household uses one more water source, the change in the odds of choosing for a water connection (rather than no choice) is 0.41. In short, the more water sources the household already uses, the less likely it is for it to choose an in-house connection as compared to choosing no source. Then, households using such sources as water kiosks, neighbour's private connections or protected springs (collective sources) as well as households using free sources have higher odds of opting for an in-house connection than for no source. The odds are higher for free water users, however the effect is significant only at 10% level. There is no major difference in the level of education and income influencing the household's choice for an in-house connection or no water source.

- *Yard tap*

One variable significantly predicts the choice of a yard tap above no choice and the effect is immense. If a household does not have a private connection, the odds of choosing for a yard tap increase 33 times (1 divided by 0.3 which is here the odds ratio). In fact, this option was the most popular choice indicated by roughly 40% of households. The other variables don't have a significant influence, however it is worth noting that poorer households are more likely to opt for a yard tap as compared to households which opted for none of the sources (the odds ratio is 2.04).

- *Shared yard tap/ water kiosk/ protected spring*

The level of income turned out to significantly predict the choice for one of the collective water sources in the way that lower income increases the odds of choosing a collective water source as compared to no source. Also, this choice is more likely for free water users as well as less educated respondents who would rather choose a collective source than no source at all. Yet, these variables are not significant predictors here.

▪ *Rainwater harvesting tank*

The number of water sources used is highly significant for the households which choose a rainwater harvesting tank, similarly to households choosing an in-house connection. The mechanism is however opposite, as the more sources the household already uses, the more likely it is to choose a rainwater

Table 5-15. Multinomial logit estimates

Willingness to pay for access to:	B	Std. Error	Sig.	Exp(B)
In-house connection^a				
Intercept	2,14 **	1,03	,037	
Number of sources used	-,90 ***	,32	,004	,41
Private connection used	-,19	,71	,788	,83
Collective sources used	1,69 ***	,63	,007	5,43
Free sources used	2,24 *	1,26	,074	9,42
Primary education or less	-,10	,41	,817	,91
Less than 200,000 TSh income	-,07	,44	,876	,93
Yard tap^a				
Intercept	2,22 *	1,25	,076	
Number of sources used	-,45	,34	,186	,64
Private connection used	-3,62 ***	,89	,000	,03
Collective sources used	,70	,84	,408	2,00
Free sources used	1,13	1,33	,398	3,08
Primary education or less	,13	,44	,777	1,13
Less than 200,000 TSh income	,71	,57	,211	2,04
Shared yard tap/water kiosk/ protected spring^a				
Intercept	-,50	1,31	,705	
Number of sources used	-,39	,35	,269	,68
Private connection used	,07	,96	,939	1,08
Collective sources used	-,76	,85	,366	,47
Free sources used	1,35	1,43	,346	3,86
Primary education or less	,69	,45	,126	1,99
Less than 200,000 TSh income	1,29 **	,53	,014	3,62
Rainwater tank^a				
Intercept	-6,38 ***	2,02	,002	
Number of sources used	1,64 ***	,47	,001	5,14
Private connection used	,48	1,41	,733	1,62
Collective sources used	-1,03	,96	,283	,36
Free sources used	4,38 **	1,91	,022	79,58
Primary education or less	-1,24 *	,66	,061	,29
Less than 200,000 TSh income	,37	,56	,507	1,45

a. The reference category is: None.

* $p < .1$, ** $p < .05$, *** $p < .01$

Note: $R^2 = .54$ (Cox and Snell), $.57$ (Nagelkerke). Model χ^2 (24) = 240.25, $p < .001$.

harvesting tank as compared to choosing no source. The use of free water sources also significantly predicts the choice for a tank, however the high numbers indicated in the model may in reality be inflated by the fact that the predictions for this category were based on 25 respondents only and are not as accurate as desired. Then, the odds of choosing a rainwater harvesting tank above no choice are significantly higher (at 10% level) for better educated respondents. Finally, private connection users are also somewhat more likely to opt for a tank as compared to no choice, but this effect is not significant.

To summarise the findings, there is considerable demand for various water source options. Somewhat richer households using a smaller number of sources would prefer investing in an in-house connection while the widely preferred solution is a yard tap desired by a vast majority of non-private water users. Households of somewhat lower income and respondent’s education would opt for one of the collective water sources, while households already using a higher number of sources and with higher-educated respondents would prefer a rainwater harvesting tank.

5.4.2. Options for financing water demand: microcredits and savings

As shown above, the majority of households which would like to gain access to new water sources dispose of a comparably lower income than households which wouldn’t opt for any source. One of the options for financing access to desired sources could be the provision of microcredits. Similar microcredits are already provided by KADETFU for female-headed households which would like to invest in improved sanitation facilities. They are provided in a number of towns participating in the LVWATSAN initiative and it might turn out desirable to provide similar ‘water microcredits’, so that the population of Bukoba can reap full benefits from improved water infrastructure provided by the programme.

Respondents were asked a couple of questions related to taking potential microcredits for water facilities and water-related products together with questions relating to household savings and credit history which are some kind of rough proxy for the ability to repay the credit. The questions were spread across the questionnaire and proper introduction to the idea of ‘water microcredits’ was given to each respondent.

Table 5-16. Willingness to take a microcredit and make related contributions

	Strong yes	Yes	Unsure	No
	Row Valid N %			
Willingness to take a micro-credit for getting stated water facilities	12,8%	28,4%	16,3%	42,5%
Potential contribution in resources (building materials, labour) to the creation of a new water point	25,7%	47,4%	16,5%	10,3%
Willingness to take a micro-credit for a low-cost water treatment method	9,7%	26,7%	24,5%	39,1%
Willingness to get a small manual on how to improve water quality and hygiene for a nominal amount of money	17,3%	51,5%	22,9%	8,3%

Roughly 40% of respondents are willing to take a microcredit for getting improved water facilities, while about the same percentage explicitly refused such an option (Table 5-16). Also, a vast majority expressed interest in actively contributing to the creation or installation of a new facility. This would encompass building materials and labour, as is similarly already done aside the implementation of the microcredit scheme for sanitation facilities. Such contributions lower the total financial cost of taking a microcredit. Yet, the interest in taking a microcredit for low-cost water treatment methods was somewhat lower, as ‘only’ one third of respondents expressed it.

Table 5-17. Correlations between microcredits, income and savings

Spearman’s rho		Monthly income per capita	Savings
Willingness to take a microcredit for improved water facilities	Correlation Coefficient	-,247**	-,230**
	Sig. (1-tailed)	,000	,000
	N	299	295
Willigness to take a microcredit for a low-cost water treatment method	Correlation Coefficient	-,179**	-,286**
	Sig. (1-tailed)	,001	,000
	N	304	300

** . Correlation is significant at the 0.01 level (1-tailed).

What is interesting to remark is the fact that the level of income and the level of savings are significantly negatively correlated with the willingness to take a microcredit. First, as for the level of savings the mean level per month amounts to roughly 30,000 TSh, although this is by no means a representative number, because the median is already half this amount. 12.7% of households save nothing and the same percentage save 5,000 TSh or less. On the other edge about 9% save 100,000 TSh or more. The level of savings is unsurprisingly very highly correlated with the level of household monthly income. As a consequence, the correlation with the willingness to take a microcredit appears for both variables.

Table 5-17 depicts the relationship between the level of income and savings with the willingness to take a microcredit. In short, the lower the household income and as a result the lower the level of savings, the more the respondent would like to take a micro-credit. Another interesting point is that higher levels of savings are more correlated with the willingness to take a micro-credit for a water treatment method than for an improved water facility. The reverse is true for higher levels of income. This can be explained by priority ranking of the two microcredits. An improved water facility is deemed a basic good desired by many, while a water treatment facility could be afforded by people having more savings to spend on products not considered an urgent investment for the household.

Finally, as one of the ideas of my host organisation comprised the use of water kiosks as information dissemination centres (related to good hygiene and sanitation practices and HIV) respondents were asked to rate their interest in getting a small manual related to these aspects. In order to increase the perceived value of the product, even a small amount of money would be charged for it. The interest in it was considerable, as only about one tenth of respondents explicitly refused purchasing it (Table 5-16).

Subsequently, respondents who did not express interest or were unsure about taking a microcredit for water facilities were asked for reasons of their refusal or hesitation. The answers split in two main categories of reasons. One category was related to the lack of felt need for water facilities (marked in blue and violet in Chart 5-2) and the other to the negative aspects of taking a microcredit (marked in green and red). These answers turned out to be statistically significantly correlated with the level of household savings. The mean level of household savings was much lower for households which acknowledged financial burden that a microcredit would pose for them (Table 5-18).

Chart 5-2. Reasons for not wanting to take a microcredit

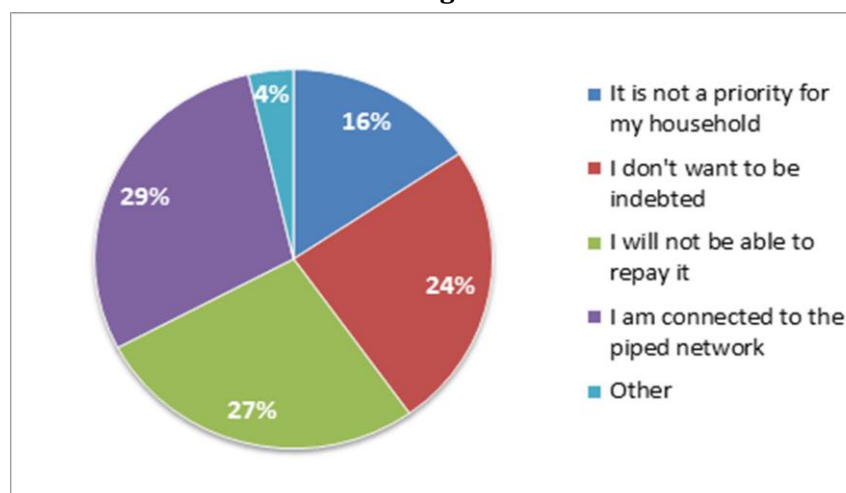


Table 5-18. Savings

	Monthly savings	
	Mean	Median
It is not a priority for my household	55,867 TSh	50,000 TSh
I don't want to be indebted	21,737 TSh	10,000 TSh
I will not be able to repay it	17,980 TSh	10,000 TSh
I am connected to piped water	51,645 TSh	50,000 TSh
Other	9,667 TSh	6,500 TSh
Correlation	Cramer's V = .403; p = .001	

Furthermore, about half of respondents are not eligible for a loan from a bank and one fourth is unsure if they are. However, roughly 40% has belonged to a credit group and 30% of females stated that the group was specifically for women (Table 5-19). The large percentage of respondents being part of credit groups could be attributed to the number of SACCOs, Savings and Credit Cooperative Organisations, existing in Bukoba. Chao-Béroff R. *et al.* (2000) noted that SACCOs operate in the most part in cash crop areas with the majority in coffee-producing zones (one of which is Bukoba). On the other hand, there are also women's groups involved in income generating activities. Most of their activities revolve around agriculture and small businesses. These groups are given financial support by a recently established Women Loan Fund by the Municipal Council.

Table 5-19. Series of questions related to credits

	Yes		No	
	Count	Row Valid N %	Count	Row Valid N %
Have you ever been a member of a credit group?	144	41,1%	206	58,9%
Was the group specifically for women?	41	29,9%	96	70,1%
Did you take a micro-loan in the past year?	128	36,5%	223	63,5%
If yes, did you face problems with repaying it?	37	26,2%	104	73,8%

A little more than a third of respondents took a microloan in the past year, although a fourth faced some problems with repaying it. As expected, the perception of eligibility for a loan is significantly correlated with the level of household monthly income.

To summarise findings of this chapter, although access to enough water does not pose a huge problem for the local population as a whole, it is especially difficult for low-income households. Private connections to piped water are the widely preferred option, however this demand cannot be met due to supply constraints in certain areas as well as prohibitive costs of connecting to the piped network. It also turned out that there is considerable demand for microcredits which would enable people to profit from the piped network as well as water-related products. When already connected, the quality of water varies a great deal and customer service is considered low. These are the reasons for substantial dissatisfaction from services provided among users, even though they acknowledge that the quality of water supply improved over the years. Further implications of these findings will be discussed in the following chapter.

6. Discussion: LED-related Implications

There are numerous implications arising from the findings presented in previous chapters. In view of the LED focus of the thesis, only the implications relevant to economic prosperity of the area will be outlined. They are divided by three respective chapter themes: first it is analysed if the (economic) assumptions for LVWATSAN have been met, and then the implications stemming from water supply and water demand in Bukoba are discussed.

6.1. Opportunities arising from LVWATSAN

The starting point of the research was the Lake Victoria Water and Sanitation Programme which would provide improved access to water and, as a consequence, result in economic opportunities for the water sector. The water infrastructure is in place since the beginning of 2009 which is enough to point out certain observations related to the realisation of goals set for LVWATSAN.

People are deemed to have proper access to water if they have available at least 20 litres per day of clean water from a source less than 1 kilometre from their home (UNDP, 2006); this encompasses three aspects: water quantity, quality and distance. In terms of water quantity, the capacity of water production at the main intake located at the shore of Lake Victoria is said to be doubled. However, according to the reports of BUWASA, the actual water production has slightly diminished over the years or at least stayed the same (BUWASA, 2007 & 2009). The enlargement of the capacity could thus be used in the years to come, as population growth in Bukoba is thought to be 4% annually. Yet, the French donor – AFD – sponsored the construction of a new intake located a few kilometres away from the existing one. In a few years a new water intake will be ready and the use of the current one in further future is hence uncertain, especially considering the quality issue elaborated below.

Water from the lake near the rehabilitated intake is considered polluted. This is especially true for the rainy season when most of the septic tanks and pit latrines are flooded. The intake is in close proximity to domestic and commercial sites whose waste is discharged into the lake. The site of the intake is exactly the same as previously, as only pumps have been extended in order to reach deeper. It can be thus concluded that the rehabilitation of the intake has not contributed to the improved quality of water supplied.

In terms of reducing the distance people have to walk to fetch water as well as reaching the poor, the picture is somewhat better. The relationship between income and water kiosk users proved to be statistically significant and negative, thus comparably poorer people profit from water kiosks. Respondents acknowledge that the construction of a water kiosk has been beneficial to them, even though they have various complaints related to the reliability and quality of water supplied. In view of the abundance of surface water in Bukoba, it can be argued that only households for which the water kiosk is located closer than another water source fetch water from it. Numerous respondents made the point that if they can walk equally far or even less to free water sources, why should they go to a water kiosk whose water is of the same quality, but to be purchased. They would have to boil it (the most popular water treatment) anyway.

Furthermore, as for the benefit of connecting to the piped network (and thus reducing the distance to water), LVWATSAN did not have a direct influence on it. Rising number of water connections has been steady for a decade now and the costs have not diminished. Besides, the use of private connections is significantly positively correlated with income, thus relatively richer households use

them (which is in accordance with numerous studies: Briand *et al.*, 2009; Larson *et al.*, 2006; Nauges & Strand, 2007; Persson, 2002).

To conclude, sole provision of hard infrastructure is not enough and the recent global paradigmatic shift to provision of soft infrastructure aside is a positive development (see Table 1-2). Also for this reason, LVWATSAN does not solely provide infrastructure, but invests in capacity building. The objective of this component is to ‘maximise the impact of the investments so that economic benefits accrue for the MDG target group’ (UNESCO-IHE *et al.*, 2008, p.36). From the abovementioned, it can be concluded that the capacity building component, especially the LED one, is absolutely necessary for the economic benefits (outlined in Figure 1-1) to materialise, especially for the poor.

A second conclusion is that it can be argued if LVWATSAN in Bukoba would pass a cost-benefit analysis. As we have seen in the theoretical framework, these analyses are hardly ever done for water supply projects (Whittington *et al.*, 2004), and similarly, the author is not aware of one for LVWATSAN. In either case, final conclusions could only be made after the realisation of all the programme’s components.

6.2. Implications of existing water supply

6.2.1. Water utilities

BUWASA faces similar problems to other water utilities, be it in small urban centres or in big capitals. For example high level of unaccounted for water is a regular problem of numerous poorly designed and maintained distribution systems, faulty or old equipment (Gleick, 2000; McGranahan, 2002). As shown earlier, the utilities’ performance can be ranked somewhere in the middle of all Tanzanian utilities, however it has to be noted that the situation has been gradually improving throughout the years.

One of the major constraints for expansion is lack of commercial culture in the organisation. The utilities stem from public ownership which has been changed only in the past decade. BUWASA became an autonomous entity meeting its own O&M costs a few years ago, while in the past it has been subsidised by the government. *De facto* change of ownership to private hands has not taken place, thus human resources stayed largely the same. They have to be developed and trained in the new spirit; as in the rest of Africa, engineers have been typically selected to operate and manage the water supply systems (Lewis & Miller, 1987). Employment of a business manager is a step in the right direction, however it can be argued that one employee with a business background is not enough for the total number approaching 60.

It is also advised to engage more private firms to carry out more services in order to improve efficiency (BUWASA, 2005). One of potential services could be plumbing, however staff members stated that there was no company or association for plumbers, thus there is no entity to enter in partnership with.

As for the financial situation, it was shown to be stable in the past years, however there is large space for improvement especially in terms of billing efficiency. The customers who fail to pay their bills are likely to be poor. One of the reasons for failures in timely payment can be sought in the tariff structure which is argued to be inappropriate. In contrast to existing practice in most developing countries, the demand-side approach recommends uniform tariff structure instead of increasing block tariffs (Gulyani, 2001) applied by BUWASA since 2008. Such increasing tariffs are applied for water conservation reasons and are also based on the assumption that high-income customers consume more and can afford more, and low-income customers consume less and can use subsistence amounts of

water for a lower price. However, the first reason is not relevant for Bukoba as the extra litres pumped from the second largest lake in the world have a minimal impact on its ecosystem (NWSC, 2007). The second reason has been refuted in studies on increasing block tariffs (Whittington, 1992; Crane, 1994), even though these are still recommended by donor agencies. The quoted studies prove that poor households often share a connection or buy from other households; consequently with rising tariff the poor end up paying a significantly higher price than richer households with individual connections. The situation is likely to be true for Bukoba, as almost 20% of respondents declared the use of neighbour’s private connection or a shared yard tap.

What is interesting to note, it is officially not allowed to resell water, but it appears to be a widely-spread practice. Crane (1994) presented in his study the positive consequences of liberalisation of water resale by households in Jakarta. Household resellers were charged a standpipe rate which resulted in money, time and consumption gains on the part of customers. As private connections are more widely spread than the network of standpipes, it is closer for the majority of households to fetch their water from neighbours. This in turn resulted in income generation of the latter. Although these measures were acknowledged to be short-time substitutes of an expanded piped water system, they resulted in true economic benefits on the supply and demand side. BUWASA could take an example from the utilities of Jakarta and assess the feasibility of issuing a certain amount of licences for water resale.

Furthermore, one of the major constraints for the expansion of private connections, and thus increasing revenue, was the large amount that had to be paid for connecting to the network. Even though the necessary fittings are likely to cost over 100,000 TSh, BUWASA, similarly to other utilities, charges 15,000 TSh new connection fees. In the meantime, Shinyanga utilities (region bordering to Lake Victoria too) gained 17% increase in their customer base in 2008/09 due to 50% discount for new customer costs (EWURA, 2009). Considering the fact that new connection fees account for only 1% of BUWASA’s yearly revenue, a similar action is recommended for Bukoba.

Finally, it can be concluded that aside investments in infrastructure made by a number of donors active in Bukoba’s water sector, BUWASA needs its own investment capital. The income is spent on operating costs and there is no capital left to undertake basic rehabilitation works. It is

Table 6-1. Range of financing sources for the water sector in small urban centres

<ul style="list-style-type: none"> • User fees • Domestic taxes • Grants • Loans • Micro-credit/micro-finance • Environmental charges • Dedicated or special purpose funds 	<ul style="list-style-type: none"> • Bond markets • Equity • Direct private investment • Mixed credits and export funds • Voluntary finance schemes • Gurantees • Debt swaps
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Source: UN-HABITAT, 2006, p.7

illusionary to assume that donors are going to sponsor all infrastructure investments. The sustainability principle is in line with the National Water Policy and current reforms transforming utilities into commercial entities. This environment is conducive to starting the exploration of beyond-external sources of financing which would stop being driven by the donor’s agenda. Some of them (Table 6-1) are covered here, however most of them go beyond the scope of this thesis. The majority of them are new and further exploration is recommended from the sponsor of LVWATSAN – UN-HABITAT in this matter.

To sum up, BUWASA is the example of the evolution from public to commercial entity without the need for changing assets to private hands. Even though, a lot of improvements are recommended, a

great deal has already been done, mainly thanks to the conducive regulatory environment created nation-wide in the past decade. There is also large space for expansion and additional revenue creation, mainly due to high demand for piped water covered in a separate section of this chapter.

6.2.2. Water kiosks

The biggest representatives of small-scale water providers, water kiosk operators, turned out to hardly make any profit on selling water contrary to the findings of most comparable studies (Colignon & Vezina, 2000; UN-HABITAT, 2003; Solo, 1999; Njiru, 2005; Snell, 1998). Instead of charging a few times more than official utilities, water kiosks provide water one third cheaper than private connections and cheaper than any other purchased water source in Bukoba. One 20-litre bucket is sold for 7.5 TSh at kiosks, while at protected springs it costs between 200 and 300 TSh. Even though the quality of water supplied may be debatable, the difference is still immense. An operator receives 2.5 TSh from every bucket of water sold. While an average income *per capita* amounted to 30,426 TSh reported for urban areas (NBS, 2002b), a water kiosk operator would earn this money, if he/she sells 400 buckets of water per day at the current price. The operator in Bukoba sells on average 50 buckets with the most positive scenario amounting to 200 which is just half of it.

The situation is caused by the management contract that operators sign with BUWASA in which the price of water, and consequently the profit made, is fixed in advance. This in turn is regulated by EWURA, Energy and Water Utilities Regulatory Authority, which supervises tariff structures of utilities all over Tanzania. Even though in 2008 BUWASA submitted an application for water kiosk tariff increase (along with increases in other tariffs) from 350 TSh to 400 TSh, the final tariff of 375 TSh was approved (field research, 2010). This in turn is caused by the policy which stipulates the special rights for water for low-income groups which are the major water kiosk users. Also, due to the abundance of other water sources in Bukoba, mainly free surface water, the increase in the price of water sold at kiosks is problematic.

Another important point to make is the balance of profit of potential price increase. It would improve the livelihoods of 39 water kiosks operators in Bukoba, but would decrease the financial assets of low-income groups fetching water at kiosks. Moreover, water kiosk operators who run a small shop with various services aside from selling water have a relatively (much) higher income than the ones solely selling water. What is more, the operators who do not offer services would like to start providing them, but lack the capital to do so. Thus, the recommended intervention would be to provide these operators with microcredits enabling them to start another income-generating activity aside from selling water. The positive aspects of such microcredits have been covered in the theoretical framework. Given the relative success of already existing operators, the risks of taking a microcredit are low, and as the majority of operators are female, the benefits of targeted microcredit for the development of income-generating activities are likely to accrue as outlined in the theoretical framework.

6.3. Implications of existing water demand

The general characteristics of water use in Bukoba largely correspond to the phenomena observed in other studies as well as global statistics. The major one is that being poor increases the likeliness of using unimproved water sources and income is a strong factor in determining access to (un)improved water and the type of technology used to collect water (e.g. UNDP, 2006). Households in Bukoba also

spend on average the same percentage of their income as in other parts of the developing world (Gulyani, 2001).

As for the water source choice model, the assumptions made at the start about the significant contribution of current water sources as well as socioeconomic characteristics turned out to be in accordance with existing body of literature (e.g. WBWDRT, 1993; Gulyani *et al.*, 2005; Nauges & Strand, 2007). A vast majority of respondents showed willingness to pay for improved water sources, specifically private connections. Even the poor tended to opt for a yard tap, and the more affluent households for the in-house connection and rainwater harvesting tanks. These findings have a clear implication. The people want and are willing to pay for improved water.

However, two major bottlenecks were singled out against this demand. One problem is lack of supply in the area which proves that BUWASA urgently needs investment capital aside from the assistance provided by donors. The water supplied will find vast numbers of new customers substantially contributing to the revenue of the Authority (as we have seen, more than half comes from domestic clients). The other bottleneck seems to be able to be resolved in an easier and more prompt way – the cost of connecting to the network. Various incentives are provided by utilities to lower that cost which has clear results, as shown in the previous section. On the other hand, providing microcredits for the poor to cover connection costs to the network seems to help solving the problem too – roughly half of them are willing to take one. This is coupled with the fact that the majority of households have some savings, no matter how low their income is. There are existing schemes which can be replicated (also inducing saving behaviour) as well as there is local knowledge on the implementation of similar, sanitation microcredits, provided by KADETFU under LVWATSAN. In fact, if the goals of the programme are to be realised, the provision of ‘water microcredits’ seem equally indispensable to the sanitation ones. The connection to the private network, a highly demanded service, means that people are aware of the economic benefits following the connection. It is however not clear, if apart from time savings, health improvements and money savings would also accrue. The cost of water provided has not lowered and the quality has so far not been improved. Big expectations in terms of changing this are associated with the investments in the new water intake with cleaner water which will be ready in a few years, but under the label of a different donor.

In the meantime, it may however turn out to be a more feasible option to develop low-cost water treatment methods. Haller *et al.* (2007) showed that household water treatment was found to be the most cost-effective intervention (instead of piped water supplies). There is also a considerable demand for this good among the users, although the level is lower than for water facilities. On the other hand, improved water supplies are unlikely to change the level of household hygiene and, as a consequence, household’s health without behavioural change (McGranahan, 2002). Here, the concept of social marketing may turn out helpful, as it did for sanitation microcredits (Box 3-1). Water kiosks are deemed to be the right place for disseminating such a message, especially because their clients are in the majority poor and fetch water.

Last but not least, no real improvements on the supply or demand side will take place unless the reliability of water supplies is enhanced. The same concerns are valid for private connections and for water kiosks as the same water is piped. Even though low incomes cannot be neglected, low demand for water kiosks and the unwillingness to pay the bills for private connections is most likely caused by the inefficiency in the supply of water. If the quality of the service is improved, supplies more reliable, billing and metering system more transparent and no corrupt practices take place, customers are most probably willing to pay the price requested, as shown by the evidence of studies carried out worldwide as well as the one presented here.

Conclusion

As for the closing part of the thesis, it is important to look back at the questions asked for this research and see if they have been answered throughout the thesis (Table 6-2).

Table 6-2. Verification of hypotheses

Question	Hypothesis	Verification
What is the relationship between water service delivery and local economic development?	There exists a two-way relationship between water service delivery and LED.	True (all chapters)
1) How is the water supply in Bukoba?		
a) How has water supply been influenced by LVWATSAN?	LVWATSAN has substantially contributed to the improvement of access to safe and clean water sources.	Not true (Section 3.3 and 6.1)
b) What is the role of small-scale water providers?	The role of small-scale water providers is very important in meeting the local need for water.	Neutral (Section 4.2)
c) What is the environment in which the water sector operates?	The environment in which the water sector operates is not optimal for the best provision of water services and should be improved.	Neutral (Chapter 3)
2) What is the water demand in Bukoba?		
a) What are the existing patterns of water use?	People mostly use unimproved water sources and do not use enough water for their daily activities.	Neutral (Section 5.2)
b) What is the willingness to change and pay for improved water sources?	There is considerable willingness to pay for improved, reliable water sources.	True (Section 5.4)
c) What is the demand for water-related products and services?	There is a low demand for water-related products, as people are not sensitised on the importance of hygienic water use.	Neutral (Section 5.3 and 5.4.2)
d) Is there demand for microcredits for improving one's water sources?	As it is hypothesised that the willingness to pay for improved water sources is considerable, there is also some demand for 'water microcredits'.	True (Section 5.4.2)
3) What interventions are desired in the water sector to meet the demand and foster LED?	Answering the abovementioned questions will allow designing potential interventions.	NA (Chapter 6)

As for the water supply in Bukoba, it turned out that LVWATSAN has not yet contributed to the improved access to water of the local population. It has been acknowledged that carrying out necessary interventions are absolutely crucial for the realisation of the improved access in this town. Then, unlike in many other towns of Africa and elsewhere in the developing world, the role of small-scale water providers turned out to be overestimated. The major providers include water kiosks used by roughly a fifth of the respondents, while other providers are hardly or non-existent. Finally, the environment in which the water sector operates proved to be one of the stronger points for local economic development to realise. The efforts of the government to improve efficiency of the water sector continue to be successful, however a longer time is needed to assess the reforms from a better perspective.

As for water demand, current patterns of water use showed great variations between different groups of the population. The ones connected to the piped network are in relatively the best position, although the reliability and quality of the service needs major improvements. The high levels in willingness to pay shown in a great body of existing studies were confirmed in this study too. A vast majority would like to gain access to the private connection, however is constrained by lack of supply in the area where they live or by prohibitive costs of joining the piped network. There is quite some demand for water-related products, although the demand for water facilities turned out to be higher together with high levels of willingness to take a 'water microcredit'.

The LED-related interventions are desired both on the supply and demand side and stem from the findings summarised above. First of all, they proved necessary for the realisation of goals set to LVWATSAN. In water supply inducing a more commercial-oriented culture in the utilities as well as revising the tariff structure and rules for water resale are deemed to be important. Besides, more (financial) incentives should be given for potential customers to connect to the network as well as the utilities should be supported in their search for investment capital, currently non-existent. Apart from that, it is recommended to give out microcredits to water kiosk operators, so that they dispose of capital to start an economic activity aside selling water, which proved to yield low profit. Similarly, microcredits are recommended on the demand side, for the vast numbers of population willing and able to pay for improved water sources. Finally, before the realisation of wider piped network coverage, it may turn out economically justifiable to introduce low-cost water treatment methods which proved to be the most cost-effective interventions in the water sector.

This brief summary brought closer the complex relationship between water service delivery and local economic development. The latter can spur from healthy functioning commercial utilities and profitable but affordable water kiosks for which reliable services customers are willing to pay a lot. Satisfied customers in turn profit from health improvement and time savings which may contribute to local economic development, however the latter cannot be taken for granted, as it depends on the individual how they will allocate the economic benefits won from water supply investments. However, if all actors perform their roles as in Figure 1-2, water service delivery and local economic development could be a virtuous circle of development. Yet, it cannot be forgotten that the full benefits of sustainable water service delivery in Bukoba are still to flourish thanks to the recommendations provided in this thesis.

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Internet websites:

Kagera Development and Credit Revolving Fund, <http://kadetfu.or.tz/>

SNV Netherlands Development Organisation <http://www.snvworld.org/>

Appendices

Appendix A. Benefits of water and sanitation interventions

Benefit to	Type of benefit	Code
Health sector	Reduction in current costs due to health intervention: materials such as oral rehydration therapy and antibiotics, staff time	Med-cost-avert
	Savings in poison control centre costs	Med-cost-avert
	Reduction in future costs (fewer cases, less severe cases)	Med-cost-avert
Third party payer	Reduction in pay-outs to health-care providers	Med-cost-avert
Patient¹	Reduced morbidity and mortality	Health benefit
	Increased life expectancy	Health benefit
	Increased health-related quality of life	Health benefit
	Reduced direct costs of attending care (out-of-pocket expenses)	Med-cost-avert
	Reduced future medical or social care costs	Med-cost-avert
	Increased productivity or capital formation activities such as less time off work and school and increased efficiency while at work or school	Prod -loss-saved
	Reduced risk avertive expenditures such as money cost (capital, recurrent) and time input	Avert-exp-saved
Family or carers of patient	Reduced time caring (back to work)	Prod -loss-saved
	Reduced out-of-pocket payments for medical care	Med-cost-avert
	Reduced risk avertive expenditures (see above)	Avert-exp-saved
Industry	Direct economic value of high quality water such as irrigation water for crops, fishery production, and sea ecosystems	Other-not-health
	Reduced sick leave of employees (paid sick leave, lost production)	Other-pay-avert
	Reduced medical expenses	Med-cost-avert
	Reduced avertive expenditures	Avert-exp-saved
Other government ministries	Reduced running costs or maintenance	Other-pay-avert
	Reduced avertive expenditures	Avert-exp-saved
All consumers	Reduced running costs or maintenance	Other-pay-avert
	Non-health benefits such as increased convenience of a good water supply, increased amenity (laundry, recreational uses), and non-use values (option, existence, bequest)	Other-not-health

Codes: Med-cost-avert: medical costs averted; Avert-exp-saved: avertive expenditure saved; Prod-loss-saved: production loss saved; Other-pay-avert: other payments averted; Other-not-health: other benefits not related to health impact.

¹The patient is the person who would have been ill in the absence of environmental health intervention.

Source: Hutton, 2001

Appendix B. Questionnaire on water kiosks

I would like to ask you some questions related to the operation of your water kiosk and possible options for improving it. Interviewing you is part of an academic research and will contribute to the work of one of local NGOs. Your input is considered very valuable to this study, so I will be grateful for your honest answers. Your answers will be kept confidential. These questions usually take about X minutes. Thank you for your cooperation!

1. Date of interview: DD/MM
2. Ward: a) Bakoba b) Bilele c) Hamugembe d) Kashai e) Miembeni f) Rwamishenye
3. Mitaa: a1) Buyekera a2) Forodhani a3) Kafuti a4) Mtono a5) Nyakanyasi
b1) Jamhuri b2) Omukigusha b3) Uhuru b4) Zamzam
c1) Kabangamilembe c2) Kashabo c3) Nyangoye c4) Omukishenye
d1) Kashai Halisi d2) Kashenye d3) Katatolwanso d4) Kilimahewa d5) Kisindi d6)
Mafumbo d7) Matopeni d8) NHC-Kashai d9) Rwome
e1) Jamhuri e2) Nyamkazi e3) Pepsi e4) Pwani
f1) Chemba f2) Kamizilente f3) NHC f4) Rwamishenye
4. **Who built your water kiosk?**
 - a) BUWASA
 - b) UN-HABITAT
 - c) Don't know
5. **Do you provide any other services next to selling water?**
 - a) Yes
 - b) No
6. **If you provide services, what kind of?** (*check all that apply*)
 - a) Small shop with basic products
 - b) Fruits & vegetables
 - c) Mobile recharge
 - d) Tailor
 - e) Other, specify.....
 - f) *Not applicable (no services provided)*
7. **If you don't provide services, why not?**
 - a) I cannot afford
 - b) I don't think there would be enough clients
 - c) I am happy with the income I make on selling water
 - d) Other, specify.....
 - e) *Not applicable (respondent provides services)*
8. **If you don't provide services, would you like to start providing them?**
 - a) Yes
 - b) Unsure
 - c) No
 - d) *Not applicable*
9. **What are the opening times of the kiosk?** From.....to.....
10. **How many 20-litre buckets do you sell per day in wet season?**
11. **How many 20-litre buckets do you sell per day in dry season?**

- 12. What is approximately your monthly profit from selling water in wet season?** TSh
- 13. What is approximately your monthly profit from selling water in dry season?** TSh
- 14. What kinds of customers buy water from your kiosk? (check all that apply)**
- a) Individuals for household use
 - b) Businesses
 - c) Water vendors who resell purchased water to others
- 15. How would you judge the status of people who buy water from your kiosk? (check all that apply)**
- a) Low-income people
 - b) Middle-income people
 - c) High-income people
- 16. Do you get complaints from your customers?**
- a) Yes
 - b) No
- 17. If you get complaints, what kind of complaints do you get?**
- a) The kiosk is too far
 - b) Opening times are too short
 - c) It is often closed
 - d) It is expensive
 - e) Not reliable water supply
 - f) Bad quality of water supplied
 - g) Other, please specify.....
 - h) *Not applicable (no complaints)*

V. ADDITIONAL INFORMATION

Now I would like to ask you some last questions characterising you and your household.

- 18. Sex:** (a) female (b) male
- 19. Age:** Years
- 20. Position of respondent in the household:**
- a) Male who is head of household
 - b) Female who is head of household because there is no husband, he is away or deceased
 - c) Wife of the head of household who is not the head herself
 - d) Other, please specify.....
- 21. The water kiosk operator has to sign a contract with BUWASA. Who signed the contract?**
- a) Male who is head of household
 - b) Female who is head of household because there is no husband, he is away or deceased
 - c) Wife of the head of household who is not the head herself
 - d) Other, please specify.....
- 22. How did you get chosen to be the operator of the kiosk?**
- 23. Who chose you to be the water kiosk operator?**
- a) Mitaa Executive Officer

- b) BUWASA
 - c) People by voting
 - d) Other, specify...
- 24.** Does your household have any other income-generating activities apart from the water kiosk?
- a) Yes
 - b) No
- 25.** What is the occupation of the other income earner in the household?
- a) Labourer
 - b) Trader
 - c) Service/shop sales worker
 - d) Street vendor
 - e) Farmer
 - f) Consultant or professional
 - g) Employee of a private company
 - h) Employee of government (public sector)
 - i) Housewife
 - j) Retired
 - k) Unemployed
 - l) Other, specify.....
 - m) *Not applicable (income only from the water kiosk)*
- 26.** What is your level of education (number of years of school)? years
- 27.** How many people (children and adults) live in your household on a regular basis?
- 28.** How many people in your household contribute to the household income?..... people
- 29.** What is the approximate monthly income of the whole household?TSh
- If respondent doesn't want to say exactly, give the options:*
- (a) 0-30,000 TSh
 - (b) 30,001-60,000 TSh
 - (c) 60,001-100,000 TSh
 - (d) 100,001-150,000 TSh
 - (e) 150,001-200,000 TSh
 - (f) More than 200,000 TSh
- 30.** What is the approximate monthly income from operating the kiosk & accompanying services?
....TSh
- 31.** Do you feel that your situation improved since you run the water kiosk? (*note any comments*)

Thank you very much for your time & engagement.
Please check if there are no missing answers on the data entry sheet.

Appendix C. Questionnaire on water supply

I would like to ask you some questions on the quality of water supply you get and options for improving it. Interviewing you is part of an academic research and will contribute to the work of one of local NGOs. Your input is considered very valuable to this study, so I will be grateful for your honest answers. Your answers will be kept confidential. These questions usually take about X minutes. Thank you for your cooperation!

I. INTRODUCTION

1. Date of interview: DD/MM
2. Ward: a) Bakoba b) Bilele c) Hamugembe d) Kashai e) Miembeni f) Rwamishenye
3. Mitaa: a1) Buyekera a2) Forodhani a3) Kafuti a4) Mtono a5) Nyakanyasi
b1) Jamhuri b2) Omukigusha b3) Uhuru b4) Zamzam
c1) Kabangamilembe c2) Kashabo c3) Nyangoye c4) Omukishenye
d1) Kashai Halisi d2) Kashenye d3) Katatolwanso d4) Kilimahewa d5) Kisindi d6) Mafumbo
d7) Matopeni d8) NHC-Kashai d9) Rwome
e1) Jamhuri e2) Nyamkazi e3) Pepsi e4) Pwani
f1) Chemba f2) Kamizilente f3) NHC f4) Rwamishenye
4. Do you participate in decision making on household major expenditures? a) Yes b) No
(if the answer is no, try to speak to someone who has a say in household decision making)
5. Position of respondent:
 - a) Male who is head of household
 - b) Female who is head of household because there is no husband, he is away or deceased
 - c) Wife of the head of household who is not the head herself
 - d) Other, please specify.....

II. GENERAL QUESTIONS ON WATER SUPPLY

6. I would like to present you a list of possible problems that might be faced by your household:

- a) Unreliable electricity supply
- b) Difficult access to (drinking) water
- c) Poor quality of (drinking) water
- d) Poor access for motor vehicles
- e) Lack of transport means
- f) No sewerage service
- g) No/inadequate solid waste collection service
- h) Lack of (good-quality) toilets
- i) Other, please specify.....

Rank these services on a scale

from 1 to 5 as follows:

1 – the most serious problem


2 – the second most serious problem

3 – major problem(s)

4 – minor problem(s)

5 – no problem(s)

- 7. a) Which sources are available in your area during wet season?**
b) Which sources are available in your area during dry season?
(check all that apply)
- 8. a) Which sources does your household use during wet season?**
b) Which sources does your household use during dry season?
(check all that apply)
- 9. a) Amount of water that you use from each source during wet season**
b) Amount of water that you use from each source during dry season
(litres per day or 20 litres buckets per day)
- 10. a) Total monthly amount that you spend on water from each source during wet season**
b) Total monthly amount that you spend on water from each source during dry season *(TSh per month)*
- 11. How far is each of your sources of water? *(minutes)***
- 12. a) How is the availability of your sources during wet season?**
b) How is the availability of your sources during dry season?
(vg-very good/ g-good/ m-medium/ p-poor)
- 13. a) How often do you have to wait/queue for getting water during wet season?**
b) How often do you have to wait/queue for getting water during dry season?
(n-never, s-sometimes, o-often, a-always)
- 14. a) How is the water quality from your sources during wet season?**
b) How is the water quality from your sources during dry season?
(vg-very good/ g-good/ m-medium/ p-poor)
- 15. Would it be beneficial for your household to gain access to any of the sources quoted?** *(note all with 'yes')*
- 16. Would you like to gain access to any of these sources if offered at an affordable price for you?**
(read out options a)-i) and note all with 'yes')

- 
- a) Private connection to piped water
 - b) Yard tap
 - c) Yard tap shared with a few HHs
 - d) Water kiosk
 - e) Neighbour's private connection
 - f) Rainwater
 - g) Water vendor
 - h) Bottled water
 - i) Protected spring
 - j) Unprotected spring
 - k) River/stream
 - l) Lake
 - m) Other, specify.....

Getting access to good quality water from a new water point which is safe can cost a lot of money. The initial costs are always high, for example, connection fees to piped network or a rainwater harvesting tank amount to at least 100,000 TSh. Yet, there are a few ways of making this investment cheaper: through contributing in resources to the building process (e.g. building materials, labour), taking a micro-credit and repaying the investment in small monthly instalments as well as through investing in the new water point collectively.

17. Would you be willing to take a micro-credit for getting such better water facilities and repay it through small instalments paid on a monthly basis?

- a) Strong yes
- b) Yes
- c) Unsure
- d) No

18. If you don't want to take a micro-credit, what are the reasons? (check all options that apply)

- a) It is not a priority for my household
- b) I don't want to be indebted
- c) I will not be able to repay it
- d) I am connected to piped water
- e) Other, specify.....
- f) *Not applicable*

19. In order to make the investment cheaper, would you be willing to contribute in resources to the creation of a new water point (e.g. building materials, labour)?

- a) Strong yes
- b) Yes
- c) Unsure
- d) No

20. If you don't have a private connection to piped water in your house, what are the reasons? (check all options that apply)

- a) No supply in the area
- b) I cannot afford
- c) Not reliable water supply
- d) Bad quality of water supplied
- e) I have access to enough water
- f) Other, please specify.....
- g) *Not applicable (respondent has a private connection)*

21. If you get water from a water kiosk, has its creation been beneficial for your household?

- a) Strong yes
- b) Yes
- c) Unsure
- d) No
- e) *Not applicable (respondent doesn't use water kiosks)*

22. If you get water from a water kiosk, what are the problems you face? (check all that apply)

- a) The kiosk is too far
- b) Opening times are too short
- c) It is often closed
- d) It is expensive
- e) Not reliable water supply
- f) Bad quality of water supplied
- g) I would prefer to use a different source of water, specify.....
- h) No problems
- i) Other, please specify.....
- j) *Not applicable (respondent doesn't use water kiosks)*

23. If you don't use the service of water kiosks, what are the reasons? (check all that apply)

- i) The kiosk is too far
- j) Opening times are too short
- k) It is often closed
- l) It is expensive
- m) Not reliable water supply
- n) Bad quality of water supplied
- o) I prefer other sources of water
- p) Other, please specify.....
- q) *Not applicable (respondent uses water kiosks)*

24. Who is responsible for fetching water in your household? (check all that apply)

- a) Adult woman
- b) Adult man
- c) Female child
- d) Male child
- e) Vendor
- f) Housemaid
- g) No one, we get water directly to our house

25. Do you face difficulties in accessing enough water for the following daily activities? (check all that apply)

- a) Drinking and cooking
- b) Washing and cleaning
- c) Sanitation
- d) I don't face any difficulties

26. Do you use water for productive purposes/income-generating activities?

- a) Yes, I use it for.....(specify)
- b) No

27. Do you face difficulties with getting sufficient amount of water for these productive activities?

- a) Yes
- b) Sometimes
- c) No
- d) *Not applicable (respondent doesn't use water for productive purposes)*

28. How do you compare the quality of water supply with a few years ago?

- a) It improved substantially
- b) It improved moderately
- c) It is the same
- d) It deteriorated moderately
- e) It deteriorated substantially

III. HEALTH & WATER TREATMENT

29. Do you treat water for household consumption?

- a) Yes
- b) Sometimes
- c) No

30. If you don't treat water, why not? (check all that apply)

- a) I don't think it is necessary
- b) I can't afford it
- c) I don't know how to do it effectively
- d) I don't have to because I only drink bottled water
- e) *Not applicable (respondent treats water)*

31. If you do treat water how do you do it? (check all that apply)

- a) I boil it
- b) I sieve it through cloth
- c) I let it stand and settle
- d) I add chlorine
- e) I use water filter
- f) Other, please specify.....
- g) *Not applicable (respondent doesn't treat water)*

32. Has any member of your household suffered from the following diseases in the last months?

- a) Diarrhoea
- b) Malaria
- c) Cholera
- d) Typhoid
- e) Intestinal worms
- f) Skin infection
- g) Other diseases
- h) No diseases

33. How often did you suffer from these diseases?

- a) Once a week
- b) Once in 2 weeks
- c) Once a month
- d) Once in a few months
- e) *Not applicable (household didn't suffer of any of the diseases)*

34. Do you think that these diseases could be the result of using unsafe water?

- a) Yes
- b) Unsure
- c) No
- d) *Not applicable (no diseases in respondent's household)*

35. There exist many low-cost water treatment methods that ensure good quality of water. Would you be willing to invest in one of them if offered at an affordable price for you, e.g. through a micro-credit repaid through small monthly instalments?

- a) Strong yes
- b) Yes
- c) Unsure
- d) No

36. Do you feel that you have sufficient knowledge of health problems related to poor quality water & sanitation?

- a) Yes
- b) Partly
- c) No

37. Would you like to get a small manual on how to improve water & sanitation facilities at your household for a nominal amount of money?

- a) Strong yes
- b) Yes
- c) Unsure
- d) No

38. Are there any community initiatives concerning water in your area?

- a) Yes, specify.....(water user association etc.?)
- b) No

IV. PLUMBING SERVICES

39. How often do you use plumbing services?

- a) Never (*go directly to section V & note answers 'not applicable' for Q40-42*)
- b) Once a year or more rarely
- c) Once in half a year
- d) Once a month
- e) At least once in 2 weeks

40. If you have a leakage, what plumbing services do you use? (*check all that apply*)

- a) I use BUWASA plumbers
- b) I use private plumbers
- c) I fix it myself
- d) *Not applicable (respondent doesn't use plumbing services)*

41. Are you satisfied with BUWASA plumbers?

- a) Yes
- b) No, they don't come on time
- c) No, they have unfair charges
- d) No, other, specify.....
- e) *Not applicable (respondent doesn't use BUWASA plumbers)*

42. Are you satisfied with private plumbers?

- a) Yes
- b) No, they don't come on time
- c) No, they have unfair charges
- d) No, other, specify.....
- e) *Not applicable (respondent doesn't use private plumbers)*

V. ADDITIONAL INFORMATION

Now I would like to ask you some last questions characterising you and your household.

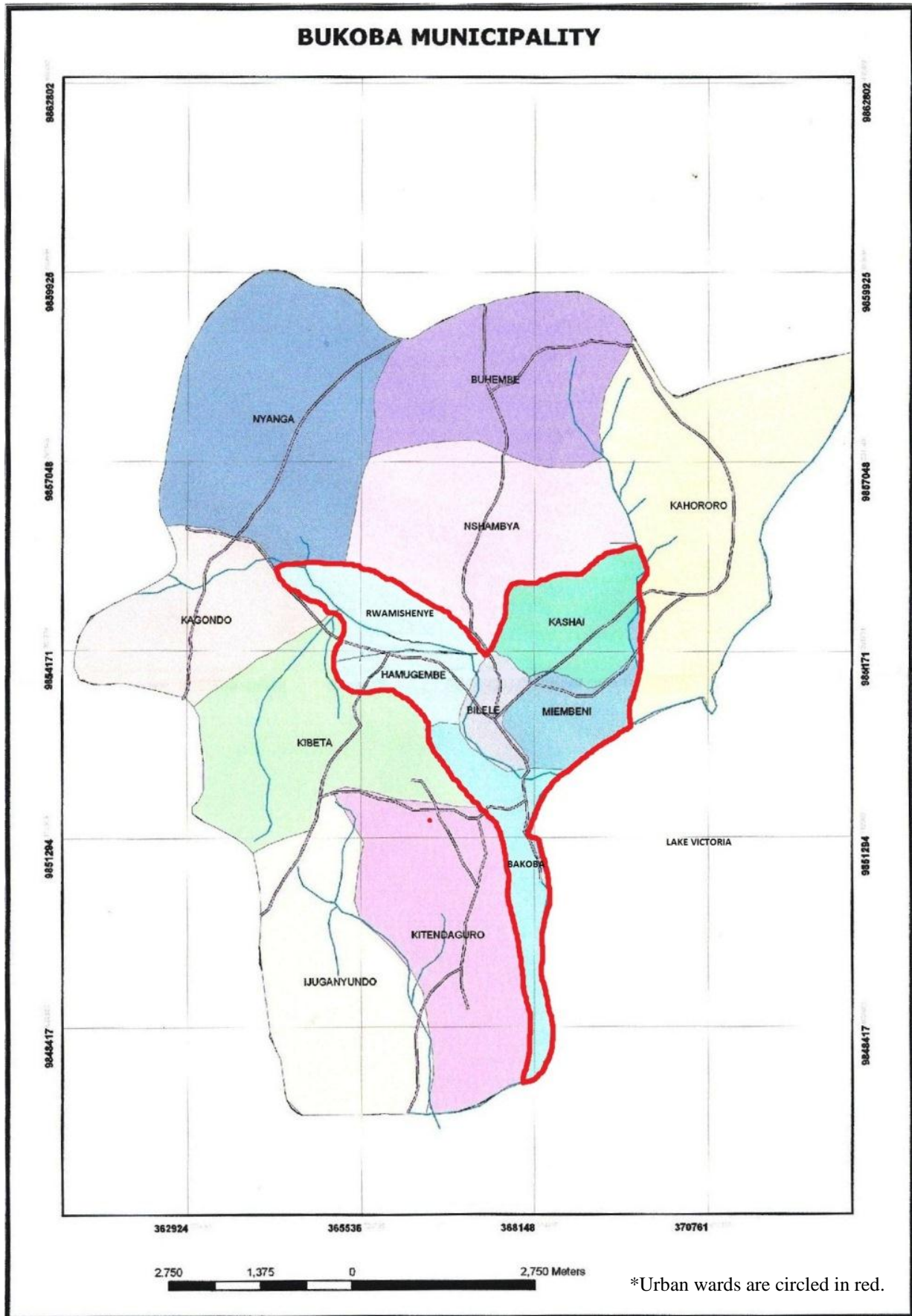
43. Sex: (a) female (b) male

44. Age: Years

- 45.** What is your occupation? (*check all that apply if more occupations*)
- | | |
|-------------------------------|---|
| a) Labourer | g) Employee of a private company |
| b) Trader | h) Employee of government (public sector) |
| c) Service/shop sales worker | i) Housewife |
| d) Street vendor | j) Retired |
| e) Farmer | k) Unemployed |
| f) Consultant or professional | l) Other, specify..... |
- 46.** What is the occupation of other income earner(s) in the household? (*check all that apply if more*)
- | | |
|----------------------------------|--|
| a) Labourer | h) Employee of government (public sector) |
| b) Trader | i) Housewife |
| c) Service/shop sales worker | j) Retired |
| d) Street vendor | k) Unemployed |
| e) Farmer | l) Other, specify..... |
| f) Consultant or professional | m) <i>Not applicable (respondent is the only</i> |
| g) Employee of a private company | <i>income earner)</i> |
- 47.** What is your level of education (number of years of school)? years
- 48.** Type of settlement: (a) slum (b) non-slum (c) slum/business (d) non-slum/business
- 49.** Do you own the house or do you rent it? (a) own (b) rent
- 50.** How many people (children and adults) live in your household on a regular basis?
- 51.** How many people in your household contribute to the household income?..... people
- 52.** What is the approximate monthly income of the whole household?TSh
- If respondent doesn't want to say exactly, give the options:*
- | | |
|------------------------|---------------------------|
| (a) 0-30,000 TSh | (d) 100,001-150,000 TSh |
| (b) 30,001-60,000 TSh | (e) 150,001-200,000 TSh |
| (c) 60,001-100,000 TSh | (f) More than 200,000 TSh |
- 53.** How much money do you usually save per month?TSh
- 54.** Did you take a micro-loan in the past year? (a) yes (b) no
- 55.** If yes, did you face problems with repaying it? (a) yes (b) no (c) *not applicable*
- 56.** Are you eligible for a loan from a bank? (a) yes (b) unsure (c) no
- 57.** Have you ever been a member of a credit group? (a) yes (b) no
- 58.** (*If respondent female*) Was the group specifically for women? (a) yes (b) no (c) *not applicable*

<p>Thank you very much for your time & engagement. Please check if there are no missing answers on the data entry sheet.</p>
--

Appendix D. Map of Bukoba



Appendix E. Sample choice method

WARD	MTAA	No. of HHs	Cumulative No. of HHs	Series Numbers/ Selected Mitaa	Sample size	Interval <i>n</i> (nth HH)	KIOSK
BAKOBA	BUYEKERA	1190	1190	1000	27	44	
	FORODHANI	540	1730				1
	KAFUTI	375	2105				1
	MTONO	575	2680	2543	27	21	
	NYAKANYASI	438	3118				1
BILELE	JAMHURI	50	3168				
	OMUKIGUSHA	360	3528				1
	UHURU	558	4086	4085	27	21	3
	ZAMZAM	70	4156				1
HAMUGEMBE	KABANGA MILEMBE	654	4810				
	KASHABO	964	5774	5628	27	36	1
	NYANGOYE	816	6590				1
	OMUKISHENYE	1200	7790	7170	27	44	1
KASHAI	KASHAI HALISI	957	8747	8713	27	35	
	<i>! KASHENYE</i>	476	9223	<i>NRC</i>			(X) 1
	KATATOLWANSO	348	9571				1
	<i>! KILIMAHEWA</i>	362	9933	<i>NRC</i>			1
	<i>! KISINDI</i>	213	10146	<i>NRC</i>			1?
	MAFUMBO	516	10662	10256	27	19	1
	MATOPENI	890	11552				1
	NHC-KASHAI	567	12119	11798	27	21	1
	RWOME	418	12537				
MIEMBENI	JAMHURI	330	12867				1
	NYAMKAZI	280	13147				2
	PEPSI	225	13372	13341	27	8	
	PWANI	217	13589				
RWAMISHENYE	CHEMBA	52	13641				
	KAMIZILENTE	726	14367				2
	NHC	658	15025	14883	27	24	(X) 1
	RWAMISHENYE	401	15426				4
TOTAL		15426			270		

*NRC – non-random choice explained in the text

Sampling interval	SI	1543
Random start	RS	1000
Series numbers	RS	1000
	RS+SI	2543
	RS+2SI	4085
	RS+3SI	5628
	RS+4SI	7170
	RS+5SI	8713
	RS+6SI	10256
	RS+7SI	11798
	RS+8SI	13341
	RS+9SI	14883

Appendix F. Additional tables for household's profile

Gender

	Frequency	Valid Percent
Valid female	232	68,0
male	109	32,0
Total	341	100,0
Missing invalid	14	
Total	355	

House tenure

	Frequency	Valid Percent
Valid owned	245	69,2
rented	109	30,8
Total	354	100,0
Missing Invalid	1	
Total	355	

Type of settlement

	Frequency	Valid Percent
Valid slum	52	14,7
non-slum	187	53,0
slum/business	44	12,5
non-slum/business	70	19,8
Total	353	100,0
Missing Not applicable	1	
Invalid	1	
Total	2	
Total	355	

Respondent's occupation

	Frequency	Valid Percent
Valid Labourer	22	6,2
Trader	90	25,4
Service/shop sales worker	24	6,8
Street vendor	5	1,4
Farmer	39	11,0
Consultant or professional	6	1,7
Employee of a private company	29	8,2
Employee of government	66	18,6
Housewife	38	10,7
Retired	15	4,2
Unemployed	18	5,1
Other	3	,8

Report

Monthly income per capita

Mtaa	Mean	N	Std. Deviation
Buyekera	31,772 TSh	25	29,374 TSh
Uhuru	33,692 TSh	23	33,291 TSh
Kashabo	23,765 TSh	27	28,760 TSh
Omukishenye	25,815 TSh	31	24,991 TSh
Mtono	42,851 TSh	21	39,264 TSh
Kashai Halisi	39,757 TSh	23	36,564 TSh
Kashenye	38,556 TSh	24	38,616 TSh
Kilimahewa	30,845 TSh	21	31,159 TSh
Kisindi	21,094 TSh	24	21,485 TSh
Pepsi	55,051 TSh	23	32,821 TSh
NHC	52,991 TSh	19	58,006 TSh
NHC-Kashai	69,855 TSh	27	35,748 TSh
Mafumbo	55,573 TSh	16	33,781 TSh
Total	39,319 TSh	304	36,662 TSh

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Monthly income per capita * Mtaa	6,274E10	12	5,229E9	4,416	,000
Between Groups					
Within Groups	3,445E11	291	1,184E9		
Total	4,073E11	303			

Measures of Association

	Eta	Eta Squared
Monthly income per capita * Mtaa	,393	,154

Correlations

		Monthly income per capita	Education level (number of years)
Monthly income per capita	Pearson Correlation	1	,369**
	Sig. (2-tailed)		,000
	N	304	304
Education level (number of years)	Pearson Correlation	,369**	1
	Sig. (2-tailed)	,000	
	N	304	355

** . Correlation is significant at the 0.01 level (2-tailed).

Correlations

			Monthly income per capita	Education level (number of years)
Spearman's rho	Unreliable electricity supply	Correlation Coefficient	,496**	,224**
		Sig. (2-tailed)	,000	,000
		N	304	355
	Difficult access to (drinking) water	Correlation Coefficient	,363**	,324**
		Sig. (2-tailed)	,000	,000
		N	304	355
	Poor quality of (drinking) water	Correlation Coefficient	,031	,113*
		Sig. (2-tailed)	,590	,033
		N	304	355
	Poor access for motor vehicles	Correlation Coefficient	,299**	,250**
		Sig. (2-tailed)	,000	,000
		N	304	355
	No means of transport	Correlation Coefficient	,243**	,209**
		Sig. (2-tailed)	,000	,000
		N	304	355
	No sewerage service	Correlation Coefficient	-,173**	-,006
		Sig. (2-tailed)	,003	,907
		N	304	355
	No/inadequate solid waste collection service	Correlation Coefficient	-,114*	-,033
		Sig. (2-tailed)	,047	,536
		N	304	355
	Lack of (good-quality) toilets	Correlation Coefficient	,329**	,261**
		Sig. (2-tailed)	,000	,000
		N	293	344

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Appendix G. Additional tables for water supply

Correlations

		No. of HH members	Daily water consumption per capita
No. of HH members	Pearson Correlation	1	-,325**
	Sig. (1-tailed)		,000
	N	350	349
Daily water consumption per capita	Pearson Correlation	-,325**	1
	Sig. (1-tailed)	,000	
	N	349	349

Number of water sources

	Mean	Minimum	Maximum
Number of available sources in wet season	4	2	7
Number of available sources in dry season	3	1	6
Number of sources used in wet season	3	1	5
Number of sources used in dry season	2	1	4

Correlations

			Daily water consumption per capita	Distance to water sources	Monthly income of the whole household	Monthly expenditure on water
Spearman's rho	Private connection users	Correlation Coefficient	,128**	-,607**	,520**	,357**
		Sig. (1-tailed)	,009	,000	,000	,000
		N	349	326	306	333
Non-private purchased water users	Correlation Coefficient	Correlation Coefficient	-,037	,423**	-,346**	-,042
		Sig. (1-tailed)	,243	,000	,000	,222
		N	349	326	306	333
Free water users	Correlation Coefficient	Correlation Coefficient	-,089*	,230**	-,224**	-,483**
		Sig. (1-tailed)	,048	,000	,000	,000
		N	349	326	306	333

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Correlations

			Private connection users	Non-private purchased water users	Free water users
Spearman's rho	Availability of water sources in wet season	Correlation Coefficient	,117*	-,076	-,077
		Sig. (1-tailed)	,014	,076	,075
		N	353	353	353
	Queuing for water in wet season	Correlation Coefficient	,195**	-,206**	,023
		Sig. (1-tailed)	,000	,000	,333
		N	346	346	346
	Water quality in wet season	Correlation Coefficient	,135**	,034	-,263**
		Sig. (1-tailed)	,006	,264	,000
		N	352	352	352

Correlations

			Private connection users	Non-private purchased water users	Free water users
Spearman's rho	Availability of water sources in dry season	Correlation Coefficient	,195**	-,252**	,033
		Sig. (1-tailed)	,000	,000	,269
		N	355	355	355
	Queuing for water in dry season	Correlation Coefficient	,265**	-,169**	-,047
		Sig. (1-tailed)	,000	,001	,193
		N	342	342	342
	Water quality in dry season	Correlation Coefficient	,189**	-,131**	-,093*
		Sig. (1-tailed)	,000	,007	,041
		N	352	352	352

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Spearman's rho		Comparison of the quality of water supply with a few years ago
Comparison of the quality of water supply with a few years ago	Correlation Coefficient	1,000
	Sig. (1-tailed)	.
	N	354
In-house connection	Correlation Coefficient	-,357**
	Sig. (1-tailed)	,000
	N	353
Yard tap	Correlation Coefficient	-,375**
	Sig. (1-tailed)	,000
	N	353
Water kiosk	Correlation Coefficient	,152**
	Sig. (1-tailed)	,002
	N	353
Protected spring	Correlation Coefficient	,138**
	Sig. (1-tailed)	,005
	N	353
Unprotected spring	Correlation Coefficient	,008
	Sig. (1-tailed)	,440
	N	353
River/stream	Correlation Coefficient	,184**
	Sig. (1-tailed)	,000
	N	353

Comparison of the quality of water supply with a few years ago

		Frequency	Valid Percent
Valid	It improved substantially	82	23,2
	It improved moderately	180	50,8
	It is the same	76	21,5
	It deteriorated	16	4,5
	Total	354	100,0
Missing	Don't know	1	
Total		355	

Reasons for not having a private connection to piped water

	Count	Column Responses %	Column Valid N %
No supply in the area	50	26,7%	28,4%
I cannot afford	109	58,3%	61,9%
Not reliable water supply	12	6,4%	6,8%
Bad quality of water supplied	13	7,0%	7,4%
Other (I have access to enough water)	3	1,6%	1,7%

Appendix H. Additional tables for health and water treatment

Sufficient knowledge of health problems related to poor quality water & sanitation

		Frequency	Valid Percent
Valid	Yes	223	63,4
	Partly	71	20,2
	No	58	16,5
	Total	352	100,0
Missing	Invalid	3	
Total		355	

Reasons for no water treatment

		Frequency	Valid Percent
Valid	I don't think it is necessary	44	47,8
	I can't afford it	17	18,5
	I don't know how to do it effectively	12	13,0
	I don't have to because I only drink bottled water	19	20,7
	Total	92	100,0
Missing	Not applicable	263	
Total		355	

Water treatment for household consumption

		Frequency	Valid Percent
Valid	Yes	271	76,3
	Sometimes	43	12,1
	No	41	11,5
	Total	355	100,0

Water treatment methods

	Count	Valid N %	Responses %
Boiling	263	90,4%	60,3%
Sieving through cloth	113	38,8%	25,9%
Letting stand and settle	22	7,6%	5,0%
Water filter	38	13,1%	8,7%

Frequency of disease's occurrence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once a week	30	8,5	10,7	10,7
	Once in 2 weeks	31	8,7	11,1	21,8
	Once a month	26	7,3	9,3	31,1
	Once in a few months	193	54,4	68,9	100,0
	Total	280	78,9	100,0	
Missing	Not applicable	75	21,1		
Total		355	100,0		

Correlations

Spearman's rho		Diarrhoea	Malaria	Cholera	Typhoid	Intestinal worms	Skin infection	Other diseases
Frequency of disease's occurrence	Correlation Coef.	,221**	-,404**	,123*	-,106*	-,055	-,108*	,060
	Sig. (1-tailed)	,000	,000	,020	,038	,180	,036	,160
	N	280	280	280	280	280	280	280
Opinion if disease result of using unsafe water	Correlation Coef.	,344**	-,287**	,121*	-,019	-,065	-,021	,054
	Sig. (1-tailed)	,000	,000	,021	,374	,139	,360	,184
	N	281	281	281	281	281	281	281

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Appendix I. Tests for meeting assumptions of the model

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	77,780	12,606	4	,013
nrsouce	74,077	8,902	4	,064
nrsouce * Lnnrsouce	71,910	6,736	4	,151

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

If the interaction between the scale predictor variable and the log of itself is not significant, the assumption of linearity of the logit has been met (Field, 2009), which is the case above.

Coefficients^a

Model		Collinearity Statistics	
		Tolerance	VIF
1	Private connection users	,241	4,147
	Collective water sources	,255	3,919
	Free water users	,345	2,900
	More than 7 years of education (primary school)	,891	1,123
	More than 200,000 TSh of monthly household income	,793	1,261
	Number of sources used by household	,748	1,337

a. Dependent Variable: Yard tap

If the largest VIF is greater than 10 and tolerance is below .2 it indicates a potential multicollinearity (Field, 2009), which is not the case here.

Appendix J. Additional tables for microcredits and savings

Statistics

How much money do you usually save per month?

N	Valid	300
	Missing	55
Mean		30,137 TSh
Median		15,000 TSh
Mode		0 TSh
Std. Deviation		35,531 TSh
Skewness		1,838
Std. Error of Skewness		,141
Minimum		0 TSh
Maximum		200,000 TSh
Percentiles	25	5,000 TSh
	50	15,000 TSh
	75	50,000 TSh

Eligibility for a loan from a bank

		Frequency	Valid Percent
Valid	Yes	89	25,1
	Unsure	93	26,2
	No	173	48,7
	Total	355	100,0

		Spearman's rho	Monthly income of the whole household
Monthly savings	Correlation Coefficient		,798**
	Sig. (1-tailed)		,000
	N		300
Eligibility for a loan from a bank	Correlation Coefficient		,377**
	Sig. (2-tailed)		,000
	N		306

** . Correlation is significant at the 0.01 level (1-tailed).