INVESTIGATION OF WATER SUPPLY ISSUES IN TYPICAL RURAL COMMUNITIES: CASE STUDIES FROM LIMPOPO PROVINCE

MP Matji

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Water Research Commission

INVESTIGATION OF WATER SUPPLY ISSUES IN TYPICAL RURAL COMMUNITIES: CASE STUDIES FROM LIMPOPO PROVINCE

REPORT TO THE WATER RESEARCH COMMISSION

by

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EXECUTIVE SUMMARY

This report emanates from the Water Research Commission project, entitled "An Investigation of Water Supply Issues in Typical Rural Communities: Case studies from the Limpopo Province".

The primary objective of this study was to develop an understanding of sustainability issues in community water supply. This objective was supported by the secondary objectives listed below.

- ✓ To identify a sample of the Limpopo Province rural communities on which the study will be based.
- ✓ To investigate the existence of water supply schemes that are not functional or functioning intermittently, and the reasons why they do not operate.
- ✓ To investigate the existence of institutions responsible for the appropriate operation and maintenance (O&M) of the schemes.
- ✓ To investigate rural water supply schemes which are functioning properly in communities with similar social dynamics and socio-economic levels.
- ✓ To develop of protocols for the community's action to ensure appropriate operation and maintenance (O&M) of the existing rural supply schemes.

The above secondary objectives have been addressed by:

- Conducting a Literature review on operation and maintenance of water supply systems throughout the world and South Africa, design of close-ended questionnaire to collect relevant data from communities, municipalities and non-governmental institutions. Selection of an appropriate tool (i.e. Successes, Weaknesses, Opportunities and Threats (**SWOT)**) for analyzing the field data collected.
- Collecting samples from two municipalities, situated in the Limpopo Province (formerly called Northern Province), namely the Fetakgomo- and Lepelle-Nkumpi Municipalities.
- Collecting samples from municipalities situated in Kwazulu-Natal, namely the Ndwendwe and Msinga Municipalities.
- Analyzing collected field data using SWOT method and formulating guidelines based on the findings.

The investigation focused on the existing rural water supply schemes which are either, **functional**, **functioning intermittently** or **non-functional,** and how these schemes impacted on the sustainability of water supplies in rural communities. The majority of these communities are not in a position to operate and maintain such systems themselves, and therefore a research into these issues became imperative.

Capacity building initiatives were introduced by involving nine students from the University of the North. These students were trained for one day before being involved in data collection. Their training included the following topics:

- ✓ Introduction to the project, project objectives and the potential contribution of the project results to the rural communities.
- ✓ General techniques of field data collection and other social issues to be taken into account when collecting data.
- ✓ Tools for field data analysis and the main tool to be used to analyze the data in this project.
- ✓ The interpretation of field data and reporting.

During the course of the project, capacity building initiatives and technology transfer were undertaken with regard to institutions. Officials of Fetakgomo- and Lepelle-Nkumpi Municipalities were informed with basic principles of operation and maintenance (O&M) of rural water supply schemes, worldwide and in South Africa.

The presentations to these municipalities were carried out over two days. The municipalities' main concern, evolving from the workshops, was the existing institutional arrangement and their technical capacity to manage future water supply schemes.

The raw data collected as part of the study can be obtained from the offices of Tlou & Matji Engineering and Management Services.

In order to develop the proposed guidelines for O & M, the following key factors affecting sustainability of the schemes were selected. These factors were:

a) Communication
b) Locally-based institutional arrangement
c) Cost recovery, and
d) Technology choice.

Community involvement is a common factor featuring in each every one of the issues. Each of the abovementioned factors will be discussed in detail below:

a) **Communication:**

Communication is one of the most effective tools required to ensure success. In most of the villages where the water supply schemes were functioning intermittently or have collapsed, communication amongst various stakeholders was part of the problem. **Figure E1** present the proposed communication model to ensure the flow of information from all stakeholders

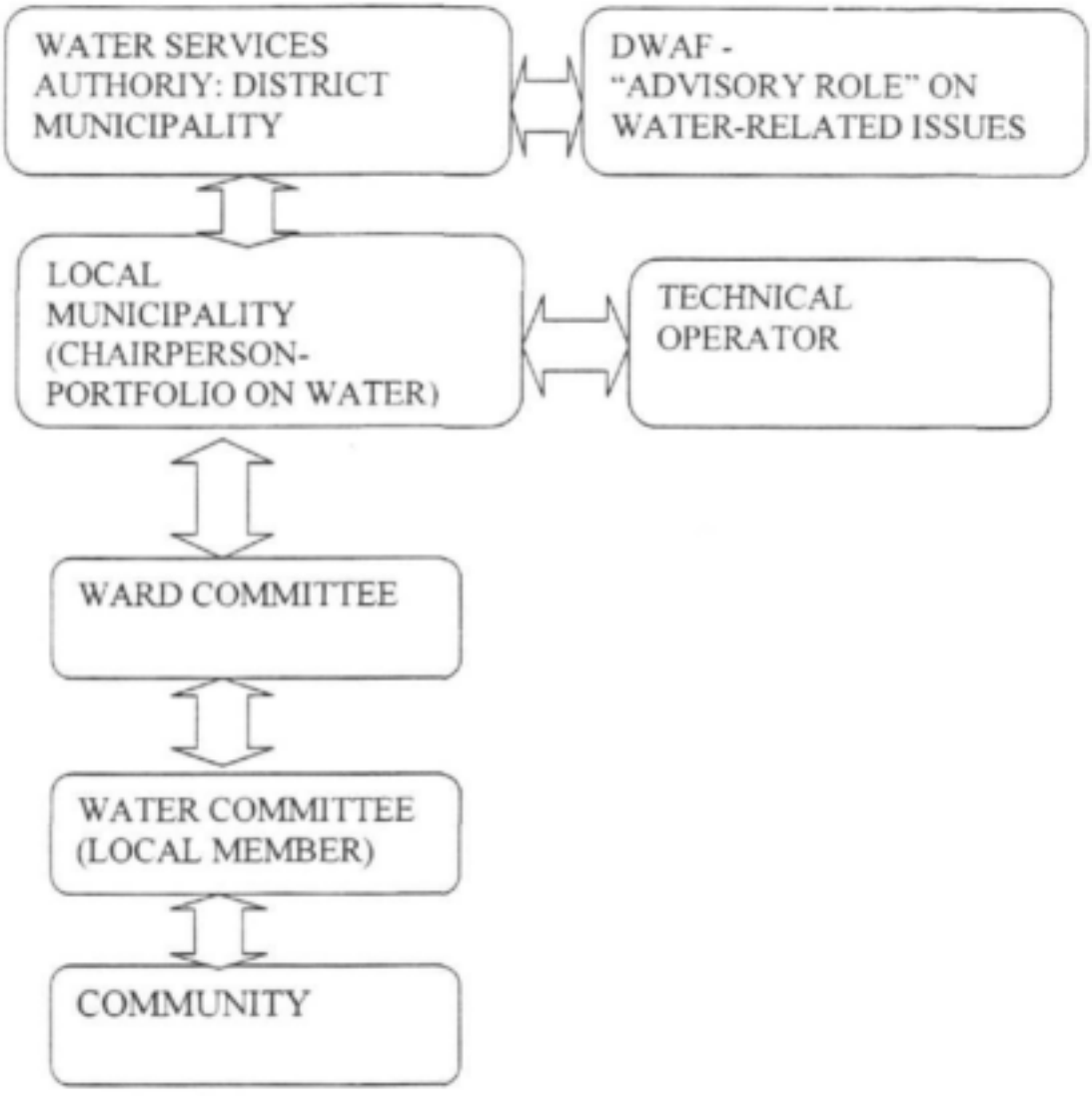

Figure E1 : Communication Model

✓ ***Community***

Community members should communicate local water-related issues with the Water Committee representative. Communication between the Water Committee and the community should be a two way process to ensure effective flow of information.

✓ ***Ward Committee***

This is the second level where issues that could not be addressed at the Water Committee should be addressed. Should the Ward Committee not be able to address some of the issues, they should pass them over to the Municipal Portfolio Committee on Water.

The Ward Committee should have regular meetings (e.g.Monthly) to discuss ways of improving the current service provision, communication channels and training requirements (if any). Communication between the Ward and Water Committees should be a two-way process.

Issues that cannot be addressed by the Ward Committee should be referred to the Municipal Portfolio Committee on water. To ensure efficient service provision, communication between the Ward Committee and the Municipal Portfolio Committee on water should be two-way.

✓ ***Local Municipality***

The Municipal Portfolio Committee (MPC) on water should address issues that the Ward Committee cannot address (e.g. Operation and Maintenance issues that involve a lot of money or require high technical skills). In order to ensure efficiency, the municipalities (i.e. Local and District) should have efficient and effective communication.

The Chairperson of the MPC should be offered an opportunity to attend training courses on operation and maintenance of rural water supply systems.

✓ ***Water Services Authority***

In most of the provinces where local municipalities have no capacity, District Municipalities are automatically Water Services Authorities. Communication between the District and Local Municipalities should be a two-way process.

✓ ***Department of Water Affairs and Forestry***

In most of the schemes, operation and maintenance of the water supply systems is still carried-out by DWAF. Even though schemes would be transferred to municipalities, DWAF would provide advisory support and should therefore be updated on any water-related activities within the municipality, and vice-versa.

✓ ***Technical Operator***

Currently, technical operators of the water supply systems are employed by DWAF. According to the outcome of the study, communication amongst some of the technical operators, DWAF and the community was not effective. When schemes are transferred to local municipalities, the technical operator should be an employee of the municipality. In order to maintain free flow of information, problems related to the water supply systems be reported as follows:

- The technical operator should inform both the ward committee and municipality about any problems with the water supply systems and the expected timeframe for the problems to be addressed.
- The ward committee should inform the water committee members about the problem and expected timeframe for addressing the problem.
- The water committee should pass the message down to the community.
- Should the expected timeframe for addressing the problem be exceeded, the technical operator should send the message following the abovementioned procedure.
- The municipalities should be charged with the responsibility of ensuring that technical operators perform their duties as expected.

b) Locally-based institutional arrangement

In the study it was found that the use of centralized-institutional arrangement had an impact on the operation and maintenance (O & M) of rural water supply schemes. It was therefore recommended that institutional arrangement be localized to ensure efficient O & M.

The model below presents the proposed operation of the locally based institutional arrangements

Figure E2: Proposed Model for the Functioning of the Locally-Based Institutional Arrangement

- ✓ **Water Committee**

  Should be responsible for operating and maintaining a specific water point.

- ✓ **Ward Committee**

  The ward committee should be responsible for almost all the activities (e.g. managerial, operational, technical and financial) for the ward.

Through the approval of the municipality, the ward committee can contract an individual (e.g. local artisan or a mechanic) to assist in technical issues related to the O & M of the scheme.

✓ **Municipality**

The municipality should be responsible for ownership and decision-making. In some cases they may decide to contract a private Water Services Provider who will also has to liaise with a specific ward committee.

c) Cost recovery

Cost recovery has a direct impact on the sustainability of the scheme. The model below presents a structure that can be used to recover operation and maintenance costs of the water supply systems.

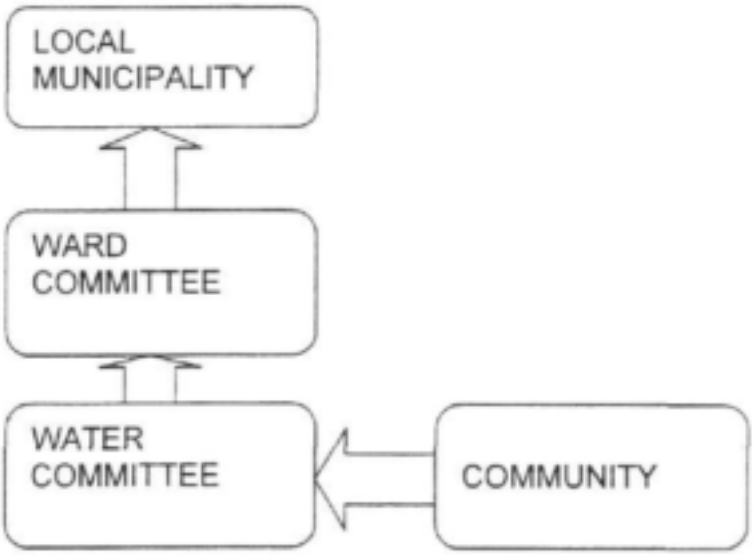

Figure E3: Proposed Model for Recovering Operation and Maintenance Costs

This is a simplistic model that could be applied in typical rural areas. In advanced rural areas other sophisticated methods could be used.

In typical rural municipalities where free basic water is implemented, the model will still be the same but costs would be recovered after the minimum free basic water quantity has been exceeded.

In conclusion, the primary issues (affecting operation and maintenance of the schemes) that emanated from this study were:

- ***Localized Institutional arrangement***;

  Most schemes that are functioning intermittently are centrally managed schemes. They are managed by the Regional Department of Water Affairs & Forestry (DWAF). Due to the location of the regional offices from the communities, it takes longer (i.e. 3 – 6 months) to respond to breakdowns. Localized institutional arrangement with inside knowledge of local problems could be the potential solution.

- ***Effective communication amongst all stakeholders***;

  Communication between the community and the water services provider (i.e. DWAF), communities and the municipalities should be improved because it affects the functionality of the schemes. In the past DWAF have been providing free diesel. In one of the villages when DWAF stopped providing free diesel, the message was not communicated properly and it created mistrust between the community and the technical operator. The community was not prepared to make any contribution to the purchase of diesel and the scheme collapsed. Improved communication would make a difference.

- ***Efficient cost recovery plan***

  Most communities do not have clearly defined and well structured cost recovery plan. This is a problem affecting most of the rural municipalities throughout the country. In some of the communities where the scheme is functioning intermittently, community members do not want to pay a flat rate because of the unequal distribution of water. The unwillingness to pay led to the intermittent functioning of the schemes.

- ***Community involvement in all phases of the project***

  Community involvement is the crucial factor, because it helps the community to have sense of ownership of the scheme. If community members are not involved throughout all the stages of the project, the possibility of them buying into the project activities are limited.

- ***Appropriate technology choices***

  Inappropriate technology choice could lead to poor cost recovery and lack of spare parts. In two of the villages surveyed, the pump could not be fixed due to lack of spare parts, whereas in the other village, the community could afford to buy replacement parts. All these led to the intermittent functioning of the scheme.

Based on the findings, the investigator would like to recommend the following:

a) DWAF is in the process of transferring schemes to the local municipalities. According to the outcome of this study, the local municipalities are not yet ready (in terms of local capacity) to manage the schemes. In order to ensure that the process of transferring schemes succeed, training workshops should be conducted to ensure technical capacity building within local municipalities and their communities (i.e. village level). Technical capacity building within local municipalities would pave a way for the establishment of the locally based institutional arrangements.

   Some of the issues which could be included in the training programmes are:

   - efficient monitoring/supervision of the scheme;
   - meter reading and reconciliation;
   - appropriate computer skills;
   - basic accounting;
   - technical skills (e.g. installation of meters, water connections)

b) Professional Service Providers carrying out projects in rural communities should be encouraged to acknowledge communities as key stakeholders in the process, recognizing that they are the clients who will have to pay for the operation and maintenance of the scheme. They should therefore be involved in the planning, design, and implementation phases of the project. This would help them understand the project and also have sense of ownership.

c) Workshops should be conducted to raise awareness with regard to who should be responsible (according to the National Water Services Act) for O & M costs of the water supply systems.

d) Appropriate and realistic cost recovery plans applicable to rural communities should be developed. Appropriate cost recovery plan would also assist local municipalities in implementing free basic water programme.

e) Technology choice of the water supply systems should be discussed with the relevant communities before installation. Rural communities should be guided by unbiased technical experts with regard to the implications of choosing a specific technology.

f) As part of information transfer, capacity building and improvement on the proposed guidelines, it is recommended that they be presented at provincial workshops that would be attended by all the municipalities within each province. Inputs from the workshops would add value to the improvement of the guidelines.

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  - Ms S.C. Lebotsa
  - Ms M.M. Thosago
  - Ms E.S. Maleka
  - Mr L.C. Mahuma
  - Ms M.M. Matji

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LIST OF ACRONYMS

ASA	- American Statistical Association
DWAF	- Department of Water Affairs and Forestry
NGO	- Non-governmental Organization
O & M	- Operation and Maintenance
RDP	- Reconstruction and Development Programme
SWOT	- Strength, Weaknesses, Opportunities and Threats
UNCHS	- United Nations Center for Human Settlements
WASH	- Water and Sanitation for Health
WHO	- World Health Organization

1. INTRODUCTION

1.1 Background

Before 1994, most rural communities (especially black communities) had limited access to clean drinking water. These communities had to find ways and means to provide for themselves, which resulted in some of them building their own water supply schemes. Most of these schemes were either community based or institutionalized, depending on the community's involvement and contributions.

After 1994, some of these schemes were inherited by the newly elected Democratic Government. The South African Department of Water Affairs and Forestry (**DWAF**) inherited about 600 rural water supply schemes from the former homeland administrators (Muller et.al. 1998). These schemes were in all sorts of conditions, ranging from schemes which have totally run down, poorly managed, desperately in need of repairs and upgrading. Research by Muller (1998) showed that some of the key factors, which led to the breakdown of the inherited schemes, were:

- poor operation and maintenance (O & M)
- lack of management staff
- poor support structures
- lack of training
- unauthorized connections
- lack of a cost recovery plan.

The new Government facilitated the development of the Water Services Act (1997) whose primary objective was to provide for:

"the rights of access to basic water supply and sanitation necessary to secure sufficient water and an environment not harmful to health or well-being."

In order to address some of the inherited problems (e.g. poor O & M), the Water Research Commission, commissioned this project to conduct a further investigation on why some of the schemes are non-functional or functioning intermittently and come up with the guidelines that would ensure appropriate operation and maintenance of the schemes.

The approach used was to select water supply schemes, which have collapsed, or functioning intermittently, and to find out why. On the contrary schemes which are functioning well in other communities, with similar social dynamics, and socio-economic levels were also investigated to get a balanced understanding that would lead to an appropriate development of guidelines.

1.2 Research Objectives

The primary objective of this study was to develop an understanding of sustainability issues in community water supply by using case studies mainly from the Limpopo Province.

This objective was supported by the following secondary objectives:

1.2.1 To identify a sample of rural communities on which the study will be based.

1.2.2 To investigate the existence of rural water supply schemes that are non-functional or functioning intermittently, and reasons why they do not operate.

1.2.3 To investigate the existence of institutions responsible for operation and maintenance (O & M) of the schemes.

1.2.4 To investigate rural water supply schemes which are functioning properly in communities with similar social dynamics and socio-economic level to communities identified in 1.2.1.

1.2.5 To develop guidelines for community action to ensure appropriate operation and maintenance of the existing rural supply schemes.

1.3 Study Area

The study area comprised Fetakgomo and Lepelle-Nkumpi Municipalities which are located in the Limpopo Province. **Figure 1** indicates the location of these municipalities in the Province.

Figure 1 : Location of the Two Municipalities in the Limpopo Province

1.4 Scope of this Study

This research covered the operation and maintenance of bulk water supply scheme managed by the Lepelle Northern Water, community-managed borehole schemes, and Government-managed borehole schemes.

1.5 Limitations of this Study

- Due to time and budget constraints, operation and maintenance of water treatment plants in rural areas was not investigated. The current practices in these schemes could also make a valuable contribution to the development of guidelines for operation and maintenance of the schemes.

- The maximum sample size collected per village comprised 18 respondents. This number is relatively small for some of the villages.

2. LITERATURE REVIEW

In order to gain a conceptual understanding of the current situation with respect to O & M, a literature review was conducted.

2.1 Introduction

The literature review for this research was divided into **four** phases.

Firstly, to ensure that the current situation in terms of **operation** and **maintenance** of rural water supply schemes, is understood.

Secondly, to ensure that comprehensive questionnaires are designed to derive relevant data that could lead to the development of protocols for the appropriate operation and maintenance of rural water supply schemes.

Thirdly, to ensure that aid for the effective training of facilitators (i.e. students) and interviewing are derived, and

Lastly, to ensure that cost-effective and internationally accepted technique of field data analyses is implemented.

All the abovementioned phases are discussed in detail below:

- **Operation and maintenance (O & M)**

According to Joubert (1998) and [2]**WHO** (2000), the **O** & **M** of rural supply schemes is a crucial factor and the primary indicator in the sustainability of the schemes. Since operation and maintenance is the primary indicator of sustainable water supply, it should start at the planning stage and not after the completion of the scheme.

The term "Operation and Maintenance (O & M)", has generally been used as a broad concept covering a wide range of activities carried out by service providers, communities, non-governmental organizations and government structures to ensure sustainability of services and maintenance of existing capital assets ([1]**WHO, 2000**).

*The two words "***Operation and Maintenance***" of rural water supply schemes can be defined separately as follows:*

Operation:

refers to the main procedures and activities that are undertaken to ensure efficient delivery of water services. These procedures and activities include, inter-alia, *abstraction, treatment, pumping, transmission* and *distribution* of drinking water.

Maintenance:

refers to activities that are undertaken to ensure that the capital assets are kept in a serviceable condition. Some of these activities are the repairing of *water distribution pipes, pumps* and *public standpipes*.

There are other factors that have to be taken into account to ensure sustainable operation and maintenance of water supply schemes. Some of these factors are presented in **Figure 2, Section 2.2**

2.2 Aspects of Operation and Maintenance

In order to ensure sustainable O & M of water supply schemes, community/cultural, financial and human resources aspects have to be taken into account in the early stages of the project (**'WHO, 2000**). These aspects are summarized in **Figure 2**.

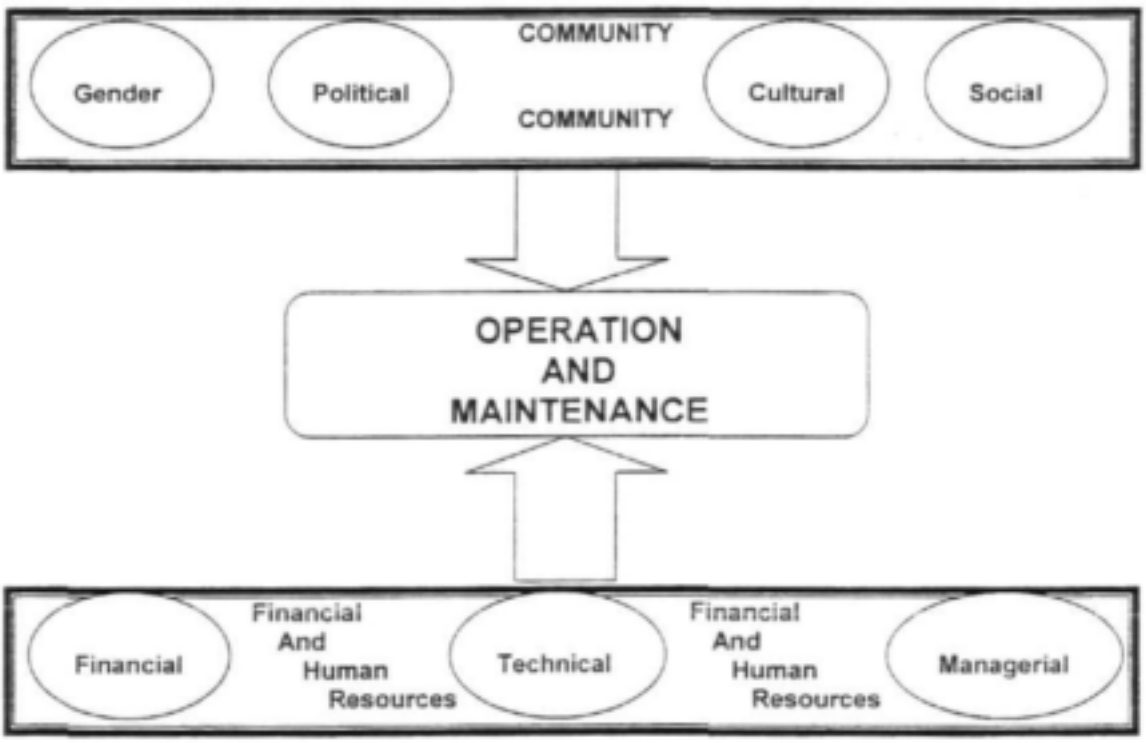


Figure 2: Aspects of Operation and Maintenance of Water Supply Schemes

2.3 Successes with regard to *Operation* and *Maintenance* around the world

Most of the rural-gravity-fed piped water supply schemes in Malawi, which serve approximately 20% of the population, have been successful because of the well defined and localized representative institutional arrangement to supervise the O & M of the schemes (**UNCHS, 1989**).

Other factors, which have contributed to the efficient and successful O & M of the Malawian schemes, are:

(a) availability of spare parts and materials to users;
(b) costs of operation which are low enough to be supported by users and not by donors;
(c) minimal costs of maintenance and repair work that could be supported by users;
(d) minimum involvement in the O & M of the water supply system;
(e) monitoring programmes that keep track of the scheme's condition by encouraging users to continue maintenance activities and prevent failures;
(f) the use of monitoring assistants that are known to the community and available when exceptional failure occurs;
(g) efficient training to ensure that the technical skills, required to repair the majority of the breakdowns, are well within the capacity of the repair teams.

2.4 *Failures* with regard to *Operation* and *Maintenance* around the world, including South Africa.

[2]**WHO** has estimated that 30 – 60% of the existing rural water supply schemes in the world are non-functional. It was found that some of the key issues, which lead to non-functional schemes, are:

- poor operation and maintenance;
- poor institutional and organizational arrangements including management ([2]**WHO, 2000**);
- bad technology choices;
- lack of training and efficient capacity building techniques and the unavailability of spare parts (**WASH, 2002**).

Since 1994, the South African Department of Water Affairs and Forestry (**DWAF**) inherited about 600 rural water supply schemes from the former homeland administrators (Muller et.al. 1998). These schemes were in all sorts of conditions, ranging from schemes which have totally run down, poorly managed, desperately in need of repairs and upgrading.

After 1994, a number of rural water supply schemes were completed in the Kwazulu- Natal, Eastern Cape, Mpumalanga and the North West Provinces through the Reconstruction and Development Programme (**RDP**). Some of these schemes are ***functional***, ***intermittently functional***, or ***non-functional***.

Research conducted by Muller (1998) showed that some of the key factors, which led to the breakdown of the inherited schemes, were:

- poor operation and maintenance
- lack of management staff
- poor support structures

- lack of training
- unauthorized connections
- lack of a cost recovery plan.

2.5 Operation and Maintenance models implemented in developing countries

In some cases, poor **O & M** has been attributed to ineffective management models. According to **'WHO** (2000), some of the common operation and maintenance management models, which have been implemented in most of the developing countries, are:

- Centralized institutional or government-managed
- Community-based
- Household-based

Centralized institutional management model

This is the management model in which government institutions (i.e. Local or District Municipalities, Provincial and National Governments) have statutory responsibility for service delivery and O & M of the system.

The main **advantages** of this model are:

- the use of labour force (both skilled and unskilled) employed by government institutions at no cost to the community.
- the availability of financial resources to develop more innovative approaches for O&M of the systems, by involving the private sector.

The main **disadvantages** of this model are:

- Lack of capacity and poor performance of the government institutions;
- the location of the institutions with respect to the communities they serve.

Community-based management model

This model refers to a group of end-users, which is responsible for the O&M of the system. In this model any external support infrastructure, roles and responsibilities for the O&M, need to be carefully defined between the community and the relevant external agency.

Household-based management model

It refers to the management model in which the responsibility for O&M of privately owned on-plot water systems rests with the owner or plot holder.

2.6 Design of Questionnaires

In order to gather reliable data, questionnaires with simple, clear, easy to answer and personally relevant questions should be designed (ASA, 1999). As part of this study, a literature review was conducted to investigate better ways of designing questionnaires.

According to ASA (1999), it is the questionnaire designer's greatest challenge to take important topics and translate them into ***simple concepts, simple behaviours, and simple words***. Two types of questionnaires could be designed (ASA, 1999), viz:

- ***Questionnaires with open-ended questions:***

  These are the questionnaires in which the questioning becomes more of a formal interview with the opinions and the view of the interviewee being solicited. The main **advantage** of these questionnaires is that they can provide more complete and satisfactory information.

  The **disadvantages** are:

  - that a well trained and experienced surveyor, who would accurately record the opinions of the interviewee, is required;
  - the questionnaires have to be administered by a well trained interviewer, and
  - and require much more skill and effort to be analyzed

  This approach could be very expensive.

- ***Questionnaires with closed-ended questions:***

  These are questionnaires in which the questions require the interviewees to supply a **yes/no** answer or they are given a series of choices

  The main **advantages** of this type of questionnaires are:

  - the relevant data can be obtained and analyzed quickly;
  - less effort, time and money are required to train the surveyors.

  However, the interviewee is limited to selecting from a restricted set of choices.

  In this research, questionnaires dominated by ***close-ended*** questions were designed to derive data from local communities on existing facilities, practices in terms of operation and maintenance, perceptions, views and preferences with respect to rural water supply.

3. STUDY AREA DESCRIPTION

The study area comprises Fetakgomo and Lepelle-Nkumpi Municipalities, which are located in the Greater Sekhukhune and Capricon District Municipalities, respectively.

➢ Fetakgomo Municipality

The municipal offices are located in Apel village, approximately 100km south east of Polokwane (formerly called Pietersburg). The total geographical area of the municipality is about 1123.18km^2. According to the Demarcation Board statistics, the approximate population in the municipality is about 97 110 and 99.95% of the population live in tribal rural villages, with about 3.86% employed. Most of the water supply schemes within the municipality were inherited from the previous homeland administrators.

Figure 3: Villages within Fetakgomo Municipality

➢ Lepelle-Nkumpi Municipality

The municipal offices are located at Lebowakgomo Township, approximately 40km south-east of Polokwane. The total geographical area of the municipality is about 3454km^2. According to the Demarcation Board statistics, the approximate population in the municipality is about 234 677 and approximately 9% of the population is employed. Unlike Fetakgomo Municipality, Lepelle-Nkumpi has a moderate urban influence. Most of the water supply systems in the municipality were inherited from the previous homeland administrators.

4. METHODOLOGY

4.1 Selection of Case studies

The following criteria were used to select case studies within the two municipalities:

1. Two municipalities within different levels of urban influence should be selected for comparative assessment.
2. Meetings should be held with these municipalities to identify villages.
3. The identified villages, within the two municipalities, should have at least a scheme, which is either non-functional, intermittently functional, collapsed, or has never been commissioned, due to other technical or social reasons.
4. Identified villages with functional schemes should either be within or outside of the municipalities or even the province, but should have similar social dynamics and socio-economic levels as the ones mentioned in 3.
5. The schemes should cover diesel and electric powered pumps, hand pumps and bulk water supply schemes.
6. Functional schemes should be identified with the help of the selected municipalities, non-governmental organizations (**NGO's**) (e.g. The Mvula Trust and Lepelle Northern Water), consultants (e.g. Partners in Development cc.)
7. The identified functional schemes should represent different operation and maintenance management models (e.g. community-based-, centralized- and household-based management models).

4.2 Classification of the schemes

The schemes were classified into three categories, namely:

- ✓ Functional schemes
- ✓ Non-functional schemes
- ✓ Schemes functioning Intermittently

- ❑ ***Functional schemes***

  In this study functional schemes were identified as the schemes, which met the following **primary criteria**:

  - The water supply system should not have more than 7 days interruption in supply to any consumer per annum (Water Services Act, 1997; Still, 2000)
  - Response to breakdowns approximately two weeks.
  - Frequency of breakdowns being once every three months

In addition to the above criteria, the scheme should meet the following secondary criteria:

- Effective communication between the Water Service Provider/ Water Services Authority and the community (Still, 2000).
- Effective institutional arrangement.
- Community involvement in all aspects of the scheme.

❑ ***Schemes functioning intermittently***

These schemes were defined as schemes that do not meet all the **primary criteria** as specified above for the functional schemes.

❑ ***Non-functional schemes***

These were defined as schemes, which have collapsed completely.

4.3 Database Development

Field data was collected from various sources, using different methods.

4.3.1 Method of Data Collection

Table 1 presents a brief summary of the methods that were used to collect data and corresponding sources.

Table 1: Methods *Used to Collect Data and Sources of Data*

Method of Field Data Collection	Sources of Data
1. One-on-One Interviews 2. E-mail 3. Fax 4. Telephone	1. Community members (e.g. Indunas, Chiefs, businessmen/women, professionals, house executives, students, pensioners, councilors) 2. DWAF satellite offices officials 3. Lepelle North Water 4. The Mvula Trust 5. Company drilling boreholes in study area

N/B : raw data collected can be obtained from Tlou & Matji offices.

4.3.2 Breakdown of Samples

Table 2: A *Summary of Breakdown of Samples*

Province	No of Villages	Minimum Number of Interviewees per Village	Survey conducted by
Kwazulu-Natal Province	2	1	Partners in Development cc.
Limpopo Province	6	18	Project leader
Limpopo Province	4	18	Students
Limpopo Province	1	1	Fetakgomo Municipality
Limpopo Province	1	10	Project leader

4.3.3 Field Data Analysis

In this study, the tool that was used to analyze field data is **SWOT** (Successes, Weaknesses, Opportunities and Threats). This tool has been used widely to analyze data by focusing on the current successes and weaknesses displayed by the sample and future opportunities based on successes and weaknesses.

4.3.4 Reconciliation of Field Data

Since field data was gathered from various sources (e.g. community members, DWAF officials, Lepelle Northern Waters, The Mvula Trust), it was, therefore, important to carry out a reconciliation process in order to find common points.

5. SELECTED CASE STUDIES

Using the selection criteria discussed in **section 4.1**, the villages presented in **Table 3** were selected. These villages comprised schemes with:

- diesel and electric driven pumps
- yard taps and standpipes
- community-managed and centrally-managed schemes
- small borehole and bulk water supply schemes
- functional, non-functional and intermittently functional schemes

Table 3: Details of the Selected Case Studies

Village Name	Scheme	Municipality	Type of Pump or Scheme	No. of Households served by Scheme	Standpipes (S) or Yard taps (Y)	Status Of the Scheme
Mohlaletse	[1]Fetakgomo	Fetakgomo	Diesel	550	S	Intermittently
Maesela	[1]Maesela	Fetakgomo	Diesel	267	S	Collapsed
Strydkraal	[1]Strydkraal	Fetakgomo	Electric	2652	S	Intermittently
Mphanama	[1]Mphanama	Fetakgomo	Diesel	3098	S	Collapsed
Machacha	[1]Machacha	Fetakgomo	Diesel	490	S	Intermittently
Matome	[1]Matome	Lepelle-Nkumpi	Diesel	988	S	Intermittently
Seleteng	[1]Seleteng	Lepelle-Nkumpi	Electric	6686	S/Y	Intermittently
Makweng	[1]Makweng	Lepelle-Nkumpi	Electric	1887	S	Intermittently
Ga-Rakgoatha	[1]Ga-Rakgoatha	Lepelle-Nkumpi	Diesel	2557	S	Collapsed
Malope	[3]Arabie Bulk	Makhuduthamaga	Bulk water	250	S	Functional
Esidumbini	[2]Esidumbini	Ndwedwe	Electric	1000	Y	Functional
Nhlungwane	[2]Nhlungwane	Msinga	Diesel	220	S	Functional
Mankotsane	[2]Mankotsane	Fetakgomo	Electric	850	S	Functional

[1]Centralized-managed schemes
[2]Community-managed schemes
[3]Bulk water supply scheme managed by the Lepelle Water

6. RESEARCH FINDINGS

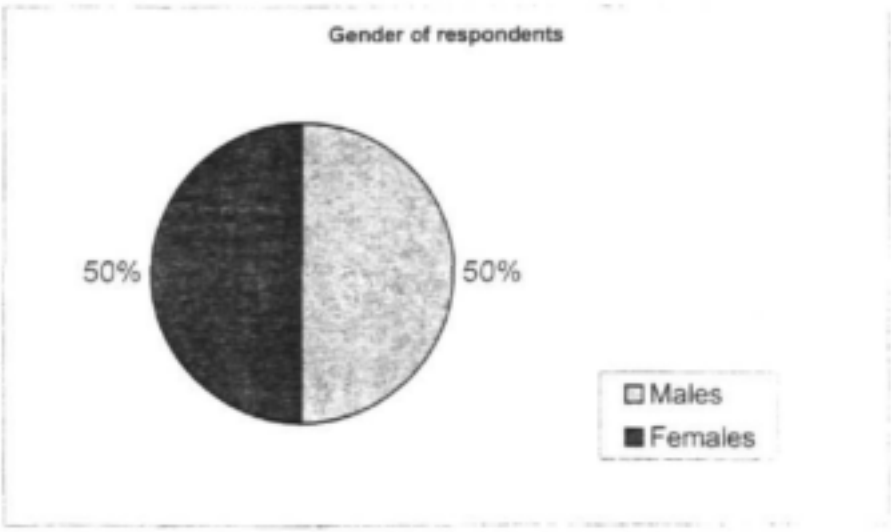
This section presents selected graphical presentation of the household surveys and detailed analysis of the assembled data for functional, intermittently functional and non-functional water supply schemes. The research findings were based on questionnaires, informal correspondences with professional experts in the field.

6.1 Household Surveys

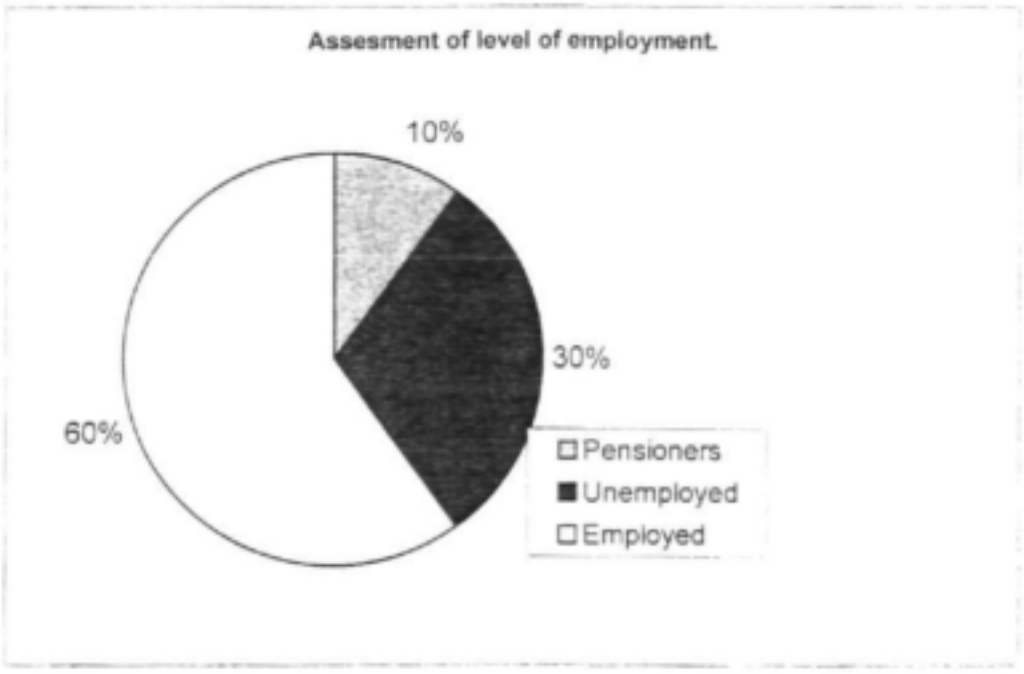
The household surveys from the villages were grouped according to the status (i.e. functional, intermittently functional and non-functional) of the water supply scheme. Only graphical presentation of selected questions from the questionnaires is presented in each case.

6.1.1 Functional Schemes

In this case the graphical representation reflects the sample composition of the respondents from Malope Village, because in the case of Mankotsane, Esidumbini and Hlungwane, the Fetakgomo Municipality and Partners in Development completed the questionnaire based on their knowledge of the situation on the ground. In Malope village a total of **10 respondents** were interviewed and the graphical presentation of the composition is shown in the following figures. These figures show that most of the people in the area are employed. They have also been consulted before the scheme was built and there is an institution, with offices in the village, responsible for O & M. Overwhelming majority of the respondents agreed that the scheme is always supplying them with water.

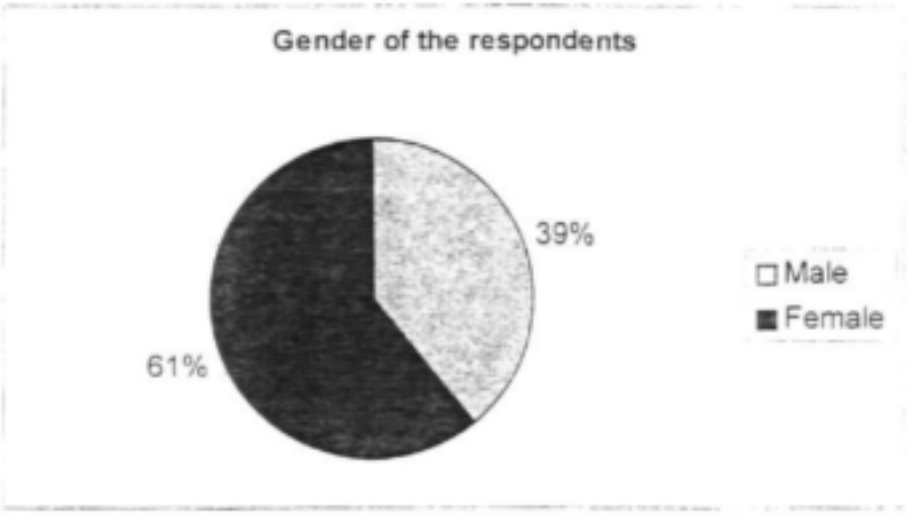


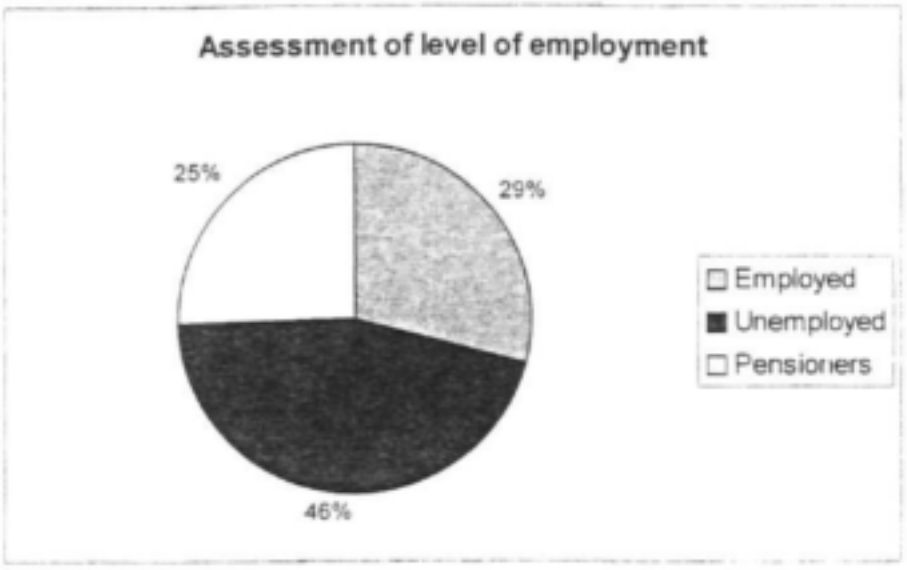
Graphical presentation of results from functional schemes (Continued)



6.1.2 Intermittently Functional Schemes

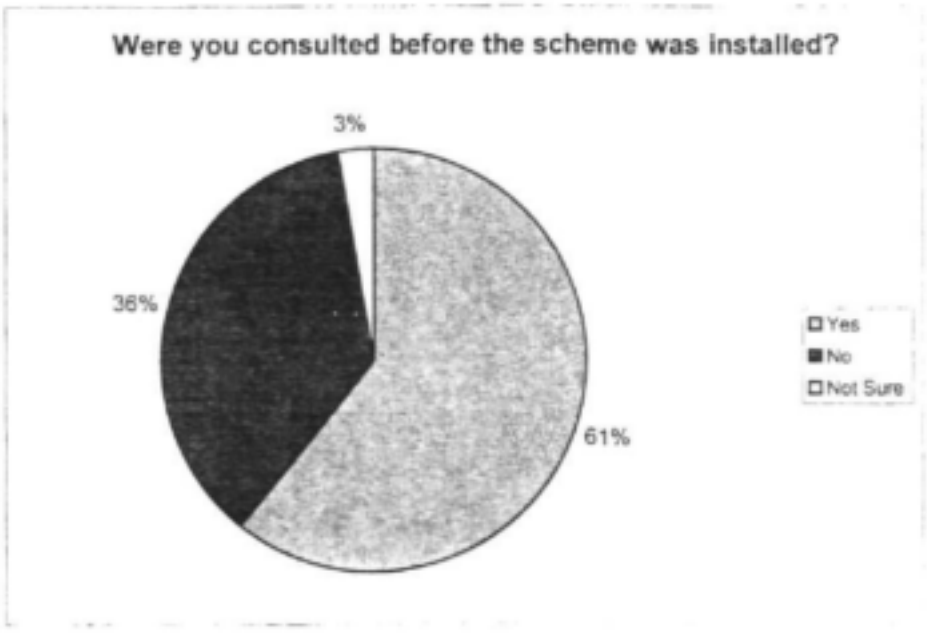
The figures presented in this section represent the combined views of respondents from Makweng, Seleteng, Matome, Machacha, Mohlaletse and Strydkraal villages. Graphical presentations in this section are based on the views of ***110 respondents*** coming from the abovementioned villages. The graphs show that most of the community members were consulted before the schemes were built. DWAF is responsible for O & M of the schemes and water is not always available.

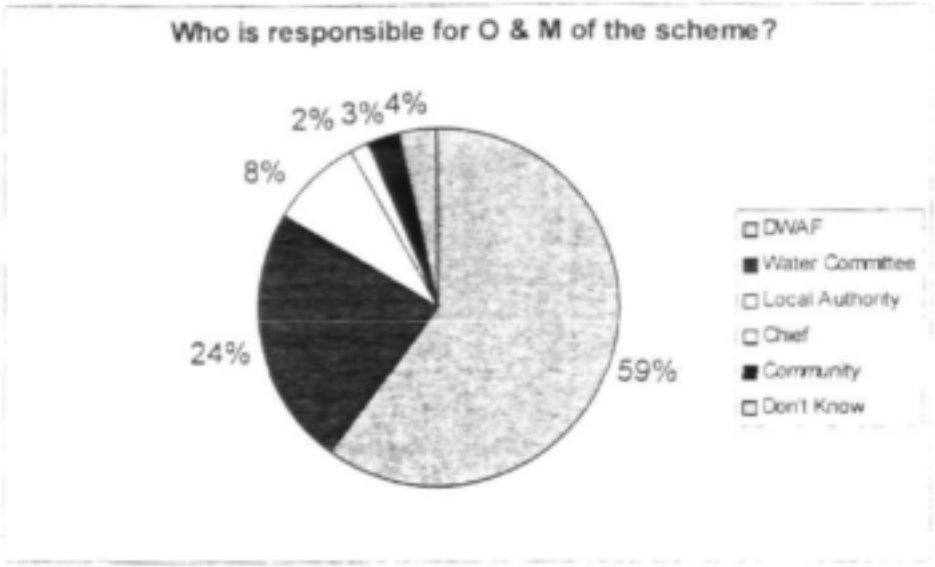




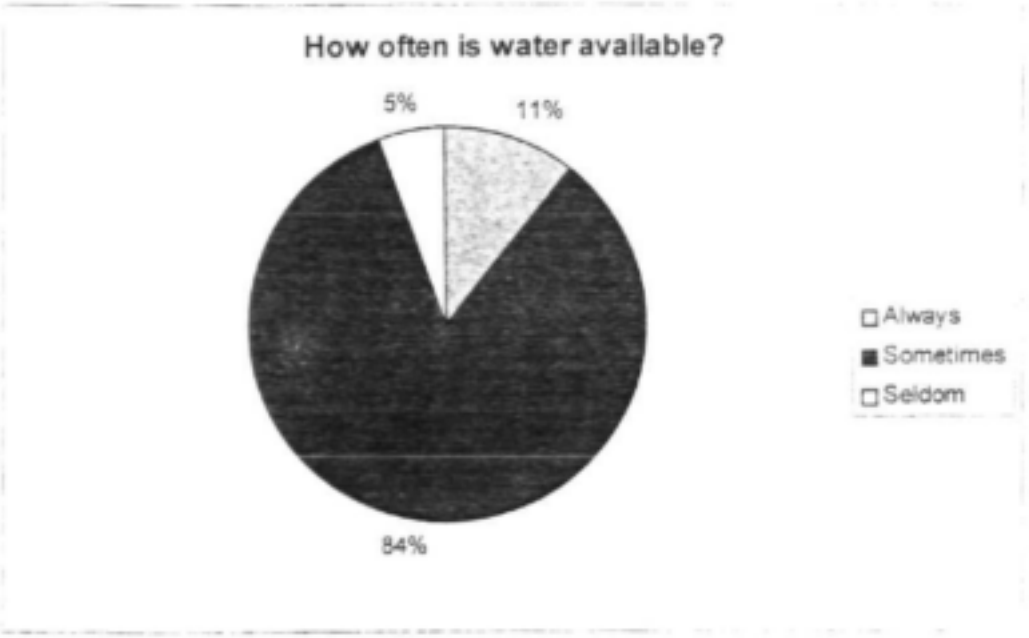
***Note**: assessment of level of unemployment was based on people who are actually looking for work and cannot find it. Women who stay at home and are not looking for work due to cultural reasons were not regarded as unemployed.*

Graphical presentation of the results from intermittently functional schemes (continued)



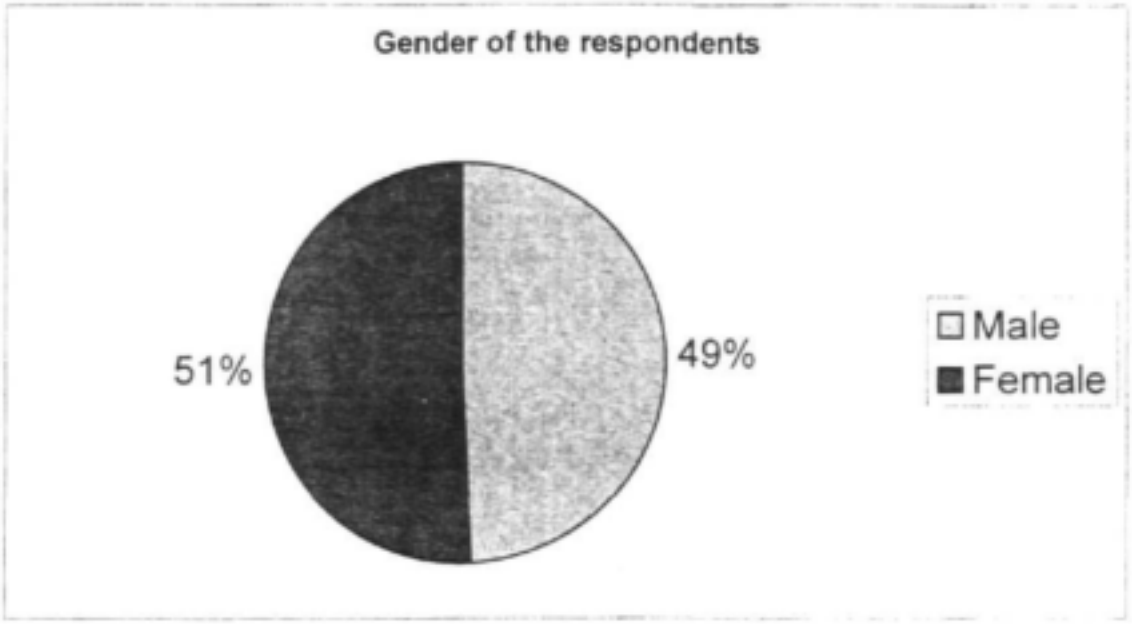


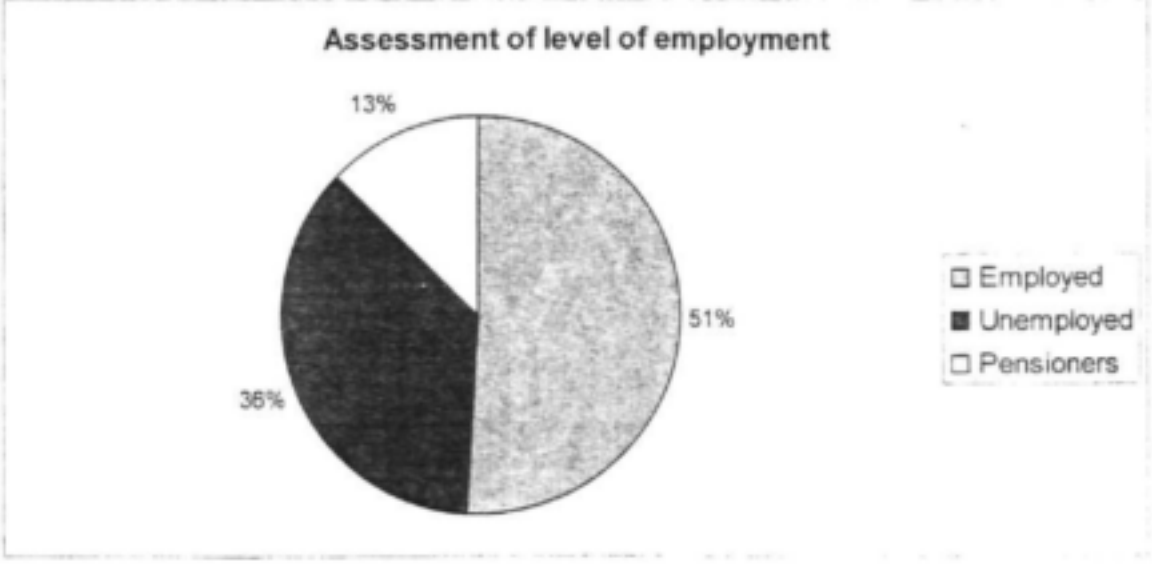
Graphical presentation of the results from intermittently functional schemes (continued)



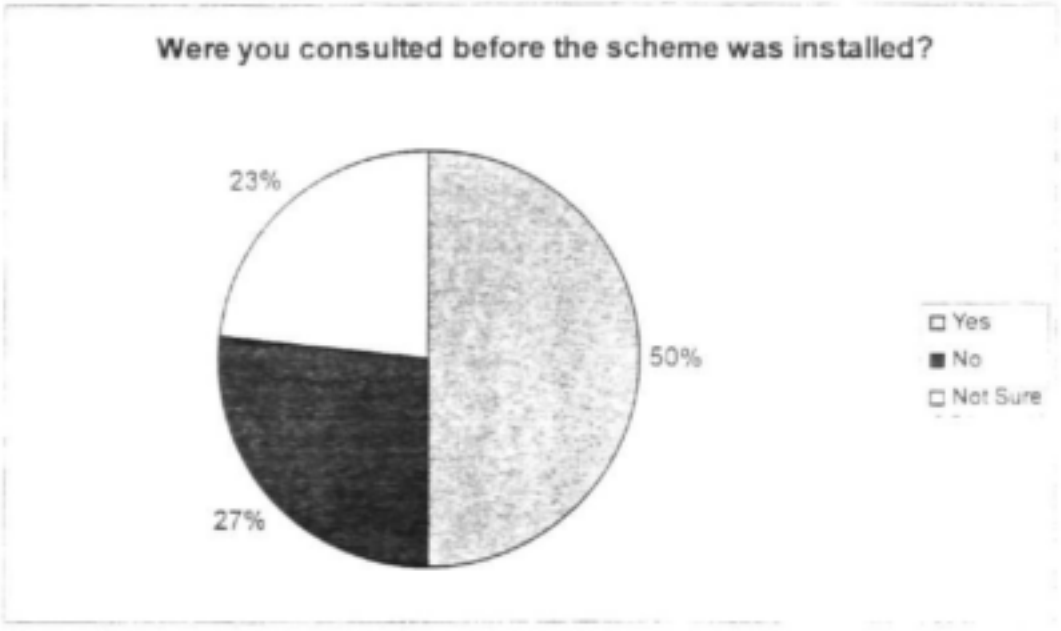
6.1.3 Non-Functional Schemes

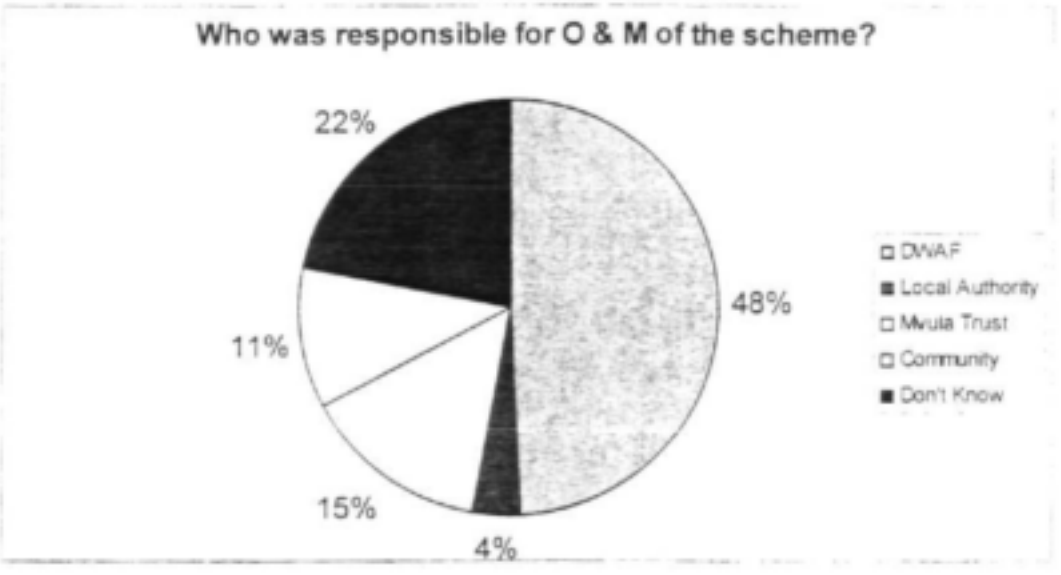
The graphical presentation in this section represents the combined views of **56 respondents** from Ga-Rakgoatha, Mphanama and Maesela villages. The results show that O & M of the schemes in these villages was carried out by the Department of Water Affairs and Forestry. According to the majority of the respondents, the community was consulted before the schemes were built. Water was not always available.



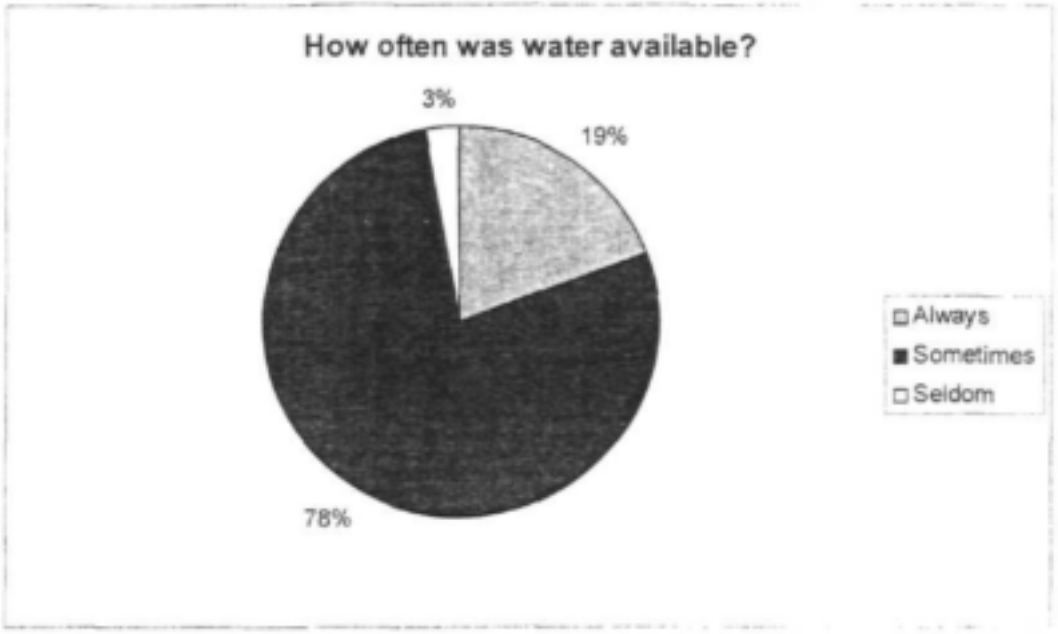


Graphical presentation of the results from Non-Functional Schemes (continued)





Graphical presentation of the results from Non-Functional Schemes (continued)



6.2 ANALYSIS OF THE DATA USING SWOT METHOD

The following table reflects a summary of the research findings, based on the "**SWOT**" method (***successes***, ***weaknesses***, ***opportunities*** and ***threats***).

The water supply schemes analyzed were classified as **functional, non-functional** and **functioning intermittently.**

Table 4: Summary of the selected research findings

"SWOT" Analysis	SCHEMES		
	Functional	Intermittently Functional	Non-Functional
Successes	✓ Existing water committees responsible for O&M of the water supply system; ✓ Community members were informed in advance about O&M and payment of water services; ✓ Community members decided and agreed on the amount to be paid; ✓ It takes 1-2 weeks for disruptions in water supply to be rectified; ✓ Received water accounts every month	✓Water committees exists ✓Community members understand that it is their responsibility to carry costs of O&M of water supply systems; ✓Community members carried costs of new parts and contributed to diesel purchases; ✓High level of trust between section representatives and community members	✓ Water committees have been established; ✓ Community members were willing to contribute upfront payments for O&M costs of water supply systems;
Weaknesses	• No meters at connection points, probably because of flat rate payment; • Offices located in the village prone to burglaries, because of weak security system	• Poor communication between water service providers & communities; • Breakdowns last 3-6 months because of ineffective and centralized institutional arrangement. This discourages the community to pay for services; • Unreliable and unequal distribution of water • Some of the community members believe it is the responsibility of the government to carry O&M costs;	• Communication between water service providers and communities was poor • Breakdowns were lasting for 3 –6 months • Even though community members are willing to pay for O & M costs, majority believe that the government should be responsible for O&M costs; • Technology choice of the water supply system • Unauthorized connections

RESEARCH FINDINGS (continue...)

"SWOT" Analysis	SCHEMES		
	Functional	Functioning Intermittently	Non-Functional
Opportunities	• Installation of meters to assess and under-stand water use and future planning; • Workshop communities to ensure that installation of meters will not effect flat rate payments; • Test Arabie water supply scheme model in other villages supplied by the bulk scheme	• Facilitate communication workshops for water services providers, water committees and NGO's; • Workshops to assist some of the community members to understand their responsibility towards costs for O&M according to National Water Services Act • Establishment of locally based institutional arrangement; • Appropriate design of the water distribution network.	• Facilitate communication workshops amongst community, water officials and NGO's; • Workshops to assist some of the community members to understand their responsibility towards O&M costs; • Establishment of locally based institutional arrangement; • Appropriate technology choice of the water supply system
Threats	➢ Co-operation between community members & government on the assumption that installation of meters will not lead to increase of charges ➢ Costs for facilitating workshops;	➢ Costs for facilitating the workshops; ➢ Lack of local capacity to run locally based institutional arrangements; ➢ High costs for pre-feasibility modeling in order to design the distribution network appropriately	➢ Costs for facilitating the workshops; ➢ Lack of local capacity to run locally based institutional arrangements; ➢ Community's cooperation in the choice of appropriate technology

7. GUIDELINES FOR APPROPRIATE OPERATION AND MAINTENANCE OF WATER SUPPLY SYSTEMS

7.1 Best O & M Practices

The best O&M practices, derived from the case studies, to ensure that rural water schemes are sustainable, were:

- Establishment of the locally-based institutional arrangement
- Effective communication mechanisms amongst all the stakeholders
- Involvement of the communities in all phases of the project;
- Appropriate technology choice of the water supply systems
- Development of the cost effective cost recovery plan to ensure sustainability of the schemes
- Inclusion of the O & M costs in the water tariffs agreed upon by the community members before hand;
- Involvement of the water committees in the operation and maintenance of the scheme
- Monitoring and reduction of unauthorized water connections

Based on the abovementioned practices, guidelines for appropriate O & M were developed. These guidelines are discussed in below.

7.2 *Guidelines for appropriate O & M*

In order to develop the proposed guidelines, key factors affecting sustainability of the schemes were selected. These factors were:

a) Communication
b) Locally-based institutional arrangement
c) Cost recovery, and
d) Technology choice,

Community involvement is a common factor featuring in each every one of the issues. Each of the abovementioned factors will be discussed in detail below:

a) Communication:

Communication is one of the most effective tools required to ensure success. In most of the villages where the water supply schemes were functioning intermittently or have collapsed, communication amongst various stakeholders was part of the problem. **Figure 4** presents the proposed communication model to ensure the flow of information from all stakeholders

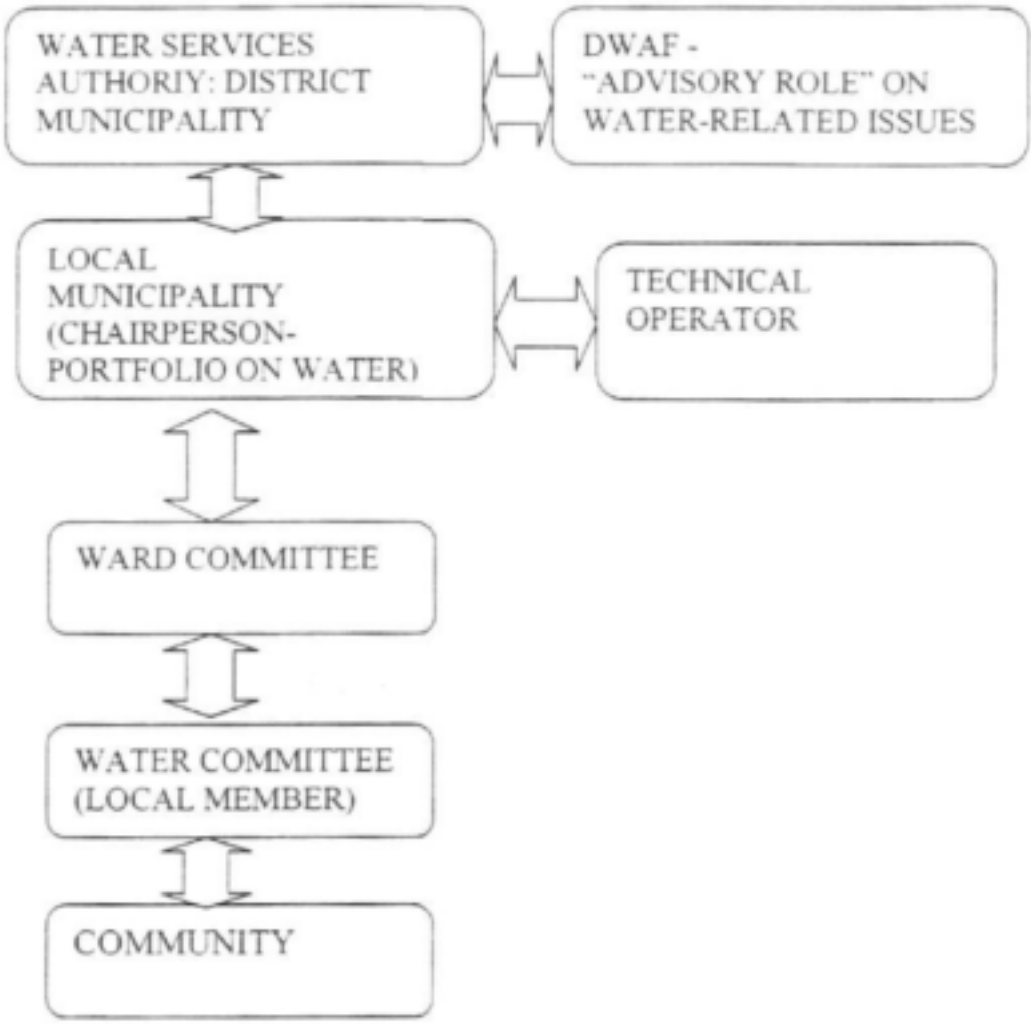


Figure 4: Communication Model

✓ ***Community***

Community members should communicate local water-related issues with the Water Committee representative. Communication between the Water Committee and the community should be a two way process to ensure effective flow of information.

✓ ***Ward Committee***

This is the second level where issues that could not be addressed at the Water Committee should be addressed. Should the Ward Committee not be able to address some of the issues, they should pass them over to the Municipal Portfolio Committee on Water.

The Ward Committee should have regular meetings (e.g. **Monthly**) to discuss ways of improving the current service provision, communication channels and training requirements (if any). Communication between the Ward and Water Committees should be a two-way process.

Issues that cannot be addressed by the Ward Committee should be referred to the Municipal Portfolio Committee on water. To ensure efficient service provision, communication between the Ward Committee and the Municipal Portfolio Committee on water should be two-way.

✓ ***Local Municipality***

The Municipal Portfolio Committee (MPC) on water should address issues that the Ward Committee cannot address (e.g. Operation and Maintenance issues that involve a lot of money or require high technical skills). In order to ensure efficiency, the municipalities (i.e. Local and District) should have efficient and effective communication.

The Chairperson of the MPC should be offered an opportunity to attend training courses on operation and maintenance of rural water supply systems.

✓ ***Water Services Authority***

In most of the provinces where local municipalities have no capacity, District Municipalities are automatically Water Services Authorities. Communication between the District and Local Municipalities should be a two-way process.

✓ ***Department of Water Affairs and Forestry***

In most of the schemes, operation and maintenance of the water supply systems is still carried-out by DWAF. Even though schemes would be transferred to municipalities, DWAF would provide advisory support and should therefore be updated on any water-related activities within the municipality, and vice-versa.

✓ ***Technical Operator***

Currently, technical operators of the water supply systems are employed by DWAF. According to the outcome of the study, communication amongst some of the technical operators, DWAF and the community was not effective. When schemes are transferred to local municipalities, the technical operator should be an employee of the municipality. In order to maintain free flow of information, problems related to the water supply systems be reported as follows:

- The technical operator should inform both the ward committee and municipality about any problems with the water supply systems and the expected timeframe for the problems to be addressed.

- The ward committee should inform the water committee members about the problem and expected timeframe for addressing the problem.

- The water committee should pass the message down to the community

- Should the expected timeframe for addressing the problem be exceeded, the technical operator should send the message following the abovementioned procedure.

- The municipalities should be charged with the responsibility of ensuring that technical operators perform their duties as expected.

b) Locally-based institutional arrangement

In the study it was found that the use of centralized-institutional arrangement had an impact on the operation and maintenance (O & M) of rural water supply schemes. It is therefore recommended that institutional arrangement be localized to ensure efficient O & M.

The model below presents the proposed operation of the locally-based institutional arrangements

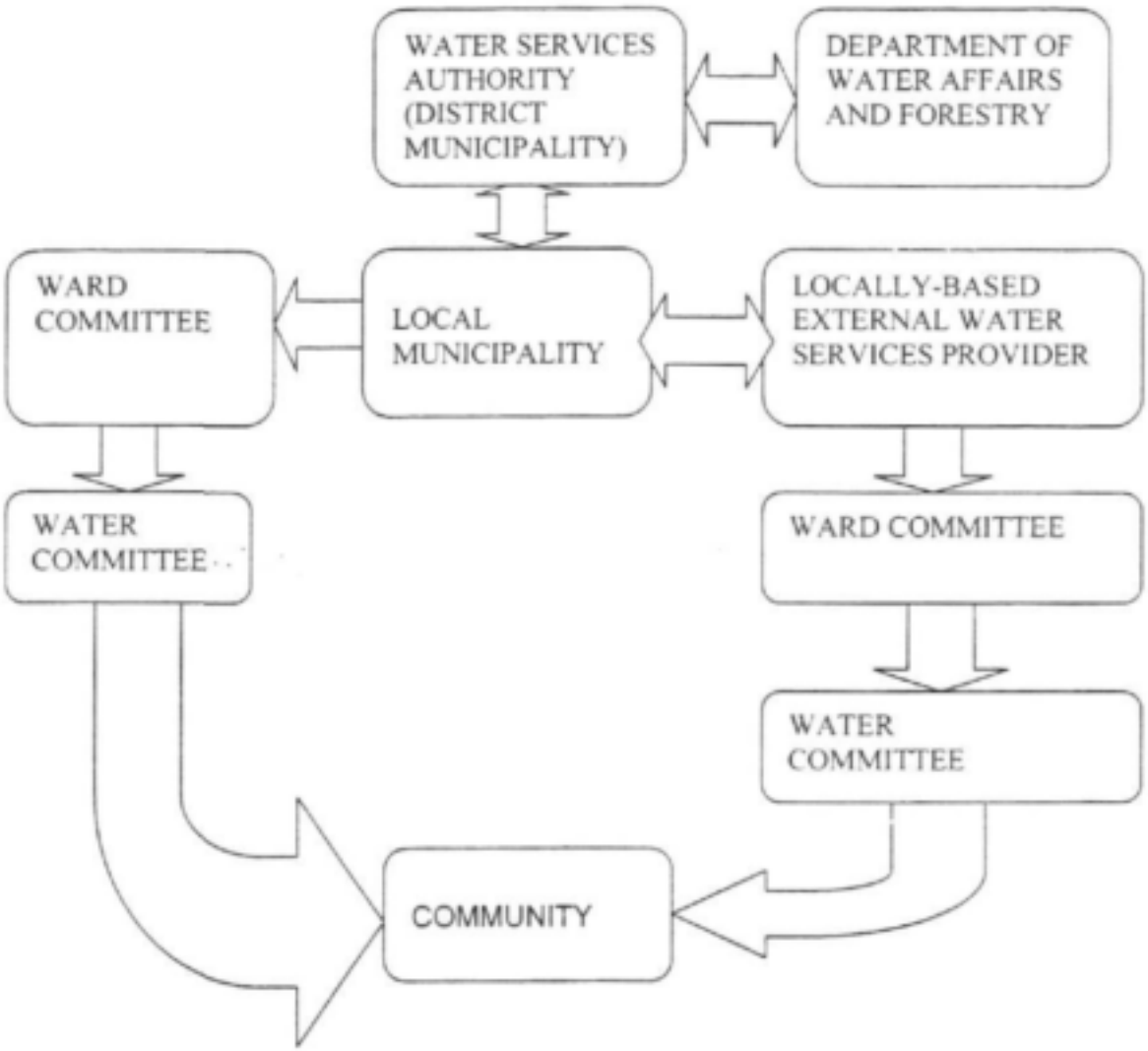


Figure 5: Proposed Model for the Functioning of the Locally-Based Institutional Arrangement

- ✓ **Water Committee**

  Should be responsible for operating and maintaining a specific water point.

- ✓ **Ward Committee**

  The ward committee should be responsible for almost all the activities (e.g. managerial, operational, technical and financial) for the ward. Through the approval of the municipality, the ward committee can contract an individual (e.g. local artisan or a mechanic) to assist in technical issues related to the O & M of the scheme.

✓ **Municipality**

The municipality should be responsible for ownership and decision-making. In certain cases the municipality may decide to contract a private Water Services Provider who will have to liaise with a specific ward committee.

c) Cost recovery

Cost recovery has a direct impact on the sustainability of the scheme. The model below presents a structure that can be used to recover operation and maintenance costs of the water supply systems.

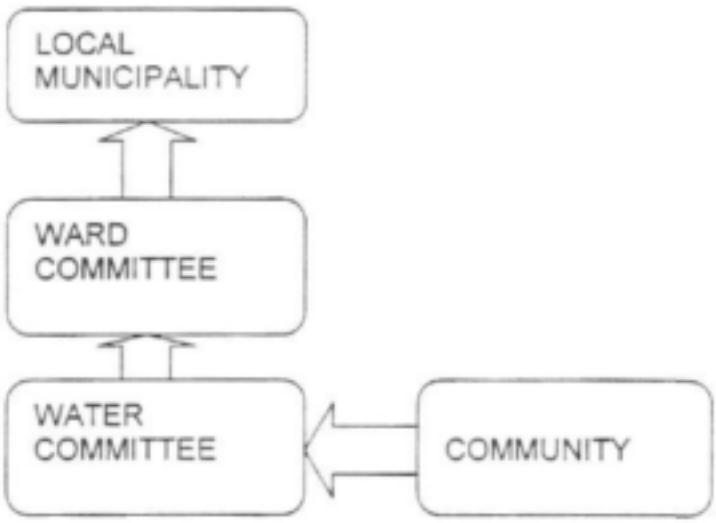


Figure 6: Proposed model for recovering Operation and Maintenance costs

This is a simplistic model that could be applied in typical rural areas. In advanced rural areas other sophisticated methods could be used.

In typical rural municipalities where free basic water is implemented, the model will still be the same but costs would be recovered after the minimum free basic water quantity has been exceeded.

d) Technology choice

Some of the water supply systems collapse, because the selected technology option is not appropriate for the local conditions and the community cannot afford to carry the costs of operating and maintaining it. To ensure successful operation and maintenance of the water supply system, the community should be consulted in advance. They should also be guided on the cost implications of various technologies.

This would assist them in making the appropriate and affordable technology choice. Before the local authority can commission the project for installing a new scheme, the following questions should be addressed:

- What are the costs (i.e. both capital and recurrent) of the technology options considered?
- What materials, spares and skills are needed to sustain the desired service level?
- What is the capacity of the community to manage, operate and maintain the new water supply system?
- What is the most appropriate structure to sustain the desired service level that corresponds to the management capacity of the community?
- What are the financial resources available and willingness to pay?
- What is the present approach to the application of O & M within the community?
- Should technology match the available O & M system and capacity or should the O & M system be adjusted to match the most suitable technology?
- What kind of support would the community need in terms of technical, financial and capacity building assistance?
- What is the overall impact of the technology selected?

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

In conclusion the following factors were found to be key to success, which if addressed, could lead to sustainable water supply system

- ***Localized institutional arrangement***;

  Most schemes that are functioning intermittently are centrally-managed schemes. They are managed by the Regional Department of Water Affairs (DWAF) and Forestry. Due to the location of the regional offices from the communities, it takes longer (i.e. 3 – 6 months) to respond to breakdowns. Localized institutional arrangement with inside knowledge of local problems could be the potential solution.

- ***Effective communication amongst all stakeholders***;

  Communication between the community and the water services provider (i.e. DWAF), communities and the municipalities should be improved because it affects the functionality of the schemes. In the past DWAF has been providing free diesel. In one of the villages when DWAF stopped providing free diesel, the message was not communicated properly and it created mistrust between the community and the technical operator. The community was not prepared to make any contribution to the purchase of diesel and the scheme collapsed. Better communication could have made a difference.

- ***Efficient cost recovery plan***

  Most communities do not have clearly defined and well structured cost recovery plan. This is a problem affecting most of the rural municipalities throughout the country. In some of the communities where the scheme is functioning intermittently, community members do not want to pay a flat rate because of the unequal distribution of water. The unwillingness to pay led to the intermittent functioning of the schemes.

- ***Community involvement in all phases of the project***;

  Community involvement is the crucial factor, because it helps the community to have sense of ownership of the scheme. If community members are not involved throughout all the stages of the project, the possibility of them buying into the project activities are limited.

- ***Appropriate technology choices***.

  Inappropriate technology choice could lead to unaffordability and lack of spare parts. In two of the villages surveyed, the pump could not be fixed due to lack of spare parts, whereas in the other village, the community

could afford to buy replacement parts. All these led to the intermittent functioning of the scheme.

8.2 Recommendations

Based on the findings, the investigator would like to recommend the following:

a) DWAF is in the process of transferring schemes to the local municipalities. According to the outcome of this study, the local municipalities are not yet ready (in terms of local capacity) to manage the schemes. In order to ensure that the process of transferring schemes succeed, training workshops should be conducted to ensure technical capacity building within local municipalities and their communities. Technical capacity building within local municipalities would pave a way for the establishment of the locally-based institutional arrangements.

   Some of the issues which could be included in the training programmes are:

   - efficient monitoring/supervision of the scheme;
   - meter reading and reconciliation;
   - appropriate computer skills;
   - basic accounting;
   - technical skills (e.g. installation of meters, water connections)

b) Professional Service Providers carrying out projects in rural communities should be encouraged to acknowledge communities as key stakeholders in the process, recognizing that they are the clients who will have to pay for the operation and maintenance of the scheme. They should therefore be involved in the planning, design, and implementation phases of the project. This would help them understand the project and also have sense of ownership.

c) Workshops should be conducted to raise awareness with regard to who should be responsible (according to the National Water Services Act) for O & M costs of the water supply systems.

d) Appropriate and realistic cost recovery plans applicable to rural communities should be developed. Appropriate cost recovery plan would also assist local municipalities in implementing free basic water programme.

e) Technology choice of the water supply systems should be discussed with the relevant communities before installation. Rural communities should be guided by unbiased technical experts with regard to the implications of choosing a specific technology.

f) As part of information transfer, capacity building and improvement on the guidelines, it is recommended that guidelines discussed in Section 7 of this report be presented in provincial workshops that would be attended

by all the municipalities within each province. Inputs from the workshops would add value to the improvement of the guidelines.

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10. ANNEXURE A: QUESTIONNAIRES

10.1 QUESTIONNAIRE FOR THE TECHNICAL OPERATOR

Date: .....

A. **DATA**

A1. **Village**

A1.1 Name of the District Municipality : .....

A1.2. Name of the villages/village served : .....

A1.3. Name of the scheme : .....

A2. **Water Supply System**

A2.1 Source (e.g. Borehole): .....

A2.2 General description of the scheme: .....

.....

A2.3 Estimated date on which the water supply system was installed

.....

A3. Institution responsible for operation & maintenance:

.....

A4. Technical Operator

A4.1 Who employed you?

Water Committee
District Municipality
Other.....

A4.2 Are you employed full-time/part-time to operate the water system?
Yes .....
No .....

A4.3 If "Yes", who is paying your monthly salary?

Village/Scheme Water Committee .....
The Chief .....
Provincial Government .....
National Government .....
No salary .....

A4.4 Did you undergo any technical training for the operation of the water system?

Yes .....
No .....

A4.5 Do you have your own transport?

Yes .....
No .....

A4.6 Where are you based relative to the village?

0 – 10km
10 – 20km
20 50 km
> 50km

A4.7 If there is a breakdown, who do you contact?

Local Authority .....
The Chief .....
Water Committee .....
National Government .....
Nobody .....

A4.8 How do you make contacts?

Telephone.....
Other.....

A4.9 How are you informed about breakdowns?

.....

A4.10 How often do you get breakdowns?

Once every week
Once every two weeks
Once every month
Once every three months.
None.

A4.11 What can you repair?

.....

A4.12 Do you have the necessary tools?

Yes .....
No .....

A4.13 If "Yes", do you have storage for your tools and other relevant materials?
Yes .....
No .....

A4.14 Are there any other operators?
Yes .....
No .....

A4.15 If "Yes", how many?

.....

10.2 QUESTIONNAIRE FOR MEMBERS OF COMMUNITIES ON WATER SUPPLY SERVICE

Date: .....

A. **DATA**

A1. **Village**

A1.1 Name of the Local Municipality.....

A1.2. Name of the village .....

A1.3. Location of the village :

Longitude .....

Latitude .....

A1.4 Name of the scheme.....

A2. **Household Members**

A2.1. Sex status of the interviewee Male or Female

A2.2. Number of members of the household who are:

At School/University/Technikon .....

Working .....

Unemployed .....

Pensioners .....

A2.3. Number of members of the household who are not living with you but send

money on a regular basis .....

A2.4 Number of members of the household who are not living with

you at present and do not send money .....

B. WATER USERS EXPERIENCE OF PRESENT OPERATION

B1. Is potable water available? Yes .....
No .....

B2 What is the estimated date on which the water supply scheme was built?

.....

B3. Were you consulted when the water supply scheme was built?
Yes .....
No .....

B4 Who is responsible for the operation and maintenance of the scheme?

Water Committee .....
Local Authority .....
Provincial Government(DWAF) .....
The Chief .....
Other.....

B5. The operation and maintenance costs

B5.1 Were you informed about the operation and maintenance costs?

Yes .....
No .....

B5.2 Do you pay for operation and maintenance of the water supply system?
Yes .....
No .....

B5.3 If "Yes", how much do you pay?

R 0 to R5
R5 to R10
R10 to R20
R20 to R40
More than R40

B5.4 How often do you pay?

When there is no diesel
When the machine is broken
Every month
Other.....

B5.5 In your opinion who should cover the operation and maintenance costs?

Water Committee .....
Your Household .....
The Chief .....
Provincial Government .....
National Government .....
Other.....

B6. *Payment for water*

B6.1 Were you informed about payment for water services?

Yes .....
No .....

B6.2 Do you pay for water use per household?

Yes .....
No .....

B6.3 In your opinion who do you think should pay for water use per household?

Water Committee .....
Local Authority .....
The Chief .....
Provincial Government .....
National Government .....
Your Household .....

B6.4 How often do you pay?

Once every month
Once every two months
.....

B6.5 If "Yes", do you pay the same amount each time?

Yes .....
No .....

B6.6 How much do you pay?

R 0 to R5
R5 to R10
R10 to R20
R20 to R40
More than R40

B6.7 How do you know how much to pay?

Someone speak to me
Someone sends me an account
Other .....

B6.8 Who do you pay?

Water Committee
District Municipality
Chief
Operator
Other .....

B6.9 What is your payment system?

Pre-paid meter
Other.....

B7. Source of water supply and sustainability of the water system

B7.1 Where do you receive your water?

At dwelling .....

Standpipe .....

Other .....

B7.2 If from standpipe or other distant source, what is the distance between dwelling and water point?

Less than 100m .....
Between 100 and 200m .....
Between 200 and 400m .....
More than 400m .....

B7.3 How often is water available?

Always .....
Sometimes .....
Seldom .....

B7.4 If there is diesel to run the system, how often do you experience disruptions in water supply?

Once every week .....
Once every two weeks .....
Once every three weeks .....
Once every month .....
Other .....

B7.5 What action do you take to ensure that the water supply is restored?

Approach Water Official .....
Approach the Chief .....
Approach Local Authority .....
Organize a meeting .....
Remain inactive .....

B7.6 Does the Water Authority notify you about disruptions before they take place?

Always .....
Sometimes .....
Never .....

B7.7 How long does it take for disruptions to be rectified?

Up to one week .....
Two weeks .....
Three weeks .....
Month or longer .....

B7.8 Does the Water Authority notify you that they are intending to do repair work on problems?

Always .....
Sometimes .....
Never .....

B7.9 Should the present supply fail, where do you obtain water?

Local stream .....
Own borehole .....
Nearest working water point .....

B7.10 Are you required to pay for water at the other source?

Yes .....
No .....

B7.11 Do you have authorized connection?
Yes .....
No .....

B7.12 Who put the Connection?

.....

B7.13 Is there a meter on your connection?
Yes .....
No .....

B7.14 Is there anybody reading the meter?
Yes .....

No .....

B7.15 In your opinion what should be done to ensure that the present Water Supply system is sustainable?

.....

.....

.....

C. FUTURE OPTIONS

C1. Operation and maintenance

C1.1 If the new system is installed or present water supply system is upgraded, are you prepared to pay for the costs of operating and maintaining the water supply system?

Yes .....
No .....

C1.2 If "No", what is your reason?

.....
.....
.....
.....

C1.3 If "Yes", what amount can you contribute towards the recovering of the operation and maintenance costs?

Less than R20/month .....
Between R20 and R30/month .....
Between R30 and R40/month .....
More than R50/month .....

C1.4 If the local person(s) is(are) trained and charged with the responsibility of operating and maintaining the system to ensure sustainability, would you appreciate the idea?

Yes .....
No .....

C1.5 Who would you prefer to manage the trained technical operator?

Water Committee .....

Local Authority .....
The Chief .....
Other.....

C1.6 Would you prefer the trained technical operator to monitor waterleaks, pump installations, other components on a systematic basis?

Yes .....
No .....

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