

**An evaluation of water supply in rural areas of Limpopo Province: Case
study of Gaba and Tshifudi**

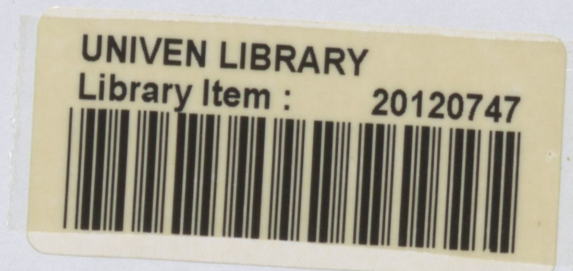
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University of Venda in partial fulfilment of the requirements for the degree
of the Masters in Public Management

Promoter: Prof M.P Khwashaba

2011



DECLARATION

I, **Gladys Stella Makomoto** student of the University of Venda hereby declare that the dissertation for the degree of Master in Public Management at University of Venda hereby submitted by me, has not been submitted previously for a degree at this university or any other university; that it is my own work in design and execution, and that all reference material contained therein has been duly acknowledged.

Gladys Stella Makomoto

02-05-2012

Signature

Date

ABSTRACT

This study deals with community experiences regarding rural water supply systems and management issues at Gaba and Tshifudi villages. The provision of free and adequate basic water for domestic uses and a more equal distribution of water for productive uses are seen as important instruments to redress inequalities from the past and eradicate poverty in South Africa. Limpopo province has the lowest total water supply coverage. Currently about 10 million people in Limpopo province do not have access to safe water and about 15 million have no access to sanitation.

The study used both quantitative and qualitative techniques for data collection and analysis. Qualitative techniques were mostly used in that they provide the researcher with an understanding of experiences and problems faced by communities who receive inadequate water supply. Random and purposive samplings were used for the selection of sample for the study. Both primary and secondary data were used for analysis in this study. Secondary data were obtained from government publication, research publication, and report. Primary data were obtained through personal observation, household's questionnaires, individual interviews and focus group discussions.

Although the government has committed itself to providing adequate basic water service for all, the findings of this study indicated that this fundamental principle is still far to be reached particularly in Gaba and Tshifudi villages. Inadequate water supply and poor management in the study area affects culinary and personal hygiene in households. Lack of access to safe and reliable supply of domestic water; poor maintenance of water system, poor services delivery and poor sanitation awareness results in poor health for rural people and loss in productive time due to sickness. School children often miss schooling while adults incurred increased medical expenditure. Women and children primarily

bear the responsibility for collecting water and are the worst affected by this situation.

Therefore, the study recommends the strategy which is based on the efficient management and equitable supply of water to rural domestic users.

Thanks to the following people who supported me during the completion of this research possible:

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- My Pastors, Makomole M.S for moral and religious support.

For all these people my thanks are due.

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- My Pastors, Makomoto M.S for moral and religious support.

For all these people my thanks are due.

DEDICATION

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- On my personal note, I dedicate this project to my parents, late Mr. Freddy Nwaila and Mrs Nyanisi Nwaila. You were there for me all the way.
 - My beloved Husband, Madumi Simon Makomoto who accompanied me every time I had to attend discussion sessions with my supervisor.
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ORIENTATION OF THE STUDY

Orientation of the study

LIST OF ABBREVIATION

DWAF	Department of Water Affairs and Forestry
IWRM	Integrated Water Resource Management
lcd	litres/capita/day
RDP	Reconstruction and Development Programme
O&M	Operation and Maintenance
RWSS	Rural Water Supply and Sanitation
WHO	World Health Organisation
WSS	Water Supply and Sanitation
WTP	Willingness to Pay

CHAPTER 1: ORIENTATION OF THE STUDY

1.1 Background of the study

Water is a valuable resource that needs to be conserved and used wisely. Water is a resource that is essential for life, without water there is no life (Mabugu, 2006:12-19). God made the heaven from the midst of water (Genesis 1:6-8). This resource influences the health and well-being of the people and the production of food, industries, power generation and sustains the natural environment that supports life on earth. Water is a renewable resource but it is non renewable limited in terms of its geographic distribution and its distribution over time (DWAF, 2004). Water is very scarce in certain parts of the world and its availability over time also changes due to changes in demand and supply (Asthana, 1997:36-7).

At present, the government has committed to provide at least 25 of clean water litres per person daily (DWAF, 2005). All humans require at least 4-5 litres of water per day to survive, but in order to sustain a minimum acceptable standard of living, 20-25 litres of clean water are required each day for cooking, personal hygiene, laundering, cleaning and other domestic activities (Altaf, 1994:46). The water supply and sanitation in the rural areas is still very inadequate. However, the provision of water service for the population is still a major challenge for the water sectors. The latest available statistics 2009 do estimate that 1.1 billion people do not have access to safe drinking water and 2.6 billion people not have access to basic sanitation.

Rural communities, by definition, are those that are without access to ordinary public services such as water and sanitation and are without a formal local authority (Charles, 1995:45-67). These communities are characterised by inferior infrastructure, low income, poor site conditions, unreliable water availability, poor access to health facilities, high population densities, lack of legal land tenure and recognition by formal government. These characteristics are much more complex than those typically found in urban areas. They affect the adaptation of safe hygiene practices in rural communities; be it on a personal, household or community level (Mazibuko, 2004:112).

Relatively isolated poor rural communities without water services are vulnerable to illnesses from unsafe water. Lack of access to a safe and reliable supply of drinking water; inadequate sanitation facilities and poor sanitation awareness results in poor health for rural communities. (Makungo, 2004:113) Water, sanitation and hygiene is important to protect people from diseases diarrhoea and small water supplies which represent health risks to people. The lack of basic services such as water supply and sanitation is a key symptom of poverty and underdevelopment.

The domestic water sector in South Africa is characterised by significant inequalities in terms of access to water which was inherited from the apartheid era policies of separate development (DWA, 2004:67). However, after the end of apartheid, several institutional and policy reforms were undertaken to address the inequalities. In rural areas in, communities rely on a variety of water sources, from surface to ground water with a significant variation in the quality and quantity of the available water. Many of these sources are used for many purpose uses varying from drinking water and cooking to laundry, bathing and gardening.

1.2 Statement of research problem

Communities in Gaba and Tshifudi villages do not have access to running water in their homes. Water systems are constrained capacity facilities and so the number of users of the system and volume of water delivered cannot exceed the capacity of which it was built. The vulnerable group, mainly women, travel long distances to fetch water spending inordinate amounts of time and energy at the expense of family activities, education and productive work in Gaba and Tshifudi villages. This situation contributes in perpetuating poverty in the Limpopo province, particularly in Gaba and Tshifudi villages. Women have to walk long distances to collect water from dam and communal taps.

The Department of Water Affairs and Forestry is now acting as a regulator and is responsible for the overall management of the nation's water resources. In the past it was deriving as both the Water Services Authority and Water Services Provider where it was also responsible for direct service delivery. Municipalities are now responsible for the delivery of Water Services and this is implemented at two levels,

at District and local levels. The district Municipality has to serve as the Water Service Authority and the local Municipality has to serve as the Water Services Provider. Despite these improvements, many people in the rural areas of the Limpopo province, lack access to adequate water supply services and sanitation.

The Water Services Act of 1997 and the National Water Act of 1998 provide the legislative framework for water services and water resource management respectively (Republic of South Africa, 1997, 1998). Since 1994, the national government has been committed to its reconstruction and development goal, which was to improve basic water services over time (Republic of South Africa, 1997:44). The Water Services Act decentralized the provision of water and sanitation services to local governments with financial and technical support from the provincial and national government. Also, under this act, the provision of free basic water and sanitation services for all end users is compulsory.

1.3 Research Aim and Objectives

1.3.1 General Aim

The overall aim of the study is to evaluate rural water supply in Tshifudi and Gaba communities.

1.3.2 Specific Objectives

- To identify factors affecting water distribution in the study area.
- To examine the current water supply delivery and management problems thereof.
- To evaluate the effectiveness of community participation
- To assess the effectiveness of the water supply system in terms of operation and maintenance.
- To develop and recommend strategies for improving sanitation and water supply services.

1.4 Research questions

Looking at the rural water supply and management the following questions can be asked:

- What are the factors affecting water distribution in the two study area villages?
- What are the current water supply delivery and management problems in the study area?
- What is the quality of water from the supply systems in the two villages?
- What is the level of the community's hygiene and sanitation with regard to household water?
- What strategies can be developed to improve water supply and sanitation services?

1.5 Research hypothesis

- Population growth demand much more water than can be supplied by the current water supply system;
- Poor management strategies and lack of community participation in managing and maintaining the water supply system is responsible for poor and inadequate water supply and;
- Lack of water affect healthy, wellbeing of people and production of food, industries and power generation

1.6 Significant of the study

The study will improve the quality of life and health of Gaba and Tshifudi communities through improved access to a clean water supply and sanitation based on community demands and needs. Improved water supply, sanitation, and hygiene practices are expected to enhance health and productivity. The study will also improve the capacity of government institutions and communities to plan, construct, manage, operate, and maintain village water supply systems and sanitation

infrastructures. It is also important to do this study in order to educate the community on preserving water and maintaining the water supply system. The study will assist the government in preparing an adequate water supply and sanitation strategy and guidelines, as well as to improve coordination and partnerships nationally and locally, which will also improve knowledge sharing, avoid duplication of efforts, and facilitate sector planning.

1.7 Delimitation of study

This study primarily focused on the problem of water supply affecting Gaba and Tshifudi villages Thulamela Municipality, Limpopo province. The assessment covered the period from 2009 to 2011. The study itself did not touch other villages, though they might be having other challenges of water supply, but it focused directly Gaba and Tshifudi in Thulamela Municipality, in Vhembe District, Limpopo province.

1.8 Limitation of the study

There were potential threats pertaining to this study. The possibility of people affected by water supply in the wrong interpretation of questions, in case of primary sources could not be ruled out, particularly with the collection of primary data through questionnaire. The use of secondary sources in this study created a very serious problem as the credibility of these sources was highly questionable due to limited scope of the study; the researcher was likely to make generalization and that can also created a serious problem in the process of assessment. The absence of water reticulation could possibly hinder the prompt assessment of the issues affecting water supply at Gaba and Tshifudi villages.

1.9 Brief summary of literature review

The White Paper on Transforming Public Service Delivery (1997:12-23) aims to address the need for a specific policy and criteria for the transformation of public service delivery. The principles for public service delivery outlined in the White paper include aspects such as consultation with the public as the client, service standards, access to services, courtesy, information, openness and transparency, redress or

responsiveness and lastly value for money. It is through these aspects that an attempt is made to restore the communities' confidence in the government and its image. The past tendencies of negligence and a less than caring attitude is addressed, including the need to view and respect community members as the targets of services on which they are consulted.

Sustainable development

Sustainability is the key word when planning infrastructure improvements (Ashley, 2004:67). Ashley *et al.*, (2004:34) defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Quality of human life is supposed to be improved within the carrying capacity of the supporting ecosystems (Ashley *et al.*, 2004:22). According to Turton & Henwood (2002:77), sustainable solutions must be found because South Africa's water demand has grown and the land-based water sources will reach its limit of economical usability between 2020 and 2030.

Small water system in rural areas

Hazelton *et al.*, (1999:55) defines rural areas as those populations perceived by local definition to reside outside urban centres and being a generally dispersed population. It is important to understand the types of water systems that rural villages such as Budeli and Tshisele villages use to understand the impacts that the water services might have on the community members. Basic water services are provided according to three main criteria: accessibility, availability and potable water.

Lack of community water committee

The problem facing some rural and peri-urban water supplies is often more of management and distribution rather than supply and the major element lacking being community organizing (Dervis, 2005:77). Lack of a community water committee may lead to the delay of water in the study area. There are places where people do not have water yet dams have been constructed that are unused and a community may wait three to six months for the government to repair pumps, even when skills are

available locally (Dervis, 2005:12). This means that there should be a community involvement approach in water supply.

Water Shortage

Water is life; it is an essential component of life support and plays a major role in poverty alleviation and food security (Banda, 2007:67). Globally, some 1.3 million people lack access to adequate supplies of clean water and three million people lack adequate sanitation facilities (DWA, 2004:22). It is generally accepted that the poor suffer most from lack of adequate water sanitation services, with water supply being identified as both a cause and a consequence of poverty (Banda, 2007:11). The World Bank identifies four key links between water supply and poverty: health, gender, social inclusion, and income/consumption (World Bank, 2003:11).

Water collection from the sources

In most developing countries, women are responsible for the collection of water (Sobsey, 2002:23). The work involved in fetching the water may differ in each region, it may vary according to the specific season, and it depends on the time spent queuing at the source, the distance of the household from the source and the number of the household members for which the water must be collected (WHO *et al.*, 2000:45).

Water Supply in rural areas in South Africa

Several factors have caused the structural imbalance between the water supply and the rural community in South Africa, making it difficult to recognize the economic value of water. In many cases, the price of water charged to consumers is below the real cost of provision. Water is often considered as a public necessity which makes it difficult to extract an economic price from users (Nickson, 1996:56). As a result it has long been financed by general public revenues (Dinar, 1997:34).

1.10 Water demand types

It is an enormous challenge to locate demand types due to the increasing population and growing demand for water and expansion of water used in sectors such as agriculture and industries in developing countries (Dervis, 2005:6).

Water demand varies among users in rural areas depending on factors such as living standards, size of household, and the type of water use. For example, communities in the study area, water sources are used for a combination of basic human needs and productive activities. In rural areas of Limpopo province, everyone uses water for various domestic purposes and many people use water for productive purposes to earn an income, such as gardening, field crops, livestock, brick making, (Dervis, 2005:67).

1.10 Operational definitions

- **Water services** are service that actually provide water services to the people (Hope, 2000:34).
- **Domestic water** is water used for all usual domestic purposes like drinking, bathing and food preparation (Dervis, 2005:90).
- **Water Quantity:** the minimum amount of water required for direct consumption, which in South Africa is 25 litres of water per person daily, for the preparation of food and for personal hygiene (Nickson, 1996:78).
- **Water Quality:** the minimum quality of water available; its health-related quality is very important in achieving the goal of an adequate water supply for health (DWAF, 2003:88).
- **Adequate sanitation:** The provision of sanitation services to all which meet basic health and functional requirements, including the protection of the quality of both surface and underground water (DWAF, 2004:7).
- **Basic water supply:** the minimum standard of water supply services necessary for a reliable supply for a sufficient quantity and quality of water to households including informal households to support life and personal hygiene (Davis, 2004:12).

1.11 Chapter's layout

CHAPTER I: ORIENTATION OF THE STUDY

This study comprises of five chapters. The first chapter provides the background of the study, a statement of the research problem, research objectives, research questions, hypotheses, significant of the study, limitations of the study, delimitation of the study, summary of the literature review and operational definitions of the study .

CHAPTER 2: LITERATURE REVIEW

Chapter 2 deals with a review of the related literature of rural water supply systems, population and the demographic situation, water quality in rural areas, sanitation and water services, water supply and hygiene, and current water supply as well as factors affecting distribution of water supply.

CHAPTER 3: RESEARCH METHODOLOGY AND DESIGN

Chapter 3 provides the overall research design which outlines research methodology and methods of data collection and analysis.

DATA PRESENTATION, INTERPRETATION AND ANALYSIS

Data analysis and data presentation is provided in Chapter 4.

CHAPTER 5: FINDINGS, CONCLUSION AND RECOMMENDATIONS

Chapter 5 is a summary of conclusion and recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The aim of this chapter is to discuss the literature review in relation to the problem of the present study. Leedy & Ormrod (2001:85) warn that a literature review should never be a chain of isolated summaries of the writing of others. Neuman (1997:212) believes that a literature review is the knowledge or information that is established by other people and taken for granted to be accepted as the truth. The literature on the successes of past water programmes points to a significant number of failed water supply systems and sanitation schemes. It was estimated in 1994 that 40-50% of the estimated 250 000 water supply systems in sub-Saharan Africa had failed, a figure corroborated by later studies. According to Harvery (2004:23) the primary cause of failure identified was inadequate operation and maintenance (O&M). There are many other studies which examine different aspects of (rural) water supply programmes, though many are constrained to the activities of a single organisation or a single programme factor.

In South Africa almost 80 percent of the population is living in rural communities without adequate water and sanitation infrastructures (Statistics South Africa, 2003:4). Many of the communities have to share water sources with domestic animals (Dunker *et al.*, 2001:45). Communal standpipes provide water on an irregular time basis and the majority of communal standpipe water is not maintained or treated. In the Vhembe region, the majority of rural communities are poverty stricken, and these lack access to potable water supplies and rely mainly on water sources such as rivers, streams, ponds, spring and boreholes for their daily water needs (Davids *et al*; 2004:89). Many of the households in rural areas of South Africa do not have individual connections to treated, piped water supplies.

Water scarcity is considered to be a major constraint to social-economic development in South Africa (DWAF, 2003:54). In most parts of the country water resources are already full utilized or overdraw. The agricultural sector is the highest

consumer while water accounting for about 62% of the total water consumed whole domestic water and industry water account for 6% and 32% respectively.

Rural water supply is presently one of the main concerns in South Africa. The South African government has therefore launched the so-called reconstruction and development programme to especially develop rural areas. Van schalkwyk (1996:53) developed guidelines for the estimation of water demand in developing communities in the Limpopo province, South Africa. According to Van Schalkwyk some of the factors influencing water demand are population density, household size, housing type, gardening type, income, education, agricultural activities, water supply systems, sanitation facilities, water tariff, water quality, people per abstraction point and water user type.

Anad and Eberhard (2001:43) stated that the water access level and acceptance (responsibility of the people) by communities are two major factors influencing water supply within rural communities. They proposed that areas should rather be classified according to water access and the socio-economical structure of the various communities. Classified groups therefore be identified and all communities grouped together should be treated equal.

The domestic water sector in South Africa is characterised by significant inequities in terms of access to water inherited from the apartheid era policies of separate development. However, after end of apartheid, several institutional and policy reforms were undertaken to address the inequalities. The water services act of 1997 and the national water act of 1998 provide the legislative framework for water services and water resource management respectively (Republic of South Africa, 1997, 1998). Since 1994 the national government has been committed to its reconstruction and development goal, on which was to improve basic water services as well as to improve level of services over time. The water services act decentralized the provision of water and sanitation services for domestic purposes to local governments with financial and technical support from provincial and national government. Also, under this act, provision of free basic water and sanitation in Gaba and Tshifudi communities.

2.2 Water supply in Gaba and Tshifudi villages

Gaba and Tshifudi villages (Fig.2.1) are found in the Limpopo province. They form part of the Far North region of the province. It is located on the eastern side of the Punda Maria gate. They are situated between 23°30`S and 29°30`S latitude and 30°30`E and 22°30`E longitude. Gaba and Tshifudi are served under the Thulamela municipality of the Vhembe district municipality (Kabanda, 2004:17).

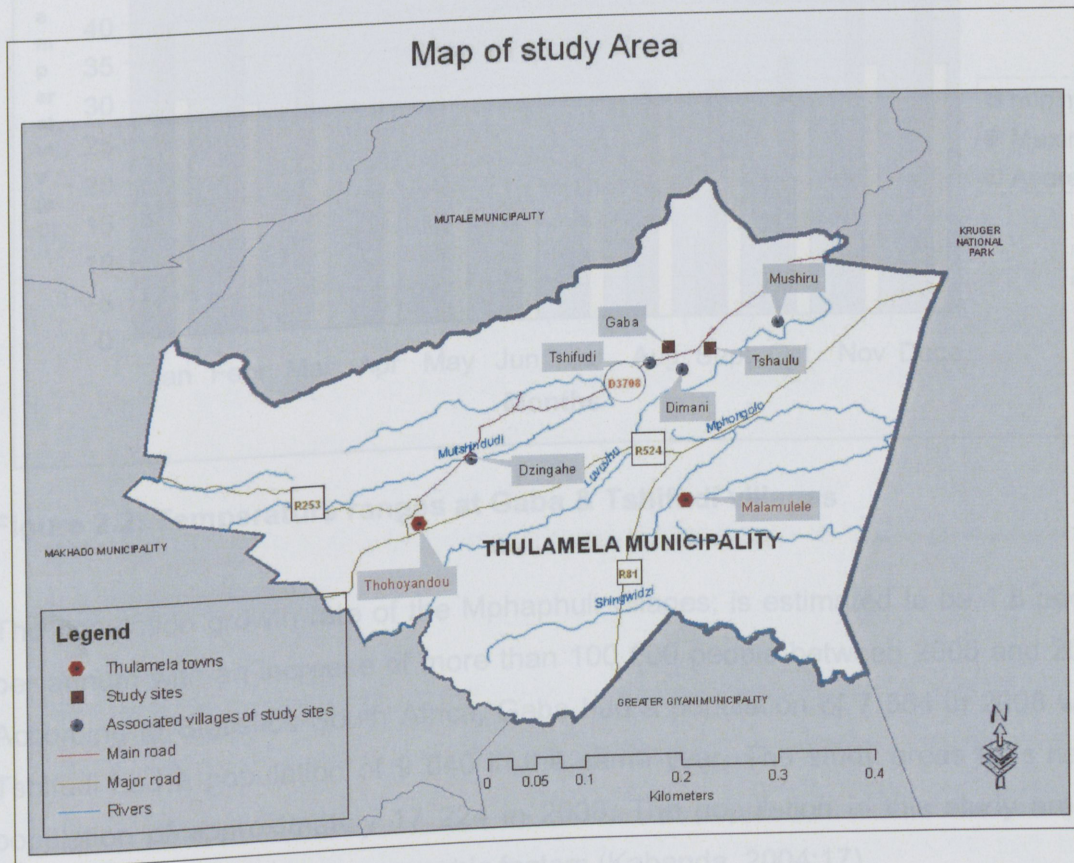


Figure 2.1: Geographical location of the study site

The climatic conditions of the two study area sites resemble some of the climatic conditions of the Vhembe district municipality. The climate of Gaba and Tshifudi can be characterised as a semi-arid. Summer maximum temperatures average from 25°C-40°C. Winter maximum temperatures average from 14°C-25°C (Fig 2.2). The rainy season in the study areas extend from October to April, with the peak of precipitation taking place during January and February. The average annual rainfall under normal climatic conditions is 450-500mm (Kabanda, 2004:23). The difference

in climate impacts on the distribution of water supply in the Limpopo province. There is also a great variation in the amount of water that is available as result of rainfall over any given period. Drought and flood events also occur frequently in the Limpopo province.

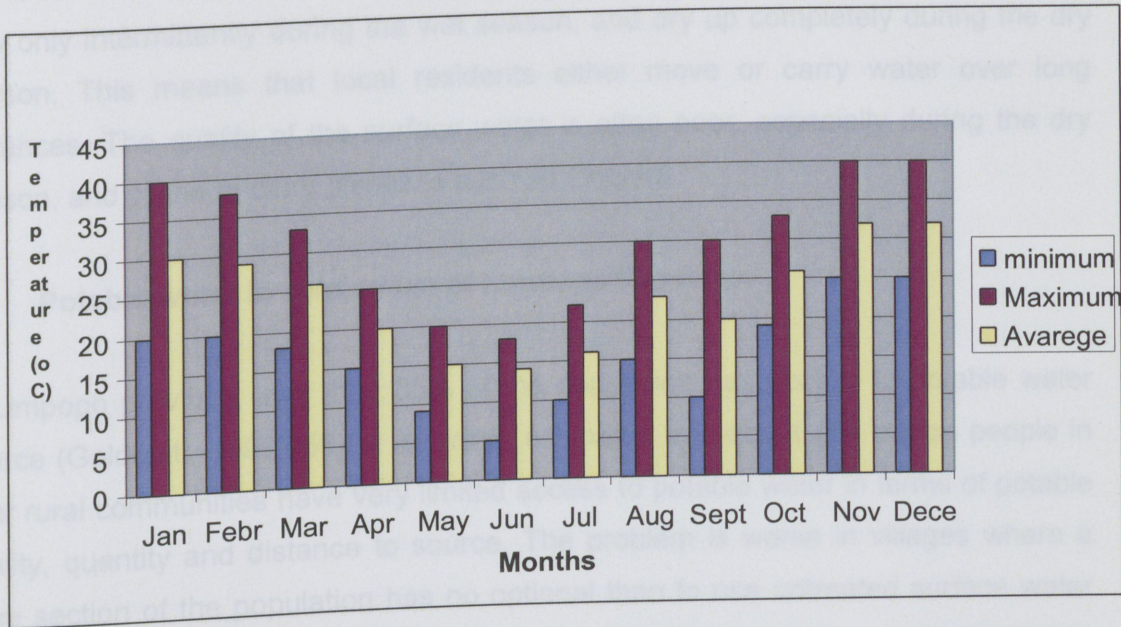


Figure 2.2: Temperature ranges at Gaba & Tshifudi villages

The population growth rate of the Mphaphuli villages; is estimated to be 1.8 people per annum with an increase of more than 100 000 people between 2005 and 2009. According to Statistics South Africa, Gaba had a population of 7 584 in 2008 while Tshifudi had a population of 9 640 in the same year. The study areas thus had a population of approximately 17 224 in 2008. The population in this study area is dynamic in terms of the demographic factors (Kabanda, 2004:17).

The study areas are mainly used for agricultural activities; like crop farming (maize, cabbages, spinach, onions, etc) and stock farming (cattle, goat and chicken farming). Settlement is one of the land uses that are undertaken in the study area. Informal settlement is one of the main patterns of settlement in study area.

The study area receives a reasonable amount of rainfall over much of its area; however, its frequency and distribution throughout the year is rarely sufficient to avoid drought conditions in low-lying areas. During the dry seasons, the people in the study area invariably have to rely on the Nandani Dam, springs, and water stored in the few Tanks for their water supply. Most streams in the Lowveld area typically flow only intermittently during the wet season, and dry up completely during the dry season. This means that local residents either move or carry water over long distances. The quality of the surface water is often poor, especially during the dry season, and prone to carry diseases such as Cholera

2.3 Potable water in rural areas of Limpopo Province

In Limpopo province, less than 35% of the population has access to potable water source (Goldblatt, 1999:456). It is further estimated that about 264 million people in poor rural communities have very limited access to potable water in terms of potable quality, quantity and distance to source. The problem is worse in villages where a large section of the population has no optional than to use untreated surface water sources, such as rivers, dams, and streams for their potable water (Goldblatt, 1999:89). This contributes to negative impacts on health in Limpopo province continuing cycle of poverty.

In South Africa particularly there is relatively good access to potable water in urban areas where water utility companies such as Rand water as well as local authorities as service provider ensure a permanent supply of good quality water for domestic purposes including drinking. However the rural areas are under serviced and the majority of the population still lack access to running clean water (Blayney, 1999:6). According to a recent demographic and health survey, the infant mortality rate in households without treated water was twice than of infant from households with tapped water (Blayney, 1999:56). Mortality rates such as these may be caused by pathogens present in untreated water.

2.4 Government participation

The provision of water supply should be considered as the domain of the local government and the state. In Mozambique the public sector has not been successful in meeting more than a small portion of demand for water and sanitation of residential and commercial users and the services are in crucially short supply (Forolfi, 2006:32). Banda (2007:33) also note that out of the out the 850 million people living in urban and semi-urban areas, less than half have reasonable access to reliable water supply. This shows that water supply services where they exist are unreliable and of low quality. According to Goldblatt (1999:55) the high cost of imported equipment has led to large financial deficits in many state water authorities. This therefore indicates that there is need to finance operation and maintenance of water supply system

Population growth impacts on water supply in most rural areas. Makungo (2005:671) shows that in Mozambique population growth has not been accompanied by an increase in the delivery of essential urban services such as water supply, sewerage and sanitation, and collection and disposal of solid wastes. The overall effective water supply coverage may be as low as 30% of the total population due to poor maintenance and unreliability of supplies and rural coverage is estimated about 35% (Makungo, 2005:32). This therefore indicates that even in other parts of African countries water supply is still a major problem to be tackled. The problem of water supply in Mozambique has led to three level of government to share the responsibility for the delivery water supply and sanitation

2.5 Public campaign on provision of clean water

There is a strong relationship between water supply and sanitation (Walker, 2000:90). This is because dirty water is believed to be principal transmission agent for 80%of the diseases affecting people living under third world condition (Walker, 2000). As a result of that there is need to implement certain programs to deal with water supply issues. According to WHO (1997) public health campaigns focus more on preventive measures than on providing clean water. Khaman (2005:45) also shows that although some government funding does go to improving water supplies,

they are still far from supplying clean water to all, the target of the water decade from 1980 to 1990.

Water is life; it is an essential component of life support and plays a major role in poverty. The prevailing distribution of water is massively unequal (Walker, 2000:44). In rural Ciskei, households use an average of 9 liters of water per person per day, in eastern cape small towns, black residents use 19 litres of water, in metropolitan port Elizabeth township, the figure is 80 litres (Dervis, 2005:23). In Gaba and Tshifudi water supply interruption results in shortage of water and may lead to certain health hazards. This shows a massive inadequate supply of clean water in many rural South African areas. Water is one of the resources whose use was restricted during the past years. Certain groups had privilege to it and with the water law reviewed each and everyone has the right to basic water supply.

According to DWAF (2002:77) the minimum quantity of water required for direct consumption is 25 litres per capita per day, which is not considered to be adequate for a full, healthy and productive, life which is it considered to be minimum. According to Hope (2003:7) white residents used to use about 200-300 litres per capita per day, but WHO standard is 50 litres per person per day and this made it difficult to get water to water to black rural and small towns population.

2.6 Lack of community water committee

The problem facing some rural and peri-urban water supplies is often more of management and distribution rather than supply and the major element lacking being community organizing (Dervis, 2005:67). Lack of a community water committee may lead to the delay of water in the study area. There are places where people do not have water yet dams have been constructed that is unused and a community may wait three to six months for the government to repair pumps, even when skills are available locally (Dervis, 2005:90). This means that there should be a community involvement approach in water supply.

2.7 Water poverty

Water is life; it is an essential component of life support and plays a major role in poverty alleviation and food security (Banda, 2007:6). Globally, some 1.3 billion people lack access to adequate supplies of clean water and three billion people lack of adequate sanitation facilities (DWA, 2004:12). It is generally accepted that the poor suffer most from lack of adequate water sanitation services, with water supply being identified as both a cause and a consequence of poverty (Banda, 2007:34). The World Bank identifies four key links between water supply and poverty: health, gender, social inclusion, and income/consumption (World Bank, 2003:67). The direct impact of water poverty on health is the most widely understood, but the role that water supply plays in education level (especially in young girls); gender and social inclusion and income and consumption level is just as important and fundamental in initiating development.

This link between water supply and general poverty is the most common understanding of water poverty, defined in this context as a lack of access to a suitable supply of water. This standard definition of water poverty however, captures only the "state" and not the "process" of water supply (Chapman, 1999:9). In the same way as we can define poverty as more than just a lack of access to food, so water poverty must be defined as more than just a lack of access to a suitable water supply. Banda (2007:23) bases his definition of water poverty on his concept and introduced the consideration of vulnerability of households to a lack of suitable water supply. He concludes that water poverty can be defined as both first order scarcity, i.e. a shortage of water, and second order scarcity, i.e. a lack of social adaptive capacity to deal with a shortage of water.

2.8 Small water system in rural areas

Hazelton *et al.*, (1999:45) defines rural areas as those populations perceived by local definition to reside outside urban centres and being a generally dispersed population. It is important to understand the types of water systems that rural villages such as Gaba and Tshfudi villages use to understand the impacts that the water

services might have on the community members. Basic water services are provided according to three main criteria: accessibility, availability and potable water. They often include systems using taps on public standpipes fed from a small distribution network, boreholes with hand pumps, protected dug wells and protected springs.

The water system in Gaba and Tshifudi villages fits the description by Hazelton (1999:341) as well as that by the South Africa government (Republic South Africa, 2004:23); of a basic Government supplied water system. It consists of a tap on a communal standpipe, installed on public ground, no more than 1000 metres (1km) from any particular household and accessible to the community with a typical ratio of 40 households per tap. Water is pumped in many instances from a groundwater to a reservoir (holding tanks) with water may which or may not be treated and it's then distributed to the communal and yard taps with underground pipelines. Water must be available (the system must not run dry season) and the quality of water must be safe for human consumption.

When there is a breakdown in the water system, communities are often compelled to collect water from other sources that are mostly much further and the water is often not potable. Hazelton (1999:7) describes these alternative water sources as rivers, springs and rainwater harvesting

2.9 Water collection from the sources

In most developing countries, women are responsible for the collection of water (Sobsey, 2002:6). The work involved in fetching the water may differ in each region, it may vary according to the specific season, and it depends on the time spent queuing at the source, the distance of the household from the source and the number of the household members for which the water must be collected (WHO *et al.*, 2000:223). Water for domestic use is collected either by:

- Dipping the container inside the water supply
- Collecting rainwater from a roof catchment system
- Using different types of pumps collected to the water supply systems

The transportation of the water from the source water supply could be either by:

- a wheelbarrow
- a donkey cart
- motor vehicle (auto mobile/ car)
- using a rolling system and
- Carrying container by hand or on the head (CDC, 2001:2).

A common practice often seen in rural areas was the use of leaves or branches, the leaves were used to stop water slopping out during transit in wide neck storage and transport containers (Sutton & Muibana, 1989:12). Consequently, a study by Sutton & Muibana (1989) has showed that these leaves can be a source of caliform bacteria. Water sources can be some distance away from households, particularly in rural areas (WHO, 1996b). In studies conducted in Kenya, Uganda and Tanzania (Lindskog & Lundqvist, 1989:90), it was found that if the water taps were situated closer to the dwelling, the amount of water collected per capita per day increased by 9,7 to 15,5 litres.

Studies in Mozambique (Cairncross & Cliff, 1987:8) showed that households collect on average 11 litres of water/person/day if the source is less than 300m from the dwelling, while the household members who have to walk more than 4km collected on average 4, 1 litres of water/person/day. Studies in rural communities in Limpopo province of South Africa (Verweij *et al.*, 1991:8) showed that on average 11, 4 litres of water/capita/day was collected in the sources that were close to the households, compared to an average of 8.6 litres of water/person/day if the sources were more than 1km from the households.

The Department of Water Affairs and Forestry in South Africa recommends an allocation of 25 l/p/d from a source within a distance of 200m from the dwellings (DWAFA, 1994:89) and the WHO estimate a minimum of 50 litres of water/person/days. These studies indicated that more water was collected per capita per day if the sources were closer to the dwellings (White *et al.*, 2002:23). Very few studies have investigated the quality of water during collection and transportation. In a study in Rangoon, Burma (Han *et al.*, 1989:78) the sources of and water collection was analyzed and indicated that the faecal Coliform counts in the collection samples

(Han *et al.*, 1989:12). The increase in faecal contamination from the water in the collection containers could have been due to an unsafe handling of the water and that poses a potential health risk of diseases to the consumers (Sobsey, 2002:90). In a study in Zimbabwe (Merteris *et al.*, 1990:23) it was found that only 5% of the water samples from tube wells were contaminated when the pump was sterilized prior to collection of the sample compared to 50% if the pump was not sterilized. This implied that the taps were contaminated during collection (Mertens *et al.*, 1990:65).

2.10 Water Supply in rural areas in South Africa

Several factors have caused the structural imbalance between the water supply and the rural community in South Africa, making it difficult to recognize the economic value of water. In many cases, the price of water charged to consumers is below the real cost of provision. Water is often considered as a public necessity which makes it difficult to extract an economic price from users (Nickson, 1996:45). As a result it has long been financed by general public revenues (Dinar, 1997:56).

Population growth is one of the factors that affect demand for a water delivery option over the life of the project. Rural populations are expected to grow very slowly, at just 0.1 percent per year during 2000 - 2030 (IRC *et al.*, 2002:76). This rate of population growth is unlikely to affect water projects. Due to economies of scale, growth in demand would lead to lower costs for water. The cost component that is affected considerably by growth in demand is the cost of the distribution network. Household water demand is not evenly spread over time. It usually follows a seasonal fluctuation pattern. In the rainy season in South Africa, which occurs during summer, water scarcity is lower because most people obtain water by harvesting rainwater into storage containers. In the dry seasons, when natural sources such as rain and open rivers and streams have dried up, water becomes scarce and water scarcity is at its highest during winter season.

There are also daily peak hours, which occur between the hours of 5:00am and 10:00am and also in the evening between 4:00pm and 6:00pm. This exhibits consumption demand patterns. It is assumed here that demand patterns even out by using simple pricing structures to price peak demands out of existence (OECD *et al.*,

1999:44). Interest in these temporal variations arise because large costs will be faced by water utilities if supply systems are to be constructed, maintained, and operated at a scale which can satisfy whatever peak flows which may ultimately be demanded (OECD *et al.*, 1999:46). Failure to take into account the peak demand factors and the projected growth rates could result in the project becoming supply constrained and unable to fully meet the demand requirements of its targeted beneficiaries from its outset (ADB *et al.*, 1999:78).

Households with in-house connections use much more water on average than households with public standpipes because of the convenience of the in-house connections. As a result, households currently using standpipes will see their expenditure on water rise once connected (Komives *et al.*, 1999:56). For example, households in Levubu consumed 30 litres per capita per day (lpcd) when public standpipes were less than 200m away and 15 lpcd when the distance to the water source is greater than 200m away. They consume 70 lpcd when they use yard taps outside their homes, and 120 lpcd with in-house connections (PDG, 1996:89).

The running of a water project could greatly depend on the ability to raise large sums of capital (which most developing countries do not have access to) the installation costs that each household would have to come up with, and the ability to amortize or annualize these costs over a period of time. Many developing countries are experiencing rapid reductions in assistance from international donor agencies and public sources of finance are no longer available to bear the costs of system rehabilitation and expansion (Johnstone *et al.*, 2000:7).

The goal of any pricing scheme is to be able to recover the costs of supply which includes both capital costs and O & M costs. In developing countries, little or no consideration is given to these O & M costs when the pricing of water services is being done. This results in inadequate repair and maintenance, frequent breakdowns, interruptions in service, lack of capacity to expand service when demand increases, and poor quality of water supply (Reweta *et al.*, 2001:32). Whereas there is cost recovery in most of the developed world (capital, O & M, debt service etc.), developing countries recover as little as 35 percent of the average cost of supply for water from consumers. Africa and Asia have been identified as having

the highest gap between costs and prices and thus have the weakest service reliability and sustainability (Briscoe & Garn, 1995:8).

Few countries in the past attempted to recover capital costs from users. However, governments are rethinking this policy and are starting to recover at least a portion of capital costs from users (Dinar *et al.*, 1997:32). Several other developing countries have other pricing strategies which they follow and other goals and objectives attached to their choice of pricing strategies. The government charges households that have access to piped water only about 20 percent of long-run marginal water costs. This policy affects distribution, because low income households with no access to piped potable water pay a higher actual price for water than households with such access that mainly belongs to higher income groups. Also low water prices encourage those with easy access to use water excessively.

The water utility does not receive enough revenues to improve and maintain the water system, resulting in high water losses, poor service delivery, and reduced incentives to extend water to additional groups of households. The real water price has been cut in half over the past 20 years, which appears to be a result of institutional incentives to keep water prices low (Strand, 2000:8). The User Pays Principle (UPP) is now widely accepted in the OECD countries. The UPP was recommended as a measure to at least cover the opportunity costs of capital, operation and maintenance, and environmental impacts (Rogers *et al.*, 2002:34). There has been increasing participation by the private sector with the government moving away from the role of provider to the role of the regulator of water services.

2.11 Lack of trained personnel

Trained personnel for the operation and maintenance of the water supply scheme are generally not available in study area communities. Although it might be expensive and time consuming it is important to have trained personnel in each community so that they could be able to make the system function well. According to Fernando (1996:65) in Latin America there is a long tradition of small, piped water supplies managed by rural and peri urban community. The communities carry out and finance all daily operation, maintenance and management tasks and also

manage the internal water quality control successfully (Fernando, 1996:9). This shows the importance of having trained team and involved in water supply system.

2.12 Water demand types

It is an enormous challenge to locate demand types due to the increasing population and growing demand for water and expansion of water use sectors such as agriculture and industries in developing countries (Dervis, 2005:9).

Water demand varies among users in rural areas depending on factors such as living standards, size of household, and the type of water use. For example, communities in study area water sources are for a combination of basic human needs and productive activities.

In rural areas of Limpopo province, everyone uses water for various domestic purposes and many people use water for productive purposes to earn an income, such as gardening, field crops, livestock, brick making, (Dervis, 2005:134).

2.12.1 Agricultural water demand

South Africa's agricultural production is limited by the availability of natural resources (soil, water, and climate). Over 70% of crop is rain fed and less than 30% is produced with irrigation. In total agriculture accounts for over 60% of the total water were utilized (Tshikhudo, 2005:8). The majority of Africa's poor live in rural areas where agriculture and livestock production, both water dependent, from the mainstay of livelihood. For smallholders in particular, basic well-being depends on water availability and reliability of supply (Tshikhudo, 2005:89).

Since most rural communities have no reliable water supply their crops fully depend on rainfall. Rain fed agriculture is risky in rural areas due to recurrent droughts and dry spell (Tshikhudo, 2005:56).

2.12.2 Domestic water demand

Domestic water uses have become a necessity to people in their homes and backyards. Domestic water is normally characterised by its use inside and outside the home through washing the dishes, cooking a meal, laundry and bathing, watering the lawn or garden, and other household activities (Hope, 2003:8).

Rural water supply studies have traditionally focused on meeting basic needs, and have not taken into account the other uses that people make of water. Considering that domestic water uses accounts for about 12% and is everyone's daily concern, it is still difficult for some people to have access to domestic water, especially in rural areas

Every person is entitled to the amount of water of 25 litres per day or 6000 litres per household a months for basic human subsistence in South Africa (Banda, 2007:34). However, when looking at people's livelihood strategies ones see that access to water affects a wide range of activities (Banda, 2007:12).

2.12.3 Environmental water demand

Environmental water demand is a term that is defined as the water usage to meet for ecosystem restoration and conservation, by considering water quantity that maintains the landscape, ecological process and a natural service of the ecosystem, water used in streams, lakes, and rivers (Blayney, 1999:56).

People are dependent on natural environment for meeting all their needs, and therefore the interactions between people and the environment cannot be separated (Blayney, 1999:87). In all rural and urban ecosystem of the world there is a need for conserving water for natural environment needs while using resources so that human and environmental needs can be met, now and in the future.

2.13 Source of water supply in rural area

The World Health Organisation (WHO) classified source water supply as either improved or unimproved (WHO, 2000:89; Gundry *et al.*, 2005:10). Improved water sources include public standpipes, household connections, boreholes, protected dug wells, protected springs, boreholes and springs connected via a pipe system to a tap, as well as a rainwater connection (WHO, 2000:34; Gundry *et al.*, 2004:90). Unimproved water sources include unprotected wells, unprotected springs, Vendor-provided water, rivers as well as tanker truck provision of water (WHO, 2000)

Several studies carried out in developing countries have determined the quality of these improved and unimproved water sources and depending on the water sources; different results were obtained (Gundry *et al.*, 2005:45). Studies conducted in Iran (Pournadeali & Tayback *et al.*, 1980:78) and in northern Sudan (Musa *et al.*, 1999:56) have both showed that water at communal taps contained pathogens and bacteria. Contrary to these findings, a study in Burms (Han *et al.*, 1989:145) has showed that tube well and shallow well water supplies were of a better quality than municipal tap water and pond water sources. All of these studies indicated that the water sources used by communities in developing countries are microbiologically contaminated and pose a Healthy risk to the consumers.

2.14 Quality of water supply and uses in rural area

In rural areas in the Limpopo province, people typically rely on a variety of water sources, from surface to ground water with significant variation in the quality and quantity of available water (Makungo, 2007:66). Many of these sources are also used for multiple purposes varying from drinking water to washing, bathing, and gardening. Often people have no choice than to use a certain water source regardless of the quality (Makungo *et al.*, 2007:8). When a small stream, an open pond or an open reservoir must be used as sources of water, the danger of contamination and of the consequent spread of enteric diseases such as cholera and typhoid fever is increased.

In the study area, villages also use a variety of sources. People from the study area use tap water, boreholes and untreated water from Mutshindudi river. Rivers in especially rural areas become polluted due to upstream activities such as washing clothes, bathing, and a lack of sanitation (Gordon, 1999:7). The source dam in study area was of this nature. Furthermore, surface water quality is often unreliable, and is likely to be more contaminated by faecal micro-organisms and pathogens than ground water; because it has undergone a natural process of physical, chemical and biological filtration through the soil (Mabugu, 2006:98). Whether people use ground or surface water being supplied in taps or collected at the source (dams and boreholes), these water sources are almost always some distance away from the households. This forces the population to collect, transport and store water in containers for in-house use (Makungo, 2007:65).

Despite the availability of cleaner water from tap tanks and boreholes, problems are often experienced with accessibility to and availability of the supply water (Khaman, 2005:76). This leads to the inevitable practice of using containers to collect and store water from various sources. Rural areas may sometimes even be supplied with tap water but the distribution system does not follow the normal regulation of the taps being in the households, but that should rather be communal taps, which often are some distances away from the households (Dervis, 2005:23). The distance from the closest tap to the house is often far enough to necessitate the use of containers. Another problem is maintenance, which influences sustainability of such services. If the supply breaks down, people use alternative often polluted sources (Dervis, 2005:43).

In both scenarios, containers are used and the source water varies in microbiological quality, all leading to the water at the point of use being of inferior microbiological quality by the time people get to drink it (WHO, 1997:21). Even when water is collected at a tap that supplies a good quality of water, the quality deteriorates during the storage process.

Domestic water uses have become a necessity to people in their homes and backyards. Domestic water is normally characterised by its use inside and outside the home through washing the dishes, cooking a meal, laundry and bathing,

gardening, and other household activities (Hope, 2003:76). It's not the most important use in terms of volume required but it is the priority as it cover all the basic needs and impacts seriously on the health and well being of humans (WHO, 2008:72). In the context of health, it is the ingestion of water that was considered above the other uses during this study.

Rural water supply studies have traditionally focused on meeting basic needs, and have not taken into account the other uses of water. Considering that domestic water uses accounts for about 12% and is everyone's daily concern, it is still difficult for some people to have access to domestic water, especially in rural areas

Every person is entitled to 25 litres per day or 6000 litres per households a months for basic human subsistence in South Africa (Banda, 2007:75). However, when looking at people's livelihood strategies one sees that access to water affects a wide range of activities (Banda, 2007:6).

In the study area people collect, carry and store water for drinking and food preparation in a variety of containers mostly plastic ones, of between 20-25 litres capacity each. These are filled at the source and stored in the household, where the handling (Khaman, 2005:876), contributes to the deteriorating quality of water (WHO, 2007:89). Hope (2003:86) also demonstrated that the storage of water in households contribute to the deterioration of the microbial water quality, with causes ranging from poor containers to open containers subjects people to poor hygiene environmental pollution, to the manner of handling the water by individuals in households.

2.15 Factors that contribution to the lack of water supply in rural areas

Factors that could account for the failure of many water supply projects to provide water of adequate quality, quantity, and convenience include: the lack of public awareness, unaffordable tariffs, insensitivity of central government and donors to local customs and beliefs, lack of technical expertise and inability to operate and maintain water systems once in place, lack of community participation and local involvement in design and management, and lack of sound economic analysis prior

to project design and construction (Brookshire, 1993:90). In choosing an option for water supply, it must first be ascertained what problems befall the pre-existing options and if the new arrangements will address and solve these problems.

2.16 Infrastructure and water access

Although 85% of the total population in South Africa has access to tap water, there is a great variation in the access of water to across district and rural and urban areas. In some rural areas, approximately 30% or less has access to tap water (DAWF, 2003:87). In the former homeland areas of the Levubu river basin, 45% of the population has water access which is below the RDP standards (Republic of South Africa, 1997:4). As is the case in many former homelands in South Africa, infrastructure development in the study areas is very low and water and sanitation services are very poor. In 2003, it was reported that 73% of the population consume up to 10 litres of water per capita per day (Thulamela municipality, 2002:8). In addition, only 10% of its population is considered to have reliable access to water.

Most of the infrastructure was built during the apartheid era by the former homeland governments in the mid eighties. Since 1994, the water supply schemes have been managed by DWAF, but only a few improvements have been implemented mainly by the scarcity of local water resources, which are not sufficient to supply all the households and also the lack of proper planning and management of infrastructure due to the shortage of human and financial capital in the local district municipality. Domestic water supply schemes are in the process of being transferred by DWAF to the district municipality and they are in need of rehabilitation, the present water supply from Thulamela district municipality intends to source water from the Luvuvhu River.

Households in the study area depend on diverse sources of water including dwelling taps, boreholes, springs, rain water, rivers/streams and dams. In study area there are mainly public standpoints where households collect water, but water supply from this source is very low and sometimes is not managed properly in, such a way that households have to depend on other sources like rivers and dams. 83% of households collect water from community street pipes; 53% of those who collect

water from communal street pipes are located more than 3 km away from the water source(s).

2.17 Nature of Current Water Supply in rural areas

Globally, rural water service delivery is shifting more and more towards piped water schemes as a result of improving standards of living and increasing aspirations of the rural populations. However, in Africa, more than 47 percent of urban households are without access to clean/treated water. The situation is even worse in rural areas. The rural water supply coverage for South Africa in 1996 was 39 percent while the rural sanitation coverage was 45 percent (Adelegan *at al.*, 2001:90). South Africa has one of the lowest rural water supply and sanitation rates in Africa. Many of its water utilities are very unproductive and the sanitation facility treatment plants do not function properly. Several other problems arise in the provision of water to households. Some cities go without water for months, primarily as a result of problems with electricity. In many water utilities in South Africa, for example, the biggest capital item is their back-up generators, and their biggest cost is fuel for powering these. On average, water utilities get only about 4 percent of total spending on water, while the other 96 percent goes to private vendors and for self-supply (Briscoe, 2000:13).

In rural communities in Ghana, 85 percent of people use water which is unsafe and have to walk long distances to get it (Mensah, 1998:7). In Kalijal village in India, people take a bath only once in fifteen days, and they obtain water for drinking purposes from wells up to 4 km away. On average, the villagers use about 27 liters per capita per day (lpcd) which is below the WHO requirement of 40 lpcd (Reddy, 1999) and households spend about 18 hours per day to haul this water (Reddy, 1999). This includes many people per household taking multiple trips to the water source each day.

Most of the water and sanitation systems in developing countries are built as universal facilities, giving households no options from which to choose. These systems concentrate more on the supply and neglect the importance of demand in the decision making process. Studies to date have shown that households have a

higher willingness to pay (WTP) for higher levels of service and high income households have a higher WTP for services than low income households (Reddy, 1999:60). As such, a combination of high and low levels of service give these differing households a choice of service level instead of having just one high service level which the poor cannot afford to pay, or one low level service which the better-off households do not find suitable. Studies have shown that in Nigeria, 100 percent of the households surveyed are WTP more for private connections than for public standpipes (World Bank Research Observer, 1993:69). The same study also shows that in Brazil and India too, a significant proportion of households were unenthusiastic about public taps but willing to pay for private connections. Households are therefore WTP more for private connections than for access to a public tap.

2.18 Water conservation

Although water can be considered as a free natural resource, people have to pay water services because more capital is used in the transportation of water to make it reach the community. (Walker, 2000:32) shows that water has been used freely because the cost has been low and the supplies have been reliable in many households in the U.S, but in recent years, drought and growing water demand has led to increased efforts to conserve water by changing patterns of use and by using efficient fixtures.

Water conservation is crucial during the period of excess. This is helpful during the drought period. Walker (2000:7) noted that drought is depriving hundreds of thousands people in Somalia and some have even resorted to drinking their urine or walking marathon distance to find water. It is important to have facilities to store water so that during the period of deficit, water will be available. According to Hope (2003:88) some people are forced to travel about 70km to find water in temperatures of up to 40⁰c. According to DWAF (2002:43) the maximum distance that a person should walk to collect water to their dwelling is 200 metres and in steep terrain this may have to be reduced to take account of the effort required to transport water up a steep slope. In Somalia many families are surviving on just 20 litres of person can of

water for three days and this is the equivalent of 830ml or three glasses of water per capita per day for drinking (Walker, 2000:7).

2.19 Needs and expectations of water service delivery

South Africa has good governance documents and structures in place to ensure that public participants form part of development projects. The guideline describes and legislation enforces the ideal state of how things should be. It does not mean that services are actually conducted at grass root level the way strategy and legislation intended it to be. While guideline and legislation present the governance and legal framework of good service conduct, studies such as this one determine whether this is done effectively.

One way of determining whether or not public participation is effective, is to establish if the needs and expectations of communities are met when a new service is introduced to them. As discussed in the review, a public participant provides a platform for communities to voice their needs and their expectations to the service providers. If a public participant was done properly, these needs and expectations would have been considered and met by a service such as water service delivery. The Batho Pele white paper states that a transformed South Africa public service will be judged by one criterion above all: its effectiveness in delivering services which meet the basic needs of all South African citizens (RSA 1997:187). Wilson *et al.*, (1999:5) warns however, that while the participation process seems cutting edge, if not appropriately applied, it might only have the purpose of making authority figures look progressive. This could lead to participatory initiatives being counter-productive, raising expectations in stakeholders that might not be met.

According to Rajindra *et al.*, (2004:18), improved water quality and quantity benefits all but it mostly benefits the poor. Hemson *et al.*, (2008:87) wrote extensively on the relationship between water and poverty. They explain that inadequate and unequal access to proper water can result in people staying in the cycle of poverty. The intent of providing communities with water services is not only to get clean water closer to the homes of people, but is critical for realizing all benefits of water supply services (Walker, 2000:65)

Moller (2007:5), who wrote on the quality of life of South Africans, explained how access to clean water enhanced the well-being of South African people. Improved water supply is mainly used for needs such as drinking, cooking, personal hygiene (bathing, laundry and cleaning), livestock watering, in some cases vegetable garden watering, and yard cleaning (Keshavarzi *et al.*, 2006:198; Hemson *et al.*, 2002:56) from the literature several needs and or expectations were identified and used as indicators in the study to determine how water services impacted on the well being of the study community. Although literature indicated a wide variety of needs and expectations, this review only focuses on seven needs and or expectations since these were also the drivers (indicators) for the study.

2.19.1 Better health

The greatest benefit of improved water quality relates to the health of members in a household. Better water quality leads to the reduction of water-borne infections and diseases. Having larger volumes of high quality water readily available increases the likelihood that household members will improve on their personal and domestic hygiene practices. It is reported that when water is not available in meaningful quantities, personal hygiene is not seen as the priority (poverty-environment partnership (PEP, 2006:37).

The lack of water services detrimentally affects all form of community life, but those who are most affected impacted upon are woman and children in rural and peri-urban areas. With no access to water delivery services, woman and children in these areas have no choice but to walk long distances to collect water and carry it in heavy containers back to their homes, a burden which impacts directly to their health (RSA, 1998:76). Placing water taps closer to households or even on the property would reduce the carrying distance and time it takes to do this, but the ideal situation would be running water available at taps inside the households where collection and storage is not needed.

2.19.2 Quality of life

The constitution commits all people, but especially service providers, to establish a society based on democratic values, social justice and fundamental human rights through, among other things, improving the quality of life of all citizens and freeing the potential of each person (RSA 1996). According to Ellis (2002:8) having access to certain assets and resources such as a portable water supply can improve the quality of life for people in rural areas.

2.19.4 Sustainable development

To many people improved convenience (of a nearby water tap) improves their quality of life. People want water closer to their homes because it is convenient in term of health (where heavy containers are not carried over long distance) and the security of women (minimizing the chances of abduction, assault, rape and even exposure to dangerous animals) (Verhagen *et al.*, 2004:1). They spend less time and effort collecting water and sufficient quantities of water that can be collected in one trip (Skat, 2004). They have extra time and water to start income generating livelihoods, that can tend to existing livelihood or to search for jobs. School attendance can improve since the chances of contracting water-borne diseases or spending time collecting water during school hours will be reduced (PEP, 2006:20; UNICEF, 1999:7).

2.19.3 Equal access

Equal access to water supply is a fundamental issue for the water sector to address by the water sector. According to Mokorosi & Van Der Zaag (2007) benefits from water services should be distributed and shared on an equal basis. To ensure that the whole community is included in the sharing, the benefits should be negotiated with all interested and affected parties so that a mutual agreement can be reached. Public participation can be used as a platform for such negotiations.

To ensure that all people have equal access to at least a basic water supply such as a small community supply system, water services need to be provided according to the basic criteria of water service delivery. Based on local and international experiences, and on the premises of reconstruction and development programmes,

the following principles were adopted for the water supply and sanitation policy (Republic South Africa, 1994) and supported by Hemson (2000). There should be 24 litres of potable water per person per day consistently available and accessible within 200 metres from each dwelling. Such services should be at least 97% reliable and be provided at a minimum flow rate of 10 litres per minute to satisfy typical peak demand of a communal street tap system. This amounts to about 6000 litres per household of eight people per month.

2.19.4 Sustainable development

Sustainability is the key word when planning infrastructure improvements (Ashley, 2004:9). Ashley *et al.*, (2004:5) defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Quality of human life is supposed to be improved within the carrying capacity of the supporting ecosystems (Ashley *et al.*, 2004). According to Turton & Henwood (2002:67), sustainable solutions must be found because South Africa's water demand has grown and the land-based water sources will reach its limit of economical usability between 2020 and 2030.

2.20 Pricing Principles

Development of rural communities through service delivery must be sustainable. It must contribute to local growth and enable rural people to have access to resources (Ashley, 2004). This, however, implies that effective participation is needed to ensure that development projects adhere to the local priorities of development. Therefore developers have to incorporate the views, opinions and perspectives of those affected especially the recipient communities. If communities do not accept development they will not support the initiative and this will lead to unsustainable water use (Turton & Henwood, 2002:23). According to DWAF (RSA 1993:6, 2002:8), and supported by Turton & Henwood (2002:188), South Africa is classified as a semi-arid country and will by 2025, be facing serious water shortage. This makes this country one of the 20 most water-deficient countries in the world. It is therefore important that people adjust to and incorporate behaviour that will contribute to the sustainable use of water sources.

One way of ensuring sustainability of the actual water distribution system is people (community members) taking responsibility to maintain the system. Where systems are not functioning optimally, water may be wasted to the extent that people are deprived of tap water and have to go back to untreated sources. Hemson (2000:90) explains how pumps and standpipes break down or fall victim to vandalism. Since most households in small systems provided by utilities do not pay for water services, there are often no funds for maintenance. Their repair process takes longer and this compels people to go back to their original water sources, such as rivers and springs (Hemson, 2000:122).

Understanding how people perceive sustainable development in their community will create an understanding on how important they think their system will be. If the community therefore does not understand the concept of sustainable development, or if they know but do not care whether or not they use water sustainably, it may impact detrimentally on the lifetime of such a system and its source, the costs to the service provider to maintain it and the bigger picture of saving water for future generations.

2.20 Pricing Principles

Sustainable and efficient use of water requires the tariff to match at least the costs of supply. If water is priced at its long-run marginal cost of supply it incorporates the environmental costs over the life of the project (Nickson, 1997:90). An efficient allocation of water generally requires that all water users face prices that reflect its scarcity value (Strand, 2000:89). In practice water pricing may be designed to meet many objectives: to ensure cost recovery, raise revenue, manage demand and improve on water allocation and conservation of scarce resources, and redistribute income by discriminating among different categories of users (Dinar, 1997:9). When the cost of water is reflected in the price charged for water, the resource will be put to its most valuable use (Rogers, 2002:90). The systematic adoption of full marginal cost pricing of water services is what is usually recommended. Full supply cost includes capital charges and O & M costs. Full economic costs include full supply costs as well as opportunity cost and economic externalities. When water prices are lower than the costs of the supply, consumers tend to use water inefficiently and this

discourages maintenance, improvements, and expansions in the distribution system (Strand, 2000:45).

This in turn leads to irregular water supply and generally poor service. Very often, the tariffs do not even meet the full supply costs, and sometimes the value of water is lower than the cost of supply (Rogers, 2002:56). There are several elements of a tariff or pricing structure. These include: a connection or fixed charge, a volumetric charge, block charge, and a minimum charge. Several countries use a combination of these elements, depending on the specific situation and characteristics of the city, utility and behaviour of customers (Rogers, 2002:90). The public or administrative pricing, two-part tariff systems and increasing block tariff structures are popular combinations.

2.21 Conclusion

This study, though, is not about determining to what extent South Africa is a decentralised state, nor will it propose what needs to be done to make it a decentralised state: it is whether its current decentralised system of governance is conducive to sustainable local government service delivery. The purpose of this thesis is not to design a model for decentralisation. Rather, it aims to examine the transformation of local government in South Africa into a sphere of government which is constitutionally defined as the fundamental sphere responsible for the delivery of basic services. As such, the question is not whether decentralisation is good or bad for service delivery in South Africa, but whether it works, whether its current configuration is conducive to efficient and effective local service delivery.

The lack of water services detrimentally affects all form of community life, but those who are most affected impacted upon are woman and children in rural and peri-urban areas. With no access to water delivery services, woman and children in these areas have no choice but to walk long distances to collect water and carry it in heavy containers back to their homes, a burden which impacts directly to their health (RSA, 1998).

3.1 Introduction

The aim of this chapter is to illustrate an overall methodology together with the methods used to achieve the objectives of this research as stated in chapter one. It also describes the overall methodology adopted, population identification, sampling procedures and unit of analysis, the means to study site methods for data collection and analysis.

3.2 The Research Design

In the present study, the research design discussed was based on Leedy and Ormrod (2001:91-92). According to these writers, in planning the research design, it is extremely important for the researcher not only to choose a viable research problem but also to consider the kinds of data and investigation of the problem which will require feasible means of collecting and interpreting those data.

3.3 Research Methods

Research methodologies refer to the rationale and the philosophical assumptions that underlie a particular study (Leedy, 2004:88). This is therefore, informed by both quantitative and qualitative approaches. Philosophically, its arguments are underlined by inequalities of water services.

According to Leedy (2004:34), quantitative approach is based on positivism, in which scientific explanation is adopted. Quantitative data collection methods are based on measurements using verification instruments in order to objectify phenomena under study. Measuring instruments involves the assignment of numbers, in terms of fixed rules, to reflect differences between them in some of their characteristics.

Quantitative research focuses on measuring objective facts and variable and uses statistical analyses to express numbers (Neuman, 2006:7). Because of the power

the statistical evidence providers to research methods; it was used in this study to statistically support how the community thinks about the water services they used. Even though it was expressed during interview schedules and households questionnaires that the community was generally not satisfied with the water services, it needed to be statistically proven to strengthen the statement made by interview schedules and focus group interviews in the study.

Leedy (2001:89) further defines qualitative study as an inquiry process of understanding a social or human problem based on building a complex, holistic picture formed with word, reporting detailed view of informants and conducted in a natural setting. From the participant's point of view, constructivist or post positivist approach. In this study qualitative research is also suitable since it provides the researcher with the understanding of experiences and problems faced by the communities that receive inadequate water. Quantitative research was used to obtain data about the water services and water supply system in the study area.

This research method allows the in-depth discussion and the freedom to capture the real life perspectives and opinion of key stakeholders including the community members, because it is not bound to predetermined codes and scaling as in the case of quantitative data. It enables the researcher to add questions and capture responses that was not initially thought of when the questions were first designed.

3.3 Population of the study

Best and Kahn (1993:13) define a population as any group of the individuals that have one or more characteristics in common that are of interest to the researcher. The population may be all the individuals of a particular type, or more restricted part of that group. A population is defined by Wimmer and Dominick (1988:57) as a group or class of subjects, variables, concepts or phenomenon. Not all the members of the population were studied, only those who were selected by means of purposive sampling were involved. In this case; the researcher purposively selected respondents who are local Municipality manager, Ward Councilor, SANCO (South African National Civic Organisation) and heads of households who experienced the problems and challenges of water supply and sanitation in Thulamela municipality.

3.5 Sampling Methods and Size

According to McMillan & Schumacher (2001:89), the nature of the sampling procedure used in a particular study is usually described by one or more adjectives, such as random sampling, convenience sampling or stratified sampling. This describes the technique used to form the sample. Wimmer & Dominick (1983:58) share similar views with Lee (1994) by referring to sampling as a subset or sub segment of the population that is taken to be representation of the population. Mouton further mentions that the aim of sampling is to produce representative's selection of population elements. With regards to presentation Wimmer & Dominick (1983:58) mentioned that a sample that is not representative of population, regardless of its size, is inadequate for testing purposes-the results cannot be generalised for the population.

3.5.1 Sampling methods

This study consists of two villages which are Gaba and Tshifudi villages. There were approximately 500 households in study area and to obtain a representative population sample; a sample size of 150 (150 were finally interviewed) was calculated as 30% of the study area. A simple random and purposive sample was used for selection of a sample population. Simple random and purposive samplings are used in different contexts for the selection of a population sample. In simple random sampling, every member of the population has an equal chance of being selected. The selection of the households sampling was done randomly for questionnaire distribution in both villages. Purposive sampling gathers data on specific descriptors. A purposive sampling technique was employed in selection study participants. Not all members of the population were studied only those who were selected by means of purposive sampling were involved. Selection of participants was based on three criteria: type of water access; point of delivery and distance from source.

3.5.2 Sampling size

Table: 3.1. Sample size of the study

TARGET	STUDY POPULATION	STUDY SAMPLE
Household	500	150
Government authorities	1	1
Local authorities	1	1

3.6 Methods of data collection

Both primary and secondary data was used for this study. Secondary data was obtained from government publications, research publications and reports. Secondary data was collected through literature reviews aimed at identifying attributes and adequate water supply, waterborne diseases and water demand by households. Primary data was obtained through field observation of infrastructure and interviews with local stakeholders, and household questionnaires. Interviews were carried in two villages which are Gaba and Tshifudi, order to validate the attributes gathered from secondary sources and to allocate significant levels of these attributes.

3.6.1 Field survey

According to Leedy & Ormrod (2002:78), observation is a qualitative method with roots in traditional ethnographic research, whose objective is to help researchers learn the perspectives held by study populations. A survey was also undertaken to assess the infrastructure used for supplying water and whether or not members of the community protect and take good care of the supplying system (pipeline, taps, dam, and boreholes e.tc.) around the community and in their houses. An observation on whether the community can afford water was also done. This was useful in collecting data with regard to current water supply systems and management.

3.6.2 Household questionnaires

In this study 150 questionnaires with structure questions were divided and distributed to the households to solicit for household demographic information, information on present water use, current water supply systems and the quality of water, personal hygiene, livelihood activities, maintenance of water systems and preferred choices in terms of water services, which includes their willingness to pay for water services the sampled households and interviewing the household owners. These were also used in collecting data on the characteristics of the respondents, education level and employment. The respondents were mostly the household heads or any member of the households water use. The questionnaires were distributed to 30% of the households in the study area.

3.6.3 Interviews schedule

According to Mcmillan & Schumacher (1994:19), once the researcher makes the decision to use an interview as data, an interview schedule is constructed. Two types of unstructured questions were distributed in the study area. The first type was distributed to the District Municipality and Department of Water Affairs; and the second type was distributed to the Headmen; civic and headmen which are responsible for the water supply in both villages; This allowed for the researcher to obtain the perspectives that authorities had on the issues of the residents. They were used in collecting data on the water supply systems and alternatives in both villages.

3.7 Data Analysis

Miles & Huberman (1994:75) state that data analyses is the process of systematically searching and arranging the interview transcription, field note, and other materials that are accumulated to increase the researcher's own understanding of them and to enable one to present what one has discovered.

Statistical package for scientific solutions (SPSS) was used to analyse the questionnaires which were used to interview members of community. Quantitative studies emphasise the use of numerical measures to arrive at specific findings. The

obtained information from questionnaires and interviews was first coded for each and every question and then entered in the Microsoft excel spreadsheet in words and number. Data from questionnaires was analysed by means of using tables and figures. The entered data from the spreadsheet was exported to the SPSS so that it could be analysed to yield the results. The unit of analysis is at the combined level of the individual, household and community participants in liaison with the local and district municipality.

3.8 The means of access to study

This research study was conducted in the Mphaphuli tribal authority, Headmen and Thulamela municipality. A letter from the Headman facilitated gaining entry to administer a household questionnaire survey. Permission was also asked on individuals that were interviewed. For clear representatives of the water supply systems and quality, pictures were deemed necessary, so permission for shooting the pictures was asked from the households and members who are harvesting and participating in water supply and management issues. Permission was also asked from the municipality to gain access to any records that they have regarding the water supply system and any documents regarding planning. In promoting anonymity the pictures were taken in wide-shot and questionnaires didn't request for names.

3.9 Research Ethics

Mouton (2001:238) indicates that the ethics of Science concerns what is wrong and what is right in the conduct of research. Because scientific research is a form of human conduct, it follows that such conduct has to conform to generally accepted norms and values. Leedy (2001:45) emphasizes the importance of studying ethics in research in order to determine ethical principles underlying protection of human rights. The rights of human research subjects need to be protected by the researchers.

3.9.1 Interviewer's ethical code of conduct for the present study

The interviewer's ethical code of conduct will be based on the ethical principle formulated by McMillan and Schumacher et al (1993:6)

According to McMillan & Schumacher et al (1992:49), ethics are the principles of right and wrong that a particular group accepts. Further indicate that two issues dominate recent guidelines of ethics in research on human subjects:

- Consent to participation; and
- The protection of subjects from harm

The aim of implementing ethics is also justified to allow respondents to enter the research project voluntarily and to ensure that the subjects are not exposed to risk that are greater than the gains they might derive. The interviewer acquired consent from the respondents that participated in the research project and informed them of their rights (Leedy, 2000:89).

3.10 Conclusion

This chapter has covered all issues concerning overall research methodology adopted, population identification, sampling procedures and units of analysis, the means of access to study sites and methods for data collection and analysis. The issue of how data were collected and analysed were dealt with in this chapter. The next chapter deals with the interpretation and analysis of the collected data.

4.1 Introduction

This chapter presents the data analysis, interpretation and description of findings from the empirical research. The data which were collected by means of focus group discussions, field observations, and household questionnaires were analysed and interpreted to determine the performance of the water supply systems and the management water sources at Gaba and Tshifudi villages. The questionnaires analysed in this chapter were based on limited statistics such as counts frequency distributed and percentages results interpretation. Photos that were presented as evidence were captured during the time of field's observation.

4.2 Institutional arrangement with regard to Water supply

The water services and providers in the study area include: Vhembe District Municipality, Thulamela Municipality, and Department of Water Affairs and Forestry. According to South Africa Water Services Act (Act no. 108 of 1997), the district municipality is given the mandate to act as the water service authority and the local municipality to act as the water services provider. In Gaba and Tshifudi, Vhembe District Municipality has given mandate to Thulamela local municipality to be water services authority and DWAF is acting as the water service provider. Thulamela municipality as the water service authority has a duty to all the consumers or potential consumers in its area of jurisdiction to progressively ensure efficient, affordable, economical and sustainable access to water services as stated in the Water Services Act (Act 108 of 1997). Thulamela municipality is responsible for the installation, collection of payment, regulating the standard of services and the repair of pipes. DWAF is responsible for provision of water.

4.3 Biographical information

Table 4.1: gender status of the respondents

	Frequency	Percentage
Male	70	47%
Female	80	53%
Total	150	100%

Out of the 150 responses the observations made were that 142 were males and 121 were females which constitute 53% and 47% respectively while 2% of respondents had not indicate their gender (See table 4.1). This means that males were in majority and the two local municipalities had to recruit more females to participate in ward committee structures and municipal governance. In addition, the 50/50 male and female ratio as required in terms of Project Consolidate is not yet achieved by the municipalities.

Table 4.2: Employment status of the respondents

	Frequency	Percentages
Full time	18	12
Part time	20	13
Unemployed	92	62
Pensioner	20	13
Total	150	100

In terms employment status the majority of the ward committee members were unemployed, that is, 62%. Ironically, 25% of the respondents were employed although the majority of this category was employed on a part-time (i.e. 14% and 11% full-time employed). In addition, pensioners constitute 13% of the total number of respondents (See Table 4.1).

Figure 4.1: Percentage distribution of the education of the household heads
Education Percentage distribution (%)

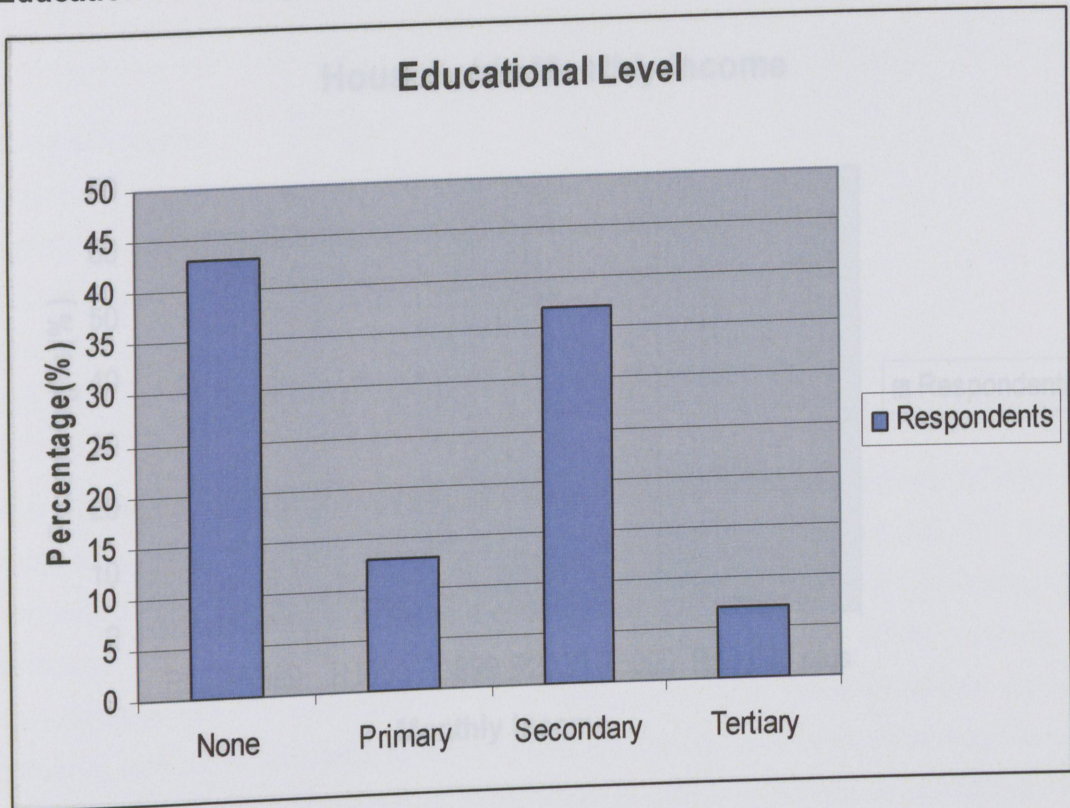


Figure 4.1 shows that the education level of the respondents is very low; more than 93, 3% of the household's heads did not go beyond matric level (grade 12). Only 6, 7% have Diplomas and Degrees whilst 43, 3% have not received any form of education. Finally 13, 3% of the interviewed population has primary level of education and 36.3% received secondary education.

Households with higher incomes can afford to have a better access to water and The level of education has an impact on the development of a particular area. Mostly an uneducated person tends to have less care on what is being done to develop the area. It was found that some of the pipes that been damaged in the study area were destroyed due to carelessness particularly by people with limited education and inability to value the water supply infrastructure.

Figure 4.2: Distribution of households per class of monthly income in Gaba and Tshifudi villages (source: Survey data, 2010)

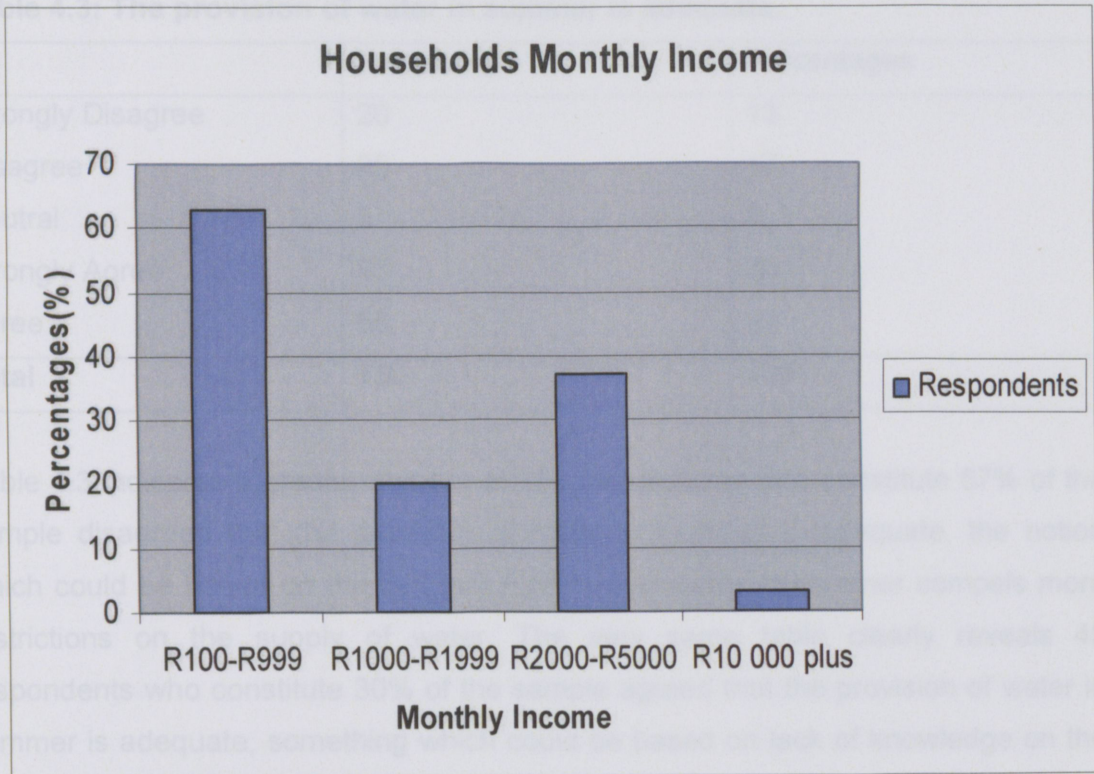


Figure 4.2 shows the monthly income of the sampled households. About 83% of the households live on a monthly income lower than R2000. The study found out that the majority of households had an income in the range of R100- R2000. Many households monthly income is R1050. Most of the high income households depend on monthly salaries, which is 17% of the sampled households (figure 4.2). Households with higher incomes can afford to have a better access to water and have higher water consumption.

4.4 Factor affecting water supply in Gaba and Tshifudi

Table 4.3: The provision of water in summer is adequate.

	Frequency	Percentages
Strongly Disagree	20	13
Disagree	25	17
Neutral	5	3
Strongly Agree	45	30
Agree	55	37
Total	150	100

Table 4.3 indicates a greater number of 100 respondents who constitute 67% of the sample disagreed that the provision of water in summer is adequate, the notion which could be based on the fact that high temperatures in summer compels more restrictions on the supply of water. The very same table clearly reveals 45 respondents who constitute 30% of the sample agreed that the provision of water in summer is adequate, something which could be based on lack of knowledge on the side of the respondents concerned. 5 respondents who constitute 3% of the sample were neutral, something which could be based on misconception affecting the respondents concerned.

Table 4.4: The provision of water in winter is adequate.

	Frequency	Percentages
Strongly Disagree	46	36
Disagree	57	38
Neutral	10	7
Strongly Agree	15	10
Agree	13	9
Total	150	100

Table 4.4 reveals the majority of 103 respondents constituting 74% of the sample disagreed that the provision of water in winter was adequate, the notion which could be based on the fact that low temperatures in winter compel more restrictions on the

Table 4.6: Water is a serious problem in the area.

	Frequency	Percentages
Strongly Disagree	25	17
Disagree	24	16
Neutral	10	7
Strongly Agree	44	29
Agree	47	31
Total	150	100

According to Table 4.6 the greater number of the respondents agrees that water is a serious problem to the community. This is clearly indicated by 91 respondents representing 60% of the total sample. The fact that 49 respondents constituting 33% of the total sample totally disagreed that there is a serious problem of water, which is a clear indication that there is a section in the community which is not conversant with the prevailing changes. The 10 respondents constituting 7% showed that very few people do not know what is materializing in the community.

Table 4.7: Women and children carry the responsibility of fetching water.

	Frequency	Percentages
Strongly Disagree	26	17
Disagree	24	16
Neutral	10	7
Strongly Agree	47	31
Agree	43	29
Total	150	100

Table 4.7 shows that 90 respondents constituting 60% of the total sample agreed that women and children carry the responsibility of fetching water, something which is necessitated by patriarchy in the community. 50 respondents representing 33% of the total sample disagreed that women and children carry the responsibility of fetching water, something which could be based on the lack of information by a certain section of the community.

Table 4.8: Women and children travel long distances to fetch water.

	Frequency	Percentages
Strongly Disagree	30	30
Disagree	22	15
Neutral	5	3
Strongly Agree	43	29
Agree	50	30
Total	150	100

It is evident from Table 4.8 that women and children travel long distances to fetch water. This notion is clearly corroborated by 93 respondents constituting 59% of the total sample. The fact that there are few reservoirs and no water reticulation, which is not available though, confirms the point that women and children travel long distances to fetch water. 52 respondents representing 45% of the respondents disagreed that women and children travel long distances while trying to fetch water, something which could be based on the lack of knowledge of the respondents concerned. Misconception surrounds 5 respondents constituting 3% of the total sample, as these respondents were neutral that women and children travel long distances to fetch water.

Table 4.9: Lack of water disturbs the socio-economic activities.

	Frequency	Percentages
Strongly Disagree	30	20
Disagree	29	19
Neutral	1	1
Strongly Agree	46	31
Agree	44	29
Total	150	100

Table 4.9 indicate that 90 respondents constituting 60% of the total sample agreed that lack of water disturbs the socio-economic activities of the community. This fact could be based on the idea that nothing can materialise without water. On the one hand 59 respondents constituting 39% of the total sample disagreed that lack of

water disturbs the socio-economic activities of the community, the notion which could be based on misconception of the respondents concerned. 1 respondent representing 1% of the total sample confirmed misunderstanding on the side of the respondent.

Table 4.10: Women and children fetch water from surface source.

	Frequency	Percentages
Strongly Disagree	24	16
Disagree	33	22
Neutral	0	0
Strongly Agree	40	27
Agree	53	35
Total	150	100

Table 4.10 indicate that 93 respondents constituting 62% of the total sample agreed that women and children fetch water from the surface sources particularly for washing. Nandoni water is highly contaminated but women and children are compelled to fetch water there, simply because the water shortage is high. 57 respondents representing 38% of the total sample disagreed that women and children fetch water from surface source, and this is a clear indication that there is a section of the community which lacks the knowledge of events prevailing currently in this area.

Table 4.11 Relationship between ward committees and traditional leaders

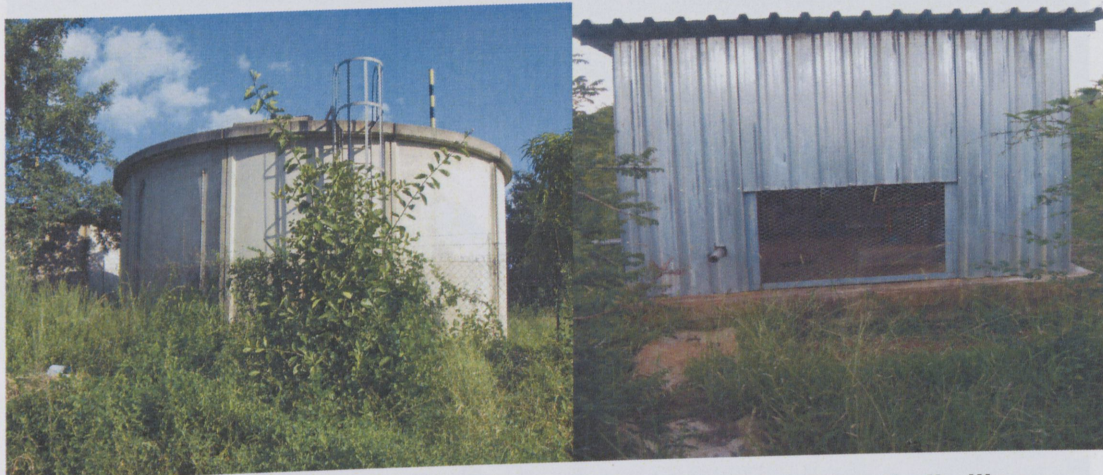
	Frequency	Percentages
Strongly disagree	43	29
Disagree	60	40
Neutral	16	11
Agree	22	15
Strongly disagree	9	5
Total	150	100

The view is that a sustainable relationship between the Ward committees and traditional leaders should be built. It was noted from the responses that some members of traditional authorities felt that the Ward councillors and Ward committees were taking their jobs and that was making them ceremonial figures in their communities. In this context, 41% of the responses showed that traditional leaders should be part of Ward committees while 35% said the opposite. Some of the respondents, 7% to be specific felt that traditional leadership were part of Ward committees as they stood chances like all people to be appointed to serve on the structures.

The second view of these respondents is that if not appointed they could attend [all] meetings and be observers. However, 7% of the respondents saw no need of the involvement of traditional leaders as they might stifle the progress and participation by young people in Ward committee affairs. The view was that traditional leaders were people of an 'old school' and the Ward committee might 'get into existing conflict between the traditional leaders and councillors'. However, 5% of the respondents remained neutral, and the remaining 5% did not respond to the question.

4.5 The water system and alternative sources in Gaba and Tshifudi village

The official water service authority for the two villages is the Vhembe District Municipality. The District Municipality delegates the responsibility of providing, managing and maintaining the water system in the village on the Local Municipality, in this case Thulamela Local Municipality who is then the service provider. Based on information obtained from the Municipality and then members of the civics in villages, the water system in two villages can certainly be described as a small community water supply. Ground water is pumped from a borehole to a clean water holding reservoir (see Picture 4.1)



Picture 4.1: Reservoirs and groundwater pump in Gaba & Tshifudi village.

This JOJO tanks in Gaba village have a capacity of 10 000 litres (per tank by four tanks) and concrete tanks have a capacity of 500m³. The initial calculation was that the reservoir would hold enough water to supply the village for 24 hours if no pumping takes place (e.g. in cases of a breakdown). From the tanks the water is distributed via underground pipes to the communal taps (see Picture 4.2)

Picture 4.2: communal tap used in Gaba & Tshifudi villages

4.5.1 Accessibility of tap water

The communal standpipes with their taps are not supposed to be further than 200 metres from the households (as discussed in chapter 2). Although all the community members had access to the pipes, not all taps are currently distanced within that guideline. Newcomers to the village settled on the periphery of the village, which meant that many of them were more than 600 metres from their closest taps. The system was not extended to accommodate them.

The 200 metres was initially complied with by placing the tap in a radius of 200 metres from the households. In practice, this meant however, that several households, although within a 300 metres radius (i.e. a straight line) from their closest tap, were actually much further from it since water collectors still had to walk



Picture 4.2: communal tap used in Gaba & Tshifudi villages

4.5.1 Accessibility of tap water

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The 200 metres was initially complied with by placing the tap in a radius of 200 metres from the households. In practice, this meant however, that several households, although within a 300 metres radius (i.e. a straight line) from their closest tap, were actually much further from it since water collectors still had to walk

around other houses and other landmarks (streets and corners) to get to the tap. Sometimes they would walk up to 1000metres to their closest tap although, geographically, that first tap was 200 metres in a straight line from the household.

Another issue related to the accessibility of the taps was the installation of yard taps. This was not originally part of the planning process of the water system and was only included a few years after the installation of the communal standpipes. Although households were expected to pay the installation of the individual yard tap, many people felt that everybody had the right to easier access to tap water dispensed via yard taps, and therefore argued that people should not have to pay for the convenience of having a yard tap.

4.5.2 Availability of tap water

As mentioned in chapter 2 water is supposed to be continuously available at the taps, but this was not the case in Gaba and Tshifudi. A major source of dissatisfaction in the villages was the issue of cut-off times (see Picture 4.3). The operator of the water system explained that the distribution of the water to the taps was deliberately interrupted during the day to ensure that the reservoir could fill up again, which immediately indicates that the current demand for water in the villages is already exceeding the original design capacity. The water was cut off from 16h00 to 06h00 daily. During the day the water demand was so high that the tank was drained completely. If these cut off times were not implemented, the pump could not replenish the water stocks in the tanks and the system would therefore not be able to deliver water at the taps.



Picture 4.3: Breakdown and cut-off of the main pipe line system

According to the results of households' interviews, the community did not agree to this arrangement, but had to accept it. They claimed that the operator did not, however, adhere to this agreement, and that, quite often, the water was only turned on late in the mornings; any time from 08h00 to 10h00. This did not settle well with the community, because they needed to collect water early in the mornings to prepare their children for school.

Another issue related to the availability of the tap water was illegal yard connections. Even though all of the headmen and the civic members that were interviewed indicated that the community members were not allowed to connect hosepipes (see picture 4.4) to the communal taps, illegal connections were a common observation in the part of the village closest to the tanks.

A second problem was that the households with illegal connections used much larger quantities of water with the hosepipes than those who collected water in containers. As a result the water pressure from the reservoir was lowered and taps supplying households further from the reservoir ran dry because the water pressure



Picture 4.4: Hosepipe illegal connection to Communal tap

These connections by default would cause inequity in the availability of the water in the community. Several households extended hosepipes from the communal standpipes to their yard to get water conveniently closer to their homes while others could not. This caused various other problems too. Occupying a tap by connecting it to a hosepipe denied others access to that tap. They then had to wait or use alternatives taps that were further away from their houses or other contaminated sources such as the Mutshindudi River. Even though other households could simply disconnect the hosepipes as it was not secured firmly to the tap to use the tap, it led to conflict in the community and owners of the hosepipes will just reconnect the hosepipes. It was the matter of first-come first-serve and the connectors felt they had right to keep the hosepipes connected as they were there first.

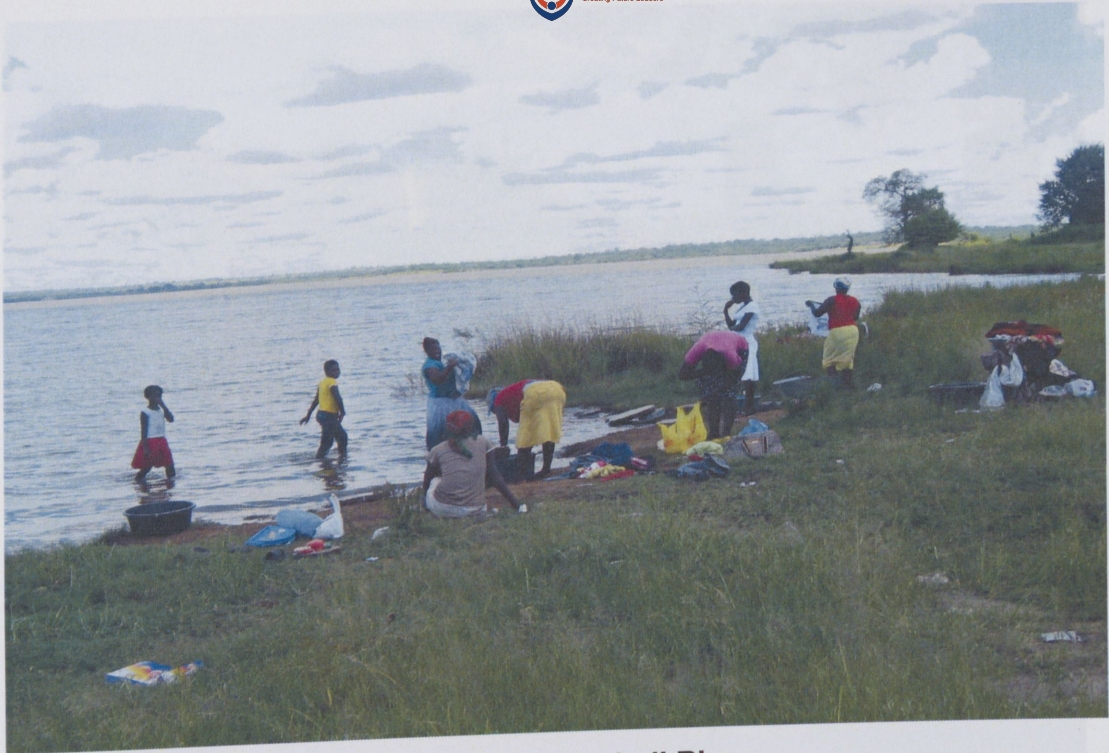
A second problem was that the households with illegal connections used much larger quantities of water with the hosepipes than those who collected water in containers. As a result the water pressure from the reservoir was lowered and taps supplying households furthest from the reservoir ran dry because the water pressure

was not sufficient to supply these with water. Officially the only instance that households were allowed to use hosepipes was when they had private connections with metered yard taps. They were then expected to pay for the quantity of water that exceeded the 6000 litres of free basic water per household per month. Water used in this way nevertheless still affected the water pressure indicating the inefficient design of the system. The municipal officials explained: "there was an intervention by the community when they were making illegal connections, but by the leadership of the Chief (Headman) and his council they (removed) the illegal connections which most of people the used.

The headman and the civic members confirmed this and said measures had been taken to prevent people from installing illegal connections. The headmen and the civic members of the village confiscated hosepipes and fined the guilty parties involved. This was not effective as many people were still using hosepipes at will. The headmen indicated that they officially permitted community members to occasionally use the hosepipes or to extend the pipe line, but only for special occasions such as funerals when large quantities of water are needed for food preparation.

4.5.3 Alternative water sources

According to a civic member the community uses the river or the canal if there is no water available at the taps. Several participants echoed this response, explaining that community members would make use of alternative water sources if water was not available at the taps. They either turned to natural water sources these were also the sources they used before the installation of the taps or they made other arrangements to get tap water from nearby villages. Sub villages such as Bengwa, Nzamwe and Madandila utilised untreated water from Mutshindudi River or rain harvesting as a water source (see Picture 4.5)



Picture 4.5: collecting water from Mutshindudi River

One civic member explained that those who preferred not to use natural water sources either waited for the water to be available at the taps or they paid to get water at taps from nearby villages. The collectors asked anything from R5.00 per 25 litres container as a starting price; depending on the number of containers and how far they had to travel to collect water. Often these alternative water sources were far from the households. According to the focus groups, community members had to walk from about 200 metres to more than three kilometres to the alternative water sources to collect water in containers (see picture 4.6). These sources were often secluded and posed safety risks such as attacks from wild animals and the assaulting of woman and children. Collecting water from remote sources also used much of their time as it could take anything from 30 minutes to more than three hours to collect a few containers of water. This time could have been used more productively.

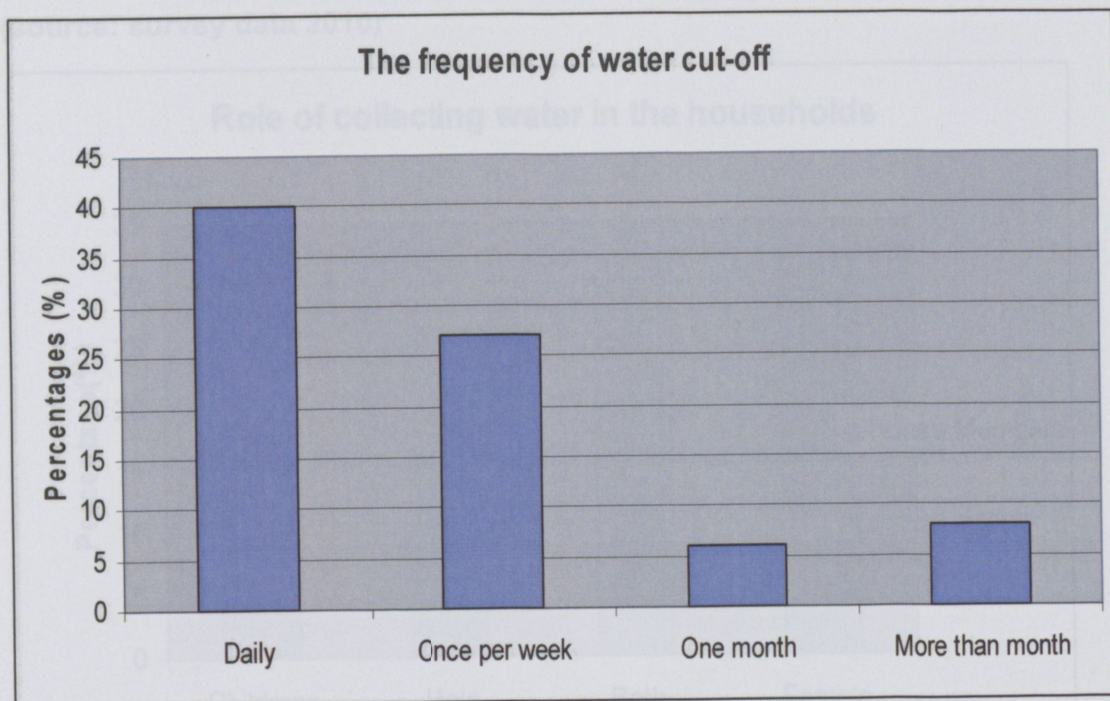


Picture 4.6: Water transportation to households

4.6 Frequency of water cut off

Figure 4.3, reflects that 40% of the households experience water cut-off on a daily basis. Their day to day activities are interrupted due to the intermittent supply. 6.5% of the households receive water after a period of more than months. Some stated it clearly that they even spend 6 months without water in their taps. While others residents have spent the longest period of six months without running water in their taps. Some only has a history of one to two weeks without water in their taps.

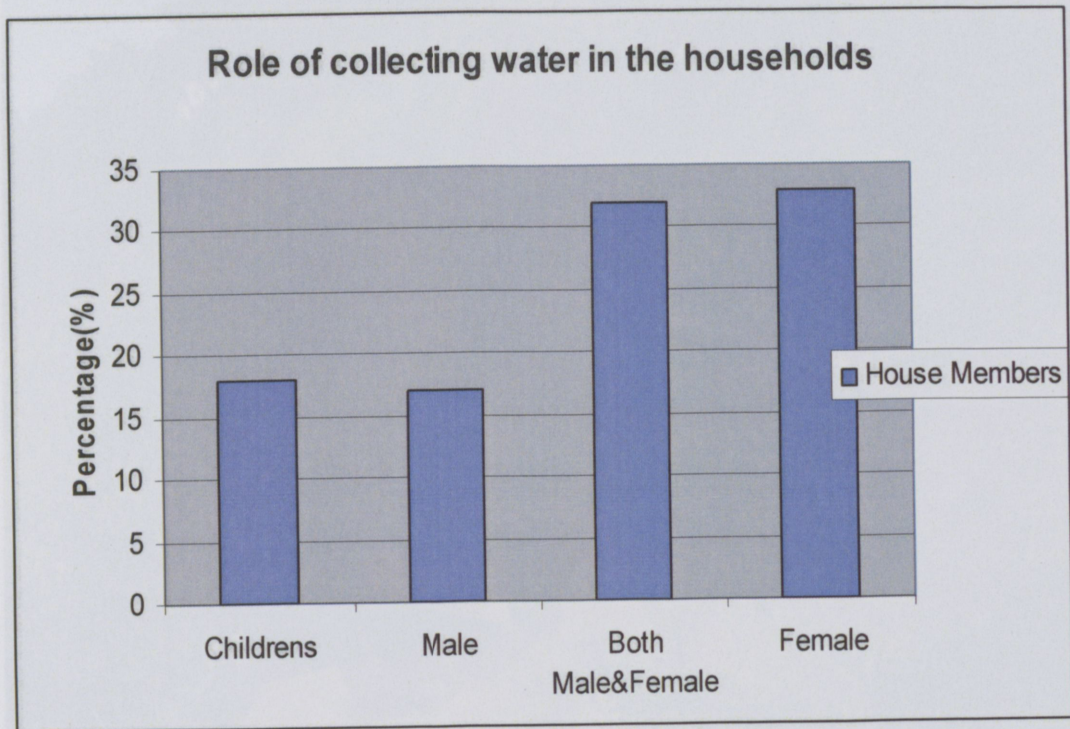
Figure 4.3: Frequency of water cut-off



4.7 Role of collecting water in the household

Figure 4.4 shows that in almost 50% of the household's water collected by the women. 32% of the households reported that even though both men and women collect water, women participate more actively in this role than men. Only 17% of the households reported that water collecting is a men's responsibility. Given the current poor access to private taps and the unreliability and low frequency of water supply of the tap water and communal pipe water supply, women are the ones who bear the burden of collecting water from other sources which are far from their homestead. Improvement of water services in the rural areas is likely to benefit women in the sense that they will have more time to do other productive activities as well as looking after the family.

Figure 4.4: Distribution of households or status of members collecting Water
 (source: survey data 2010)



4.8 Operations and maintenances of water System

Apart from water cut-offs at certain times of the day, breakdowns in the system also occurred (see Picture 4.7). This led to water not being available at the taps often for more than two days. According to the operator these breakdowns were random. It could be caused by electricity not being available to pump water, by the pump itself breaking or by a burst pipe. There could also be a specific situation where pipes were damaged. For example, when electricity was installed in the village and holes were dug for the electricity poles, the underground location of the water pipes was not properly indicated and the diggers sometimes struck a water pipe. According to the operator and the municipal officials the main responsibility of fixing the breakdowns was with the municipality. The local system operator fixed the smaller problems. If the problem was beyond his ability to repair he reported the problems to the municipality and they would send a team to fix it. This could take anything from one day to a week, depending on the nature of the problem and the response time of the municipality.



Picture 4.7: Poor maintenance of water supply system

4.9 Conclusion

The data analysis confirms the theoretical stance of this study. The community experiences a number of challenges in their daily lives. The service provider is also trying in various ways to improve the provision of services in the community. The Municipality has to demonstrate and integrate extra strategies towards committing themselves to improving the provision of services. Ongoing improvement is needed to improve water service delivery from the municipality as a government institution. The water available in the source directly affects the quality of water to be treated in the water purification plant. During the low flow of the river the pumping machine will draw very little water from the river. This lead little water is being available for purification and hence very little water leaving the plant to the storage reservoirs. Since there is little water in the storage reservoirs there will be very little distribution to the service reservoir. During the times of high flows of the river the plant has

enough water to pump and therefore there will be enough also to purify and hence distribute to the reservoirs. In the study area, water supply problems become better few months after a rainy seasons. Gaba and Tshifudi villages, water is scarce in such a way that it is only sufficient for domestic purposes. During dry seasons problem of water supply is accelerated in Gaba and Tshifudi villages, households depend on the rivers and communal pipes, which are supplied with boreholes water. This occurs when the flow of the river is very low hence the raw water pumps will pump little water the river. At the time of the study, most of the communal pipes were not working except for two.

5.2 Major Findings of the study

- The findings of the research confirm that there is a need to improve water supply and management system in the study area.
- The study found that communities are not willing to pay for water and the communities are still using water from rivers.
- The finding of the research shows that there is a need to implement government programme of encouraging water supply and management of rural water supply system by both the local government and residents separately. The focus will be to move the ownership and management of the water supply system significant into the community with increasing local control by the local government and the local residents and technical support, with a view to involving various stakeholders in both the operation and maintenance.
- There was no operational problem in Gaba and Tshifudi before installing their small community water supply system and subsequent delivery of the services. The greatest benefit reported was the use of a water system such as this one is the improvement of the community health condition.

5.1 Introduction

In this chapter the researcher begins with a general overview of the assessment of water supply systems, which shows that the aims were achieved. The experiences of stakeholder and government officials obtained from interviews conducted are described together with the recommendations for improving water supply in rural areas and the management of the water sources. This chapter contains some concluding remarks about the contribution of this study to stakeholders in general.

5.2 Major Findings of the study

- The findings of the research confirm that there is poor performance of water supply and management system in the study area.
- The study found that communities are still walking kilometres to fetch water and the communities are still buying water from vendors.
- The finding of the research shows that there is need to implement government programme of encouraging shared ownership and management of rural water supply system by both the local government and resident community. The focus will be to move the ownership and managements of the water supply system significant into the community with increasingly less control by the local government and this will require training and technical support, with a view to involving women more fully in both the operation and maintenances.
- There was no community participation in Gaba and Tshifudi before installing their small community water supply system and subsequent delivery of the service. The greatest benefits expected with the use of a water system such as this one is the improvement of the community's health. According to the

5.3 water services provider (Thulamela Municipality) this is a main driver of delivering clean water to small communities.

This study was set to assess the performance of local water supply systems and

findings

- Household members and stakeholders were interviewed about/concerning the system installation and it seems that it has indeed had a positive impact and the community. These health benefits were reported by the community to be reduced occurrences of water-borne diseases, less physical pain because the containers were carried over short distances and even in some cases an improved diet.

water supply and sanitation services in rural areas, the

- The community members mentioned several other problems that they experienced from the water supply such as cut-off times lasting too long or a frequent breaking down in the system which compelled the residents to walk long distances with heavy containers to collect water from untreated environmental sources.

The provision of water services in rural areas: the

- The results presented in this chapter shows that there are variations in household characteristics and water services across villages, gender and livelihood activities. Most of the respondents were female and this was an advantage as women are the ones who are more aware of household water use and sources.

A number of water supply systems in rural areas

- The respondents' educational level was very low, many did not reach the secondary level and some did not receive any form of formal education.

capacity of the community. Gender

- Unemployment is very high, many household heads are not employed and the dependence on social grants is still very high in the area.

5.4 Recommendations for future research

- Though generally a significant number of households have access to communal taps, quite a number of taps are not working. This is because there was no major improvement of water infrastructure.

projects is effective. The

the community. From the

This study was set to assess the performance of rural water supply system and management with regard to the provision of safe, reliable water and sanitation services to Gaba and Tshifudi communities. On the basis of this, the following are study conclusions:

- Even though the municipality has made significant progress towards meeting the national target of providing water and sanitation in most rural areas, the water supply and sanitation situation at the study area leaves much to be desired. In most cases, more than half of the population is without access to convenient and reliable sources of water. Households therefore, cope with the unsatisfactory baseline condition, which is usually communal taps, river sources or public wells that are several metres away from the homes.
- The provision of water and sanitation to the study area villages of Gaba and Tshifudi villages is a complicated and costly process that faces a range of constraints. Lacks of co-ordination among all stakeholders and conflicts that may arise with regard to water delivery are challenges these communities face.

A number of water supply systems have failed because either they were not properly designed or not completed. In most cases there were no provisions which were made for continued maintenance since such maintenance activities were beyond the capacity of the community. General observation indicates that there is need to improve community involvement in all aspects of rural water systems and sanitation.

5.4 Recommendations for future research

- More research needs to be done firstly to determine whether the government's current strategy of including communities into development projects is effective, and secondly if it meets the needs and expectations of the community. From this study it seemed that residents needed more from

- the system and its delivery and the only way to get it was to inform the service provider which did not seem to be responding. As mentioned communities are unique and its people have different cultures and live in different physical environments. Therefore a generic framework for community participation in water services must be suitably flexible and supported by effective guidelines to ensure that it can be applied by service providers to effectively assess a particular community's needs and expectations through community participation.
- Merely telling communities the system belongs to them and they should take ownership of it clearly did not work in the case of Gaba and Tshifudi villages. Other ways should be explored on how to bring people to actively care for their service infrastructure and not letting them fall prey to apathy and adopt an attitude that the government will provide for everything we need. People must take responsibility for their own actions in their lives. Research is needed to first determine the cause of apathy and secondly find out how to overcome it. This can have a snowball effect in a community: first they realize that if they protect their system against vandalism and inequitable over use by some the taps will not run dry. Then if they draw up a agreed on water schedule concerning the time when water would be cut-off, it can spread to a community actively caring for its whole environment e.g. not wasting water, caring for the environment and being more diligent and persuasive towards the relationship with a service provider such as the municipality
 - Councilors are being deployed by their political parties to their positions as councilors. Therefore every councilor should be accountable for his/her duties and responsibilities to his/her political organization. For this reason, the study recommends that political organizations/parties should strengthen their branches by electing dedicated and committed members to the executive positions of their branches and that the councilors should have people to whom to account for their duties and responsibilities.

- The third recommendation is education in the communities, not only for school children, but all community members. Research is needed to determine why people do not understand the importance of issues such as rights about standpipes, paying for water or using water sustainably. Education initiatives must be established to make people aware of the consequences of their actions; they must adopt an attitude to conserve water and accept that some people can afford stand pipes and others can't. People using these small community water supply systems need to change their behaviour towards the way they live around their around their water supply and how they use it to empower themselves and how to be less antagonistic towards their service provider.
- IWRM in developing countries also includes the efficient and equitable allocation of water to rural domestic users. The lack of equity in the provision of water services in these areas is flagrant. A minimum amount of water must therefore be supplied free of charge and in a reliable way (collective taps, private taps) to all rural households. These households should not be obligated to pay, because of their low income, for additional amounts of water supply systems. These additional amounts would further improve the quality of life of rural households and can be used for non domestic uses such as gardening irrigation, beer production, etc, which are likely to foster local economies and improve local livelihood and reduce rural poverty.
- Institution dealing with water services delivery in the area shows lack of capacity to fulfil their mandate. They are afflicted with poor management practices, over staffing with poorly motivated and trained personnel, inadequate equipments and technical expertise and manager financial resources. These institutions have had a difficulty of recruiting and retaining skilled staff.
- Comprehensive program of capacity building is required to assist both the existing and incoming administrative cadres. A transfer of skilled staff from

- national government to the municipal sphere may be required to provide much needed capacity of municipal employee.



- Capacity can also be achieved by motivating the staff through providing sufficient incentives such as promotional opportunities and employee benefits. Proper institutional managements are necessary to foster coordination and cooperation in many areas of common interest in service delivery.
- The leakage that are not repaired in time are an indication of poor cost recovery strategy. The municipality most comes up with a proper strategy for improving on the cost recovery because without money there would be no service provided for the community. This will also make the treatment plants to perform its process well. The money that will be charged will be used in the operation and maintenance of the whole system.
- In conclusion, lack of access to safe and reliable supply of domestic water, poor maintenance of water system, poor services delivery and poor sanitation awareness resulted in poor health for rural people and loss in productive time due to sickness. Women and children primarily bear the responsibility for collecting water and are the worst affected by this situation. Therefore, the study recommends the strategy which is based on the efficient management and equitable supply of water to rural domestic users.

5.5 Recommendations for further research

Further research in this field is recommended that will enhance and supplement the study on the water supply in Gaba and Tshifudi Villages by Thulamela Municipality as a third sphere of government. The following research that is not covered in this study is recommended for further study:

- Unlocking the existing resources necessary for the development of the community in order to improve the quality of life, especially the most poor and marginalized sections of the community;



• improving living conditions through better access to basic physical and social services and health care for the community;

• The control and regulation of the electricity distribution system in the community;

• Promotion of efficient and compassionate delivery of basic health care systems in the community.

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Name of the Village

Wilson, D. 1999. **Exploring the limits of public participation in local government. Parliamentary Affairs**, 52 (2): 246-259.

1. Are you the head of the household?

White G, F. 2002. **Drawer of water: Domestic use in East Africa. Bulletin of the World Health Organisation**, 80(23): 100-119

2. How old are you

WHO 1996b. **Global health for all: Indicators.** Available from [:http://www.who.ch/hst/a/9106ind:htm](http://www.who.ch/hst/a/9106ind:htm). (Accessed 17 December 2010).

Female

WHO 2000. **Global water supply and sanitation assessment report.** WHO. ISBN 92-4156202-1.

educational level?

Primary

Secondary

Tertiary

None

6. How many people live permanently in your household?

7. How much is the household earning per month

R100-R9999

R1000-R1999

R2000-R50000

R10 000 Plus



Questionnaire directed to head of Households at Gaba and Tshifudi villages
 Name of the Village _____

SECTION A: SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS

1. Are you the head of the household?

Yes

No

2. How old are you _____

3. Are you _____

Male

Female

4. How many rooms do have in your house? _____

5. What is your educational level? _____

Primary

Secondary

Tertiary

None

6. How many people live permanently in your household? _____

7. How much is the household earning per month

R100-R9999

R1000-R1999

R2000-R50000

R10 000 Plus

8. If yes, do you get water from the tap?

Yes

No

9. Do you store water?

Yes

No

10. If yes, for how long

Less than five day

More than five days and less than six day

SECTION B: WATER SUPPLY AND DELIVERY



9. How much water is your household using per day?
1. Does the village have a water committee?
 - Yes
 - No
 2. From where do you get your water?
 - River/dam
 - Public standpipe
 - Rainwater
 - Boreholes
 - Other (specify) _____
 3. How far is the source from your home (in meters?)
 - 0 (at home)
 - 50-100
 - 100-500
 - 500-1000
 - <1000
 4. What time is the water source the busiest?
 - Morning
 - Afternoon
 - Night
 - No busy time
 5. Do you have a private tap?
 - Yes
 - No
 6. If yes, do you get water from this tap?
 - Yes
 - No
 7. Do you store water?
 - Yes
 - No
 8. If yes, for how long
 - Less than five day
 - More than five days and less than ten day

- More than ten days
9. How much water is your household currently using per day?
- In number of 25 litres containers
- Less than 3
- 3-6
- 6-12
- More than 12
10. How often do you have access to water?
- Less than 2 times per week
- 2 times per week
- Every 2 days
- Everyday for limited hours
- Everyday at all times

SECTION C: WATER SUPPLY AND SOURCES

Please complete all questions Mark with an "x" Mark from Strongly Agree to Strongly Disagree

STATEMENT	Strongly agree	agree	uncertain	disagree	Strongly disagree
The provision of water in summer is adequate.					
The provision of water in winter is adequate.					
There are enough reservoirs in the area.					
Water is a serious problem in the area.					

<p>Women and children carry the responsibility of fetching water.</p> <p>Women and children travel long distances to fetch water</p>					
<p>Lack of water disturbs the socio-economic activities.</p>					
<p>Women and children fetch water from surface source.</p>					
<p>Relationship between ward committees and traditional leaders</p>					

8. Are there households that have yard taps?

7. If yes, why do some households have yard taps and others do not have yard taps?

8. Do those households with yard taps pay for the water?

9. How is the payment of water controlled?

10. What is the water volume capacity of the reservoir?

11. How much water is the community member supposed to collect from the standpipe per household?

12. Are they allowed to connect hoses/pipes to the communal stand pipes?

13. Does the water supply system in Goba and Tshifadi experience breakdown

Interviews directed to government officials, headmen and other stakeholders

Water supply systems and management

1. Can you please explain how the water supply system in Gaba and Tshifudi village works?

2. Who was responsible for providing the water services to the community?

3. When was the taps installed? _____
4. How far should standpipes be from the households? _____

5. If there are new comers to the village and they live on the peripheral of the village far from the standpipe, why is the system not being extended to them?

6. Are there households that have yard taps?

7. If yes, why do some households have yard taps and others do not have yard taps

8. Do those households with yard taps pay for the water? _____
9. How is the payment of water controlled? _____
10. What is the water volume capacity of the reservoir? _____

11. How much water is the community member supposed to collect from the standpipe per households? _____
12. Are they allowed to connect hosepipe to the communal standpipe

13. Does the water supply system in Gaba and Tshifudi experience breakdown

14. If yes who is responsible for fixing the water problem _____
15. How long does it usually take for the problem with the water system to be fixed?

16. Where are the community supposed to collect water during this time if there is no water available at the taps _____
17. Is the tap water in Gaba and Tshifudi Treated? _____
18. If yes, how is the tap water treated _____
19. If no, why is the tap water not treated? _____

Solutions

20. What are currently employed strategies for solving the problem?

21. What are the measures taken for those who do not pay for water services?

22. When there is water cut-off, do you have any means of ensuring that the communities get water? _____

23. Recommend the strategy for solving this water supply problem? _____

Thank you for your co-operation