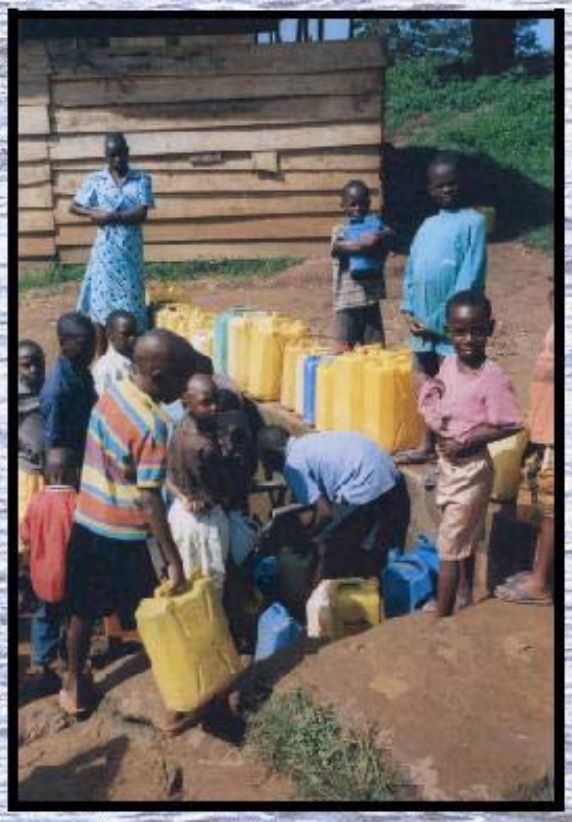

Water choice in a low-income area in Kampala, Uganda

Master's Thesis by
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So it was true after all. Many times I have doubted those claiming that also master's degrees do have an end. Finally I am there myself, which is a thrilling and enjoyable feeling. Many people have assisted me in various ways through the course of this work. I am grateful to all those who have rendered me any form of assistance. The following however, need special mention.

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Abstract

The intention of this study is to elaborate on important factors determining choice of water in a low-income area in Kampala, Uganda. The study area is located in a parish called Nateete, at the outskirts of the city. My approach includes both a questionnaire survey and in-depth interviews with people living within a defined geographical area. An important aim of the study is to link social practices to the *water landscape*. The latter is in this thesis understood as the *physical water resources available to people in the geographical area under study*. In my attempt to relate actions to the *water landscape,* I have employed a theoretical direction called the *time-space perspective*. Of special interest is this direction's emphasis on how human action is influenced by various *constraints*. However, the understanding of water-collection practices is also sought in culturally embedded perceptions. In this thesis objective meaning of physical and social reality is not seen as pre given, but as a product of meaningful construction by interacting subjects. In this regard the influence of culture on both preference and perception of risk is elaborated.

Among my respondents no one have a household connection to the piped water network. This implies that unless rainwater is collected from the roof, water has to be carried from the source to the dwelling. The study area is also characterised by having different water sources, with different characteristics available to people. Many of my respondents buy water from outdoor taps serving piped water. Nevertheless, the study shows that a large proportion still obtains water from traditional sources. Sadly, these are of questionable microbiological quality. Traditional sources are in this thesis understood as *water sources where accumulated ground water can be fetched*.

The study illustrates the importance of distance to source on choice of water. The number of collectors decreases with distance from the source for all sources in the study area. The influence of the form and character of the *water landscape* has thus been indicated. However, the *distance decay* is not equal for all sources, making it necessary to focus on the characteristics of the water. Cost is one factor significantly influencing choice of water. Since water from traditional sources is free of charge (unless vendors who bring the water are employed), many overcome *constraints* in order to collect from these. Another factor hindering a transition from traditional to modern water sources seems to be culturally embedded perceptions in disfavour of piped water. Even though piped water is of good microbiological quality, there is a considerable dissatisfaction with this kind of water.

Central in this thesis is it to explain why many prefer water from some traditional sources, even though these are of poorer microbiological quality compared to piped water. Much of the dissatisfaction with the latter seems to be related to the use of chlorine, affecting the taste and smell of water. There also seems to be a fear of visible contamination at times present in piped water. I assume the fear is related to the greater inability to predict when, and understand why, this contamination occurs. In comparison, visible contamination in traditional sources is closely related to rainfall. The emphasis of visual judgement of water is also believed to be an important reason for the lack of focus on the microbiological content of water in Nateete. In general, piped water seems mostly to be used when it is considered as the most convenient option. It is thus relatively little attention among my respondents to the improvements in microbiological quality that it offers.

The main conclusion of this thesis is that the respondents seem to take into account the *subjective*, *physical* and *social world* in the process of choosing water source. It is thus not a question of whether structure **or** agency determine water-collection practices in Nateete, but rather of how these work together.

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Glossary

CIDA = Canadian International Development Agency

GIS = Geographical information systems

KCC = Kampala City Council

KUS = Kampala Urban Study

NEMA = National Environment Management Authority

NWSC = National Water and Sewerage Corporation

PAPSCA = Programme for the Alleviation of Poverty and Social Cost Adjustment

USH = Ugandan shillings

WHO = World Health Organization

WSSP = Water and Peri-Urban Water Supply Surveillance Programme (Howard/Luyima 99)

Chapter 1
Introduction

The World Health Organization (WHO) has estimated that every day 6000 children die in developing countries due to diseases caused by unclean water, bad hygiene, and miserable sanitary conditions (United Nations 2003a). Despite the focus on the importance of safe drinking water the last 10 years, 2003 being the year of the fresh water, 1.1 billion people are lacking access to improved water supply on a world basis (ibid). According to United Nations (2003a), almost 80 percent of all diseases in the world are related to health damaging water and poor sanitation. In many cases, the use of piped water may seem to lead to improved health (e.g. Tumwine 2002; Shi 2000). Access to a safe water supply is therefore crucial to human health, and one of the absolute goals in present "development thinking". In 2002 the World Summit on Sustainable Development agreed to halve the proportion of people who are not able to reach or afford safe drinking water, by 2015 (United Nations 2003b).

A number of water-studies in Africa have been carried out in places where there is an absolute lack of water. This may lead to an impression among many of Africa as a continent constantly lacking water. This is of course not true, and Kampala is an example of a city localised in a region with abundant amounts of water available. Situated on the fringe of the great Lake Victoria and with a fair rainfall throughout the year, it could be expected that water is easily accessible for the inhabitants of Kampala. Sadly, this is not the case since the water resources are not evenly distributed. This study of determinants of water choice in a low-income area, illustrates how water can be relatively hard to access in a region not lacking water.

1.1 Topic of study

Many of the problems connected to water and sanitation in Kampala, are being experienced by other fast growing cities in the third world. One characteristic of the urban expansion in third world countries is the growth of the slums. This results in a tremendous challenge in handling the fields of water and sanitation. Considering that people living in slum areas are the first to be affected by water-related diseases (United Nations 2003b), this is especially important.

Providing piped water to residents in unplanned settlements is in many cases technically difficult and economically unprofitable. Concentration of pipes in slum neighbourhoods is therefore often low. A common way to access piped water in these areas is through outdoor taps called standpipes. A standpipe is here understood as *an outdoor tap where piped water is sold*. Since there are vendors operating such standpipes, this water is normally much more expensive than regular piped water. This, among other factors, makes many depend on alternative water sources in their every-day use. Falkenmark (1982) asserts that: *"One common characteristic of low-income communities is that there is much more necessity for choice of source than in higher income areas, where piped water serves almost everyone"* (ibid:36).

75 percent of the population in Kampala has access to piped water according to the National Water and Sewerage Corporation (NWSC). However, according to the National Environment Management Authority (NEMA), not more than 8 percent have piped water in their home (NEMA 1997). Access is not clearly defined here, but a substantial proportion of those defined as having access probably have to walk quite a distance to fetch water from standpipes. The pipes in Kampala are not evenly distributed, but concentrated to the central areas. My study area lies in Nateete parish, at the outskirts of Kampala. It is a slum-infested area with high population density and low income among the people residing there. Nateete parish is an example of an area where the distribution of piped water is relatively low and dependence on other sources still high.

An alternative water source is the so-called protected spring. This kind of source is the primary source for 36 percent of the population in Kampala (van Nostrand 1994). I will describe the characteristics of the protected spring later. Here, let me just mention that it is a gravity fed natural system where the water is filtered through gravel and stones. Another frequently used water source is the so-called unprotected spring. This source resembles the protected spring, since both are gravity fed with ground water. Lacking the constructed facilities characterising the protected spring, the latter is however more exposed to contamination. Even though the protected springs deliver water of better microbiological quality than the unprotected spring, these too are contaminated. The Chief Health Inspector of Kampala municipality has estimated that 65 percent of the protected and unprotected springs in Kampala are faecally contaminated (ibid). Two important reasons for this contamination

are the intense land utilization and the inability of the municipality to remove garbage from the city.

All the sources described are shared water sources. They are also sources situated at a given distance from the household. Both these characteristics have implications, which may contribute in making collection of water a time and energy consuming activity. In this thesis I will elaborate the reasons behind choice and use of water sources. The mixed water use characteristic of my study area is therefore very central, since the many sources available enables people to make a choice between different water sources.

A central intention of this study is to link social practices to the *water landscape* the people are living in. By *water landscape*, I mean the *physical water resources available to people in the geographical area under study*. In practice this involves the water sources registered in use by the questionnaire survey. I have chosen to include only the physical water sources in the use of the term *water landscape*. I will illustrate this with an example: The protected spring in Kigaga has two pipes from where people can fetch water. This characteristic fall under the category *water landscape*. However, what happens at the springs, such as queue-culture, age and sex composition of the collectors etc. belongs to the field of social practices. In this study social actions have been emphasized. A substantial part of the study has therefore been to map my respondents' water related activities. Werlen (1993) calls this action-theory research, where the aim is to: *"...classify the complexity of social phenomena and problem situations in the light of the actions of the members of society"* (ibid:19).

Scientists often emphasise the microbiological aspect when making assumptions about quality of water. However, this is not the only method used to assess water quality. Neither is quality the only aspect that is considered when choosing water source. If piped water is introduced in an area and a substantial proportion of people nevertheless choose not to change their collection pattern, it is important to try to explain why. This is especially important if the alternative sources are heavily microbiological contaminated. Nateete has experienced an expansion of standpipes through a development program named Programme for the Alleviation of Poverty and Social Cost Adjustment (PAPSCA). In spite of this there is still a substantial part of the population who prefer to use traditional water sources. This indicates that an introduction of piped water does not automatically lead to a change in water collecting practices among all. *Traditional sources* are here defined as *water sources where accumulated*

ground water can be fetched. In the case of Nateete, this encompasses protected and unprotected springs. When describing water sources as *modern*, it is piped water that is being referred to. Rainwater fall outside both these two categories, involving that it will be referred to by using its name.

A central focus of this study is therefore to elaborate how the cultural context influences water collection. Falkenmark (1982) emphasises the importance of adaptation to the natural and socio-economic conditions of the implemented area, in order to achieve success when carrying out a water project. I believe that to take such aspects into account is equally important in a water study such as this one. To this study that involves to understand how and why the respondents' reasons for water use may differ from what seems logical from my point of view.

1.2 Research questions and hypothesis

The intention of this study is to study the relationship between people and water in Nateete parish, Kampala. The study aims to elaborate important determinants in choice of water. The main focus will be on this choice process and not so much on what happens with the water afterwards. The influence of culturally embedded perception and *constraints* (see 3.2.1) will be central. *Cultural embedded perceptions* is here understood as *a process, influenced by the cultural context, where people select, organize, and interpret sensory stimulation into a meaningful and coherent picture of the world* (based on Saarinen's definition of perception, see 3.3.2). I have formulated two main research questions, and two subordinate ones. In this section I will also present some central initial hypothesis I had, before entering the field.

The first research question is: 1) *How are water collecting practices influenced by the characteristics of the water landscape?*

This research question contains two aspects. Firstly, it focuses on the influence of the *water landscape* on the choice of water source. Secondly, on how the *water landscape* influences collection practices after the choice of source has been made. The main focus will be on the former aspect. The first subordinate research question is closely interlinked: *1.1) To what extent can choice of water source be said to be a result of a desire to reduce drudgery?*

An initial hypothesis was that choice of source to a large degree was influenced by this factor. This was based in a belief in water provision to be a physical burden for many in Nateete. I assumed therefore that choice of water source to a large degree would be influenced by a

desire to reduce drudgery or effort. It was further assumed that such considerations could happen at the expense considerations about quality.

Distance was a factor I believed heavily influenced choice of water source. The hypothesis was that people would tend to use the nearest source, especially if the difference in distance between the potential sources was great. In accordance with seasonal changes, I assumed that the *water landscape* also changed. During the rainy seasons it was believed that the number of unprotected water sources would increase, involving a reduction in distance to the nearest source for many. I assumed that a consequence of this was that more people would use these "new" sources. It was also believed that people would use the permanent protected and unprotected sources more during the rainy seasons, since the amount of water increases during the rainy seasons, resulting in less queuing at the source.

As mentioned, the understanding of water quality is not universal. Firstly, knowledge and awareness about the importance of water quality (especially the microbiological content) of water may vary. Secondly, people may attach different meaning to the concept of water quality. This leads to the second main research question: *2) To what extent can the cultural context explain the slow transition from use of traditional to use of modern water sources?*

Many factors influence choice of water. One aim of this thesis is to elaborate on whether culturally embedded perceptions hinder a transition from traditional to modern water sources. Even though such perceptions to a certain degree were assumed to influence the choice of water source, I believed the influence of restricting factors like distance and cost to be more influential. Hence, use of water from traditional sources was assumed to be more a question of necessity than of preference.

Even though the main focus of this thesis is on choice of water source, the question of how collected water is being used will also be elaborated. A part of the study is therefore concerned with how water is being used when the household have water from more than one source (a household is in this thesis understood as the people who normally sleep in the dwelling). The second subordinate research question is: *2.1) To what degree do people differentiate between water from different sources?* An initial hypothesis was that people to a large degree would recognize the health dangers connected to use of water from unprotected sources. In households using two sources, of which one was unprotected, the assumption was

that water from these mostly would be used for washing purposes. The distinction in use was believed to be less clear between water from other sources.

1.3 Structure of the thesis

The next chapter (chapter 2) is focusing on the broader context of this study. Here I will present different aspects, which are considered as being relevant to the study. The chapter starts with a general description of Uganda, before focusing on Kampala and in the end on Nateete parish where the fieldwork was conducted.

Chapter 3 is focusing on the theoretical framework of this thesis. The chapter starts with an elaboration of different trends in human geography, whereby the study of space is focused on in particular. Since I believe water-collection practices are influenced by both structure and agency, this will be reflected in the theoretical chapter. First, there will be a description of the structure-oriented *time-space perspective*, where Hägerstrand's concept of *constraints* will be presented. Thereafter follows more agency-oriented approaches. Of great importance in this section is the phenomenological and action-oriented approach of Werlen and Schutz. Another important part of this chapter is focused on the concept of risk and how the perception of risk is culturally influenced.

Chapter 4 focuses on the methodological approach to this study. There will be an elaboration of the methods employed, mainly being quantitative and qualitative interviews, field conversation, spatial analysis and water tests. Along with an account for the choices made during the research process, I will also describe the methodological challenges I have encountered through this study.

Chapter 5 is a pure empirical chapter. First, the water sources and their characteristics are presented. Thereafter follows an elaboration of the contamination in the water sources and the causes for these. Integrated in this chapter is also a description of the water vending activity and the organization of maintenance work at the water source. Research question 2.1 will be partially elaborated in this chapter, by describing whether people are using water from unprotected sources differently than other kinds of water. At the end there will be a short empirical summary.

Chapter 6 focuses first on restrictions in access to water sources. Thereafter follows an elaboration of the relationship between distance and use of water. In this analysis, also the household's distance to other sources is considered. The chapter will mainly focus on research question 1 and 1.1. However, the influence of cost on choice of water is also an important part of this chapter. At the end there will be a short summary. To avoid repeating myself too much, I will in this summary focus on the empirical findings, leaving the theoretical findings to be summed up in chapter 8.

Chapter 7 is focusing on the perceptions people seem to have of the water and its sources. It starts with an elaboration of some important reasons for the dislike of piped water. Towards the end of the chapter I will discuss why there to a large extent is a lack of focus on the microbiological content of water among people in Nateete. As mentioned, chapter 5 covers a part of research question 2.1. This chapter elaborates a second part of this research question, namely whether people differentiate in use between standpipe and protected spring water. Research question 2 will also be a main issue of this chapter. At the end of the chapter there will be a summary. Of the same reasons as mentioned for chapter 6 this will only be an empirical summary.

In chapter 8, I discuss and conclude on basis of my findings. The chapter is also intended to sum up empirically and theoretically. The research questions will here be explicitly discussed in light of the empirical findings. In the last part of this chapter, I suggest how a model of Werlen can be used in the understanding of water collection in Nateete.

Chapter 2

Description of the research area

In order to better understand many of the aspects that will be elaborated in this thesis, it is necessary to describe the broader context of my study area. I have chosen to call this the *research area*. This must not be confused with the term *study area*, which comprises only a part of Nateete parish. On the macro level a description of Uganda is included in this chapter, while on the micro level the parish of Nateete will be described. Other aspects that will be described are the climate, the city of Kampala and the piped water network of this city.

2.1 Uganda

Uganda lies in the eastern part of Africa. The country, covering an area of approximately 241 000 km^2, is landlocked surrounded by Tanzania, Congo, Kenya and Sudan. To the south the great Lake Victoria constitutes most of the national border. This lake is the worlds second largest, with a surface measure equalling the size of Ireland. Lake Victoria has also been defined as the source of the Nile and this river starts its journey northwards to the Mediterranean Sea through Uganda. The country has in other words a lot of surface water resources. Actually, as much as 20 percent of its area consists of lakes, swamps and numerous waterways (van Nostrand 1994).

After decades of misrule and terror since independence from the British in 1962, Uganda has been quite stable for over a decade. During the 1990s the economy improved rapidly, and the country has been credited for its stability and high rates of economical growth (Britannica 2004a). In 1997 Uganda was one of very few countries that received debt relief as a result of successful economic reformation projects. However, especially because of its high dependence on fluctuating markets for agricultural products, Uganda still strives with inflation and unemployment (Britannica 2004b).

2.2 Kampala

Kampala, the capital of Uganda, is situated eight kilometres north of the Lake Victoria. In addition to being a municipality, Kampala is also a district, containing five divisions. These are Rubaga, Makindye, Nakawa, Kawempe and Central division. The city is built on and around numerous low hills. Between these is there a network of wet valleys. Originally these wetland or

swaps were in most cases covered with papyrus. However, urbanization pressure has lead to reclamation of the wetlands. Often it is the poorer neighbourhoods and industry that are located on these drained land areas, while the more well of population lives in the hillsides.

The population of Kampala was in 1998 estimated to 1 154 000 (Britannica 2004c). The city encompasses an area of approximately 190 km^2. Like in many developing countries, there is a huge difference in population size between the cities in the country. Kampala has a population ten times the size of the second largest city, Jinja. The capital had a growth rate of 4.9 percent per annum between 1980 and 1991, which is double of the national growth rate of 2.5 percent per annum for the same period (NEMA 1997). A lot of this growth is due to migration from the countryside. This high population density and rapid urbanisation have severe consequences for the natural environment. Matagi (2002) states: *"The anthropogenic activity of this population far exceeds the infrastructure capacity of the city, leading to the deterioration of the urban environment"* (ibid:121).

2.3 Climate

Kampala is situated only 45 kilometres north of equator. Despite of this, the city has a tropical rather than a typical equatorial climate, with an annual mean of 1200 mm (Matagi 2002). Due to the closeness of Lake Victoria, Kampala receives a regular rainfall throughout the year. There are however some seasonal variations. The rainiest period is from March to May, with a smaller rainy period from September to November. The driest months are January and February (NEMA 1997). However, the regularity of the rainfall-pattern seems to have been somewhat disturbed during the last years. Situated at 1300 metres above sea level and close to the Lake Victoria, Kampala has a relatively pleasant climate. This is especially due to the presence of clouds and wind. In comparison to Kampala's annual average of 21.9^oC, temperatures up to 48^oC have been recorded in the northern parts of the country. The temperature in Kampala is also very stable throughout the year, only ranging 2.4^oC on average (ibid).

2.4 The piped water network

The existence of piped water in Kampala goes back to 1929. Since 1974 NWSC has been responsible for the water supply and distribution system. Private connections and standpipes are not included in NWSC's sphere of responsibility. The corporation is parastatal, and follows the directions of the Ministry of Water, Energy, Minerals and Environmental

Protection. The majority of distribution mains were installed in the 1940s, and until 1994 no substantial repairs, rehabilitation or extension had been done (van Nostrand 1994). This has resulted in many bursts of pipelines causing both a danger of contamination and loss of water.

NWSC supplies piped water from the Gaba 1 and Gaba 2 waterworks, of which the latter is the newest. Here the water is filtered and treated to international standards. Chlorine is primarily added here, but if the level of chlorine drops, it is added at different points in the pipe network. Every day the waterworks pumps 120 millions of litres to the city (New Vision 2002). A large proportion of the water is pumped to a hill called Muyenga tank hill, where a central reservoir is situated. From there the water goes by gravity, backed by boosters, either directly to the costumers or to other smaller reservoirs. All in all there are 19 reservoirs operated and maintained by NWSC (van Nostrand 1994).

Kampala has both its raw-water intake and outlet for waste in Murchinson bay. A severe problem for NWSC is thus that effluents from Kampala are contaminating the raw fresh water. It seems as if a combination of increased amounts of produced waste and reduction of wetland severely impair the water quality in Murchinson Bay. The waste mainly enters the lake through a channel called Nakivubo Channel. The distance between the mouth of this channel and Gaba waterworks is only five kilometres. Earlier, solid wetlands filtered and purified the water on its way to Lake Victoria. This ability is now greatly impaired due to cultivation and colonization of the wetland. When the wetlands are encroached, their ability to neutralize pollution decrease (NEMA 1997). It is claimed that the expansion of the Nakivubo Channel is intensifying these problems. This World Bank founded project is not only increasing the capacity of the channel to transport waste, but also increasing the speed of the flow. It has been estimated that the filth Nakivubo Channel daily delivers, is equivalent to raw sewage from 100 000 people (New Vision 2002). As a result, the amount of money that is used on water treatment at Gaba is steadily increasing (ibid). Only since 1995, NWSC's use of aluminium sulphate has increased with 20 percent, because of the impairment of the water quality in Murchinson bay (ibid).

2.5 Nateete parish

The area where I did my field study lies in Nateete parish, Rubaga division (figure 2.1). The parish is situated at the western outskirt of Kampala, along an important west going exit road. My study area falls more or less within two of Nateete's 11 zones. These are the zones Kitoro and Kigaga. Both zones have clear slum characteristics with poor infrastructure, high population density and miserable housing conditions. A distinctive characteristic of the study area is the enormously close setting of the dwellings. The flats often consist of one single room and it is not uncommon for six persons to share around 10 square metres. 58 percent of the respondents in this study lived in one-room dwellings (figure 2.2). Most houses are made of bricks, but also houses of waddle and poles are found.

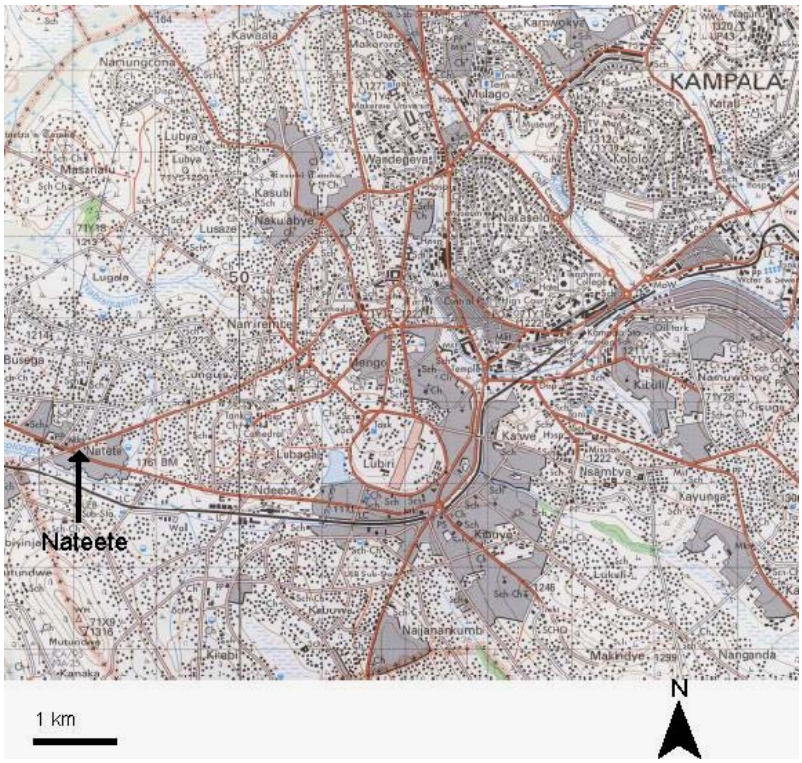

Figure 2.1: Location of Nateete
Source: Surveys and Mapping Department, Uganda 1998

Except the main exit road, there are no asphalted access roads. Most of the inhabitants live on a former wetland and on the lower parts of an adjacent hillside. Standard of living seems to increase up-hill. Even though the wetland has been drained and settled, it still maintains some of its wetland characteristics, notably that it is prone to flooding after rainstorms. Very muddy conditions after rain are exacerbated by the slum characteristics of the area. High mobility is

often characterizing slum areas, and Nateete is no exception. 80 percent of the respondents in my study were living in rented dwellings, an indication of both low income and high mobility. This has severe negative consequences for the organization at local level and may explain many of the problems related to living in such housing areas. The high mobility is for example likely to negatively influence people's willingness in maintenance of their neighbourhood. This again affects the quality of water.

Even though Kitoro and Kigaga share many of the same characteristics, there are some differences between the two zones. In general Kitoro appears a bit more slum infested compared to Kigaga. Kitoro hosts the local market and is situated close to the exit road. The population density seems higher, and the intense human activity makes the area rather stressful. In comparison, Kigaga is situated at a greater distance from the main road and the market. The space between the houses is greater, and many of the houses seem to be of better quality compared to houses in Kitoro.

Figure 2.2: Densely populated housing unit

There are especially four characteristics of the *water landscape* in the study area that require mention. Firstly, household connections to piped water are extremely limited in this area. Secondly, there are different kinds of water sources available to people. Thirdly, these sources have different levels of microbiological contamination. Fourthly, the water sources are points and not streams. These characteristics have several implications: For example water has to be transported from the source to the household in most cases and at some sources there is at

times congestion. Another characteristic not falling under the category *water landscape*, but important nevertheless, is that some of the sources are free of charge while others have to be paid for. These are a few of the factors that potentially influence people's choice of water source; but it is important to bear in mind that such choice is not stable or inflexible.

Chapter 3

Theoretical approach

This chapter states the theoretical framework used in my approach to the relationship between people and water in Nateete. It will contain both structure- and agency-oriented approaches, as I believe both are influencing water practices in the study area. Many of the theories have elements from both and deserve therefore not to be labelled as either structure- or agency-oriented. The reason for making a divide between these two approaches in this chapter is just to facilitate reading. At the end of the chapter the dichotomy of *western* and *indigenous knowledge* is discussed, before an alternative is suggested.

3.1 Trends in human geography

I will begin this theoretical chapter with a short description of the development within geography the last decades. First, the general structure/agency debate will be covered, before focusing on the development in the study of space.

3.1.1 Structure and agency

A central debate in the academic discourse has been to what extent structures are influencing human actions and thoughts. At the one extreme there are objective approaches, where human beings are perceived as responding in predictable ways to stimuli. Humans are here perceived as products of the external forces in the environment. According to this view, the reality is seen as a concrete structure. This involves that: *"Any aspect of the world that does not manifest itself in some form of observable activity or behaviour must be regarded as being of questionable status"* (Morgan and Smircich 1980:277). This is a direction where the influence of structure is strongly emphasised. At the other extreme (subjective approaches), reality is perceived as a projection of human imagination. Humans are seen as shaping the world within the realm of their own immediate experience (ibid). It is often here an extreme emphasis of agency.

In accordance with an objective approach, a common notion in geography (among other sciences) was that people at all times would try to maximize their behaviour. The individual was according to this train of thought looked upon as being an *economic man*, always trying to get as much output as possible out of every choice made (reacting in a lawful manner). Especially from the 1960s and onwards the direction has been criticised among other things

for reducing all choice to a question of economic maximization. In doing this it allows only one logical outcome of any choice, namely the economical most beneficial. It has been claimed that people instead of maximizing, tend to function as *satisficers*. This involves trying to find a satisfactory solution instead of dealing with the tremendous task of elaborating all alternatives in order to maximize every choice. Walmsley and Lewis (1993) assert that decision makers will have limited information. They also claim that decision makers will be subject to factors that are not predictable.

I believe there are many things other than economical maximization that determines human choice. Memories, upbringing and emotions are for instance not incorporated sufficiently in this theoretical direction. However, as I will come back to later, I believe there are some structures influencing human behaviour. In Nateete many of these are related to the prevailing poverty. Lack of household connections to the piped water network and ownership of land, and dwellings are important structural factors, just to mention some. My approach will therefore not be one of neither extreme objectivism, nor extreme subjectivism. On the contrary, I will try to illustrate how structure and agency work together in Nateete.

3.1.2 Study of space

Defining, describing and studying space is a tremendous project. Space has been termed as *relational*, *absolute*, *relative* and *symbolic*, just to mention some aspects. To capture all aspects of space is a far too extensive task for this thesis. Aase (1994) asserts that we have to allow for various conceptions of space, in order to understand and describe society. Instead he recommends treating space contextually. Aase writes: *"Various spaces emerge in different social contexts, and our energy should be spent on understanding those contexts rather than searching for a 'real', once-and-for-all definition of space"* (ibid:5). Simonsen (1996) is also in favour of treating space contextually. She argues that in an approach where time and space are seen as social spatial and social temporal, context is not just seen as a pre-given framework for social practices. Instead context is seen as *"...directly involved in the constitution of social practices, just as these practices, in turn, are forming the context"* (ibid:507).

Also the view on the influence of the material environment has changed during the last decades. According to Simonsen (1996), environmentalism and German-inspired landscape

geography viewed the material environment to a large degree as being the casual or at least the conditional background of social phenomena. This tradition was rather structure-oriented and tended to focus on the material aspects of culture. Many have later rejected this, and according to Simonsen, most now consider the material environment only to be a part of socio-spatial relations. This involves a more agency-oriented approach. In my opinion however, it is important to keep in mind that there are some structures influencing human action. An agency-oriented view must not lead to ignoring important structures completely. The influence of these will be elaborated especially through research question 1) *How are water collecting practices influenced by the characteristics of the water landscape?* and 1.1) *To what extent can choice of water source be said to be a result of a desire to reduce drudgery?*

Simonsen (1996) asserts that the only way to study the connection between social life and material environment is through an indirect approach of studying social practice. She recommends a study of social practices of different groups of people, operating in different social contexts against the background of the material environment (ibid). According to her these practices can be classified as three different, but interconnected modes. I will not discuss here whether the indirect approach through social practice is the only way to study the link between social practice and material environment. What is most important to this thesis is that the three modes offer a good and structuring way to approach the issue of water collection in Nateete. They will therefore be used as a guiding principle for the structure of the empirical chapters.

The first mode is the *production of the material environment*. This includes not only the built environment and material things, but also indirect production in the form of unintended consequences of activity (ibid). In my study area the physical water sources are examples of built environment, while the pollution of these is an example of an unintended consequence of activity. The second mode is the *use of the material environment*. This mode encompasses a number of uses: *"...from the direct preparation of nature in production to the use of naturally or socially created material forms in all kinds of practices that are performed every day"* (ibid:497). This is in other words a focus on the use value of things in the material world, of how things actually are being used. In relation to my study area, this mode could describe to what extent the different water sources in the area are being used and for what purposes.

The last mode is the *ascription of symbolic meaning to the material environment*. Simonsen (1996) writes: *"...these symbolic meanings are not qualities of things in themselves; they are ascribed to things by the social and cultural contexts of which they are a part"* (ibid:498). Symbolic meanings are in other words socially and contextually anchored. The boundary between meaning and symbolic meaning is without doubt not an absolute. I nevertheless feel that I have focused more on meaning of water and water sources. Thus I will not use the term symbolic meaning to describe my approach. A focus on the ascription of meaning of water enables me to study why people in Kampala may give water a different meaning, compared to for example people living in Norway. This may in turn influence their water practices.

3.2 Approaches emphasising structure

I will now describe approaches emphasising the influence of structure on human action and thought. I will start with the *time-space perspective*, before proceeding with an approach emphasising the structural influence of poverty.

3.2.1 Time-space perspective

Torsten Hägerstrand was the first to advocate a *time-space perspective*. This was in the mid-1960s, but it took time before the approach became widely known. The *time-space perspective* is closely connected to the Royal University of Lund in Sweden. The theoretical direction focuses on the locational dimension of human activities and is therefore especially relevant in the elaboration of research question 1 and 1.1. Through a focus on *constraints*, the *time-space perspective* is well suited to uncover structures I believe are influence water-collection practices.

The *time-space perspective* of Hägerstrand ([1970] 1991) contains two systems interacting. One is predominately time-directed, while the other is more space-oriented. I will start this presentation with the former. One of Hägerstrand's basic postulates is that man is not capable of escaping time or space. It is impossible not to have a location in time and space:

> *"As long as he is alive at all, he has to pass every point on the time scale. Every point in space does not demand the same of him; he needs only be somewhere in an environment which grants at least minimum conditions for survival. But this 'somewhere' is always critically tied to the 'somewhere' of a moment earlier"* (ibid:145).

Carlstein (1982) also advocates the *time-space perspective*. He emphasises that human time is a limited resource and therefore a *capacity constraint*. Carlstein writes: *"Human time is a resource since* all *activities necessarily require it as an input and since we have limited capacity to act in relation to time"* (ibid:27). Often the agent is exposed to demands from different groups at the same time, and this may lead to a great cleavage between aspiration and capability of the individual. If an individual has a number of activities open to him, and the *time expenditure* that would be used on them is greater than the *time income* (or amount, my addition), there is scarcity which forces the individual to choose (ibid). Following this, Carlstein assigns each activity a *time price* and each population to have *time budgets*.

The purpose of Hägerstrand ([1970] 1991) is to *"...try to define the time-space mechanics of constraints which determine how the paths are channelled or dammed up"* (ibid:146). According to him there are three kinds of *constraints* that at all times influences us. They are of varying strength and may interact in many ways, but we can never free ourselves from them (ibid). The first type of *constraints* is *capability constraints*. These involve limitations of actions due to the individual's biological construction and/or the tools it can command. Two of the most important *capability constraints* are the necessity to eat and sleep at regular hours. Also important are distance-oriented *constraints*. These depend on the individual's ability to move or communicate and on the conditions under which it is tied to a rest-place (ibid).

Even though some activities can be carried out at the same time, most activities are mutually exclusive. Because of *capability constraints* human beings cannot carry out many activities at the same time. This is both due to physical and mental limitations (Carlstein 1982). Carlstein states that *capability constrains* vary with age, sex, cultural conditioning, experience and skills. While some of the *constraints* are biologically founded, others are more due to social norms (ibid). Provision of water seems to be the responsibility of women and children in Nateete. Following Carlstein (1982) this involves a *constraint* induced by a social norm. Even though this is not a gender study (there are for example single males among my respondents), the issue of gender without doubt influences water-collection practices in Nateete. It is therefore highly relevant to many of the findings of this study.

The next type of *constraints* defined by Hägerstrand ([1970] 1991) is *coupling constraints*. These are restricting because they: *"...define where, when, and for how long, the individual has to join other individuals, tools, and materials in order to produce, consume and transact"*

(ibid:149). Carlstein (1982) emphasises that we form bundles with both living organisms and material. People working in a factory is an example of how humans both couple with machines and other people.

The last sort of *constraints* is what Hägerstrand calls *authority constraints*. According to him, the world is filled with *domains* of various strength, duration and size. He defines *domains* as a time-space entity within which things and events are under the control of a given individual or a given group. *Authority constraints* are the hindrances encountered when trying to enter a *domain*. According to Hägerstrand ([1970] 1991), *domains* in time-space appear as cylinders, where access to the inside is either restricted or only accepted on invitation or after some kind of payment, ceremony or fight. Some *domains* have to be protected through immediate power or custom, e.g. a good spot in an auditorium. Others have a strong legal status, e.g. ownership of land property. Some are permanent, while others are temporary.

The relevance of *constraints* to this study may be illustrated by imagining an example of a female household head with small children to look after. This woman, in instant need of water, may be influenced by *coupling constraints*. She may be tied to her dwelling, because that is where she has to do her domestic work. She is also tied to the home due to her small children, who cannot be left alone and are difficult to bring. Research has revealed that in terms of travel behaviour women (together with elderly and ethnic minorities) in general are more constrained than the population at large (Walmsley and Lewis 1993). *Coupling constraints*, tying them to the home base may explain a part of this picture.

However, the same woman may also be influenced by *capability constraints*. She may be constrained from doing the additional task of fetching water from distant sources on top of her other duties. The solution may be a dependence on her children to fetch water for her. In a situation where she is in instant need of water, and lacking the tools to communicate with her children who are not around, she may adapt to this situation by choosing another "water solution".

A discovery of *distance decay* of water collection, from the sources in the area can be taken as an indication of *constrains* in force. *Distance decay* is here understood as attenuation of a pattern with distance (Johnston, Gregory, Pratt and Watts 2000). In Nateete this will be represented by decreasing number of users with increasing distance to a water source. In

particular such decay may be taken as an indication of *capability*- and *coupling constraints*. However, it is important not only to focus on mere distance, but also on the *intervening opportunities* that may be attractive to the households. *Intervening opportunities* is here involving that *"...the number of movements from an origin to a destination is proportional to the number of opportunities at that destination and inversely proportional to the number of opportunities between the origin and the destination"* (ibid:406). In this way attenuation with distance is explained with increase of number of *intervening opportunities* with distance and not by mere distance. A standpipe may therefore be rejected on basis of an unprotected spring being situated just nearby and not only because the distance to the standpipe is relatively long.

3.2.2 Economical scarcity as a structuring factor

> *"Knowledge without opportunities to apply it is of little use*" (Lindskog and Lundqvist 1989:17).

It is important not to get stuck in a belief that new knowledge automatically will lead to improved practices. I find this notion too simple, as it implies that the relationship is one of stimuli-response according to an extreme objective approach, as referred to in 3.1.1. In my opinion human behaviour is a result of very many factors and not of knowledge alone. Throughout this study I will try to show how agents are both active in the construction of their own reality, as well as influenced by some important structures. In a study of people and water in Malawi, Lindskog and Lundqvist (1989) emphasise both structure and agency as influencing water consumption and handling. In this section I focus on the findings emphasising the influence of structure. Their description of the influence of agency will be described in 3.3.6.

Lindskog and Lundqvist (1989) assert that people's knowledge about the relationship between water and health is important, but only one of the aspects determining the water use pattern. According to them, individuals may have the insight of the need for improvement in a water supply system, but be unable to change their situation due to lack of time or economic resources. Following Lindskog and Lundqvist, a consequence of this is that knowledge about the dangers of using water of poor quality may not be enough to change behaviour. Thus lack of action must not be regarded as the same as lack of knowledge (ibid).

According to Lindskog and Lundqvist (1989), the knowledge of the population in third world countries is often underestimated by "outsiders". The latter is also claimed to often forget the multitude of worries that beset poor people. They assert that a child under five years is ill on average for 40 days per year. It is possible to imagine how this affects the choices made by the household, having perhaps several children under five. Neither does the economically marginal situation of the household give any room for experimentation. So, unless the benefits of changed habits become apparent, it is not likely that people will take the risk of changing (ibid). From this approach, we see that human behaviour is significantly influenced by some important structures related to poverty. I will now continue with approaches focusing more on agency.

3.3 Approaches emphasising agency

Even though I assume that the material environment influences water practices, I also believe that people are not deterministically responding to stimuli in a lawful manner. Hence there is a need to include theoretical approaches emphasising the influence of the agent on human behaviour. Common for many of the following theories is a focus on interaction between people and the influence of earlier experiences. Also central is the understanding of how the meaning content of social phenomena is not given, but actively being shaped.

3.3.1 Action theory

Werlen advocates a focus on human action at the expense of a focus on spatial analysis alone. He asserts that it is reductionism to try to understand the immaterial socio-cultural and subjective worlds in spatial terms. He is also strongly opposing a stimuli-response thought, which he feels dismisses all non-observable cognitive aspects of human activity. The influence of the agent and not only structure is also clear in his definition of action:

> "'Action' *can be broadly defined as a reflexive and intentional activity: a consciously considered, 'freely' performed activity which is goal oriented"* (Werlen 1993:11).

According to the phenomenological perspective, objective meaning of physical and social reality is not pre given, but a product of meaningful construction by interacting subjects (ibid). Objective meaning is here seen as: *"...the communal and associative relationship between the subjects' streams of consciousness, i.e. their stock of knowledge at hand"* (ibid:58). According to Werlen, the *stock of knowledge* is mostly gained through social

interaction and to a lesser extent through personal experience: *"Only subjects can act, but there is no such thing as a purely individual action"* (ibid:6). Central in Werlen's elaboration of the subjective perspective, is the works of Schutz. Much of the following will therefore be Werlen's interpretation of the latter. When describing this interpretation, I will use Werlen as reference.

> *"...any understanding of the meaning of a set of circumstances points back to other, earlier intentional experiences. These may be the agent's own experiences or those of others which have been passed on to him"* (ibid:59).

According to the subjective perspective, the *stock of knowledge at hand* (Shutz's concept) is the sediment of all previous experience (Werlen 1993). This involves that a given perception is a product of earlier perceptions. Acts are however not only influenced by previous experiences, but also by the objects of present experience (ibid). Any given fact is according to this perspective claimed by to be intentional, and should not be seen as a purely physical or psychological fact. According to Schutz (in ibid), the action situation is comprised of two main components. The first component is the ontological structure of the pre-given world. These are the constraints outside the sphere of influence of the agent, imposed on him or her in a given situation. The second component is the nature of the *stock of knowledge* of the agents at the time of the action. In this approach, I see an emphasis on both structure and agency. It is therefore well suited for my study of water practices in Nateete.

The *stock of knowledge at hand* being the result of previous experiences has several implications. First, the *stock of knowledge* is because of this never in a steady state, but developing all the time (ibid). Thus each action situation is unique. Second, it makes each subject unique (ibid). Factors like whether the subject is small, tall, educated, not educated, divorced, married etc. may all lead to different *stocks of knowledge*. Because of the different experiences, the subject's range of possibilities in both the physical and social worlds is limited accordingly. Due to the subjective orientation the subject is not aware of the limited nature of the possibilities (ibid).

The nature of the *stock of knowledge* at the time of the action situation is therefore very influential on the action situation. Different causes for depression may illustrate this point. While a person in Uganda may be depressed because of an inability to secure the household economically, a person in a western country may be depressed due to a feeling of lack of self-

realization. For each of the two persons, their reason is perceived as a meaningful reason for depression. Reflection of the other person's reason for getting depressed may first occur after in one way or the other getting in contact with the other persons life world. In the same way, the *stock of knowledge* may explain why the knowledge and perception of water in Nateete may be different from a scientific one. An understanding of this is central in the elaboration of research question 2) *To what extent can the cultural context explain the slow transition from use of traditional to use of modern water sources?* and 2.1) *To what degree do people differentiate between water from different sources?*

According to the subjective perspective there is a reality independent of the knowing subject. However, the subject cannot perceive it as it might exist in itself, but as it appears to him or her (Werlen 1993). The direction therefore puts the individual's experience of the world in the centre. Social reality is according to this belief understood as meaningful construction by subjects. A belief in a totally independent and objective reality has been sacrificed at the expense of a belief in a relative meaning structure of reality (ibid).

Following Husserl, Schutz (in ibid) distinguishes between what he terms the *natural attitude* and the *theoretical attitude*. According to this view, the subject's intentional actions in the everyday world are carried out within the frames of the *natural attitude*. Therefore this is the attitude I will describe most in detail in this section. In the *natural attitude*, the acting person will be guided by a naive attitude and pragmatic motives (ibid). It is a taken for granted world, where the doubt that the world and its objects may be different from how it appears to him or her is put in brackets. The subject is only concerned with the objects that stand out from the unquestioned background. However, the selective process of determining which objects are typical and which are individual depends on the nature of the subject's *stock of knowledge at hand* (ibid). The world can be taken for granted and appear as real for the subject only as long as it is not being questioned or becomes problematic. If disequilibrium occurs, the subjects may have to adjust their *stock of knowledge* to this new situation.

The distinction between the *natural* and *theoretical attitude* is best illustrated with this abstract:

> *"Following Husserl, Schutz calls the style of cognition which constitutes the reality of the everyday world the 'natural attitude', and that which does the same in the world of science the 'theoretical attitude'* (Werlen:63).

While the *natural attitude* is characterised by pragmatic motives, the *theoretical attitude* is characterised by the absence of such. Instead of bracketing indications that the world might be different from how it appears like in the *natural attitude*, the subject brackets all practical personal interest. Werlen (1993) asserts that in the *theoretical attitude*, the *natural attitude* of the researcher has to be replaced by that of the pertinent discipline. Related to my study, the difference between the two attitudes can contribute to an explanation of why water from traditional sources is used, despite its microbiological poor quality.

Schutz's theory of life-forms

According to Schutz (in Werlen 1993), there are three worlds the agent's *natural attitude* takes into consideration. These are the *subjective world*, the *physical world* and the *social world*. When describing these three worlds, it is necessary to go briefly through the different life-forms constituting them. Schutz asserts that the agent's ego has its existence in six life-forms. The life-forms are accumulative, i.e. each life-form builds on the other. This involves that the most complex life-form has its foundation in all other life-forms. The life-forms describe more detailed the distinction between the *natural* and *theoretical attitude*. The six are the life- forms of: *pure duration*, *memory-endowed duration*, *the acting I*, *the Thou-oriented I*, *the speaking I* and *the thinking I*. An important contribution of Werlen is to integrate the *theory of life-forms* of Schutz, into a three-world model of the *subjective-*, *physical-* and *social world* (see figure 8.1).

The *subjective world* consists of the agent's *stock of knowledge at hand*. It is constituted in the *life-form of pure duration*, which is the life-form with least complexity. It is characterised by representing a non-attentive experience of the world. In this life-form there is only ever a "now" (Werlen 1993). Not all of the experience in *pure duration* can be transformed to a higher life-form. This selectivity is a part of the *life-form of memory-endowed duration*. Here the experiences become present, past and future oriented. It is only the aspects that are relevant to the actual situation of the agent that are retained (ibid).

> *"...pure duration experiences only acquire meaning when they are remembered and ordered in relation to a specific situation and according to the relevance system in the natural attitude"* (ibid:75).

The provision of water may exemplify this. In Norway we are used to a dependable provision of piped water. A steady supply is therefore a part of our *stocks of knowledge*. If the system suddenly fails to bring water on a regular basis, the agent may obtain a more conscious relationship to the provision of water. A reflection of how dependent the household is of this commodity may perhaps also result from this change in *stock of knowledge*. Tvedt (1997) uses the term *water blindness* to describe a lack of attention to how society is influenced by water in various ways. For him, it was experiences from the rainy city of Bergen that made him aware of his *water blindness*.

The *physical world* consists of the material facts of the external world the agent has to relate his or her *subjective world* to. The *physical world* is constituted in the *life-form of the acting I*, when the conscious self experiences his or her body in movement (Werlen 1993). This is done when the agent brings things from the outer world into its sphere of action and uses them as means or goals for subjective actions. In the *physical world* there is no room for negotiations. The individual has to accept and adapt to this sphere's constraints. Schutz (in Werlen 1993) sees the body as the connection between the *subjective* and *physical world*, as it links inner processes and movements directed towards the outer world. This means that the things are given meaning through the body's experience of them. The physical location of the body both structures what may affect the self in the *life-form of pure duration*, and determines the direct influence of the agent (Werlen 1993).

According to Schutz (in ibid) the starting point for the constitution of the *social world* is the *life-form of the acting I in the Thou relation*. The *Thou* is according to Schutz constituted: *"...at the intersection of two durations, two memories and two courses of action: mine, of which I have primary knowledge, and those which I interpret as my experiences of him"* (Schutz cited in Werlen 1993:77). The *Thou* therefore describes the agent's meeting with other agents. Central here is the agent's perception of other people's expectations of him or her in a given situation. While a direct checking of symbolic gestures conveyed via the body of the agent is central in the life-form just described, meanings are re-presented in the intersubjective meaning-context of the language system in the *life-form of the speaking I* (Werlen 1993). The most complex life-form is the *life-form of the thinking I,* which is the precondition to the *theoretical attitude*. It is thus the life-form furthest away from the *life-form of pure duration*, and objective knowledge is the goal of this life-form (ibid).

In order for successful interaction to take place, the agent has to communicate with other agents about the meaning content of subjective actions. The greater the correspondence between agents is, the greater the chance is for intersubjective understanding (ibid). Having the same culture and operating in the same society, increases the chances for intersubjectivity between people. If the divergences are too great, an adjustment of the different *stocks of knowledge* must occur before intersubjective understanding can be established (ibid). This may help to an understanding of the problems of cooperation between public servants and the people in Nateete, the former trying to sensitive about the health dangers connected to use of traditional sources.

3.3.2 Perception - a selective process

Walmsley and Lewis (1993) point out that humans have a limited ability to process information. One way of dealing with this is by developing a strategy of *bounded rationality*. This implies that individuals seek only to be rational after there has been a simplification of the choices they are dealing with (ibid). However, which stimuli that are being processed will vary from person to person. Saarinen defines perception as *"...a process by which people select, organize, and interpret sensory stimulation into a meaningful and coherent picture of the world"* (Saarinen cited in Austrheim Larsen 1998:10). According to this view the individual is seen as active in the construction of his or her reality.

Some claim that individuals have a tendency of seeking information maintaining the existing picture of the world. This involves a tendency to reject information that does not correspond to ones own understanding. As described in 3.3.1, here too the individual is seen as actively creating meaning, and not passively receiving information from the environment. As Walmsley and Lewis (1993) put it:

> *"Rather information about the environment is sought and collected in a subjective and purposeful way, that reflects the needs and values of the individual concerned. In other words, how an individual approaches the environment determines what he or she finds"* (ibid:69).

3.3.3 Culturally constituted categories

According to Wadel (1991), data is a result of observation and concept. This means that observation has to be conceptualised in order to be data. He further asserts that in order to move from observation to data, a first step is to acquire some of the *cultural knowledge* of ones respondents (ibid). *Cultural knowledge* is here understood as *"...the knowledge that our*

informants use to develop and to interpret social behaviour" (Spradley and McCurdy in ibid:82, own translation). One of the most basic components of *cultural knowledge* is cultural categories, because all *cultural knowledge* in one way or the other is based on categorization (ibid). Aase (1997) uses the metaphor of a container to describe what a category is. For every concept we know there is a set of categories, which makes our cognitive consciousness contain an endless number of such containers (ibid). Categorization must therefore be looked upon as a tool to systemize our perceptions.

However, it is important to note that the set of categories a person has is not universal, but varies within as well as between cultures. Neither can it be taken for granted that a given category is comprehended equally by all possessing it (ibid). Aase asserts that when studying other cultures, it is especially important to avoid using our own categories when interpreting the respondents' life world. Instead he stresses the importance for the scientist to try to understand the respondents' categories and how they are constituted (ibid).

When studying use and perceptions of water in Kampala, it is important to include considerations of cultural differences. The different cultural categories may explain why some of the respondents' behaviour differs from what seems logical from a "western" point of view. Scientists often stress the microbiological and chemical aspects of water. In other cultures people create meaning based more on e.g. taste, smell, feelings and sound (Östberg and Reij 1996). However, it can be said that the chemical content of water significantly influences the smell and taste of water, indirectly making also a community like Nateete (as will be shown) concerned with the chemical aspects of water. In this thesis I will focus on the respondents' view of the microbiological content of water. Recognition of this does not involve that people must be able to explain the details of disease transmission. An awareness of the microbiological content of water simply implies recognition of the health dangers connected to use of water with a high content of bacteria.

Visual judgement is in many cultures a common way of determining water quality (Drangert 1993; Rinne 2000; Shaw 1993). In a study from the southern shores of Lake Victoria in Northern Tanzania, Drangert (1993) highlights taste, odour and appearance as key elements in popular assessment of water quality. He notes that water does not necessarily need to be clear in order to be rated as being clean. Rinne (2000) shows in her study from Nigeria how people believe more in the visual evidence of dirt flowing away from the stream, than in the

knowledge that consumption of stream water may lead to river blindness. Her research shows that many actually are more suspicious towards piped water compared to water from natural sources, despite seasonal variations in the latter. Even though the piped water in this case also proved to be of varying quality, it was, unlike stream water, not connected to river blindness disease (ibid). Clean water seems here to be defined on the basis of the flow of the stream, and not on type of source. Also Shaw (2003) illustrates the importance of visual judgement in her study from Nepal. She concludes that water treatment there seems more to be based on removing what is visible, than on killing bacteria.

Given my knowledge that different approaches are used in the assessment of water quality, I will in this thesis try to specify in cases of doubt whether I am referring to e.g. microbiological- or visual water quality. However, to facilitate reading I will also sometimes write only *water quality*. When using this term, the meaning is either given from the context or describing a general concept of water quality, including both microbiological- and visual aspects. When referring to other authors, it is the scientifically influenced concept of water quality that is referred to. Even though there are different ways of assessing water quality, the goal is shared, namely to decide whether the water is safe for human consumption or not.

3.3.4 Perception of risk

A central aim of this thesis is to elaborate why water of poor microbiological quality is used in Nateete. It is therefore necessary to study whether people's perception of risk is influencing this practice. In this elaboration I have mainly chosen the approach of Beck (1999). He calls the period we are now experiencing *the second reflexive modernity*. This period is seen as having succeeded *the first stage of modernity*, essentially being the period from the beginning of the industrial modernity to the early twentieth century. Beck uses the term *risk society* on *the second reflexive modernity*.

Even though his theorization concerns perception of risk in modern (and to a large extent western) societies, some of the characteristics of risk perception are general and can be transferred to my study area. The perception of risk characterizing *the second reflexive modernity* is also relevant since it is the point of departure of authorities, trying to sensitise people on the danger of consuming water of poor microbiological quality. Further, the *second reflexive modernity* perception of risk is an integrated part of the researcher (me), and thus

important for my interest in why water of poor microbiological quality is consumed. As will be shown, risk is not an objective standard, but influenced by cultural perception and construction. Hence the concept of risk is varying considerably. An understanding of this is especially important in the elaboration of research question 2 and 2.1. I will now describe some of the characteristics of the *risk society*.

Beck (1999) asserts that the concept of risk characterises *"...a peculiar, intermediate state between security and destruction, where the* perception *of threatening risks determines thought and action"* (ibid:135). According to him it is cultural perception and definition that constitute risk. "Risk" and the "(public) definition of risk" are thus regarded as being one and the same. This does not involve that risks are not real. Risk statements are seen as neither only factual statements nor only value statements. Instead they are claimed to be both combined in *mathematicized morality*, involving that:

> *"As mathematical calculations (probability computations or accident scenarios), risks are related directly and indirectly to cultural definitions and standards of a tolerable or intolerable life"* (ibid:138).

This resembles the view of the subjective perspective of Schutz (in Werlen 1993) referred to earlier. There it was claimed that even though there is a reality independent of the subject, the latter can only perceive it as it appears to him or her and not as it might exist in itself. Transferred to Beck, it may be said that there are hazards existing independent of the subject, but the perception of risk depends on the subject.

The cultural influence on the perception of risk partly explains why a risk may be perceived differently in different cultures. What may be perceived as a risk in one society may not be perceived as a risk in another. The cultural influence on risk can be illustrated with this example: After September 11. 2001 there has been a more attentive attitude among people in Manhattan, New York. One result of this is more nervousness of alarms and temporarily parked vehicles along the sidewalk. Actually it has been difficult for people operating in the logistic business to find parking space because of this. This, what I choose to call "the Manhattan perception of risk", cannot automatically be transferred to other societies, since it is contextually and locally constituted. What needs to be explored, according to Douglas and Wildavsky (1982), is how people agree to react upon selected aspects, while ignoring most potential dangers. They exemplify this with the fear of asbestos, which was first taken into

use because it was cheap and not easily flammable. The latter aspect has later been totally ignored as the fear of cancer increased.

While risk essentially signified a way of calculating unpredictable consequences in the *first stage of modernity*, new types of uncertainties arise in the *risk society*. Beck calls these *manufactured uncertainties*. The contemporary concept of risk associated with *manufactured uncertainty* refers to a synthesis between knowledge and unawareness (Beck 1999). New knowledge may become the source of new risks. Beck writes: *"By opening more and more new spheres of action, science creates new types of risks as well"* (ibid:140). An example of this is how the development of genetically modified food creates risks connected to the consumption of such food.

However, risk may also come from unawareness. Beck describes unawareness as *"*...not yet *aware or no longer aware..."* (ibid:140), which is seen as the opposite of a certainty in which the life world resides. The inability to know, is according to Beck one of the central features of modernity. Risks may therefore also come from unawareness. Beck (1999) writes:

> *"Everything falls under the imperative of avoidance. Everyday life thus becomes an involuntary lottery of misfortune. The probability of a 'winner' here is probably no higher than in the weekly lottery, but it has become almost impossible* not *to take part in this raffle of evils where the 'winner' gets sick and may even die"* (ibid:141).

An example of this is how research points at more and more factors enhancing the chances for cancer, resulting in an opening of a new and threatening sphere of possibilities. Extensive knowledge about the dangers of microbiological contamination may also explain the great attention to this issue by WHO.

Another important element of risk theory is that hazards are often latent and immanent, involving that they are invisible to everyday perception. According to Beck (1999), it is only when risks are clearly brought to consciousness that they can be said to constitute an actual threat. This is a process including cultural values and symbols, and scientific arguments. It might be said that the inability to track hazards in our everyday world hinders these hazards to stand out from the unquestioned background, described by Werlen (1993) in 3.3.1. This may be useful in the elaboration of why people use water of poor microbiological quality in Nateete.

Perception of risk is not independent of wealth. The characteristics of the *risk society* described here are therefore closely connected to the wealth experienced in the *second reflexive modernity*. Douglas and Wildavsky (1982) write: *"Once people have satisfied their main material wants, from cars to television, they can concern themselves with safety"* (ibid:11). Following this, the marginal economic status of many households in Nateete is likely to influence the perception of risk. It is not a thing that every society can afford, being a *risk society*.

3.3.5 Social action

An important distinction between realism and phenomenology is the emphasis on social action. While the economic rationalist was operating in a lonely wasteland, the phenomenological man is according to Ley (1977) unavowedly social. He further asserts that meanings are rarely fully private, but constantly shared and reinforced in group-actions. Rinne (2000) asserts that it is the community and not the individual that forms the primary actor in the environmental health risk process.

> *"If environmental reproduction is perceived as a socially and cultural constructed process (...), it seems natural to highlight a communal action instead of an individual one"* (ibid:2).

Meaningful social action was a very important term already in the works of Max Weber in the 1920s. Since the individual is not only orienting him or herself after own perceptions, Weber ([1922] 1999) calls the action social. Additional to own perception, actions are also influenced by the interpretation of other individuals' actions (ibid). On the basis of this, individuals seek to form a picture of how the world is presented to them. Central is which norms, values or plans they will face and act upon (ibid). It is important to note that the term social action also involves desisting from taking action. Weber's concept of *meaningful social action* resembles much the process in the *life-form of the acting I in the Thou relation* of Schutz (in Werlen 1993).

Weber divides action into four sub-categories, which in reality will be combined in many different ways. The first kind of action is *traditional bound*. It is characterised by being so incorporated that one to a very little degree reflects upon it. Also here there are similarities between the works of Weber and Schutz. The *traditional bound* action of the former resembles the action influenced by the *natural attitude* of the latter (in Werlen 1993). An

example of a *traditional bound* action is how we eat together. These habits are very incorporated, and will in most cases only be reflected upon when meeting people with other traditions. The second kind of action is *emotionally rooted*. This kind of action is often characterised by being spontaneous, but not necessarily rational (Engelstad 1999). It is performed on the basis of an emotion or deep involvement.

The last two categories differ because they are rationally founded. This involves that they have been thought through in a thorough and reasonable way. The first kind of rational action is the *rationality of ends and means*. It is characterised by having a relatively clear objective and the individual chooses to use the means that are best suited for reaching the goals. It involves a choice of an alternative, after an elaboration of all advantages and disadvantages. The second type of rational action is the *value rational* action. Here the goal is subordinated the value of the action itself. It is the belief that a certain behaviour *"...in itself and independent of the result- has an ethic, aesthetic, religious or other* intrinsic value*"* (Weber [1922] 1999:43, own translation). In this kind of action the rationality is not based on the relationship between objective and means.

Weber ([1922] 1999) defines custom in the following way: *"Use is to be referred to as* custom *when this de facto practice has been established over time"* (ibid:47, own translation). In Weber's view the notions *custom*, *convention* and *right* are closely connected. Often the acting subject is not even aware of whether he or she is facing a *custom*, *convention* or *right*. However, *custom* in principle differs from *convention* and *right* by describing a rule without formal guaranties. *Customs* do change. Some develop and others fade out. The practice of eating with knife and fork is an example of a *custom* that is considered as being strong in Norway. There is no rule that people must participate, but a clear anticipation that others in the same circle too will follow the *custom* (ibid). As long as the majority recognises the *custom*, violators will face consequences of different degrees when not following them. A *custom* will be stable as long as the majority acts according to it, and find it inappropriate not to do so.

> *"Action, especially social action and again especially social relations, can be oriented after the* conception *of the existence of a* legitimate arrangement*. The probability that this actually happens, is to be described as the current arrangement's «validity»"* (ibid:49, own translation).

The notion *legitimate arrangement* contains both *convention* and *right*. Even though they resemble each other, *right* has stronger means to prevent violations. It also has stronger sanctions to induce if a violation has occurred. The legitimacy of an arrangement can be maintained in two ways. Trough internal conviction and (or only) through expectancy of external consequences.

Though old, I find Weber's categorization of action very useful for my study. Consumption of water from traditional sources may have many reasons. One may be that the household has been using traditional sources for generations. It may be perceived as the most logical option, and therefore not reflected upon. Through the habit of using traditional sources there may also grow an emotional link, resulting in a preference of traditional water. Use of traditional sources may however also be rationally founded. The household may be aware of the differences in microbiological quality between water from modern and traditional sources (without necessarily knowing the details of disease transmission). However, human health is also dependent on sufficient quantity of water. All the time piped water costs money, it may be rational for them to fetch sufficient amounts of water from traditional sources instead of insufficiently from the piped water system. Collection of water from traditional sources must therefore not automatically be categorized as *traditional bound*, since it also may be influenced by a *rationality of ends and means*. This illustrates how Weber's ([1922] 1999) sub-categories of action may combine. His notion of *legitimate arrangement* will also be central, since the presence of such may influence people's collection of water in Nateete.

3.3.6 Knowledge and traditions

There is a vast amount of definitions of knowledge. In this thesis I emphasise especially two elements. Firstly, I find it important as emphasised by Werlen (1993) to view knowledge as continuously developing. Secondly, it is important to emphasise the influence of social activity on knowledge. These two elements are both represented in this abstract from Douglas and Wildavsky (1982):

> *"Instead of the old recurrent imagery of knowledge as a solid thing, bounded or mapped out, we prefer the idea of knowledge as the changing product of social activity. It is not so much like a building, eventually to be finished, but more like an airport, always under construction"* (ibid:192).

As described in 3.2.2, Lindskog and Lundqvist (1989) emphasise the influence of both structure and agency on water related behaviour. According to them, water consumption and water handling is determined by a mixture of:

1 needs of the individual
2 the social and cultural norms prevailing in that society
3 the resource situation

They believe traditions and social norms significantly influence individual practices. In some cases traditions and social contact networks may restrict the choice of action. As mentioned in 3.2.2, lack of action must not be regarded as the same as lack of knowledge. Neither must the knowledge of people be underestimated. Even though most people in the third world do not know the details of disease transmission, they have a lifelong experience with them on which they base their understanding and behaviour (ibid).

> *"This experience constitutes the basis of their knowledge and has two components. It is firstly gained through inheritance from the society in which the person lives and secondly, it is determined by events, which the individual herself has gone through or is exposed to"* (ibid:23).

The experience of surviving and growing up despite all warnings from outsiders is influential and may contribute to continued consumption of water of poor microbiological quality. However, it is important to remember that *events* also may lead to a change in behaviour in direction of improved water related practices. An example of such an *event* may be an individual believing in the quality of a water source, until an expert who has measured the water successfully manages to convince him or her that it is not.

Drangert (1993) also includes the importance of *events* in his explanation of human behaviour. Here he tries to identify the factors leading to either *continuity* or *change* (figure 3.1). The latter is defined as *doing new things*, while the former is defined as *doing more of the same*. Drangert states that: *"People's own assessment of their water conditions, or a stimulus of some sort, evokes responses of various kinds"* (ibid:28). The responses may be either *change* or *continuity*. *Change* has happened when an individual performs a practice, which has earlier not been available on its repertoire.

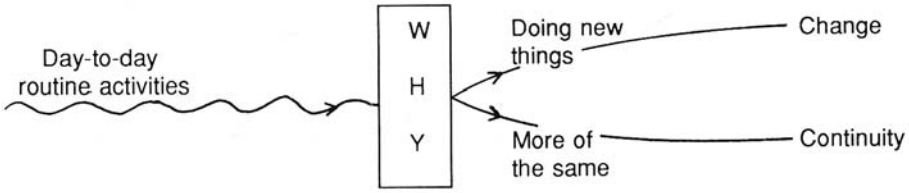

Figure 3.1: Drangert's model of *continuity* and *change*

An example of a *change* may be the first time a household boils their drinking water. When this is done on a regular basis, the practice of boiling has become incorporated and therefore represents *continuity* and no longer *change*. The opposite response of *change* is *continuity*. This is a response that has been developed and learned at an earlier stage as the appropriate response. Even though such habits have become routine, they may be well elaborated. Compared to *change*, *continuity* is expected to dominate (ibid). In my case the continual use of traditional water sources may represent *continuity*. The concepts of *continuity* and *change* can therefore be employed in the elaboration of research question 2.

3.4 "Western" and "indigenous knowledge"

Indigenous knowledge is a term often used to describe a set of thinking of people living in third world countries. It is often compared to what is called *western* (or scientific) *knowledge*. Agrawal (1995) has studied the basis for and use of these terms. He has found three aspects that are often used to distinguish *indigenous* from *western knowledge*: 1 *Substantive*- there are differences in the subject matter and the characteristics of *indigenous* vs. *western knowledge*. 2 *Methodologically and epistemological*- the two possess different views of the world and uses different methods to investigate reality. 3 *Contextual*- compared to *western knowledge*, *indigenous knowledge* is more deeply rooted in the context (ibid).

Agrawal is however very critical to the notion of *indigenous knowledge*. A part of the critique relates to the lack of a claim for deep-rooted change from people advocating *indigenous knowledge*. He claims that the ones often emphasising the empowerment of economically marginalized groups, *"...seldom emphasize that significant shifts in existing power relations are crucial to development"* (ibid:416). There are also weaknesses connected to the use of the dichotomy; *western* and *indigenous knowledge*. According to Mundy and Compton (1995) the process where the individual decodes received information and matches it with existing

knowledge, leads to "noise" in the communication channel. This leads to no people having the exact same knowledge about anything. Is it then correct to talk about **one** *indigenous knowledge*? Agrawal (1995) claims that the dichotomy also fails fatally, because it is incapable of capturing the diversity within the boxes that are labelled *indigenous* and *western*. According to him it is also unable to capture the similarities between them. It is important not to forget the continuous interaction that exists and has existed through centuries between different cultures.

As shown, the concepts of *indigenous* and *western knowledge* are not unproblematic. I will therefore try to deal with them as careful as possible. At the same time I believe there are some substantial differences, I will try not to use a rigid dichotomy between the so-called *western* and *indigenous knowledge*. Instead I will to a large degree make use of Schutz's (in Werlen 1993) concepts of *natural* and *theoretical attitude*. My reason for using this approach is that the *natural attitude* is not a label put only on third world societies. Also in so-called modern societies we operate in the *natural attitude* in our everyday world. This attitude simply describes the unexamined ground of everything given in ones experience (ibid).

In this theoretical chapter, I have presented approaches emphasising both structure and agency. This is due to an assumption that both influence water-collection practices in Nateete. As will be shown in this thesis, it is thus not a question of structure **or** agency, but rather of how these work together.

Chapter 4
Methodological approach

"A method is a procedure, a means to solve problems and to reach new knowledge. Any means that serves this purpose, belongs to the arsenal of methods" (Aubert cited in Hellevik 2002:12, own translation).

In this chapter I will describe the methodological choices I have made throughout the research process. The chapter starts with an elaboration of choice of study area and the difficulties I encountered as a consequence of this choice. Thereafter follows a description of the quantitative and qualitative interviews I carried out during my period in field. In this part of the chapter I will give an account for choice of informants and methodological difficulties. Further I will discuss the use of research assistants, reflect upon my role in the research process, before finishing with a description of the use of Geographical Information Systems (GIS) and water tests.

4.1 Periods in the field

I made a preliminary field trip to Uganda in April 2002. This provided firsthand knowledge of wetland slums, although choice of study area was made later. It also enabled me to access important literature and to discuss water issues with scientists and officials. No interviews were made. In a second period of fieldwork lasting from September to November 2002, Nateete was chosen as the area of study in consultation with my co-supervisor at Makerere University. The main data collection also took place during this period: mapping, sampling, quantitative and qualitative interviews, and water tests.

4.2 Choice of study area

The choice of Nateete as study area was partly based on a classification system of parishes developed in a research project called Urban and Peri-Urban Water Supply Surveillance Programme (WSSP). In this project the parishes were categorized after population density, income and water use. There Nateete had the characteristics of; low income, high population density and mixed water use (Howard and Luyima 1999). This category was given the highest priority by the study. The mixed water use in particular, is of great relevance to this study.

What makes Nateete such an interesting case in my opinion is the presence of different water sources, with different characteristics that people choose between. Another reason for choosing Nateete was that not too much research had been done in this area before. Except from the population census, which had just been carried out when I did my field study, the reactions among the respondents confirmed that there had been very little other research in the area. This gave me the advantage of not being "just another researcher", which could have negatively affected the data quality. It was also inspiring for me to work in a rather unstudied area.

At an early stage of the research process, I decided to focus on a limited geographically area. A reason for doing this was that I wished to study the *water landscape* at a parish level. The geographical limitation enabled me to go in depth and study more aspects in this particular area, compared to if I were to study a more extensive area. In particular, it enabled me to do a detailed mapping of the water sources in the area. The study area is located between two protected springs in Nateete. The distance between them is approximately 730 meters. As I believed distance to be a factor significantly contributing to people's choice of water source, I needed to interview respondents living at an increased distance from a protected spring. Since there are two such springs in the area, I decided to make a transect between these two.

The result was a transect of 700 x 200 meters. It is in this transect the respondents were selected from. As standard of living seemed to increase up-hill, I decided to concentrate my study on the reclaimed wetland. Since the transect had to be in an area where people actually live, it is not placed along a straight line between the two protected springs (figure 5.2). This location of the transect was also favourable since it included many unprotected water sources. This enabled me to study not only choice (and use) of protected spring and piped water, but also of unprotected spring water.

4.2.1 Challenges in choosing Nateete as study area

Problems related to choice of study area can be divided into two categories. First, there are problems of doing research in a developing country in general and second there are the problems of doing research in a slum area specifically. I will begin with the former. My greatest problem of doing research in Uganda was the lack of available prior research. I found only a limited number of studies that could provide me with basic knowledge about relevant

issues in Kampala. In 1994 a large project called Kampala Urban Study (KUS) was concluded with a final report. This is an extensive and thorough study, which I have benefited a lot from. The problem is that many other studies have used this report as their only source. This has led to a rather uniform projection of the status of Kampala in many of these studies. Another problem was that the KUS was almost 10 years old at the time. Also the population census was quite old, dating back to 1991. I therefore experienced significant differences between text and reality.

The second part of the problem is related to doing research in a slum. The topic of study is in many ways very suitable. It was a theme that everyone had a relationship to, but not a sensitive issue. I benefited considerably from this. As already mentioned, the area had not been much studied before. Neither was it my impression that too many white people were operating in the area. My presence was in other words noticed to a very large degree. One problem was that the children became extremely exited whenever I moved into a new area. At times I felt I was just moving around disturbing the neighbourhoods. I feared that this could negatively affect my respondents and tried as much as possible to tune down my presence.

Especially in the beginning there was also very much suspiciousness among the adults towards my presence in Nateete. I felt that it was especially the men who were suspicious, at least they communicated this to a larger degree. Even though I tried to be polite and greet as many as possible, it seemed as though my continuous presence was experienced as offensive to some. Being under study must be unpleasant and I can understand some of these feelings. There were also a lot of rumours about my intentions and not all were positively loaded. Very many believed I was in Nateete to buy up land, others believed I was a missionary. I was even confronted with a rumour that I had poisoned some of the water sources and wanted to find out through the interviews whether people had gotten ill or not. Even though it was at times a demanding area to work in, my research assistants contributed significantly in creating a relatively good atmosphere between the inhabitants and us (the role of my two research assistants will be discussed later).

However, throughout the field study there was a relatively large gap between the inhabitants of Nateete and me. I never got on very intimate terms with the inhabitants. To me it seemed as if especially three factors contributed to this. Firstly, I was significantly hindered in communicating with my respondents, as I do not speak Luganda. Secondly, my clear

scientific intentions probably contributed in maintaining the gap, even though I believe the suspiciousness of my intentions decreased after a while. Thirdly, however much I tried to adapt the customs in the area, I was clearly a representative of another culture. My skin-colour did not undermine this fact and my presence was at all times a disturbing factor in the daily life. My intention was never to "go native" and my methodology never included participant observation. However, I always had a distinct feeling of being a very external element in Nateete. I can only hope that this did not have a negative effect on my data.

Another methodological problem of doing research in a low-income area is that pride may influence the answers given. I, entering the field as a representative of a totally different culture, may further have reinforced the possibility of this. One variable that is likely to be influenced by pride is the reasons given for collection of water from traditional sources. This involves that due to pride the influence of cost on choice of water may be tuned down, while preference may be emphasised. The possible influence of pride is thus important to keep in mind when considering my respondents attitudes to different kinds of water.

4.3 Combining methodologies

In reality, the qualitative and quantitative orientation of methodology does not exclude each other (Fossåskaret 1997). In this study I have combined qualitative and quantitative methodologies. The quantitative survey was mostly used for mapping the activities within the study area, while the qualitative interviews were aimed at seeking a deeper understanding of use and perception of water. The latter was partially based on the findings from the quantitative survey.

Rudie (1997) has termed two strategies for production of qualitative data: *mapping* and *text reading*[1]. While the former may be associated with entering unknown terrain, the latter may be associated with interpretation. Partly *mapping* and *text reading* cover different questions, and partly the two strategies represent different stages in the research process. While the *mapping* aims at providing knowledge about material and social structures, the *text reading* is beneficial to *"...illuminate subjects in a complex discourse, with a built-in condition that the*

[1]Though terming it qualitative, a lot of her mapping from the field study in Malaysia 1964-65 has clear quantitative characteristics. Giving social relations a spatial expression, mapping of agricultural coverage and quantification of material resources are examples of this. Hence, I feel her concepts can be used for describing my use of methodologies.

interpretation must be an important element" (ibid:137, own translation). *Ethic* and *emic* understanding are terms used to describe the scientist's external perspective and the respondent's internal perspective respectively. *Mapping* can be seen as representing an *ethic* orientation, while the *text reading* represents an *emic* one. According to Rudie (1997), interpretation without having knowledge of the physical and social structures is a risky project.

4.4 The quantitative survey

In research question 1 and 1.1 I focus on how water-collection practices are influenced by the *water landscape*. In order to illuminate these questions I decided to carry out an extensive mapping of people's use of water. An assumption was that the distance to the different water sources significantly influences people's water related practices. I therefore wanted to do a comparison of households on basis of this variable. I was also interested in how different household characteristics were influencing water use. Especially interesting were the number of people and the gender composition of the household. In an elaboration of such factors quantitative methods are well suited.

The result was quantitative interviews of 109 respondents. The respondents were interviewed using questionnaires, which involved that the research assistants translated questions and registered answers. Use of questionnaire is therefore here understood as a structured personal interview of selected respondents. There were mainly three reasons why I chose to use questionnaires. Firstly, I expected that there would be a significant proportion of illiterate among my respondents. By using questionnaires this would not influence the accomplishment of the survey. Secondly, it enabled my research assistants to explain questions that were not immediately understood. Thirdly, use of questionnaires was believed to ensure a low dropout rate.

Even though I was not able to participate in this interviewing, it was important for me to be present. One reason was that such presence gave me an opportunity to observe. This observation, most often from the respondent's veranda, was important in shaping my understanding of the context. As described above, many did not enjoy being under study, so all observation and registration was done in a very discrete manner. The interview situation, where I sat beside one of the research assistant while they were talking with the respondent,

gave me a unique opportunity to do exactly this. My presence in the interview-situation also enabled me to guide my research assistants when they faced difficulties. Misunderstandings and clarifications were also discussed between my research assistants and me every morning before going into the field. During these sessions all interviews from the previous day were discussed.

In order to secure as reliable information as possible about water use practices, respondents were asked what they did the day before the questionnaire survey. This allowed the detailed record of the kinds of water they had fetched, how much they fetched, how much they paid for it, and what they used it for. A more general mapping of respondents' behaviour would have been preferable. However, I suspected that questions about habitual behaviour would be difficult to answer, as there are probably significant seasonal variations in collection practices. In consequence data reliability has been gained at the expense of representativity. I cannot be certain that patterns of behaviour recorded on one single day are typical, or that the survey captures all types of activity. A household may for example choose to fetch water from different sources on different days, storing water in between times. Nevertheless, the sample is sufficiently large (estimated at 25 percent of the total number of households in the transect) to ensure against large systematic bias. It is however important to keep in mind that the survey is very influenced by the season it was carried out within, a relatively humid period. When percentages of the respondents are referred to later in the thesis, these percentages will always be based on the quantitative survey.

4.4.1 Choice of respondents

The shape of the transect described in 4.2, was my point of departure for selection of respondents. The transect was divided into 14 squares, each of 100 x 100 meters (figure 5.2). My intention was to interview eight persons within each of these squares, as I wanted a more or less even distribution of respondents away from the two protected springs. This would have resulted in 112 interviews. Within each of the squares every second household was to be selected from a given starting point. The survey started in Kitoro, from where I systematically moved in direction of Kigaga.

This kind of selection falls under the category of area based ratio sampling. This involved that when eight interviews had been conducted in one square, I moved on to the next before

carrying out more. Ratio selection is an example of *non-probability selection*, since not all possible samples have a known probability of being selected (Hellevik 2002). Differently from *probability selection*, use of ratio selection involves that the selection technique does not in itself guarantee a representative sample (ibid). The problem with *probability selection* is that it may be an expensive method to employ. *Non-probability selection* like *ratio selection* is in comparison often cheaper. For my study, use of *ratio sampling* represented a method that offered me an acceptable security of selecting a representative sample given the available resources. The slum characteristics of Nateete would have made it an extensive task to register the whole population before carrying out a probability selection.

This would have been complicated by differences between map and reality I experienced. The map I followed, printed at the NWSC GIS-section, was probably based on the 1991 population census. Since then it had been a significant increase in the unplanned settlement in Nateete. At times this made it extremely difficult to orientate after the map within the study area. Another problem was that what seemed like passages on the map, were in reality blocked.

When a household had been selected, I tried to interview the ones that were assumed to be responsible for the collection and use of water. Being responsible is here understood as the one administering the water and not necessarily the ones fetching it. For this reason female household heads and not children were preferred as respondent. Even though male household heads may use more water for body wash than the rest of the household members, I have not categorized them as being responsible for the use of water in households also containing a female household head.

Household head is in this thesis understood as people in charge of the household. Women and men are responsible for different spheres of the household, giving room for both a male and a female household head. In households containing both, the preferred respondent was the female, given my knowledge that collection of water in Uganda seldom involves participation of men. According to Tumwine (2002) it is mostly a job for women and children. The sex ratio of the interviewees turned out to 89 women and 20 men. The age limit was set to 15 years, involving that the household was rejected if no persons over this age were available. The next household then would be selected, and the interviewing of every second household continued from there.

I did not register the number of denials we got from people not wishing to participate in the survey. However, the response was surprisingly good and the number of denials few. In those cases where a selected household refused to participate, the principle was also here to select the next household and continue from there.

4.4.2 Sampling problems

I managed to make eight interviews in all but one square, where there were simply not more than five households. This is why the quantitative survey contains 109 and not 112 interviews. I made one exception to the rule of selecting every second household. Since large housing units could contain up to 20 one-room dwellings, I decided to just interview maximum three people within each housing unit. When people were living so crammed, I felt that the spatially diversity within the square easily could vanish, if using all of the interviews on just one housing unit. Compared to the street structure we are used to in a western society, there is clearly a subjective element in classification of what is to be "every second household". In some parts of the study area the settlement was very unorganised and dense. This made it at times really hard to decide what the next household should be.

In three of the 14 squares there were too few households to select every second household. In one, a road and numerous shops occupied a lot of the area in the square. As households were the scope of this thesis, I was not interested in interviewing shop owners or attendants. In the two other squares there were simply not enough houses to maintain the principle of selecting every second household. I take self-criticism for not having investigated my study area thoroughly enough to ensure equal sampling procedures in all squares. In my own defence I can only refer to the limited resources available for the survey and the problems of orientation already described. In general it was my experience that the slum characteristics of Nateete was a complicating factor for use of a strict methodology.

4.5 The qualitative interviews

Even though the quantitative survey produced quite a lot of interesting data, I felt that it was not able cover some of the issues I wanted to focus on. I had been *ethic*-systematic oriented in the quantitative survey and now needed to continue with an *emic*-interpretative orientation. Especially important was an interpretation of the respondents' perceptions of water. This was important for the elaboration of research question 2, which was focusing on whether the

cultural context was hindering a transition to modern water sources. Since there was water with different characteristics, cost and qualities in the area, I wanted to find out how the respondent perceived them. I also wanted to get a deeper insight of the interplay between the different agents dealing with water in the study area. For these issues I needed to continue with qualitative interviews.

Carrying out structured interviews in a culture that is unknown to the researcher has several consequences. One is that the cultural differences may reinforce the problem of validity. Even though I had studied the water situation in Kampala intensively before carrying out the quantitative survey, I had questions in the questionnaire that just did not work in field. One example of this is the rating of different aspects of water[2]. The respondents were here asked to rate variables like quality, distance and reliability on a scale from *very important* to *not important at all*. Here the variables were too many, which probably contributed to an overweight of positive answers. Some of the "unfit" questions were detected during a small preliminary survey, but some were still present when the survey commenced. In comparison, the probability of misunderstandings is significantly reduced in the qualitative interview. Another advantage with the qualitative method was that I more easily could include more than just one climatic season. During the quantitative survey I had focused only on the present season, while the qualitative interviews gave more insight into other seasons as well. This revealed patterns that had been hidden in the quantitative survey.

Another reason for following up with qualitative interviews was that I felt rather passive during the quantitative survey. Compared to qualitative methodology, the participation of the researcher is limited in quantitative methods. In my case a language barrier, making me unable to participate in the quantitative interview, reinforced this. In reality I could only observe my research assistants carrying out this part of the study. This resulted in a distanced feeling to the subject under study.

During the qualitative interviews, my role was more central. In these more unstructured interviews I asked the questions and the research assistants functioned as translators. The interviews were recorded, which gave me the opportunity to focus entirely on the meaning of my respondents' answers. The use of tape recorder was agreed upon before starting the

[2] See appendix, e.g. question 28.

interview and I had no feeling of making any of the respondents uncomfortable by using it. After transcribing the interviews, I went through them again with the research assistant who had accompanied me in field. The intention of this was not only to ensure a correct interpretation of the translation. I also wanted to give the research assistant a chance to listen to the interview, to ensure a correct interpretation of the respondents. This led to corrections of and additions to the initial transcription.

After having carried out the structured interviews, I plotted some of the variables into a statistical program called NSDstat. This preliminary analysis enabled me not only to see some tendencies, but also to adjust the interview-guide to each respondent. The guide then would consist of some general questions for all respondents and some adjusted to each respondent based on the answers given in the structured interview. All in all I carried out 16 qualitative interviews in Nateete. In addition I also interviewed five public servants, working with water related issues. These were able of providing background information for my study. Some of them were very cooperative, and also contributed to the study by commenting upon my findings later in the research process.

The last qualitative oriented technique I want to describe is field conversation. This is not an arranged interview, but more like the everyday conversation between people (Fossåskaret 1997). Being informal and totally unstructured, this method became important in the shaping of my understanding of the area. Its ability to lead me into unexpected insights, was especially important.

4.5.1 Choice of respondents

One qualitative interview was carried out in each of the 14 squares. All but one were done with respondents who had been interviewed in the quantitative survey. In one square I did two interviews, because I wanted to include an extra respondent who was making and selling ice. I also interviewed a former local councillor, who had not been interviewed in the questionnaire survey. The selection of respondents was based on the preliminary findings of the quantitative data. Important when choosing respondents was also that they had shown willingness to cooperate during the questionnaire survey. This by no means involved a selection of those who had given the most information during this survey, but simply that they had been willing to cooperate.

4.6 Use of research assistants

As very many people in Kampala do not speak any English, use of translators was a necessity. Carrying out more than 100 structured interviews, it was also practical to use assistants. Two research assistants were enlisted from Makerere University. They also functioned as translators. In addition to the two research assistants, I hired a local guide to assist us when we were in the field. The field study started without this guide, but I decided to employ him after a couple of days on recommendation from the assistants. It turned out to be very beneficial. The young man facilitated interaction with the people of Nateete, which I believe had a positive effect on the data quality. He also provided us with his knowledge about the area.

4.6.1 Positive and negative aspects of using research assistants

Using research assistants both have positive and negative implications. My experiences are much more positive than negative. The assistants, one male and one female, were great help to me as they were both experienced research assistants. They both showed good skills and appeared to be very motivated for the project. Their clearest strength was the ability to communicate with the inhabitants living in Nateete. Coming from a different culture, not knowing the cultural codes, I would have had enormous difficulties if operating on my own. On several occasions we had the problem of people interrupting the interview situation. Without offending anyone the research assistants managed well to solve these situations and carry on with the interview.

Since I do not understand Luganda, I can only base my assumptions on codes other than language. However, it was my clear comprehension that the research assistants were very good in motivating the respondents to participate in the study. This involved both recruitment and motivation during the interviews if needed. Especially during the quantitative survey, which was probably a bit too extensive, there were at times need for some motivational input. Another significant contribution of the research assistants was their effort trying to make people comfortable with me operating in their neighbourhood.

The negative aspects of using research assistants can be divided into problems of using translators and problems of using assistants. Here I will only focus on the latter. Even though I found the research assistants very skilled, there were differences in academic traditions

causing some problems. Most problematic was their use of a technique called *probing*. In short the method involves stating a general question, which may lead the respondent to talk about the topic under study. The advantage of *probing* was claimed to be that respondents more easily can answer the questions posed to them if using the method. Especially when operating in a slum area, where the motivation for answering questions from strangers can be low, *probing* was claimed to get the respondents on "the track". For my research assistants this was a legitimate method, while I felt it was too close to putting the words into the mouth of the respondents. After discussing the problem I feel that we managed to establish a good communicative situation, without the use of leading questions.

4.7 Reflections of own role

"...the collection of data is a discriminating activity, like the picking of flowers, and unlike the action of a lawn-mower.."(Koestler cited in Wadel 1991:75). The subjective influence when choosing respondents has been described earlier. However, the researcher also is selective in the research process. It is important to be aware that data is not something "out there", ready to be collected. Wadel (1991) asserts that not only is all observation selective, but so to is the interpretation of what we have chosen to observe. Fossåskaret (1997) writes:

> *"The concepts and categories the scientist develops and chooses to use in his or her analysis, highlights some characteristics of the observed society, and overlook others"* (ibid:37, own translation).

Data can therefore be seen as being created through an interpretative process. In this process it is of paramount importance to avoid using ones own categories in the interpretation of the respondents' life world (Aase 1997), as described in 3.3.3. Being a foreigner in a research-field has both advantages and disadvantages. One advantage of a naive observer is that all senses are susceptible to the new and unfamiliar. This may make it easier for the researcher to discover correlations, compared to a native who is too accustomed to the topic under study. However there are disadvantages as well. When entering a culture totally different from ones own, the encounter with the unfamiliar is overwhelming. The process of understanding my respondents' categories and trying to avoid using my own has been difficult. It is likely that I have made some wrong steps along the road.

4.8 Spatial analysis and Geographical Information Systems

A part of the research tries to link people's choice of water source and their respective distance to them. For this spatial analysis I have been using GIS. Spatial analysis can be defined as: *"...a set of methods whose results change when the locations of the objects being analyzed change"* (Longley, Goodchild, Maguire and Rhind 2001:278). Spatial analysis and GIS are not the same. GIS must be understood as a tool for analysing spatial data. Long before there was any GIS, spatial analysis have been conducted. Dr. John Snow's spatial analysis on the relationship between water and health from the 1850s is an example of this (ibid).

In order to study the influence of distance on choice of water, I had to map the exact position of each household interviewed in the quantitative survey. I also had to map the water sources in the area, again on the basis of this survey. All water sources that had been registered as having been collected from were given an exact position on a paper map. This included protected springs, unprotected springs and standpipes. For obvious reasons rainwater was not registered here as a water source, since it is collected from the roof of the household. One of the standpipes was treated differently than the other standpipes. This source was exclusively for the ones living within a fenced housing unit. Since the respondents living outside this unit had no access to the standpipe, it was only included for the ones living in the housing unit.

After the field study, a paper map of the study area was scanned and imported into ArcGIS (a vector GIS). On this digitalized map, the exact position of the households and water sources were marked. The work was further transferred to MapFactory (a raster GIS), where the analysis was carried out. In my opinion ArcGIS presents features better visually and was therefore used for illustrations. Nevertheless, I chose to carry out the analysis in MapFactory, since I am more accustomed to this software. The respondents' distance to the different water sources was then measured. In this operation it was always the nearest source that was registered.

The measurements were done in two ways. One method was to use a tool called *tracker*, which enabled me to measure the precise distance from the respondent to each of the three different water sources. To do this I had to make a map layer that combined the three layers describing the location of the water sources (standpipes, protected springs and unprotected

springs) and the layer describing the location of the respondents. The distance from each respondent was then found by using a measuring tool to each of the different water sources.

The other method employed was to make three different map layers, one for each of the three different water sources. On these maps the *spread* function was used, centred on the water sources. In this way there was one map with distances centred on the standpipes, one on the protected springs and one on the unprotected springs. Since the *spread* function counts every meter away from the sources, I had to make larger categories. The result was to recode the three maps, making different map layers with buffer zones of various sizes. Buffer zones of 40 meters centred on the unprotected springs is an example of such a map layer. In the rest of this thesis I will call these buffer zones for *distance zones*. The next step would then be to decide which distance zone the different households were situated within. This was done with a function called *score*. Putting the map presenting the location of the respondents and the map with the distance zones into the *spread* function did the operation. This had to be repeated for all desired sizes of distance zones, as well as for all three water sources. Finally, the results were plotted into NSDstat for further analysis. Of special interest was the relationship between distance to sources and choice of water (see 6.2).

4.8.1 Limitations of the GIS study

My greatest problem when carrying out the GIS analysis was the differences between map and reality (see 4.4.1). Many of the interviews were done in houses that were not registered on the map. Especially in areas where the reference points were few, I had some problems in determining the exact location of the household. I did not want to use GPS during the fieldwork, as I believed this would have caused too much curiosity and possibly interfere with the interview situation. Instead I mapped the dwellings manually, by measuring their distance to known reference points on the map.

In this GIS analysis I have been treating the landscape in Nateete as a flat surface, even though a part of the study area is not. Since there was relatively little elevation in the study area, neglecting the topography is not creating a large discrepancy between factual distance and distance measured in MapFactory. An inclusion of topography would have made the analysis very complex and the benefits of such an approach in this case would have been

marginal. The low gradient of the slope in the study area was also the reason why the influence of topography on choice of water source not has been focused on.

4.9 Water tests

During fieldwork water samples were taken for testing at several sources in the area. All in all two standpipes, two protected springs and three unprotected springs were tested. In addition I tested water from a tank containing rainwater. Since there were many standpipes in the area, I selected two randomly for water testing. Samples were taken on two different occasions in order to reduce the chance of casual results (the rainwater was only tested once). All tests were taken during two mornings. Considering possible contamination after the source, water-tests were carried out in three households as well. These were randomly chosen and tested once. In these tests the households were told to pour the water they were using for drinking into a cup that was normally used for drinking. In this way I hoped to detect if the water got contaminated after the source.

The water samples were immediately brought to the NWSC laboratory for analysis. NWSC has high competence and the necessary laboratory facilities. However, it is not a neutral instance, since it is responsible for piped water supply in Kampala. To minimize the risk of bias, the samples were coded. Due to the extremely high content of contamination in samples from unprotected springs, these samples had to be identified to facilitate the analysis.

Central to water quality is whether disease-causing micro-organisms (pathogens) from faeces are found in water (Howard 2002). It is difficult to test pathogens in water, so an indicator of faecal pollution is used. WHO (1993) calls such indicators *faecal indicator bacteria*. *E. coli* (Escherichia coli) and *Thermotolerant coliform* are commonly used indicators. The former is reckoned by WHO (1993) to be the most precise faecal indicator of the two. All of my water tests from Nateete, referred to in this thesis, are so-called *confirmed E. coli*. At the NWSC laboratory, this involved that the sample was analysed after 24 hours of incubation. The water was also tested for turbidity and colour, but these factors are not emphasized to the same extent.

Chapter 5

Production of the water landscape

This pure empirical chapter is focusing on the water sources available to people in Nateete. Following Simonsen's (1996) approach, this falls under the first mode: *production of the material environment* (see 3.1.2). The aim of this chapter is therefore to describe different aspects of the *water landscape*. The chapter starts with a description of the water sources, before proceeding with a description of the contamination the different sources are exposed to. A description of water vending and maintenance work (of sources) will also be integrated in these sections. Towards the end, the vital importance of water quantity will be discussed.

5.1 Water sources in the study area

According to this study, people obtain water from four different sources: standpipes, protected springs, unprotected springs, and rainwater. The distribution is shown in table 5.1. *First source* refers to the source the household had been collecting most from; while *second source* refers to the source the household had been collecting second most from. 77 percent of the respondents had collected water from one source, 21 percent from two sources, and 2 percent had not fetched water at all on the previous day. If *first-* and *second source* collection are added up, standpipes (piped water) is the most used water source, followed by protected springs. Standpipe collection is also the largest category within *first source* collection. However, it is worth noticing that a relatively large number collect water from protected springs. Independent of which source the household uses, the most common way to reach it, is by foot. Bicycles and pushcarts seem to be used primarily by water vendors[3].

[3] There is a need to distinguish vendors bringing water from protected springs and vendors selling water from standpipes. In most cases it is the former that is being described in this thesis and they will therefore be referred to as *water vendors* or simply as *vendors*. When referring to vendors selling water from standpipes, the term *standpipe vendors* will be used.

Table 5.1: Respondents by water sources used the previous day in raw numbers (N= 109).

Source	First source	Second source
Standpipe	49	7
Protected spring	32	11
Unprotected spring	23	4
Rain water	3	1
None	2	

Four respondents had collected equal amounts of water from two sources. In the cases of equal amounts, the principle was to rate the water of assumed worst microbiological quality as *first source*. The reason for this practice was that I was interested in understanding why people were using water of poor microbiological quality. Since the *first source* was the point of departure in question 16 in the questionnaire (see appendix), it was beneficial to register the water use in this way.

5.1.1 Standpipes

The piped water in Nateete comes via a reservoir situated on a hill in the division. None of the respondents had a household tap although three owned a connection just outside the house. The most common way of obtaining piped water was from so-called standpipes. These are just connections to the piped water system, where people come with their cans and pay cash for water. Very often these cans are 20-litre jerry-cans of plastic. Rubaga Division, in which Nateete parish lies, had been a recipient of the World Bank funded development program PAPSCA (figure 5.1). This program ran from 1989 to 1992 and was aimed at improving access to adequate water supply and sanitary facilities for the urban poor. Rubaga Division received 33 standpipes from this program (City Council of Kampala 2002). Since the end of the project, there has been a lack of common understanding as to responsibility for maintenance. According to Kampala City Council (KCC), more than 90 percent of the standpipes provided by PAPSCA are not in function because they have broken down, or due to failure of payment (ibid). Some of them have been taken over by private persons, making water sale a means of livelihood.

The questionnaire survey registered 14 standpipes in use (figure 5.2). Some of them have many customers, while others have few. At the time of the study, the price per 20-litre jerry-can was USH 50, apparently a uniform price among the standpipe vendors but more than three times the price charged by the NWSC for domestic consumption[4]. The calculation excludes the cost of connection to the mains supply, which consumers must bear them selves.

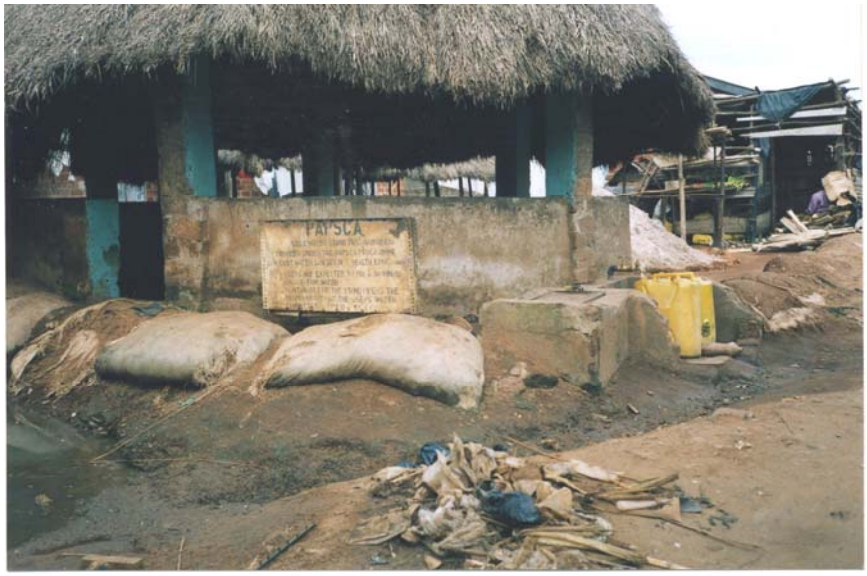

Figure 5.1: Standpipe provided by PAPSCA

This cost is the reason why many households find it hard to afford a household connection. Firstly there is a connection fee of USH 125 000 covering the installation of the meter (Howard and Luyima 1999). In addition, the customer has to cover the cost of pipes from the mains to the household. People are not allowed to lay the pipes themselves, to reduce the potential for leakage. The total cost may therefore amount to as much as USH 500 000, which is a considerable sum even for more wealthy households. Furthermore, obtaining a connection to the network is a lengthy process involving many authorities, all of which may demand money for processing the application. Lastly, the land-tenure system makes it costly to lay a water pipe. Landowners may demand financial compensation, and this in many cases is a hindrance to households wanting a pipe connection. The fact that nearly 90 percent of all land in the division is privately owned, is seen as one of the obstacles to development (City Council of Kampala 2002).

[4] One US dollar is approximately equal to USH 2000

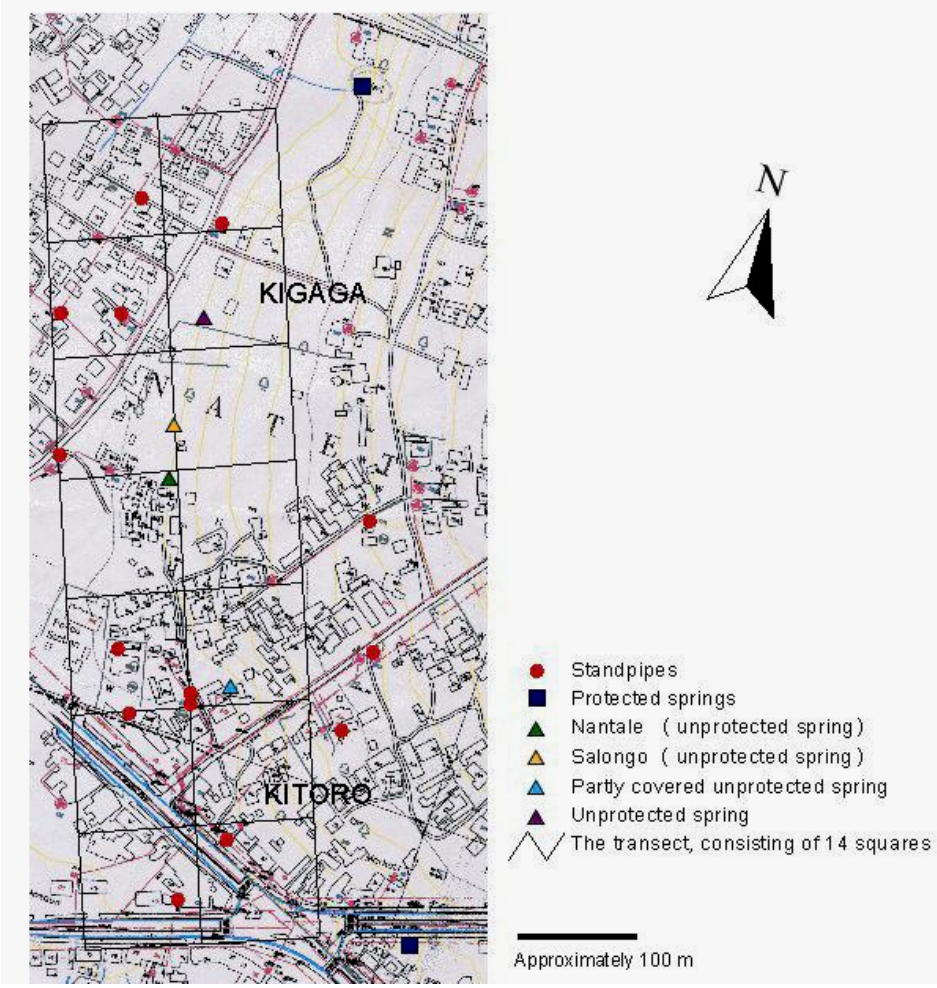

Figure 5.2: Map of water sources in the study area

5.1.2 Protected springs

The protected spring is another frequently used water source. All in all, Rubaga division has 148 of them, which is twice as many as any other division (van Nostrand 1994). In the study area there are two such springs, one in Kitoro and one in Kigaga (figure 5.2). The protected spring is constructed using stones and gravel of different size to filter the water, which runs underground in the hillside. The water accumulates at a collection point, where it is fed from one or more outlet pipes. In Nateete the spring in Kitoro has three pipes, while the spring in Kigaga has two. The water runs non-stop regardless of whether people fetch it or not, as there is no stop-tap. Protected springs supply more water during the rainy season and less during the dry season. Belonging to a natural system, they collect and purify water effectively if well maintained. At the collection point there is a concrete wall, from which the pipe(s) emerge(s) (figure 5.3). Often there are steps down to the collection point, and a concrete drainage channel leads away from the spring.

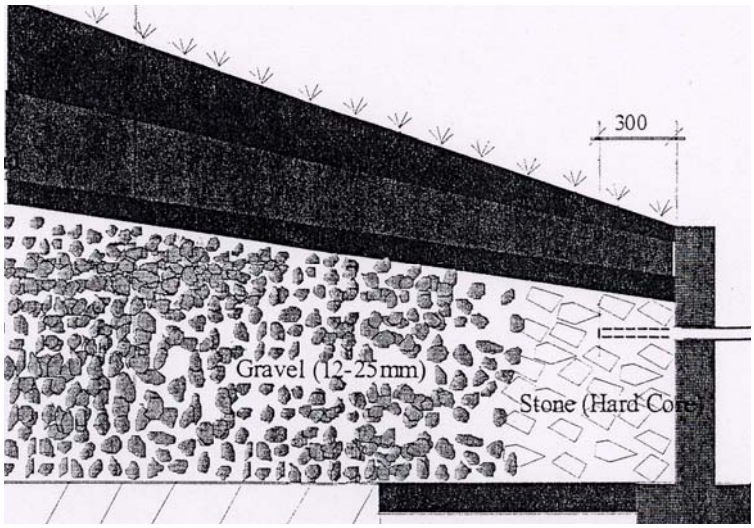

Figure 5.3: Cross section through a protected spring
Source: Howard 2002

At protected springs water is free of charge. This is one of the reasons why many people use them. Even though it is a free good, some people make a profit from this water as well. Vendors, usually being young men, transport water in jerry-cans to households that desire and can afford their service. Regular deliveries may be agreed, e.g. every second or third day. Where no such agreement exists, the customer can call the vendor in the street, asking him to bring the desired amount of water. The price per jerry-can of this service is usually USH 100, twice the price at the standpipes. However, it is important to remember that water is delivered to the doorstep, whereas users have to transport water themselves when buying from a standpipe. No respondents used vendors who brought them water from standpipes. It was very clear that the use of vendors was most widespread in the area around the protected springs (table 5.2).

Carrying jerry-cans with water is heavy and since the price is fixed, profitability decreases with distance. Vendors seem therefore to have a restricted action-space around the protected springs. As already mentioned, the price in Nateete at the time of the study was USH 50 per jerry-can from a standpipe. An increase in vendors' price would probably reduce their competitiveness vis-à-vis standpipe vendors. The former did not seem to be available in the areas beyond a certain distance from protected springs, rather than that people did not choose to use them.

Table 5.2: Households buying from vendors by distance from a protected spring. Percentage of households in each distance zone (N=107).

Distance	Users of water vendors (percent)	Raw numbers
100 - 199 m	30	(10)
200 - 299 m	13	(5)
300 – 403 m	3	(1)

Two respondents were not included since they had not procured any water the day before the questionnaire survey. Persons within each zone: 100-199 m =33, 200- 299 m =38, 300- 403 m =36. The zone from 300-399 m was set to 403 m to include the households furthest away. Chi 10.407. Significant at the 1 percent level.

5.1.3 Unprotected springs and rainwater

The unprotected spring is the third water source used in Nateete. They can be compared to protected springs, but the water is usually of much poorer quality (both visibly unpalatable and microbiologically contaminated). There are four such sources in the study area; three of them are open ponds, while the fourth is partly covered (figure 5.4). Being unprotected they lack the construction characteristics of protected springs. They are merely holes in the ground, dug down to the water table. Two of them have a pond of about 2 m^2, while the other two have a smaller hole. Being open, an unprotected spring is sensitive to environmental changes. In the rainy seasons it carries a lot of water, while in the dry season it can more or less dry up. Depletion can also result from heavy use, e.g. during a certain period of the day. Especially the partially covered spring seems vulnerable to depletion. Most of the unprotected sources in the study area are situated at a considerable distance from the protected springs. Consequently, people may be heavily dependent on them even though the microbiological quality of water is poor. Water is free of charge, but not necessarily free for everyone to use. There seem to be no vendors fetching water from these sources.

Collected rainwater is the fourth source of water. During the rainy seasons, water-fetching practices change considerably. During these, many seem to collect rainwater for domestic consumption. The wealthier have a specially designed water-tank, while others collect it in drums. In more wealthy housing areas rainwater is often used as a back-up source, in case of failure in the piped water supply. In Nateete however, back-up seems not to be the purpose of rainwater collection.

Figure 5.4: Partly covered unprotected spring

5.2 Water quality

Microbiological quality is by many claimed to be a key concern for promotion of good health (e.g. Howard 2002; Drangert 1993). It is therefore the microbiological quality of water that will be focused on in the following section.

5.2.1 Quality of piped water

As already mentioned, Kampala has its raw water intake in Murchison Bay, where there is increasing pollution from the city (NEMA 1997). NWSC therefore uses an increasing amount of money on water treatment. Water leaving the plant at Gaba is of international standard (van Nostrand 1994), but it may become contaminated on the way to the consumer. According to NEMA (1997), there has been poor maintenance of the sewer and water systems for the last two decades. The problem of leakages is not primarily loss of water, but that loss in pressure may allow external contamination to enter the pipes. KUS concludes that it is relatively easy for sewage and household wastewater to enter the water distribution mains. The report also attributes some of the bursts and leakages to the increased pressure after the commissioning of the waterworks Gaba 2 (van Nostrand 1994). Mains bursts are not always reported to NWSC immediately (Wasswa 2002). Leakages may be too small for the NWSC to register a drop in pressure, and it may therefore be long before they are repaired. Meanwhile contamination can enter the pipe.

The greatest change in quality experienced by my respondents, occurred during the morning hours. The complaint was that standpipes brought contaminated water in the morning, when they were first used, as the water had a brownish colour or stain. A NWSC official put this down to corrosion in the pipes due to chlorination. Especially when left stagnant in the pipe during the night, the water may become discoloured. Quality can also deteriorate after cleaning operations and repairs, when contamination may enter the system. Visible contamination does not however appear to be a frequent problem, although infrequent occurrences it influences people's perceptions significantly.

As described in 4.9, I took water tests of several sources in the area. The tests of standpipe water were taken in the morning, but neither of the two days it was the first water that had been tapped. Taken at two randomly chosen standpipes, the tests showed piped water of very good microbiological quality; three of the samples had no counts of *E. coli*, while one test had one count. This is a very low result, compared to unprotected sources were counts up to 4200/100ml were made. Also WSSP found piped water in Kampala to be of very good quality (Howard and Luyima 1999). From a total sample of 1459, 97.5 percent had 0 *faecal coliforms* per 100ml[5]. Considering that many respondents were suspicious of piped water, the results of these tests are interesting.

5.2.2 Quality of protected spring water

Given the right circumstances, protected springs have the potential of delivering water of very good microbiological quality. Sadly this is not the case in Kampala, where *faecal indicator bacteria* is often found in samples (e.g. NEMA 1997; Tumwine 2002; Howard and Luyima 1999; van Nostrand 1994). In my study area, a wetland slum prone to heavy rain and flooding, there is no sewage system. No respondents had water closets, the usual facility being pit latrines often shared by many households. Some do not have access to a latrine at all.

A pit latrine is simply a deep hole dug in the ground, in which people defecate. Since user pressure in many cases is great, the latrine quickly fills up. Some owners solve this problem by opening an outlet pipe, releasing excreta into the environment (Matagi 2002). Outwash also occurs during floods, so that excreta find its way to drainage channels and ground water.

[5] *Faecal coliform* is a often-used term for e.g. *E. coli* and *Thermotolerant coliform*. Howard and Luyima (1999) does not say which *faecal indicator bacteria* they used for this analysis.

In some cases people are hired to manually empty the content of the latrines into the drainage channels. The lack of a sewage system has contributed to a phenomenon called *flying buckets* - people defecate in polythene bags, which they then throw in to drainage channels or wherever they find it convenient. The sum is a very unhygienic environment, with obvious danger to water sources. Protected and unprotected springs are usually found at breaks of slope between the hillsides and wetlands, where the ground water table is close to the surface. As is the case of one of the protected springs in the study area, there are often dwellings with pit latrines on the upward slopes. KCC, Rubaga Division, states therefore that even though a lot of money has been invested in the protection of spring wells, these are now unsafe for domestic use due to ground water pollution (City Council of Kampala 2002).

KCC also faces a huge problem of dealing with garbage, only being able to collect and transport 25 percent of the total amount produced every month to the dumping site at Mpererwe. Furthermore it is estimated that almost 80 percent of the population in Kampala is not served by the KCC (NEMA 1997). Refuse is dug down, burnt or disposed of at unofficial dumping-sites in the neighbourhoods. According to WSSP, seepage to ground water due to poor waste disposal is a most serious threat to protected springs, water quality deteriorating noticeably during the rainy seasons (Howard and Luyima 1999). Lindskog and Lundqvist (1989) have also confirmed the tendency of lower water quality during rainy periods. According to them, the time of survival of pathogens increases with humidity and high rainfall. In addition, WSSP reveals great daily variations in quality following heavy rainfall (Howard and Luyima 1999). In Nateete, the protected spring in Kigaga has garbage-dumping sites in the vicinity, one immediately above it. The protected spring Kitoro has a road and a market upslope from it. Since there are no dwellings in the immediate vicinity, ground water seems not so seriously threatened.

Two pairs of water samples were taken from the two protected springs in the study area. They were taken on the same mornings as the tests on standpipes. Both springs had counts of *E. coli* and suggest variability over a short space of time. There had been rainfall during the two previous nights. On the first test the protected spring in Kigaga had a count of 92/100ml and 120 in the second. This must be regarded as a substantial amount, considering that the national standard for drinking water quality is 0/100ml. Also WHO (1993) states that there should be no bacteria indicating faecal pollution in water intended for human consumption. It should be mentioned that some consider such a demand to be too strict and suggest more

achievable standards (Drangert 1993). Lower counts at the other protected spring in Kitoro, 5 on the first test and 54 on the second, may be due to the fact that there are fewer dwellings nearby. Nevertheless, it must be emphasised that three out of the four of tests show contamination worth noticing, the more so considering that this water is often drunk without having been boiled first.

Poor maintenance may contribute to poor microbiological quality and unpalatable appearance of water. A blocked drainage channel can lead to stagnant water, resulting in contamination of the spring[6]. It may also result in favourable breeding conditions for mosquitoes capable of transmitting diseases like malaria. The area around the spring may also become a source of cholera (NEMA 1997). During my fieldwork, there were clear signs of accumulation in the drainage channels, before being cleaned by voluntary workers.

From time to time community work is organized to improve conditions around the protected springs. The drainage channel leading wastewater away from the source is cleaned and surrounding vegetation is cut back. Under the supervision of a local councillor, people work a certain amount of time before being allowed to fetch water. However, the maintenance work does not seem to be well enough coordinated and defined to ensure a good microbiological quality of the springs. According to WSSP, the problems of protected springs stem both from poor maintenance and poor design. They claim that the backfill medium used is often too coarse and offers little or no filtration. Hence the aggregate does little more than to channel the water from the eye of the source to the outlet pipe, and the result is reduced capacity to deliver water of good quality (Howard and Luyima 1999).

5.2.3 Quality of unprotected spring- and rainwater

Many of the same problems occur at unprotected springs. They are also often located at breaks of slope between hillsides and flat land and are exposed to contamination, particularly after heavy rainfall. Not constructed with backfill media, they are more exposed to environmental pollution than protected springs. At two of the four unprotected sources there are pit latrines scattered in the immediate vicinity: At a source called Nantale the nearest is only four meters away. The result of this is also visible at the collection point. The water is obviously very rich in nutrients, and green algae develop fast. Although cleaned from time to time, two of the unprotected sources were not cleaned before the pool and its walls were full

[6] According to WSSP, vibrios can survive up to 190 days in source waters.

of green algae. At one spring, an accumulation of garbage made very unpleasant conditions (figure 5.5).

Unless they are cleaned frequently, the drainage channels from unprotected springs (which are not concreted) tend to become blocked, leading to similar problems as described above. As mentioned in 4.2, Nateete parish was classified by WSSP as a low income, high density, and mixed water use zone. After the cholera outbreak of 1997-98, a high correlation was founded between these zones and number of cases recorded, indicating a strong link to water quality (Howard and Luyima 1999).

Figure 5.5: Contamination at the unprotected source Nantale

The unprotected sources are cleaned from time to time, an important part of the work being to clear the drainage channel and remove algae that accumulate in the open pool and on the walls of the spring. Work is organised differently from source to source. At a source called Salongo, the households using it share responsibility of cleaning it. Work rotates according to a schedule, and this seems to function quite well as there are not too many households. At Nantale, one man has the responsibility of maintaining it. He cleans the well when he has the opportunity, and is paid a certain amount of money by the users the first time they use it after cleaning. However, what seems clear is that a substantial amount of contamination is accepted before the two springs are cleaned.

In Nateete there seem to be no rules safeguarding the quality of water at the unprotected springs. This is especially the case at Nantale and the partly covered unprotected spring. Both sources have several pit latrines uphill within a radius of 10 metres. Nateete parish is considered to have a high water table, increasing the likelihood of contamination when pit latrines are emptied (City Council of Kampala 2002). In addition there are numerous social practices contributing to degradation of the water quality. It is common to step into the ponds while fetching water, some were said to wash their clothes there, and at the Nantale spring children even bathe in the evenings. People also dip dirty jerry-cans or other utensils directly into the water. By comparison, the jerry-cans are put under the pipe at protected springs.

Not surprisingly, therefore, water samples from the unprotected sources showed large counts of *E. coli*. Three of the unprotected sources were tested, Nantale, Salongo and the partly covered spring. The fourth unprotected source was not tested since only one household was registered as having collected from it. The two sets of tests were made on the same mornings as the protected springs and the standpipes. Counts of *E. coli* from Nantale and Salongo varied from 1500/100ml to 1830. The third spring varied enormously between the two tests, the first being 4200/100ml and the second 100. Heavier rainfall the night before the first test may account for this, although sampling error cannot be entirely excluded. This spring also has the highest number of latrines in the immediate vicinity. Compared to the results from the protected springs, which varied between 5/100ml and 120, these are very high counts. It must be mentioned though, that most respondents seem to use water from unprotected springs somewhat differently from water from other sources. Differentiation in use will be discussed later in the chapter (see 5.4).

Rainwater may also become contaminated at ground level. In many cases storage tanks are open and exposed to pollution, e.g. from air-borne dust, dirty utensils, and dirty hands. Water is often stored for too long in the tank, increasing the risk of bacterial contamination (Wasswa 2002). One sample of tank water was taken. This tank was owned by a wealthier household and was enclosed. The test showed no counts of *E. coli*.

5.3 Contamination after the source

When considering microbiological water quality, it is important to take into consideration the quality at source, how it is being treated afterwards, and how it is being used. A study carried out by the Canadian International Development Agency (CIDA), has revealed the importance

of testing water in households as well. Their test, which was carried out in 1990, showed that stored water was contaminated in two out of three households surveyed (Kendie 1999). The importance of household water tests is also emphasised by Lindskog and Lundqvist (1989). In their study from Malawi they found that water quality in general deteriorated after collection and during storage. It is therefore not sufficient to merely include analysis of the quality at source in this study. If the conditions under which it is stored are unhygienic, the microbiological quality of water may suffer. As an example of how easily for example dirty fingers may pollute water, one milligram of fresh faeces put into a 10-litre bucket of boiled water, can result in a load of 1000 *faecal coliforms* per 100ml (Drangert 1993)[7]. However, Drangert does not say over what period of time this is likely to occur.

One factor that may contribute to contamination after the source is the shape of jerry-cans. They have a small opening, making it difficult to clean them properly. According to an employee at KCC, Rubaga Division, cans are often not cleaned from the time they are bought, until they are taken out of use. It is often possible to see from the outside of cans how green algae are developing on the inside. According to Lindskog and Lundqvist (1989), it is of great influence whether the same or different container is used for drawing and storing water. They write:

> *"The reason why those using the same container for both drawing and storing water had the best water quality is probably that they emptied and usually cleaned the container at the water source. Those using different containers on the other hand mostly topped up water in the storage container without cleaning it. There was then mostly some water left, which was likely to be contaminated"* (ibid:72).

When testing contamination after the source, it is very difficult to predict where the contamination stems from. Water may be clean until it reaches the utensil from which it is consumed, if water from an unprotected spring is used for dish washing. My tests taken from households show great differences. Two of them contained considerable counts of *E. coli*, 160/100ml and 600 respectively, while the third had none. In the first case the water came from the protected spring in Kigaga, while the second came from a standpipe. Interestingly, the sample with the highest count of *E. coli* originated from the standpipe. The samples taken are few, but nevertheless show variations between households. It is especially interesting that the tests from the households using standpipes vary as much as they do, given that the tests at source found practically no contamination. Presupposing that the water with an *E. coli* of

[7] Drangert (1993) does not say which *faecal indicator bacteria* that are used for this analysis.

600/100ml was clean at the source, the relevance of considering contamination after source is clearly demonstrated.

5.4 Differentiation in use of unprotected spring water

Compared to other water studies from Kampala (Howard and Luyima 1999; van Nostrand 1994), this study registered a larger number of people fetching water from unprotected sources. 39 percent of the respondents said that that they used unprotected sources at least once a week during the season when the field study was conducted[8]. Firstly, it was therefore important to find out whether people were aware of the differences in quality that existed between the different kinds of water. Secondly, I wanted to find out whether such recognition led to a differentiation in use. Differentiation between protected spring and piped water will be dealt with in chapter 7.

What seems clear is that people to a large degree recognise the poor quality of unprotected spring-water. The low status of the unprotected springs can be illustrated with the following quote from a respondent:

> **Interviewer:** *In the first interview you told me that you never use water from unprotected springs. Can you explain why not?*
> **Respondent:** *That water is always dirty and does not have a god taste if you want to drink it. It's never sweet.*

Especially during rainy seasons or after heavy rainstorms the visual appearance of this water is less appealing. The result is that unprotected spring water then to a large degree is being treated differently from standpipe and protected spring water. Even though there is a distinction in use during the dry seasons as well, people seem to be a bit less consequent compared to in the rainy season. Consequent distinction refers here both to a clear divide in use and to consistency against making exceptions. During the dry periods, unprotected spring water seems to be more palatable and of better microbiological quality.

From the quantitative survey, people using two sources, one of which was unprotected, reported that they reserved different types of water for different uses. For those collecting water from two sources, one of the sources was usually unprotected, which can be taken as an

[8] As mentioned earlier, the second period of fieldwork lasted from September to November. Most of the interviews in Nateete were carried out from the beginning of October to the middle of November. This was a relatively humid season, but not a rainy season.

indication of a distinction in use. People seem to avoid water from unprotected sources for drinking purposes. Only one household of the 17 using unprotected water in combination with another source reported having used it for drinking. This indicates both recognition of the dangers connected to use of unprotected spring water and differentiation in use. People prefer to use this water for what they term *dirty* or *outdoor activities*. As quoted by one respondent:

> *"Piped water is good, but the other water from the unprotected spring is only used for washing clothes and cleaning jerry-cans. Piped water is used for drinking, cooking and all other sorts of things. On the other hand the water from the unprotected spring, once you even use it for bathing, it sort of itches."*

While there is a common understanding that unprotected spring water should not be drunk, 59 percent of the ones having collected from an unprotected spring had used this water for dish washing (N=27). Thus the level of contamination may still present a considerable health risk. Considering the poor quality of unprotected spring water, it is surprising that a substantial number use it for dish washing. Also the practice of cleaning jerry cans with contaminated water becomes problematic, if these are later used for drinking water.

5.5 Quantity of water

When discussing health aspects of water use, it is important not to focus on water quality alone, as this can happen at the expense of water quantity. The consumption of too little water can represent a health hazard. In an ideal world each household should consume sufficient water of good quality every day. Sadly this is not the case, and it is necessary to accept at the time that water of poor microbiological quality is used for some household purposes. Water for drinking is required in relatively small quantities, but it needs to be of good microbiological quality. Water for hygienic purposes does not need to be of the same quality, but there must be enough of it. Cairncross (in Drangert 1993) has argued that people may benefit significantly by using more water even though it is of poorer quality. As one respondent said:

> *"The unprotected spring is near and free and a lot of water is collected from it. Since it is free we collect as much as we can."*

This illustrates how more water may be fetched when it is free. According to Weber's ([1922] 1999) classification of actions, this collection practice tends towards being the *rationality of ends and means*. Thus collection of unprotected spring water in this case can be classified as rational in Weber's terms.

A study carried out at different sites in Uganda, has revealed that there are great differences in the average use of water per capita between households with and without household connections (Tumwine 2002). Among my respondents, of whom no one have a household connection, all water has to be carried to the dwelling. On average the households used 20.6 litres per person. This is more or less equal to the minimum standard of WHO/UNICEF (2000), of 20 litres per capita per day. However, there were significant differences between households. The amount decreased as the number of household members increased - 25.7 litres per capita in households of 1-3 persons and 15.6 litres in households of 4-12 persons, a difference of almost 40 percent[9]. This tendency has also been confirmed by other studies (e.g. Falkenmark 1982; Tumwine 2002; Lindskog and Lundqvist 1989). I assume there are two important reasons for this. Firstly, the capacity of the household to provide water seems not to be equal to the demand when the size of the household increases. Lindskog and Lundqvist (1989) assert that the consumption of water per household varies much less than consumption of water per capita, with potentially negatively health consequences for large households. Secondly, it is important to keep in mind that the amount of water needed for e.g. washing and cooking does not increase proportionally with the number of people in the household. I simply assume that larger households require less water per person compared to smaller ones.

5.6 Empirical summary

This chapter has mainly been focusing on the water sources in the study area and the contamination in these. With these sources as the point of departure, many of the structures affecting daily life in Nateete have been described. The study indicates that piped water is the most used water source. The respondents were purchasing this kind of water from 14 standpipes, where USH 50 is paid per jerry-can. Piped water seems to be of good microbiological quality, but there were complaints that it from time to time changed colour, or contained foreign particles. The former is probably due to repair works or busts on the network, while the latter probably is due to corrosion in the pipes. Even though not happening on a regular basis, contamination of piped water seems to bother people to a large extent.

The second most used water source according to this study is the protected spring, of which there are two in the study area. In this gravity based system, water is filtered through gravel and stones before it is being collected from an outlet pipe. The water at the protected springs

[9] Number of respondents in the two categories: 1-3 persons: 49, 4-12 persons: 60. One household was omitted from the calculation, since it had collected 400 litres of water and thereby would have disturbed the analysis.

is free of charge, unless water vendors (bringing the water to the doorstep) are hired. These vendors, who seem to be most active around the protected springs, charge USH 100 per jerry-can. Even though the protected springs have the potential of providing water of good microbiological quality, three out of four water tests from Nateete showed noteworthy levels of contamination. Pit latrines and garbage polluting the ground water probably cause most of this contamination.

The unprotected spring is the third most used water source according to the study. However, dependence on this source, which is free of charge, is relatively high in some areas. There are four such sources in the study area. The unprotected spring is also gravity fed with ground water, but is much more exposed to contamination and stagnation of water. The level of contamination was therefore extremely high in five out of six tests taken. The springs are cleaned from time to time, but it seems as if a large degree of contamination is accepted before action is taken. Even though this water seldom is being drunk, a substantial proportion of people nevertheless seem to use it for dish washing. Rainwater is the last kind of water people use. The questionnaire survey registered only a few households collecting rainwater. However, the qualitative interviews revealed that rainwater collection is rather common during times with copious rainfall.

Chapter 6

Use of the water landscape

In this chapter I will be focusing on the *use of the material environment*, which is Simonsen's (1996) second mode (see 3.1.2). The elaboration of research question 1) *How are water collecting practices influenced by the characteristics of the water landscape?* and 1.1) *To what extent can choice of water source be said to be a result of a desire to reduce drudgery?* are central here. Since distribution patterns are focused on, quantitative methodology is to a large extent being employed. However, qualitative methodology will also be present. The chapter starts with restrictions and problems of access which the people of Nateete face in their procurement of water. Thereafter follows an elaboration of how distance, cost and gender relations are believed to influence water-collection practices.

6.1 Restrictions and problems of access to water

"Access involves the ability of an individual, family, group, class, or community to use resources which are directly required to secure a livelihood" (Blaikie, Cannon, Davis and Wisner 1994:48). Water is in this regard without doubt an essential resource. As will be shown in the following section, not all water sources are equally easy to access in the study area.

6.1.1 Accessing standpipes

Some standpipes are more used than others. Some of them have a relatively small number of customers, mainly neighbours, while others attract large numbers. Nevertheless, the pressure at each standpipe is not too great since there are many of them. This is an important reason why many choose to buy water from standpipes. However, queues do form at some standpipes at certain times of day.

From time to time, there are water stoppages at the standpipes due to repair work on the network, cleaning of reservoirs, and power cuts. As mentioned in 5.1.3, people in more wealthy housing areas often have storage tanks as insurance against system failure. Breakdowns have therefore a greater effect in poor areas. Most people in Nateete do not have such tanks, and face therefore acute problems when no piped water is available. In poor neighbourhoods people generally have neither the money nor the space in their compound to

install a tank. As described earlier, most of the people in these areas live in small one-room apartments.

When standpipes fail, people usually resort to the protected springs. If this occurs during the dry season, the situation can be quite difficult. Water vendors often deny access to people who normally do not use the springs. Many are therefore forced to fetch water at night or very early in the morning. As a result of increased demand, the price of water from these vendors rises. The water vendors, operating at the protected springs, are also being discussed by Tønnesen and Bennett (in preparation). Even though Rubaga seems to be one of the divisions with most problems related to dependable supply (Howard and Luyima 1999), water stoppages in Nateete seem fortunately to be of short duration. A NWSC employee also told me that Nateete is an area with quite constant supply compared to some other areas.

Standpipes can also be closed if the owner fails to pay the bills from the NWSC. Every month approximately 200 water-connections in Kampala are disconnected due to non-payment (van Nostrand 1994). Failure to pay is a serious problem for NWSC; in 1997 it was estimated that the corporation was owed USH 24 billion in outstanding debts, almost equal to its annual turnover (Tumwine 2002). Ironically government ministries are the largest debtors, accounting for a third of the total debt. Domestic consumers account for 22 percent (ibid).

6.1.2 Accessing protected springs

A lot of people depend on the protected springs in the study area. There are few wells. As a result there is a good deal of user pressure on the springs. As mentioned in 5.1.2 and 5.1.3, the supply rate of natural sources varies a good deal. During the dry season, both the protected and unprotected springs produce less water at the same time as rainwater is in short supply. Crowding increases as supply declines. The situation is aggravated by the fact that people apparently use more water during the dry season. Respondents, of whom 67 percent totally agreed that they used more water during the dry season, confirmed this. Only 5.5 percent totally or partly disagreed. The main reason, they said, was greater thirst during the dry period due to the heat.

User pressure at the springs varies throughout the day and through the week. 98 percent of the respondents had collected water the day before. Most of them had fetched once. There were however respondents who had fetched four times, probably influenced by the household's need for water and their ability to fetch it. There are two peaks of water collection during the

day, one in the morning and one in the late afternoon. The midday heat is a factor influencing the temporal pattern of water collection. At midday it is simply too hot for many to carry out the task of collecting water. However, the temporal pattern is also influenced by whom the water collectors are. As described in 4.4.1, water collection in Uganda is mostly a job for women and children. This seems also to be the case for Nateete. In households that had fetched water from an external source and consisting of a male and a female household head, only 6 percent of the males had contributed to water collection (N=51).

In an attempt to reveal if there were any distribution patterns of water collection between female household heads and children, households with the following characteristics were analysed:

1. Having fetched water from an external source.
2. Consisting of at least one person between 5 and 18 years[10].
3. Consisting of a female household head.

This analysis revealed that in 62 percent of the cases children had collected water alone. In 23 percent of the cases the female household head had collected water alone, while in 15 percent the task was shared between children and the female household head (N=53)[11]. This indicates a central role of children in water collection, a tendency that also was confirmed through observations in the study area. However, it is important to keep in mind that while the female household head is only one, the category *children* in the questionnaire may encompass many, sharing the burden between them. Therefore the contribution of female household heads to water collection seems still to be important.

According to Tumwine (2002), there has been a significant increase in the contribution of children to water collection during the last 30 years in Uganda. The large participation of children significantly affects the temporal pattern of behaviour. Many children cannot fetch water at midday since they are at school, forcing them to collect water only at certain hours. Crowding therefore occurs at peak hours of the day and during weekends, when the children are not school. This is an example of a *coupling constraint* (Hägerstrand [1970] 1991) influencing water-collection practices. One woman answered this, when asked why she had bought protected spring water from a vendor:

[10] Household heads in this age span were not included.
[11] This category of *children* is a bit problematic, since the definition of children may vary a bit from respondent to respondent (see appendix, question 12). The respondents' use of the category may also vary from the one I have employed for this analysis (a person between 5 and 18 years).

"If there is need and the children have gone to school, then I use the vendors who are always ready."

For this household, water provision is clearly influenced by *coupling constraints* affecting the children. However, provision is also likely to be influenced by the respondents' inability to carry out the additional task of water collection on top of other domestic tasks. This inability may, according to Hägerstrand's ([1970] 1991), terminology be classified as a *capability constraint*. The quote may therefore illustrate how different kinds of *constraints* interact.

Figure 6.1: Tendency of congestion at the protected spring in Kigaga

When collecting water at the protected springs, the people themselves do not actually queue up. They put their jerry-can in the line and wait until it is first. This system eliminates the drudgery of standing in line, but it also makes it easy lose the number in the queue. In the dry season when there is less water available and increased demand for it, the line tends to grow long. A result of the decrease in water-pressure is that it takes a long time to fill a jerry-can, and frustration rises. Vendors, as mentioned usually being young men, exercise control at the protected springs. Here they compete with and dominate the women and children. They may push away jerry-cans that are already lined up or exclude people by physical force. Children especially suffer at their hands and may even become injured. As one respondent put it:

> *"During the dry season, when the speed is low* (of the water, my addition) *we get problems with our children. Whenever they go there, they tend to spend a lot of time there fetching water. They might even forget that they went to fetch water and sometimes they come with injuries because of fighting."*

It is important to understand however that fetching water from the protected springs is the vendors' means of livelihood. It is also important to mention that even though the vendors are especially active during times of pressure, others too may behave dominatingly at the springs.

This exercise of control of vendors at the protected springs is an example of an *authority constraint* (Hägerstrand [1970] 1991) that the people of Nateete face. Since water vendors at times defend this *domain* by force, it then becomes a *domain* protected through use of immediate power (ibid). It seems obvious that the legitimacy of this arrangement is only maintained through the expectancy of external consequences (Weber [1922] 1999). When people let the vendors dominate at the springs, it seems to be only because they fear the consequences if they do not. Since many continuously challenge the dominance of vendors, a low validity of this *legitimate arrangement* is indicated (ibid).

6.1.3 Accessing unprotected springs

Tension may grow at unprotected springs too. This was especially noticeable at the partially covered, unprotected spring, which had limited capacity during the dry season. It seemed to happen regularly that people tried to fetch more water than it was able to provide; and when first emptied it seemed to take about 30 minutes to recharge. At these times, tempers tend to rise among the users. Those living nearby have tried to deny access to others, and from time to time they block it with poles. This well clearly means a lot to people living around it. When a local landowner wanted to fill it in to build more housing units, the neighbours were so strongly opposed to the plan, that he left the well open.

There are clear rules as to who is permitted to fetch water and who is not at one other unprotected spring in the study area. Another landowner, who rents out many dwellings in the area, stipulates these rules. He has constructed two unprotected springs on his land, one of better quality than the other. The worse one - Nantale - is located at maximum distance from the two protected springs in the area. Dependence on it is therefore high. As user demand grew at Nantale, the landowner built a second spring - Salongo - about 40 metres away reserving its use for relatives and tenants. As one respondent put it:

"I use Nantale because its near my dwelling and it's the one which we are allowed to use compared to Salongo, which belongs to other people."

In contrast to the conditions at the protected springs, this restriction of access is a clear example of a *legitimate arrangement* with high validity (Weber [1922] 1999). Interviews and observation confirmed that the rules of this landowner were respected, even though there was no one at the spring continuously controlling the *domain*. During a 30-minute period at midday, I registered 173 litres fetched at Nantale, but no more than 25 litres at Salongo. We see here an *authority constraint* that seems to be respected also without use of immediate power (Hägerstrand [1970] 1991). The *domain* also appears to be both temporally stable and supported by a strong legal status (ibid), clearly differently from the *domain*s at the protected springs.

6.2 Distance and choice of water

There are great differences in minimum and maximum distance between the different sources. The respondents' dwellings are situated between 100-403 meters away from one of the two protected springs. In comparison, the same dwellings are situated from only a few meters up to 122 meters from the nearest standpipe. Table 6.2, shows that the maximum distance to a standpipe lays within the first distance zone in table 6.1. Comparison between so different distance-ranges is therefore difficult, but in spite of this difficulty, I will still try to do this. For analysis of distance and use of water, the spatial analysis with GIS is central (see 4.8).

As earlier mentioned, the study area lies between two protected springs. The area between 100-403 meters was divided into zones of 100 metres. I therefore obtained three distance zones and in each of them I registered the collection of protected spring water. Table 6.1 illustrates that use of the two protected springs seems to tail off with increasing distance, although not as sharply as could be expected. Among people walking themselves (column 1), the decreased use with distance is not significant at the 5 percent level. If collection of protected spring water includes households using vendors (column 2), 64 percent had obtained protected spring water in the nearest zone. In the middle zone, 34 percent of the households were registered as having obtained protected spring water, while this had sunk to 25 percent in the zone farthest away from the springs. Even though there is a decrease in people collecting protected spring water with increasing distance from the source, it is worth noticing the number of people living far away from the springs still using them.

Table 6.1: Households collecting water from protected springs by distance to the nearest protected spring. Percentage of households in each distance zone (N=107).

Distance	Fetching (column 1)	Raw numbers	Fetching and buying (column 2)	Raw numbers
100 - 199 m	33	(11)	64	(21)
200 - 299 m	21	(8)	34	(13)
300 - 403 m	22	(8)	25	(9)

Two respondents were not included since they had not procured any water the day before the questionnaire survey. Persons within each zone: 100-199 m =33, 200- 299 m =38, 300- 403 m =36. The zone from 300-399 m was set to 403 m to include the households furthest away. Column 1: Chi 1.673. Not significant at the 5 percent level. Column 2: Chi 11.568. Significant at the 1 percent level.

It is not sufficient to include only distance to one source in this analysis. When analysing use of a water source, it is also necessary to consider the household's distance to other sources. There is a clear connection between collection of standpipe water and distance to the nearest protected spring. Among those living from 100-199 meters away from a protected spring (closest zone), only 21 percent had collected water from a standpipe. 79 percent of the "standpipe users" were thus located 200 meters or more away from the protected springs (N=56). This illustrates the relevance of *intervening opportunities* (as defined in 3.2.1) on choice of water source.

Multiple regression analysis established that two main variables influence choice of standpipe as water source:

1. The household's distance to the nearest standpipe.
2. The household's distance to the nearest protected spring[12].

These variables together explained 36 percent of the variance in registered collection of standpipe water. Firstly, this indicates the influence of distance on choice of standpipe water. Secondly, the importance of the distance-relationship between the sources has been indicated. Also collection from protected springs is influenced by the household's distance to nearest standpipe (figure 6.2). While 24 percent of the households having a standpipe within 39

[12] 1) Exact distance to nearest standpipe (Beta = 0.609). 2) Exact distance to protected spring (Beta = -0.383). Both significant at the 1 percent level.

meters had collected from a protected springs, this had risen to 67 percent among those living between 80-122 meters from a standpipe.

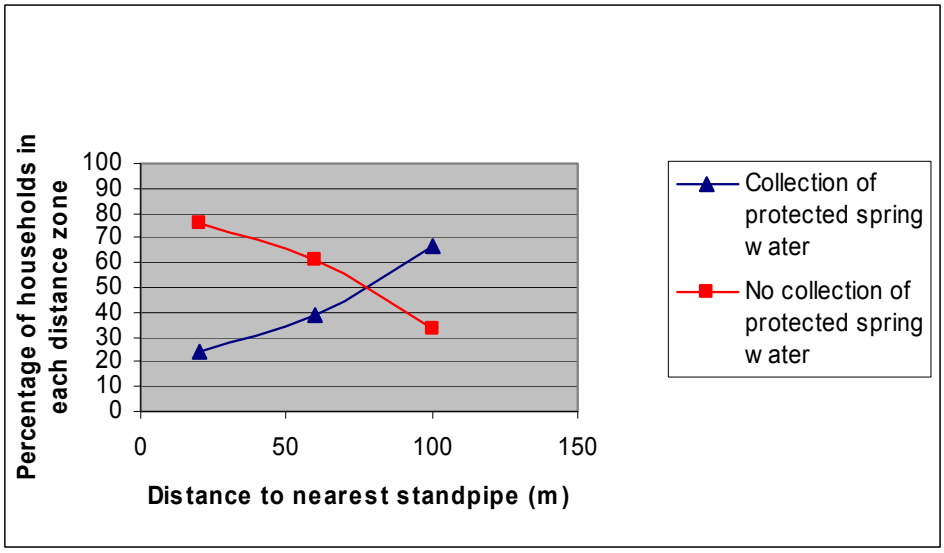

Figure 6.2: Collection from protected spring by distance to standpipe
The dots were set in the middle of each distance zone. Households having used vendors collecting from protected springs are also included in this figure. Persons within each zone: 0-39m = 37, 40-79m = 46, 80-122m = 24 Chi:10.896. Significant at the 1 percent level.

In an open-ended question in the questionnaire, respondents were asked to explain why they had fetched water in the way that they did on the previous day[13]. 66 respondents had included accessibility in their answer for having collected as they had done (the answers were mostly related to distance and congestion). 35 respondents had included cost in their answer, while 19 had included an aspect of quality. It must be mentioned though that this open-ended question targeted only the *first source* among households having collected from two sources. It might therefore be that more respondents would have emphasised the quality of water if also the *second source* had been included. Nevertheless, the open-ended question clearly illustrates the importance of accessibility, of which distance is an aspect, in the choice of water source.

This tendency was also confirmed when making zones of 40 meters away from every standpipe and unprotected spring in the area. Table 6.2 shows that collection of water from both standpipes and unprotected sources is clearly subject to *distance decay* (as defined in 3.2.1). Both have a very high percentage of collectors within the nearest distance zone, but it decreases rapidly in the next two zones. Especially the unprotected springs seem to be mostly

[13] When the household had collected from two sources, the *first source* was the point of departure for this question (see appendix, question 16).

used by people living close to them, a reflection perhaps of the poorer quality of the water. I was not able to carry out a distance analysis during any of the dry seasons. However, it is likely to believe that the *distance decay* from unprotected sources would not have been equally steep then, when the general quality of water is better (including both microbiological quality and palatability).

Table 6.2: Households collecting water from standpipes and unprotected springs by distance to nearest standpipe/unprotected spring. Percentage of households in each distance zone (N=107).

Distance	Collectors of standpipe water (column 1)	Raw numbers	Collectors of unprotected spring water (column 2)	Raw numbers
0 – 39 m	81	(30)	75	(15)
40 – 79 m	46	(21)	24	(9)
80 – 122 m	21	(5)	12	(3)

Two respondents were not included since they had not procured any water the day before the questionnaire survey. Standpipes: Persons within each zone 0-39m = 37, 40-79m = 46, 80-122m = 24 Unprotected springs: Persons within each zone 0-39m = 20, 40-79m = 37, 80-122m = 25. No collection of unprotected water from zones further away was registered. For collection from standpipes the zone from 80-119 m was set to 122 m to include the households furthest away. To make the presentation more understandable this was also done for collection from the unprotected sources. Column 1: Chi 22.628. Column 2: Chi 37.030. Both columns significant at the 1 percent level.

Also the use of vendors can be explained with distance to the source. Table 5.2 illustrated that the use of vendors is most widespread in the areas around the protected springs. However, the use of them is also related to the household's distance to nearest standpipe. Of the 16 households who had used vendors, there was only one who was living between 0-39 meters from a standpipe. This indicates that the vendors are delivering water mostly to households located relatively close to a protected spring, and at the same time not too close to a standpipe. Households located close to a standpipe spend less effort in water collection, probably making paying double for vendors undesirable. This indicates that use of vendors is a practice intended to reduce the drudgery of water collection.

6.2.1 Constraints and distance to source

Hägerstrand's ([1970] 1991) view of the indivisibility of man, where the *somewhere* always is connected to the *somewhere* of a moment earlier, was described in 3.2.1. Here it was also stated that because of *capability constraints*, most activities are mutually exclusive (Carlstein

1982). Especially female household heads in Nateete to a certain degree seem hindered by *coupling* and *capability constraints* in their ability to fetch water from external sources. The main reason may be the numerous daily tasks, both binding them to the dwelling and hindering them in doing the additional task of fetching water. *Coupling constraints* also hinder children, being tied to school as described in 6.1.2. If the *time budget* of a household is tight, there may be a cleavage between *aspiration* and *capability* of the individual (ibid). Collection of water from the nearest source may therefore have a positive effect on the household's *time budget*. A decrease in water collection with distance to the source (*distance decay*) can therefore be taken as an indication of distance-oriented *constraints* in force.

Reusing water involves water being used for more than one purpose. 62 percent of the respondents had reused water the day before, indicating that the distance to the source is significantly influencing water related practices. The more water is being reused, the less water the household needs to collect. Reuse of water has however also a health aspect. The most common way of reusing the water is by first using it for washing of clothes, and then to clean the dwelling. Far less mentioned, but worth noticing, is reuse of water that has been used for body-washing, a practice likely to be connected to health risk.

As shown, distance seems to influence use of water for all sources (figure 6.3). This is especially clear for the standpipes and unprotected sources in the area. For example, of all respondents having used piped water, 70 percent were living within 49 meters from the nearest standpipe (N=56). Equally important as the actual decay, is the very high percentage of collectors among those living close to these sources. This indicates that water that is close to the dwelling tends to be used. Thus, also the influence of *constraints* on choice of water has been indicated.

In Nateete, the protected springs in most cases are located further away than standpipes from the respondents' dwellings. In addition there are longer queues to fetch water at the former. *Capability* and *coupling constraints* are therefore most likely to be in force in connection to use of these. However, the *distance decay* is not equally clear for the protected springs, with a substantial proportion of collectors located far from the springs. It must be mentioned that *second source* collection comprises a larger proportion of the "protected spring collectors", compared to "standpipe collectors" (table 5.1). Since *second source* refers to the source the household had been collecting second most from, this collection is likely to involve less effort

(unless e.g. a vendor is being hired for *first source* collection). Nevertheless, people seem more willing to overcome *constraints* for the protected springs. This indicates that Hägerstrand's ([1970] 1991) notion of *constraints* only can explain a part of the picture. What needs to be elaborated further is how different properties of water influence the choice of source. Cost is one such property.

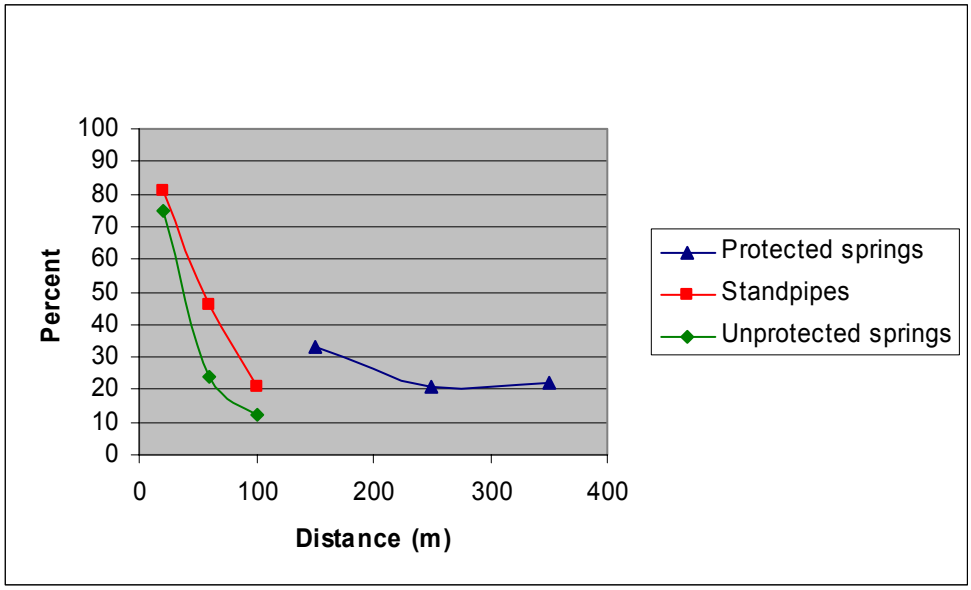

Figure 6.3: Distance decay for three types of water source
Percentage of households in each distance zone (based on table 6.1 and 6.2). The dots were set in the middle of each distance zone. For protected spring collection, the households having used water vendors are not included.

6.3 Cost

The analysis indicates that willingness to overcome distance is influenced by characteristics of the water, differing between the types. Obviously other factors than just distance to source are influencing choice of water source. Even though it has not been a central focus of this thesis, cost is a factor of great importance (Howard and Luyima 1999). As mentioned in 4.2.1, the influence of cost may also be tuned down intentionally by the respondents. It may therefore have been more influential than what was registered in the study.

Since water from protected springs is free of charge, many are willing to struggle against various *constraints* to fetch this water. This may partially explain why use of these did not tail off with distance as sharply as could be expected. While water from the protected springs is free of charge as long as the water is fetched by the people themselves, the water at the standpipes costs money. Actually these customers pay the same price per litre as domestic costumers in Bergen, Norway. Considering the differences in cost level and the tight

economical budget among many in Nateete, it is evident that the cost of water at the standpipes is significant. Given the poor economical situation of the households, collection of protected spring water can be classified as being *rationality of ends and means* (Weber [1922] 1999). If the household has thought the decision through and decided that collection of water from the protected spring is the best way to reach the goal of managing economically, it is therefore a rational action according to Weber. One respondent, collecting from a protected spring, put it this way:

> *"Water from the protected spring is free compared to the piped water system, since it is paid for and expensive for me as a widow."*

As shown, collection from standpipes is more affected by *distance decay* compared to collection from protected springs. Cost can probably partially explain this tendency. Collection of "free water" from either a protected or unprotected spring can thus be a way of saving money for many. To a certain degree there seems to be a directly negative attitude against using money for water, which may lead to use of water known to be unsafe for human consumption. This respondent illustrates this, by explaining his reason for using an unprotected spring:

> "*The well is near the dwelling and I don't want to spend any money buying water."*

Habits may be hard to change, and beginning to pay for piped water, when being used to free water from traditional sources, may therefore be difficult. Deeply rooted traditions of using free traditional sources may therefore affect people's willingness to pay for this commodity. Water is considered to be a free good, not to be paid for. This may also partially explain why the NWSC has such enormous problems of making people pay their water-bills. The influence of traditions on choice of water will be thoroughly dealt with in chapter 7.

Choice of water source is not only a question of willingness to pay, but also one of capability to pay. When analysing the relationship between use of modern and traditional water sources, it is therefore important to consider the poor economical status of many households. Economical scarcity may force people to unfavourable decisions from a health point of view, like reuse of water as just described. A former local counsellor illustrated how people have not stopped using the partly covered unprotected spring, despite warnings about the health dangers connected to the use of it:

> *"The toilets were almost floating there, so that one was closed. You know, eventually they just dug it* (the locals reopened it, my addition). *They dug that one, and they are still using it. It is very bad. Even doctors came and inspected it, and they said: 'This is very dangerous.' But the people they are continuing to use it."*

There were also talks about making this unprotected spring protected, but the people refused. Although this would have improved the water quality considerably, the users protested, fearing that more people would want to use it. There was also a fear that water vendors would invade and dominate it. Facing the possibility of such a development, they preferred to leave things as they were. This illustrates how safety is primarily considered after primal needs have been covered, which is in accordance with the assumption of Douglas and Wildavsky (1982).

Calculating the cost of water for households not having piped water is difficult. As quoted by Tumwine (2002):

> *"Estimating the cost of water is a more complex situation for households without piped connections. It usually involves a direct cash price paid at the source, as well as the time and energy expended in travelling to and from the source, queuing for water and carrying it home"* (ibid:54).

This is a description of costs connected to collection of water from standpipes. Protected and unprotected springs differ from standpipes, since the former two are basically free of charge. However, *constraints* connected to distance and queuing may be more significant here, especially for the protected spring. It is therefore important not to think of water from protected springs as a totally free product. According to Adelekan (2001) strenuous and time demanding water-collection practices can have negative consequences, for example on the school performance of children who have to fetch water in the morning before going to school. She also points out the wasted effort in fetching and queuing for water (both for women and children), efforts which could have been better spent in more productive activities (ibid).

Heavy work is also likely to require an increased intake of calories. Carrying heavy loads of water over distance is a strenuous activity, probably requiring an increased intake of calories (provided that the household can afford it). Tumwine (2002) asserts that due to an increase in water consumption in households without piped water, resulting in an increased amount of trips to the source, there has been a substantial increase in total daily energy expenditure from 1967 to 1997 in Uganda. Total energy expenditure is understood here as calories per trip

multiplied by number of trips. Considering such factors, the difference in cost between water from the adjacent standpipe and protected spring-water may decrease. Choice of standpipe water presupposes of course that there is money available. One respondent gave this reason for having chosen to collect from a standpipe:

> *"Piped water is nearer my place than the protected spring and also you don't find a long line of people waiting. It is time consuming at the protected spring."*

According to Falkenmark (1982), cost seems to be significantly influencing choice of water source. Cost is to her understood as cash payments, distance walked, or time spent waiting in queue. Even though these factors are believed to influence choice of source, Falkenmark believes they are not affecting the quantity of water that is brought to the household. Her assumption seems to be confirmed by this study, which found no differences in fetched amounts of water on the basis of source used. Quantity per capita seemed only to vary according to the number of people in the household, as described in 5.5.

6.4 Variations in practices

Choice of water source is a broad and complex phenomenon. It is not even a stable one, but may change on a daily or seasonal basis. Several factors influence choice of water source. Even though people to a large extent seem to follow routines, there are *constraints* and opportunities that can break such patterns. Household economy is one of these. In a study from another poor housing area in Kampala, 95 percent of the respondents answered that they did not save any money (Kateregga 1996). In Nateete too, household economy seems to a large degree to be built on a day-to-day basis. Lack of money can therefore force a household normally using piped water, to use a protected spring as an alternative. Similarly, a household normally using a protected spring can ease the domestic burden by buying water from the nearby standpipe if they have money available. Another factor influencing patterns is the presence or absence of water-carriers, as described in 6.1.2.

There also seem to be great seasonal changes in the water related practices. As mentioned in 2.3, there are two rainy seasons, one between March and May and the other between September and November. However, in recent years the distribution of rainfall has been more irregular, and during my field period the regular rain characterizing a rainy period had not yet commenced. A consequence of this is that the questionnaire survey registered no more than

four households using rainwater. However, qualitative interviews revealed that rainwater collection was very common during what they described as the wet season. Reduction in household effort seems to be the most important reason for this practice. During this period, they fetched far less water from other sources. As quoted by one respondent:

> *"During the rainy season we usually collect rainwater. The more we collect, the less we go to the protected spring. If we have collected enough, then we don't go there."*

For people usually collecting water from protected springs, the practice of collecting rainwater may reduce the time used on water collection and thus possibly decrease the cleavage between *aspiration* and *capability* (Carlstein 1982). It may therefore have a positive effect on the household's *time budget*. Collection of rainwater does not necessarily lead to a large increase in consumption, since the use of water from other sources seems to decrease at such times. As shown in 6.1.2, people also seem to use less water during the rainy season. For this reason, rainwater must be looked upon as an important water source during certain periods of the year and not just a supplementary one. Copious rainfall seems therefore to change water-collecting practices noticeably.

An initial hypothesis was that the number of users would increase when water from unprotected springs was assumed to become more available (see 1.2). While the supply of water at unprotected springs increased during the rainy periods, the number of springs remained unchanged. Similarly, the hypothesis of more people using the permanent unprotected sources was not corroborated. Rainwater substitution is probably the most important reason for this, although it cannot be ruled out that awareness of the declining quality of unprotected spring water has some influence.

6.5 Gender relations

From this analysis it seems clear that distance and cost significantly influence water-collection practices. However, it is important to keep in mind the influence of gender relations and how these influence *capability constraints* for example. Referring especially to the dominant role of men in households in Ghana, Kendie (1999) asserts that: *"The social context provides inhibiting mechanisms which tend to negatively influence the effective use of the water facilities"* (ibid:16). The low percentage of males registered as collectors of water in Nateete, may be taken as an indication of this. Drangert (1993) writes:

> *"Household decisions are not made on the basis of minimizing total time or energy spent on supplying the household with water, as would be expected of an economic entity. On the contrary, the household is like two separate companies which do not fancy merging vertically. The spouses' tasks are completely separated and it seems more important to uphold this division than to facilitate women's work"* (ibid:250).

Drangert (1993) illustrates how men are worried that means of transport for water, like a bicycle, will threaten to alter the gender base of the task of fetching water. According to him such gender relations often lead to an impasse, resulting in *continuity* and not a *change* that could be of benefit to the household. In Nateete there are many bicycles, but I saw no women riding them. Hägerstrand ([1970] 1991) claims that in the daily life, everyone exists spatially on an spatial island. The size of this island depends on what means of transportation are available. Access to bicycles is one such mean of transportation, capable of making the actual size of women's spatial islands larger. That use of a bicycle may facilitate water collection seems obvious, after all a large proportion of the water vendors use them for transport of water from the protected springs. When writing about vendors, it can just be mentioned that women's competition with these strong men at the protected springs, also illustrate how gender relations influence water collection. This competition for water was described in 6.1.2.

The importance of children as collectors of water has been elaborated, but I was unable to discover any influence of gender composition among children on choice of water source. Neither does the amount of water fetched per person seem to be influenced by this factor. This indicates that girls and boys contribute more or less equally to the collection of water.

6.6 Empirical summary

Since there are a number of standpipes in the area, they are quite available to people. This seems to be an important reason why many choose to buy water from the standpipes. Most restrictions in access are connected to the use of protected springs. Belonging to a natural system, they supply far less water during the dry seasons. This reinforces the tendency of queuing, as it takes longer to fill a can. Unfortunately people also seem to use more water during these times. Water vendors tend to dominate at the spring, at times using physical force to exclude others.

There are also restrictions of access at two of the unprotected sources as well. At one of them, the tendency to exclude others seems clearly related to the capacity of the source to deliver

water. Collection of water has two peaks during the day, one in the morning and one in the afternoon. Children being tied to school during the day is a reason for this pattern, which often results in congestion during peak hours. In general, water collection seems to be the responsibility of women and children in Nateete.

Collection of water from standpipes and unprotected springs is clearly subject to *distance decay*. For the protected springs, the pattern is somewhat different. Even though there is a certain decay from these too, the tendency is much weaker. This indicates that many are willing to overcome distance in order to collect from the protected springs. However, when analysing the connection between distance and use of one water source, it is also necessary to see this source in relation to other sources. The analysis show that collection of standpipe water is significantly influenced by both distance to nearest standpipe and distance to nearest protected spring. Similarly, also collection of protected spring water seems influenced by distance to nearest standpipe.

Cost is a factor significantly influencing collection of water. It may partly explain why many are willing to overcome both distance and congestion in order to collect water from the protected springs. Similarly, cost can probably partly explain why the miserable unprotected springs have not been abandoned. Due to the tight economical situation of many households, economy is to a large degree built on a day-to-day basis. This seems to involve that choice of source also is varying according to the constraints and opportunities determined by the economical situation. Therefore a household may collect from a nearby standpipe if money is available, or be forced to fetch from a distant protected spring during times of acute shortage.

In a wider use of the concept of cost, time and energy used in the provision of water may also be included. Given this use of the concept, use of protected springs may involve a significant cost to many households. This is probably a reason why a substantial proportion chooses to pay for standpipe water, when this involves considerably less effort.

Chapter 7

Ascription of meaning to water and water sources

Even though at a slow rate, the public water network is being extended in Nateete. Thus more standpipes are becoming accessible for the purchase of water. Proximity to the source is of great importance in choice of water, but can only explain a part of the picture. My analysis indicated that willingness to overcome distance varied between the different water sources. It was therefore asserted that an elaboration of the characteristics or properties of water was necessary to explain water-collection patterns.

The influence of cost has already been described. I will therefore now focus on culturally embedded perceptions of water. The elaboration of research question 2) *To what extent can the cultural context explain the slow transition from use of traditional to use of modern water sources?* will therefore be central in this chapter. Even though I am focusing more on meaning of water and to a lesser extent on its symbolic meaning, this chapter can be related to Simonsen's (1996) third mode: *Ascription of symbolic meaning to the material environment* (see 3.1.2). In the elaboration of perceptions of water, qualitative methodology has been central to my understanding. A central point for me is to elaborate on some of the reasons why many prefer water from the protected springs, even though these are of poorer microbiological quality compared to piped water. The chapter starts with a description of some important reasons for the dislike of piped water. The second part of the chapter discusses why people to a large extent do not focus on the microbiological content of water. The main focus of this chapter will on be the relationship between protected spring and piped water, involving that a focus on the unprotected springs has not been prioritised.

7.1 Questioning the quality of piped water

Nateete lie in a sort of transition between two water systems. In the same way as there are both traditional and modern water sources present in the study area, there is also diversity in preference. Three categories were found: One part of the population recognised that piped water was the safest for human consumption, another preferred water from protected springs, and a third group had no clear preference. However, it is important to keep in mind that choice of water does not necessarily correspond to preference. In this chapter much of the focus will be on the group favouring protected spring water, over piped water. Even though

the former was the largest group, it is important not to forget that there also is a group favouring piped water.

While people to a large degree use water from unprotected sources differently (see 5.4), mainly reserving this water for washing purposes, the study revealed no pattern of distinction in use between standpipe water and protected spring water. People seem to use both kinds of water for all purposes. Even though a quite large proportion uses the standpipes, this water has a low status among many. A substantial number of respondents, including people who used piped water, were directly negative towards it. As quoted by one respondent:

"The piped water I use is tasteless. It is just because it's near my home that I use it."

This respondent illustrates how piped water may be used even though it is not preferred. Had it not been for the restricting factor of distance, this respondent would probably have used water from a protected spring. When asked the open-ended question in the questionnaire, of why they had fetched water in the way that they did on the previous day, as many as 80 percent gave accessibility as a reason for choosing piped water. 74 percent stated it as their only reason. No more than 20 percent mentioned any aspect of quality as (one of) their reason(s) for choosing piped water (N=49).

7.1.1 Taste and smell

"Piped water is sort of salty. It is not good for drinking."

This quote from a respondent illustrates a central reason for the dislike of piped water. For people being used to water from protected springs, piped water has a distinct different taste and smell. This seems to influence choice of water source in Nateete significantly. The difference in taste and smell is clearly in favour of the protected springs. People simply do not think that piped water tastes good, lacking the so-called sweet taste of the protected spring. The use of chlorine is probably an important reason why piped water may taste salty and smell offensive. It is therefore an important source of discontent.

"Water from the protected spring is considered safe. One can even drink it without boiling it, compared to piped water which has chemicals."

This quotation indicates that chlorine is not only perceived to influence the taste and smell of water, but that it is also capable of making the water less safe for consumption. Another respondent explained her reluctance towards piped water in the following way:

> **Respondent:** *They say that in piped water they put in chemicals, so I don't want to use that water. Protected spring-water comes from the ground, so to me that is safe.*
> **Interviewer:** *Is it negative that they use chemicals?*
> **Respondent:** *I don't prefer that, I prefer water which is coming from the ground.*

The empirical examples in this thesis illustrate the importance of being aware that the respondents' categories may vary from ones own, as emphasised by Aase (1997). Even though the use of chlorine improves the microbiological quality of the water, it is not perceived as an undivided positive characteristic among my respondents. It is not obvious that people like the taste of clean water (Falkenmark 1982; Howard 2002). Neither does the microbiological content seem to be the most important factor in assessment of water quality in Nateete. Different cultures may value different qualities. Drangert (1993) writes:

> *"Water quality is a concept that includes taste, odour, colour, appearance, softness, temperature, as well as bacteriological and chemical properties. Household members use some or all of these criteria to assess their water"* (ibid:107).

The study of Drangert reveals that clear water may be regarded as being less tasty compared to *milky water*, which is considered to be more filling[14]. *Milky water* is also a term used by the respondents in Nateete to describe good water. This is a term primarily reserved for protected spring water. While protected spring water seems to be regarded as being filling, it was remarked that piped water was sterile or tasteless. This indicates that the clearest water is not necessarily considered to be of best quality. It is interesting to note at this point that the water tests showed on average higher counts on both turbidity and colour at protected springs compared to standpipes. This quote from Douglas and Wildavsky (1982) illustrates how water with a high concentration of particles is not necessarily reckoned as being contaminated:

> *"A river that flows over muddy ground may be always thick; but if that is taken as its natural state, it is not necessarily said to be polluted. The technical sense of pollution is not morally loaded but depends upon measures of change"* (ibid:36).

In 3.3.1, it was asserted that the *stock of knowledge at hand* is the result of all previous experience (Werlen 1993). For many Ugandans the protected spring is the most common

[14] Even though the *milky water* referred to is not clear, it can be sieved through a white cloth without leaving traces.

water source, whether they live in Kampala or in the countryside. Piped water on the contrary represents *change* (Drangert 1993). In Nateete, standpipes have become more widespread only during the last decade. This implies that the respondents in Nateete have a *stock of knowledge* significantly different from those who have grown up with piped water. For the latter, the taste and smell of chlorine in piped water may be totally incorporated and therefore not reflected upon. Due to subjective orientation (Werlen 1993), it can be difficult for this person to realize how piped water appears unpalatable to others.

In Nateete however, a *stock of knowledge* favouring the smell and taste of protected spring water vis-à-vis piped water seems to prevail. It is important to note at this point that the experience, on which people base their understanding and behaviour, also is gained through inheritance from the society (Lindskog and Lundqvist 1989). For a large proportion of the older generation, natural sources have earlier probably been the only alternative, possibly explaining the strong link to these sources among many respondents.

As already described, Weber ([1922] 1999) calls actions that are automated and hardly reflected upon *traditionally bound*. My empirical findings show clear traces of *traditionally bound* actions, especially among those collecting water from the protected springs. The quote below illustrates a collection practice that tends in that direction. It also supports the assumption of Drangert (1993), that *continuity* tends to prevail over *change*:

> "*The protected spring is the one we are used to from when we were young. We are used to fetch water from there, the tap* (standpipe, my addition) *is modern. That is why we use the protected spring."*

7.1.2 Contamination

Even though there are sources of contamination for piped water in Kampala, this water is in general of good microbiological quality. This was corroborated by the water tests I took in Nateete, although variations cannot be ruled out. Given that water from protected springs is often contaminated, it is interesting that it has such strong status vis-à-vis piped water. This reinforces the point that public perceptions of water quality are not necessarily concomitant with scientific knowledge.

There seems to be a genuine fear of contamination in piped water. As described in 5.2.1, there is dissatisfaction with piped water at times coming with visible contamination. Even

though this does not to happen on a regular basis, it nevertheless severely affects people's perceptions of this kind of water. This respondent, feared contamination in piped water caused by bursts in the pipeline network. The discontent was a reason for him to differentiate between water from protected springs and standpipes:

> **Interviewer:** *When you use water from more than one source, do you use some kind of water for some purposes, and other kinds of water for other purposes?*
> **Respondent:** *When I am fetching water both from the protected spring and from the tap* (standpipe, my addition)*, I use them equally. But when it is for drinking, I fetch the water from the protected spring and not from the tap.*

How can the great fear of particles in piped water be understood? Why are considerable amounts of faecal contamination and changes due to rainfall in protected springs not questioned to a larger extent? These questions bring us back to the point of departure of Douglas and Wildavsky (1982), namely a focus on why people agree to react to selected aspects, while ignoring most potential dangers. Beck's (1999) assertion that perception of risk is always contextual and locally constituted is of great relevance in this elaboration.

The less fear of protected spring contamination can be related to the *natural attitude* within which people's actions in the everyday world are being carried out (Werlen 1993). Within this taken for granted frame, the subject is only concerned with the objects that stand out from the unquestioned background. In 3.3.1, it was stated that the process of deciding which objects that stand out is selective and depends on the nature of the subject's *stock of knowledge* (Werlen 1993). Given that people to a large degree are accustomed to the protected springs, this may influence their view on contamination in them. In comparison, the use of standpipes is a newer phenomenon, which involves that people are less accustomed to its kind of contamination. Thus high concentrations of suspended material in protected springs may to a lesser degree stand out compared to contamination in piped water, and explain the greater focus on piped water contamination.

As mentioned in 5.2.2, protected springs are able to deliver water of good microbiological quality if well maintained. Unfortunately, intensive utilisation of land makes protected springs biologically unsafe (Tumwine 2002). In areas not so intensively used there is reason to believe that springs deliver water of better quality. Many of the inhabitants of Kampala have their origins in countryside villages. Over half of the respondents in the quantitative survey had lived in Kampala for 10 years or less. Coming from less densely populated areas they

may believe that water from protected springs in Kampala is of a better quality than it really is. Schutz (in Werlen 1993) asserts that in the *natural attitude*, the world is not experienced as an arrangement of individual unique objects, but in its ideal types. In the case of Nateete, this may involve that people relate to the ideal type of protected spring (maybe as found in the countryside), a traditional water source delivering safe water, while in reality it does not. This can partially explain why many continue to use water of poor microbiological quality. The belief in the capability of the soil can be illustrated with this quote from a respondent:

> "*It doesn't change* (the water, my addition)*, it is always the same. It comes from underground, so it is always the same."*

In 3.3.3, Rinne (2000) described that people preferred water from natural sources, compared to piped water. One reason underlying the greater trust in traditional sources was the feeling of knowing the state of the water source. Due to regular cleaning they were able to predict, and be aware of possible problems. On the contrary, clean piped water could get contaminated in the distribution system due to rusty pipes (ibid). The difficulties of the community in predicting this kind of contamination, contributed in this case to the low status of piped water. There is reason to believe that Rinne's findings are also relevant to this study. The source of contamination in piped water is not easily traceable for the people and contamination can occur without any warning. In an interview with a NWSC official, he commented on the discontent with piped water in the following way:

> *"At times the pipe system, it might be that at a joint is leaking, or it is broken somewhere. Those are points where recontamination can happen. Generally people are now scared, they do not know the source of the recontamination. So you find that a person will just say: 'I prefer spring water to piped water'."*

The inability to recognize the source of contamination may also make piped water contamination foreign. In comparison, visible contamination of protected spring water is closely related to rainfall. This makes it easier both to understand why and when this contamination occurs. Even though people recognise changes in protected spring water caused by rainfall, this contamination seems to bother them less than contamination of piped water. If this assumption is correct, knowledge of the source influences water quality assessment as suggested by Rinne (2000). It also supports Beck's (1999) argument, that unawareness is a source to perception of risk. This respondent, referring to use of a protected spring, can illustrate a feeling of expertise of the water source:

"When it rains like at night, around ten in the morning the mud disappears. Then it starts bringing good water."

7.2 How can a lack of focus on the microbiological quality be explained?

Lack of focus on the microbiological quality of water covers both lack of willingness/ability to focus and lack of awareness. All these aspects will be covered in this section. As described in 3.3.3, an awareness of the microbiological content does not imply people being able to explain the details of disease transmission. It only implies recognition of that there are health dangers connected to use of water with a high content of bacteria.

Interviews with respondents in Nateete and civil servants dealing with water and health indicate a lack of good communication between them. An example of this is that residents claim they are not informed about results of water quality tests. KUS states that water other than piped, in general is tested only when there are complaints from the public (van Nostrand 1994). While tests of piped water are carried out on a regular basis, natural sources are tested quite infrequently in Nateete. When I asked a former local counsellor in the area how people obtained health information, she answered:

"They don't. Unless there is a serious disease, that is when they come."

This quotation indicates that there is not a stable and enduring cooperation between the authorities and the inhabitants of Nateete regarding health aspects. Such failure to inform and create awareness among the public clearly hinders improvements in health safety practices among people. Sporadic and insufficient health information may in worst-cases lead to misunderstandings, illustrated by this respondent:

"I prefer water from the protected spring, because I can drink it even if it is not boiled. Piped water cannot be drunk, according to scientists without boiling, but water from the protected spring one can drink since it is not contaminated."

Public servants told me they found it hard to penetrate in their attempts to sensitise people to health issues. The lack of success is obviously related to the catastrophic state of municipal finances, hindering them among other things in carrying out extensive health programmes. This is an example of how economical scarcity (of the municipality) structure people's perceptions, since lack of resources of the former prevents them from educating communities on health issues. However, the sensitising campaigns, which are carried out meet problems. People do not like to be told what to do by public servants. Some of the explanation to this

problem can be sought in lack of correspondence between the agents involved. In 3.3.1, it was emphasised that the greater correspondence, the greater the chances for intersubjective understanding would be (Werlen 1993).

Different orientations to water between public servants and respondents can explain some of the problems of the sensitisation process. While public servants are more oriented towards a *theoretical attitude*, emphasising the microbiological content of water, the respondents in Nateete seem more oriented towards a *natural attitude* (ibid). Laying aside or bracketing the doubts that objects are otherwise than they appear, is one distinctive characteristic of the *natural attitude*. Another characteristic is that the realm of reality is primarily comprised by the world that is directly accessible to perception (ibid). This is also in accordance with the findings of Drangert (1993), Rinne (2000) and Shaw (2003), all emphasising the importance of appearance in assessment of water quality. Water of poor microbiological quality can therefore be classified as safe water, as long as it appears visually palatable. Even though the "attitudes" of Schutz (in Werlen 1993) were not present in their ideal form in Nateete, I found clear traces of a *natural attitude* towards water. This quote from a respondent illustrates the importance of visual appearance in quality assessment:

> *"I just look at the water. If it looks colourless, I determine the water to be clean."*

The nature of the *natural attitude* may thus explain why there is a lack of focus on the microbiological quality of water in Nateete. By elaborating how the *natural*- and the *theoretical attitude* can lead to different views on contamination, some of the problems of communication between civil servants and the respondents can be addressed.

When studying people's reception of public advice, it is also important to take into consideration their bacterial tolerance. Over time people using traditional sources develop resistance and may not become ill after drinking contaminated water. WHO (1993) states that the immunity of the individual, in combination with the invasiveness and virulence of the pathogen, determines the likelihood of a successful challenge of a pathogen. When asked whether people became sick after drinking water from protected springs, a former local counsellor answered:

> *"Very few. I don't know how God created them. That God just helped them, because they don't boil. They are lucky."*

Whether "luck" or resistance, it makes it harder for the authorities to sensitise people to the importance of consuming boiled water and the use of safe sources. In 3.3.1, it was described how disequilibrium may lead to an adjustment of the *stock of knowledge* of the agent (Werlen 1993). High bacterial tolerance is a factor capable of hindering such a process. The result may be continuous use of water of poor microbiological quality. An elderly man, answered this when asked whether he experienced any problems in using water from an unprotected spring for drinking and cooking:

> *"I don't face a lot of problems with the water. The only problem is that the water does not have the taste like the water from the protected spring. That is the only problem I have. We Africans are people who have grown with this culture of drinking that kind of water. There is no bad problem with it, there is no problem actually."*

This quote supports the assumption of Lindskog and Lundqvist (1989), that the experience of surviving despite warnings from outsiders is influential to water related practices.

NEMA (1997) states that: *"Malnutrition and lack of clean drinking water and sanitation cause frequent occurrence of gastro-enteritis and high mortality among children"* (ibid:53). It is however important to consider that these calculations are made by a scientific organisation. A possible consequence of this is that what appears as a high frequency of sickness to them, may not be considered equally high by the people in Nateete. Since the *stock of knowledge* is a result of all previous experiences (Werlen 1993), it is likely that a high frequency of sickness is integrated into the *stock of knowledge* of people without access to proper toilet and water facilities. Without doubt the people residing in such areas are aware of and bothered with sickness, but compared to a wealthy person they will probably be more accustomed to and possibly accept a higher frequency of sickness.

It is only when risks are clearly brought to consciousness that they can be said to constitute an actual threat (Beck 1999). Physical resistance and adaptation of the *stock of knowledge* described above may be two factors hindering development of consciousness to the risk of consuming water of poor microbiological quality. It is also likely that awareness of the link between water and health is brought more into focus during or immediately after epidemic events. This is also the period when organized health work in the community seems to be most active. WSSP states:

> *"It is likely that compliance with boiling will be much higher during and in the immediate aftermath of an epidemic as such events represent crises for the family. Outside such events, the perception of the family may be that the importance of boiling is greatly reduced"* (Howard and Luyima 1999:45).

From the paragraphs above it may seem as though the *stock of knowledge* is static, thereby hindering changes in practice. This is not the case however, as it is continuously developing in accordance with the experiences of the person. One respondent answered this, when asked why she thought it was important to boil water:

> *"Before I always got fever, I always got sick. So I went to the hospital and the doctor told me that maybe it was because I drank unboiled water. That is why I boil the water."*

It can be said that in the taken of granted world of this woman, consumption of unboiled water was not reflected much upon. However, the continuous sickness made her go to the doctor and this consultation resulted in a change in *stock of knowledge* (Werlen 1993). The quote also illustrates the importance of *events* (in this case the encounter with the doctor) in the process of changing the way of thinking (Lindskog and Lundqvist 1989; Drangert 1993).

Beck (1999) describes how better knowledge can become the source of new risks. A far-reaching consequence of this is that everything falls under the imperative of avoidance. There is obviously a difference in *stock of knowledge* between the authorities, setting the national *E. coli* standard in drinking water at 0/100ml, and the inhabitants of Nateete. The former may have a lot of knowledge about the dangers of contaminated water, resulting in great attention to these issues. There seems not to be an equal awareness among the inhabitants, a fact that may explain the low attention to microbiological contamination. As already mentioned, Beck (1999) asserts that also unawareness may lead to perception of risk. However, unawareness of microbiological contamination does not seem to lead to a perception of risk in this case.

7.2.1 How safe is safe enough?

The answer to such a question is not self-evident, but is a result of social construction and therefore contextually dependent (Beck 1999). Beck states that risks are related to the cultural definitions of standards of a tolerable or intolerable life.

> *"Dangers are integral to normal consumption habits. And yet they are and remain essentially knowledge-dependent and tied to cultural perception, whether they are manifested as alarm, tolerance or cynicism"* (ibid:143).

If the *stock of knowledge* is a result of previous experiences, knowledge in Nateete will be influenced by a culture of poverty. This entails that compromises are necessary to make ends meet. Concern for the microbiological content of water seems to suffer in this context. What is viewed as an intolerable level of *E. coli* by a public servant, is thus viewed as tolerable by the inhabitants. This indicates that Nateete to a large degree cannot afford to be a *risk society*. As claimed by Rose (in Beck 1999), the *risk society* has a flavour of wealth and security.

As mentioned in 3.3.5, it is important to be aware of how an action not necessarily can be classified as *traditional bound* or *rationality of ends and means*. On the contrary, Weber ([1922] 1999) emphasises that the sub-categories of action often are being combined. Especially social action is seldom only oriented after one or the other (ibid). Consumption of water from the protected springs is therefore probably not only *traditional bound*, but also influenced by a *rationality of ends and means*.

When asking respondents whether they did anything to the water before drinking it, 94 percent answered that they usually boiled it. There is reason to believe that this percentage is too high. This suspicion was confirmed during the qualitative interviews. WSSP concludes as following:

> *"...whilst most households accept the need for boiling, a very significant proportion of household do not translate this into practice. Boiling of drinking water has in many ways become a socially desirable response for low-income families where questioned about household management of water but not something that is being perceived as being essential"* (Howard and Luyima 1999:44).

Also Kateregga's (1996) study indicates that boiling is not prioritised. 72 percent of the population of Kampala district use charcoal for cooking (NEMA 1997). Charcoal is considered to be expensive, since a bag costs USH 8 000. Boiling water is therefore costly as well as time-consuming. Instead of a single focus on the boiling of water, WSSP has encouraged a greater emphasis on the promotion of safe sources and handling after source (Howard and Luyima 1999). Respondents admitted that they tended to quit boiling when they were very thirsty and there was no boiled water available. This was especially true in the dry season, when they were bothered with heat and dust. This is also the season they consider

protected spring water to be of best quality (which is confirmed by ibid). As one respondent put it:

> *"If I have charcoal I boil it. If I don't have charcoal to boil, I just drink as long as it is from the protected spring"* (comparing water from protected and unprotected sources, my addition).

In 3.2.2, Lindskog and Lundqvist (1989) asserted that knowledge is of little use unless the agent has the opportunity to apply this knowledge. They further asserted that knowledge about the dangers of using water of poor quality, may not necessarily be enough to change behaviour. It is worth noticing that my study from Nateete found no relationship between level of education and choice of water. This respondent illustrates how choice of water of poor microbiological quality can be a result of different factors and not necessarily of knowledge:

> *"We like piped water, but cannot buy it because my father doesn't have money. The protected spring is far away from us. That is why we use water from the unprotected spring."*

Choice of water is obviously influenced by the poor economical situation of the household. However, it is also possible that perception of water quality is affected by this variable. If the selective process of deciding which objects that stand out is dependent on the *stock of knowledge* (Werlen 1993), then economical scarcity is a central part of this stock for the people of Nateete. Even though the various factors described in this chapter are likely to affect people's attitude to piped water, use of "free" water without doubt may be perceived to suit the economical situation of the household well. Obviously pragmatic motives, characterizing the *natural attitude*, are present when decisions about water use are being taken. The necessity of saving money is one such pragmatic motive.

In 4.2.1, the methodological problem of respondents emphasizing the qualities of the protected spring due to pride was described. However, such an adaptation of perception of water quality need not be a conscious process. In 3.3.1 social reality was described as meaningful construction by subjects (ibid). Perceiving piped water, which one cannot afford to be of questionable quality, is an example of such a construction. Similarly indications of poor quality in the protected springs may be ignored due to the economical situation of the household. In such cases, the agent can be said to seek information that reflects his or her needs and values, which is in accordance with the assumption of Walmsley and Lewis (1993).

Even though there are clear connections between culture and cost, as illustrated in the preceding paragraphs, the two will be treated separately in the next chapter.

7.3 Empirical summary

The study found no pattern of distinction in use between water from standpipes and protected springs. A central aim for this chapter has therefore been to elaborate the reasons for this tendency. The chapter began with an elaboration of the reasons for dislike of piped water in Nateete. An important reason for this dislike is related to the taste and smell of piped water. Protected spring water is to a large extent reckoned to be more palatable. On the contrary, the taste and smell of chlorine appear offending to many. Another cause for discontent is the contamination occurring in piped water. As mentioned earlier, piped water is in general of good microbiological quality. However, this water at times changes colour and other times contains particles. It is assumed that the inability to predict and understand this kind of contamination is an important reason for the scepticism to piped water.

The latter part of the chapter has focused on why there to a large extent is a lack of focus on the microbiological content of water in Nateete. Some of the explanation can be found in the lack of good cooperation between the authorities and the respondents. This seems to be related to both the quantity and quality of cooperation. It is believed that some of the lack of focus on the microbiological content of water can be related to an understanding of reality emphasising visible facts. Further, bacteriological tolerance is believed to be a central factor hindering more attention to this issue. However, one must not forget that economical scarcity is a limiting factor on the number of choices. Water from traditional sources may therefore be chosen on this basis.

Chapter 8

Discussion and conclusion

After the elaboration of the empirical findings in the preceding chapters, I now wish to round off this thesis by discussing the research questions in light of these findings. Furthermore I will illustrate how the agent relates to the *subjective*, *physical* and *social world* in the process of water collection. At the end of the chapter, I state what I believe are the most important contributions of this thesis. In this section topics for further research will also be suggested.

The question of determinants to water collection is not a question of structure **or** agency, but rather of how these work together. As described in 3.3.1, Schutz (in Werlen 1993) asserts that there are two main components of the action situation. The first is the *ontological structure of the pre-given world*. This involves that the agents are influenced by some conditions, which are outside their sphere of influence (ibid). The second component of the action situation, according to Schutz, is the *biographical circumstances of the agent*. This means the nature of the *stock of knowledge* at the time of the projection of the act and the action (ibid). It is therefore not a question of whether it is distance to the source or the cultural context that determinates choice of water, but how they interact. It is also important to keep in mind that given the differing *stocks of knowledge* and different spatial position in the *physical world*, the reasons behind choice of water source vary among the respondents. But let us start the elaboration of the research questions, by focusing on research question 1: *How are water collecting practices influenced by the characteristics of the water landscape?*

The characteristics of the *water landscape* have a number of influences. One basic characteristic of the *water landscape* in Nateete is that the different sources are exposed to different kinds and degrees of contamination. Particularly exposed to contamination are the unprotected springs, being open systems. The level of microbiological contamination is high and algae blooms occur frequently. The water is therefore very unhealthy for human consumption. This significantly influences both the extent to which this water is used and the way it is used. It can therefore be said that the vulnerability of unprotected sources (being a characteristic of the *water landscape*) influences water related practices. In protected spring and standpipe water, the level of contamination is much lower compared to unprotected springs. However, both protected springs and standpipes are subject to contamination for various reasons, issues that will be dealt with later in the chapter.

One of the research questions is concerned with the degree to which people differentiate between water from different sources (2.1: *To what degree do people differentiate between water from different sources?*). As shown, people to a large extent use unprotected water only for certain purposes. For those collecting water from two sources, one of them is usually an unprotected spring, indicating differentiation in use. The negative characteristics of the unprotected springs are reinforced during the rainy seasons, leading to a more consequent distinction in use compared to in the dry seasons. This water is most often used for outdoor activities like washing and very seldom for drinking. However, a large number of people use this water for dish washing. The study found no pattern of distinction in use between protected spring- and piped water. Most respondents seem to use both kinds of water for all purposes.

Limitation in supply from traditional sources is a characteristic of the *water landscape* in Nateete, and this too influences water-collecting practices. Firstly, protected and unprotected springs deliver less water during the dry seasons, causing congestion at the source during these times. Secondly, the limited number of outlet pipes at the protected springs influences congestion at the source. These characteristics clearly contribute to making water collection a time demanding activity, thus affecting the choice of water source.

Another important characteristic of the *water landscape* is that the water sources are point sources, making them much easier to control than if they had been streams. This allows *domains* of power and *authority constrains*. Upholding a *domain* along a river would probably have been much more difficult. Therefore it can be said that the sources being points (a characteristic of the *water landscape*), influences water-collection practices.

The drudgery of water collection is not only a question of the conditions at the source, but also of distance to it. As shown, the study indicates that people living close to a water source tend to use this source, especially so if there are no competing sources nearby. Collection from all sources is subject to *distance decay* (as defined in 3.2.1), even though the tendency is clearer for the standpipes and unprotected sources. For example, the long distance to both nearest standpipe and nearest protected spring is an important reason why people around Nantale tend to use this unprotected spring, despite having knowledge of the contamination it contains. This clearly illustrates how the desire to reduce drudgery influences water-collection

practices, which is the focus of research question 1.1: *To what extent can choice of water source be said to be a result of a desire to reduce drudgery?*

People try to reduce the effort in many ways. Besides choosing between different external water sources, they use adaptive strategies such as hiring vendors, collecting rainwater and reusing water. The existence of vendors can be seen as a direct consequence of the lack of household connections to the piped water supply. Buying water from vendors is therefore an adaptive strategy of the household to a characteristic of the *water landscape*. Collection of rainwater, common during rainy periods, indicates that people seize the opportunity to reduce the toil and cost of water collection whenever possible. The same can be said about the practice of reusing water. All three examples show that water collection is influenced by the characteristics of the *water landscape*.

Without doubt reduction of drudgery is important in choice of water source. An increase in the number and distribution of standpipes will therefore probably cause to more people using piped water. However, collection patterns can also be partially explained by the cultural context. As already mentioned, people do not seem to differentiate in use between piped and protected spring water. This actualises research question 2: *To what extent can the cultural context explain the slow transition from use of traditional to use of modern water sources?*

It seems clear that people to a large extent mostly buy water from standpipes when it is considered to be the best opportunity. This choice is most likely to occur when use of a standpipe represents considerably less hardship than collection from a protected spring. However, people seem more willing to overcome *constraints* in order to collect water from protected springs. Cost can explain much of this tendency. It is therefore important to recognise how economical scarcity is a factor that structures behaviour (thereby water-collection practices). Nevertheless, protected spring water also seems to appear more palatable to people. An initial hypothesis was that when water from natural sources was used, this was more a question of necessity and than of preference (see 1.2). This assumption seems to be the correct for use of unprotected spring water. Use of water from protected springs however, seems to a larger degree than I assumed to also be based on preference. Cultural context needs therefore to be taken into consideration. This indicates that Hägerstrand's ([1970] 1991) approach through *constraints* is of relevance, but not sufficient.

Even though there is a group cherishing the improvements connected to piped water, a general problem is that most people seem not to recognize the improvements in microbiological quality that it offers. Chemical treatment, intended to ensure quality, is to a certain extent perceived as having a negative influence on taste and smell. People do not therefore put extra effort into collecting piped water. Its use seems largely to be a matter of convenience. Lindskog and Lundqvist (1989) have focused on the success of development programs. According to their view, if people had started using piped water on the basis described above, it could be classified as a changed practice, without the message having been understood. In their terms this is not rational behaviour, in the sense that practice does not correspond to comprehension of the message. They further assert that this kind of behaviour requires attention, since it jeopardises the expected outcome of development projects (ibid).

In his study of communities heavily dependent on traditional water sources in Tanzania, Drangert (1993) revealed that improved quality was a weak incentive for *change*, since few respondents were dissatisfied with the quality of water. This also seems to be the case in Nateete, where people in general are not dissatisfied with the quality of protected spring water. Negative remarks about water quality were aimed primarily at unprotected spring water and secondarily at piped water. Consideration of quality is probably not the single most important reason why people choose to overcome great distance to fetch protected spring water. However, they seem to be less willing put effort into fetching piped water due to a combination of culturally embedded perceptions in its disfavour, a lack of recognition of the health advantages it offers, and cost. In this context many stick to the protected springs.

When a substantial number of people choose to overcome significant distance to collect from the protected springs, this can be explained with the relationship between the number of opportunities at the protected spring and the opportunities between the household and the protected spring (*intervening opportunities,* as defined in 3.2.1). In this case lack of cost and possibly preferred water seems to be the opportunities at the protected spring, while the unprotected springs and standpipes (potentially being *intervening opportunities*) offer water that to a certain degree seems not to be preferred. In the case of standpipes, this water also costs money. Thus piped or unprotected spring water may not be perceived as an attractive *intervening opportunity* to the protected spring. This respondent, a primary school teacher, illustrates how piped water is used most of all because it is considered as the most convenient option. The quote thereby also illustrates the close link between structure and agency.

> **Interviewer:** *Lets imagine that the standpipe you have down here, was a protected spring. Would you have used it in the same way as you are using the standpipe now, or would you have changed how you fetch water?*
> **Respondent:** *Yes, I would have used it. I don't even give it a second thought. I would have used it like I use the tap* (standpipe, my addition).
> **Interviewer:** *So you wouldn't have gone further to get water from another standpipe?*
> **Respondent:** *No, I wouldn't have done that.*

The influence of the *natural attitude* (Werlen 1993) has been elaborated. Two characteristics of this attitude are of special interest. Firstly, the agent tends to lay aside the doubt that objects are different from how they appear. A consequence of this is that the reality directly accessible to perception is emphasised. Secondly, pragmatic motives are characteristics of this attitude. The emphasis of visual appearance in assessment of water quality may seem to slow down a transition from protected springs to standpipes. It also seems to be important in explaining the apparent lack of focus on the microbiological content of water. However, people also seem be more comfortable with visual changes in protected spring water compared to piped water. I assume one reason for this is that they understand more easily when and why protected springs are contaminated. On the contrary, contamination in piped water may be difficult to understand and predict, seemingly bothering people to a certain extent. This scepticism illustrates how water-collection practices not only result from characteristics of the *water landscape* alone, but also from the agent's ascription of meaning to water and water sources. The same can be said about people's relaxed attitude to contamination in protected spring water. It also supports the assertion of Beck (1999), that perception of risk is culturally influenced.

As mentioned, choice of unprotected spring water seems to be the result of a desire to reduce cost or drudgery. However, the prevailing economical marginality of the community can also be said to be a part of the cultural context in Nateete. The issue of cost is thus influenced by cultural context. Choice of water may therefore be a compromise, where a source is chosen despite knowledge about contamination. Thus unprotected spring water may be considered as being good enough for a number of purposes, also to a large extent dish washing. Again we see how economical scarcity is a factor that may structure collection practices. Even though people in general do not seem to fear contamination of protected spring water, the same mechanism may also influence choice of this water source. This exemplifies how cultural context, of which the economical marginal situation of many households is an aspect, slows

down the transition from traditional sources to piped water. It also illustrates how the basic needs have to be covered before safety is being considered (Douglas and Wildavsky 1982).

Werlen (1993) asserts that the spatial position of the agent is an important factor influencing the action situation. This seems also to be the case for water collection in Nateete. Unless people become much more aware of the health benefits of consuming piped water, it is likely that increased distribution of standpipes will have different outcomes in different parts of the study area. In areas far away from the protected springs, collection practices may change more than in areas closer to these springs. With greater distance to the protected springs, new standpipes will there probably to a large extent become an *intervening opportunity*.

However, in areas closer to the protected springs, where the difference in strain between the two sources is less, cost and culturally embedded perceptions are likely to influence water-collection practices considerably. Of course the advent of piped water in areas close to protected springs will undermine to a certain degree the trade of water vendors delivering from protected springs, but I believe that cost and culture will still slow down the process of *change* in these areas. Nevertheless, the cultural context seems most likely to hinder a transition from protected springs to piped water when use of piped water does not offer significant benefits in reducing effort. This illustrates how water-collection patterns in Nateete are influenced by both structure and agency.

8.1 Werlen's model of the 3 worlds and choice of water

In the preceding chapters it has been my aim to show how choice of water is a result of various factors. I now wish to illustrate how these different aspects may be integrated into a holistic model. For this purpose I have chosen a model of Werlen (1993), built on the works of Schutz (figure 8.1). I will not repeat all my empirical findings; neither will I try to incorporate all the theoretical approaches previous described. I nevertheless mention some empirical findings and some theory here for two reasons: Firstly, I wish to illustrate how the model of Werlen is able to incorporate many of the theories I have employed, and secondly, I wish to illustrate how the agent in the *natural attitude* takes into account the *subjective*, *physical* and *social world* in the process of action. As asserted by Werlen (1993):

> *"All agents are distinguished in their own life-worlds by their specific positions in the social world, the particular constitution of their stocks of knowledge, their current stage in their life cycles, and their spatial position in the physical world"* (ibid:125).

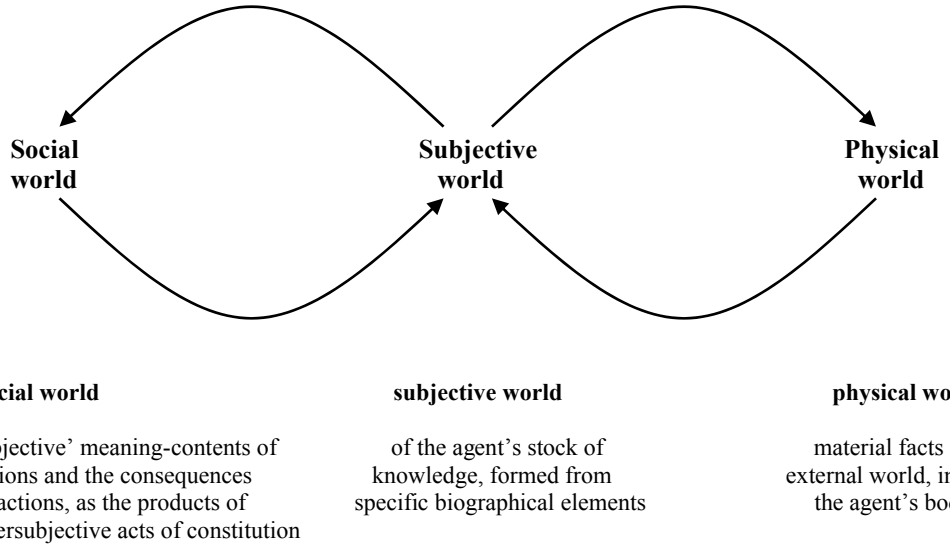

Figure 8.1: Werlen's model of the three worlds (adjusted version)

The subjective world consists of *"…the agent's subjective consciousness in the form of the stock of knowledge at hand"* (ibid:74). The nature of this stock has been described earlier. Here it must suffice to repeat that it is only that part of the background knowledge the agent uses for the interpretation of the action situation that is being evaluated. In the process of action it is not only the *subjective world* that is taken into consideration. This world relates both to *the physical* and *the social world*.

The physical world describes material facts of the external world (ibid). The form and character of the *water landscape* in Nateete is thus a central part of *the physical world* in this study. It is of particular interest that all respondents have to carry water from the source to the dwelling. Schutz (in Werlen 1993) sees the location of the body as the centre of all activities directed towards the outer world. As in the *time-space perspective*, this approach takes into account the locational dimension of human activity. This indicates a link between the works of Schutz/Werlen and Hägerstrand's ([1970] 1991) approach through *constraints*. According to Schutz, the constitution of *the physical world* takes place through the conscious self's experience of his or her own body in movement. This is done when the agent brings things from the outer world into his or her sphere of action and uses them as means or goals for subjective action. Water may be regarded as one such thing that is being brought from the

outer world, indicating the importance of distance to the water source. The relevance of the form and character of the *water landscape* (*physical world*) has thus been illustrated.

The social world is the third world the agent takes into consideration. In order for successful interactions to take place, the agent has to communicate with other subjects regarding the meaning content of subjective actions (Werlen 1993). In this way, *the social world* is being connected with *the subjective world* in the process of action. The agent's orientation towards *domains* (Hägerstrand [1970] 1991) at some water sources is an example of this. According to Werlen (1993), the agent will always refer directly or indirectly to the *defined reality of physical things* (Schutz's concept), with every definition of an action situation. It is possible to see similarities between the concept of the *defined reality of physical things* and Beck's (1999) assertion that "risk" and the "public definition of risk" are the same. In Nateete it is considered to be a meaningful action to collect water from protected and unprotected springs. Water from the former is also drunk, since the *defined reality* of good water seems more based on palatable appearance than on microbiological quality. In the same way, the *defined reality* of piped water seems not to be exclusively positive.

8.2 Concluding remarks

During a research process a number of choices that influences both the study and the end product are made. I have chosen to combine quantitative and qualitative methods. The use of these has without doubt provided me a good insight in water-collection practices in Nateete. However, there are also benefits of going in depth with either quantitative or qualitative methodology. I will therefore now suggest some quantitative and qualitative approaches for further study of water-collection practices.

For instance, especially my quantitative survey has been very focused on the season when the fieldwork was carried out. It would have been interesting to do a comparative study during another period of the year (e.g. during the peak of a dry season). In this way the influence of seasonal difference could have been covered more extensively than I was able to. Similarly, it would have been interesting to do repetitive quantitative surveys within one season as well, to focus on how collection practices vary.

There are also important aspects that would have been interesting to cover with in-depth qualitative interviews. One such aspect is the high mobility of people living in areas like Nateete. How does this affect their perception of the neighbourhood and does this affect water-collection practices? This study has to a large extent focused on choice of water. A second aspect that would have been interesting to focus more on is how water is being handled after it has been collected. The third suggestion for further qualitative research is to approach perception of water through semiotic analysis. For example a term like *milky water*, as described in 7.1.1, without doubt attracts my attention.

The most important contribution of this study is in my opinion twofold. Firstly, I have illustrated how it is important to be aware that people's categories vary, as suggested by Aase (1997). In my study I have shown how this fact has a strong influence on what is considered as good water quality. It also influences how risk is being perceived. While water quality in "western societies" is often associated with microbiological quality, assessment in Nateete seems to be based on visual appearance, taste and smell. Similarly, the national standard of 0 *E. coli* per 100ml for drinking water is, for the time being, rather unrealistic in a low-income area like Nateete. Such a standard is built on a "western perception of risk", which is difficult to transfer to the inhabitants of Nateete. The whole concept of microbiological contamination needs to be educated successfully to economically marginalized communities, before such an orientation in behaviour can be expect. Without doubt the economical situation of household's also needs to be improved if the goal is to abandon contaminated water sources.

The second contribution of this study is that it illustrates the importance of the physical environment to the understanding of social action. In accordance with Werlen's (1993) action-theory research (see 1.1), much effort has been used on classifying the complexity of water-collection practices in light of the actions of my respondents. This approach has been central in my understanding of the vital importance of the form and character of the *water landscape* on water-collection practices.

During field work my respondents often asked me about how they would benefit from this study. I do not want to seem pretentious as to the practical use value of this master's thesis. Nevertheless, I believe it is of vital importance to pursue further research on these issues. Too many development projects have failed because the implementers have not made sufficient efforts to understand the specific setting and culture of the target group.

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Appendix:

Questionnaire

Questionnaire

Water-use in Nateete, Kampala

Name of interviewer: **Date:**

Subject no: **Plot no:**

Respondent:

Male ☐

Female ☐

Child (over 15 but, not household head) ☐

***1* Facts about the household**

The household is here defined as the people who normally sleep in the dwelling.

Person (in the household)	**Family-status** (male household head, female household head, child etc.)	**Sex** (male/ female)	**Age** (years)	**Last completed educational level** (for those still under education, register **only** their last completed level)	**Present main occupation**	**Days with sickness last 7 days** (number of days)
1 Respondent						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

2 **To be filled out by interviewer** (only question 2)**.**
What are the walls of the dwelling made of?

Wattle and poles	☐
Mud bricks	☐
Cement/sand	☐
Wood	☐
Other	☐

3 *How many rooms does your dwelling have* (all rooms in the dwelling included)*?*

One room	☐
Two rooms	☐
Three rooms	☐
Four rooms	☐
More	☐

4 *Do you, or any members of the household own the dwelling or do you rent it?*

Own	☐
Rent	☐
Do not know/ does not apply	☐

4.1 *If you* ***rent****, does the rent include water?*

Yes	☐
No	☐
Do not know/ does not apply	☐

5 *About how much did you earn last month?*

Ushs. 0 - 14 999	☐
Ushs 15 000 - 29 999	☐
Ushs 30 000 - 44 999	☐
Ushs 45 000 - 59 999	☐
Ushs 60 000 - 74 999	☐
Ushs 75 000 - 89 999	☐
Ushs 90 000 –104 999	☐
Ushs 105 000 +	☐
Don't know/ does not apply	☐

6 *How long have you lived in Kampala?*

_____

7 *How long have you lived in Nateete?*

_____

8 *Is this household connected to the National Water and Sewerage Corporation's water distribution network?*

Yes	☐
No	☐
Don't know/ does not apply	☐

8.1 If ***Yes***, who is normally responsible for paying the bills from the National Water and Sewerage Corporation (you can tick more than once)?
If the respondent is ***normally responsible*** or among the ***normally responsible***, tick him or her in 3. person. If the respondent **only names one** responsible, ask whether there is anyone else contributing.

Female household head	☐
Male household head	☐
Children	☐
Others	☐

9 *Did the household use more than one water-source yesterday?*

Yes	☐
No	☐
Do not know/ does not apply	☐

If the household are connected to the National Water and Sewerage Corporation (question no. **8 = Yes**) and did not use more than one source (question no. **9 = No**), go directly to question no. **14**

10 *How long time did the household use yesterday to fetch water* (included walking to the source, waiting, filling and walking back)*?*

0 min - 29 min	☐
30 min – 59 min	☐
1hour - 1h 29 min	☐
1h 30 min – 1h 59 min	☐
More	☐

11 *When did the household fetch water* ***yesterday*** (you may tick **more** than once if the household fetched water at different times during the day)*?* If the respondent **only reports one** fetching period ask whether any water was fetched at any other time.

Between 6 a.m. – 8.59 a.m. ☐
Between 9 a.m. – 11.59 a.m. ☐
Between 12 a.m. – 2.59 p.m. ☐
Between 3 p.m.- 5.59 p.m. ☐
Between 6 p.m. – 8.59 p.m. ☐
Between 9 p.m.- 5.59 a.m. ☐

12 *Who had the responsibility for collecting water* ***yesterday*** (you may tick **more** than once)*?* If the respondent had or were among those who had the **responsibility** tick him or her in 3. person. If the respondent **only names one** responsible, ask whether there were anyone else contributing.

Female household head ☐
Male household head ☐
Children ☐
Others ☐
Do not know/
does not apply ☐

13 *Did the household buy any water from vendors who bring the water to the door* ***yesterday***
(buying from tap operators not included)*?*

Yes ☐
No ☐
Do not know/
does not apply ☐

13.1 *If **Yes**, who paid for the water from these vendors **yesterday*** (you may tick **more** than once)*?* If the respondent **paid** or were among those who **paid** tick him or her in 3. person. . If the respondent **only names one** responsible, ask whether there were anyone else contributing.

Female household head	☐
Male household head	☐
Children	☐
Others	☐

13.2 *Why did you buy this water?*

---

14 *Do you know where the water from vendors who bring it to the door comes from?*

Always	☐
Often	☐
Sometimes	☐
Rarely	☐
Never	☐

If **Never,** go directly to question no. **16**

15 *What kind of sources do you think the water sold by these vendors around here normally comes from* (you may tick **more** than once)*?*

Protected springs	☐
Unprotected springs	☐
Public standpipes	☐
Household connection	☐
Rainwater	☐
Lakes/streams	☐
Other	☐

16 *I want to ask you about the water you used* ***yesterday****.*
What water-sources did the household get water from ***yesterday****, and what did you use it for?*
Rate the sources after amount used. Source **a)** is the one the household used **most** of. If the respondent **only names one** source, ask whether she or he used water form any other sources.

Source type (table below)	Where (location and/or name of source)?	How many times did you go?	How much did you fetch there altogether (in litres)?	**Usage** What mainly did you use it for (table below)?	What did you pay?	Distance *****
a)						
b)						
c)						
d)						
e)						
f)						

*****= To be filled out later, on basis of a map

Categories:

Code	**Source types**
1	Protected springs
2	Unprotected springs
3	Yard tap
4	Household connection
5	Public standpipes
6	Rainwater
7	Water from vendors
8	Other

Code	**Usage**
1	Drinking
2	Cooking
3	Personal hygiene
4	Cleaning of dwelling
5	Washing of clothes

Code	**Usage**
6	Cleaning of dishes
7	Water used for animals
8	Cultivating
9	Other

16.1 If the household used **most** water from the **piped water-system**, *ask why they preferred to use most water from this source, instead of water from a* ***protected spring****?*

16.2 If the household used **most** water from a **protected spring**, *ask why they preferred to use most water from this source, instead of water from the* ***piped water-system****?*

_____

_____

16.3 If the household used most water from either the piped water system, nor from a protected spring, *ask why they preferred to use most water from this source instead of the two others?*

_____

_____

17 *Does the household ever use water from unprotected springs?*

Yes	☐
No	☐
Don't know/ does not apply	☐

17.1*If* **Yes,** *how often does the household fetch water from unprotected springs* ***at present time*** (during this rainy period)?

Several times a day	☐
Once a day	☐
Several times a week	☐
Once a week	☐
Once a month	☐
Don't know/ does not apply	☐

18 *When the household uses water from a protected spring, do you have one spring you* ***normally prefer*** *to use* (if the household never uses water from a protected spring, tick **Don't know/does not apply**).

Yes	☐
No	☐
Don't know/ does not apply	☐

18.1 *If* **Yes**, *why do you prefer this protected spring instead of others?*

_____

_____

19 *Does this household* ***usually*** *wash the clothes at the dwelling, or do you wash it other places?*

Wash at the dwelling ☐

Wash other places ☐

20 *Does this household have their own bath facility, or do you share with other households?*

Own bath facility ☐

Share with others ☐

21 *Are any children in this household breast-fed?*

Yes ☐

No ☐

Don't know/
does not apply ☐

22 *Did you re-use any of the water you used yesterday* (e.g. that water used for cooking later is used for animals or that several people washed themselves in the same water)*?*

Yes ☐

No ☐

Don't know/
does not apply ☐

22.1 *If* **Yes**, *illustrate this by using the codes representing the different kinds of use*. If water **V**) first was used for washing clothes, write an **A** in column **1**. If it later was used for body wash write a **C** in column **2**. If it was used for body wash once again by an other person, write a **C** in column **3** as well, etc.

Number of uses: →

		1	**2**	**3**	**4**	**5**	**More**
Water with different **first** use ↓	V						
	W						
	X						
	Y						
	Z						

Code	**Usage**
A	Washing of clothes
B	Washing of dishes
C	Body wash
D	Cooking
E	Cleaning of dwelling

Code	**Usage**
F	Water used for animals
G	Watering plants
H	Washing of vehicles
I	Other

23 *Do you agree or disagree with the following statements* (tick **once** in the section that suits you the most)*?*

	Totally agree	Agree to some extent	Neither/ nor No difference	Disagree to some extent	Totally disagree	Do not know/ Does not apply
My children are more often ill during the dry-seasons						
My household uses more water during the dry seasons						
My household uses more water from **unprotected springs** during the rain seasons						
During the dry season, we buy more water from vendors who bring it to the door						

24 *When is water from protected springs of best quality?*

During the rainy seasons ☐

During the dry seasons ☐

Don't know/
does not apply ☐

25 *Now lets talk about the water source you use the* ***most****. How important are the following about this water* (tick **once** in the section that suits you the most)*?*

	Extremely important	Very important	Important	A bit important	Not important at all
Quality					
Distance to the source					
Reliability					
Accessibility					
Price					

25.1 *Are there* ***anything else*** *which is important to you about this water* (if the respondent answers **Yes,** ask her or him to specify)*?*

_____

26 *What characterises* ***safe*** *water?*

_____

_____

27 *What characterises* ***clean*** *water?*

_____

_____

28 *Now lets talk about the water source you use for* ***drinking****. How important are the following about this water* (tick **once** in the section that suits you the most)*?*

	Extremely important	Very important	Important	A bit important	Not important at all
Quality					
Distance to the source					
Colour					
Temperature of the water					
Accessibility					
Taste					
Price					
Odour					
That it runs constantly					
Reliability					

28.1 *Are there* ***anything else*** *which is important to you about this water* (if the respondent answers **Yes,** ask her or him to specify)*?*

_____

29 *Do you do anything to the water before drinking it?*

Yes ☐

No ☐

Don't know/ does not apply ☐

29.1 *If* **Yes***, what do you do?*

_____

_____

30 *Now lets talk about the water **after** it has been fetched at the source. How important are the following to you* (tick once in the section that suits you the most)*?* Please note that these are **general questions**. Therefore the respondent can answer on e.g. the first question even though the household does not have any animals.

It is important to.....	Totally agree	Agree to some extent	Neither/ nor No difference	Disagree to some extent	Totally disagree	Do not know/ Does not apply
..keep the water-container out of reach of animals						
..use sand when one is washing the jerry cans						
…let some algae grow in the container						
..boil water before drinking it						
..store water in a covered container, or a container with a little opening						

31 *Are there* ***occasions*** *when you think* ***more*** *about the quality of the water than you normally do?*

Yes ☐

No ☐

Don't know/
does not apply ☐

31.1 *If* **Yes**, *what are these occasions?*

_____

_____

31.2 *What do you do?*

_____

_____

Thank you very much for your time and cooperation!