

Republic of Zambia

Ministry of Local Government and Housing

National Guidelines for Sustainable
Operation and Maintenance of Hand Pumps in
Rural Areas

1st Edition

November, 2007



FOREWORD

The Government of Zambia places a high priority on ensuring that all Zambians in rural areas have access to safe water supply and sanitation. This is reflected in the current 5th National Development Plan for the period 2006 - 2010. The challenges of meeting the defined targets for coverage for rural water supply and sanitation as laid out in the FNDP are enormous. The percentage of people with access to RWSS facilities in the rural areas is unacceptably low. This means that unless there are fundamental changes in the manner of doing business in the sub-sector, the country risks failing to meet its FNDP targets, and thereby uplifting the well being of the people.

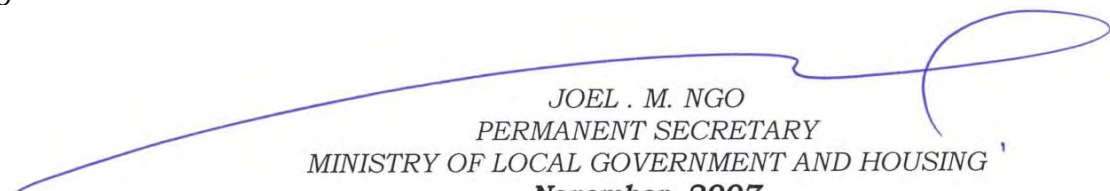
One way my Ministry is driving to effect change in sector management is through the development of a comprehensive sector wide National Rural Water Supply and Sanitation Programme, for the period 2006 – 2015. The NRWSSP introduces harmonized and coordinated approaches of implementing rural water supply and sanitation activities.

Over the past 20 years, the government has invested in new rural water supply facilities throughout the country. Unfortunately, periodic reviews have indicated that a number of these water points fall into disuse just a few years after their commissioning. Various factors have been seen as contributing to this state of affairs, one being poor operation and maintenance (O & M) practices. Related to this has been the absence of government policy and guidelines on operation and maintenance practices to guide the sector.

These guidelines have been developed to close this policy gap as well as to harmonise O & M practices. The need to harmonise approaches in the implementation of rural water supply activities is now widely acknowledged in Zambia. The guidelines are also intended to guide all the sub-sector stakeholders; beginning with the Local Authorities who are the agents responsible for rural water supply, the communities, the private sector and other rural water supply implementers on how to establish and sustain operation and maintenance systems.

The guidelines are the first in a series of implementation guidelines being developed and issued under the National Rural Water Supply and Sanitation Programme, and which the Government shall use to regulate the sub-sector.

Practitioners are encouraged to give feed back to the Ministry on the use of the guidelines.



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We also pay tribute to all Cooperating Partners, Public Institutions, Private Sector, Civil Society and indeed Individuals who participated in the meetings and workshops to finalise this document.



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ABBREVIATIONS AND ACRONYMS

ADC	Area Development Committee
APM	Area Pump Mender
CBM	Community-based Management
CPs	Cooperating Partners
CS	Council Secretary
CU	Commercial Utility
DDCC	District Development Coordinating Committee
DISS	Department of Infrastructure and Support Services
DLAs	District Local Authorities
D-WASHE	District Water Sanitation Health Education
EHT	Environmental Health Technician
GRZ	Government of the Republic of Zambia
ICWSSRA	Implementing Community Water Supply and Sanitation in Rural Areas
M&E	Monitoring and Evaluation
MCDSS	Ministry of Community Development and Social Services
MCTI	Ministry of Commerce, Trade and Industry
MEWD	Ministry of Energy and Water Development
MFND	Ministry of Finance and National Development
MLGH	Ministry of Local Government and Housing
MoE	Ministry of Education
MoH	Ministry of Health
NGO	Non-governmental Organisation
NHC	Neighbourhood Health Committee
NRWSSP	National Rural Water Supply and Sanitation Programme
NWDP	National Water Development Programme
O&M	Operation and Maintenance
OPS activities	Operations activities
PLGO	Provincial Local Government Office
P-WASHE	Provincial Water Sanitation Health Education
R&D	Research and Development
RWSS	Rural Water Supply and Sanitation
SOMAP	Sustainable Operation and Maintenance Project
SOMAp	Sustainable Operation and Maintenance Approach
SWAp	Sector Wide Approach
TA	Technical Assistance
VLOM	Village Level Operation and Maintenance
V-WASHE	Village Water Sanitation Health Education
WASHE	Water Sanitation Hygiene Education
WSS	Water Supply and Sanitation
ZMK	Zambian Kwacha

DEFINITION OF KEY TERMS

Accessibility

Accessibility is having a functioning and reliable water supply facility without any barriers within a radius of 500 metres.

Adequate Water

Adequate water is the quantity of water required to meet the minimum demand per capita per day.

Collaboration

Collaboration is defined as the overall interaction between agencies involved in planning, implementation, providing support or operationalising water sanitation health education (WASHE).

Co-ordination

Co-ordination is the principle mechanism for effecting collaboration within the sector. In the context of Community Water Supply, co-ordination entails creating an institutional framework, which promotes co-operation among stakeholders.

Community

Community refers to people living in a designated area who share residential and developmental challenges and benefits. It may also refer to all people sharing such challenges and benefits regardless of geographical or social boundaries.

Community Management

Community management is a form of community participation in which the community takes the final decision on all aspects of planning, implantation, management, monitoring, evaluation, operation and maintenance of the water supply facility.

Coverage

Coverage is the percentage of people with access to safe, adequate and reliable water supply.

Demand Responsive Approach

Demand responsive approach is the way in which an informed expression of desire for a particular service is made and responded to, with the assumption that the expression and response reflect choices that the communities are willing and able to make, receive and sustain.

Environmental Sanitation

Environmental sanitation is a set of interdependent factors, such as hygiene practices, faecal and solid waste disposal, safe water use, management and maintenance, which reduce health risks and increase well-being.

Evaluation

Evaluation is the periodic and systematic review and analysis of a practice to determine the relevance, effectiveness, efficiency and impact of programmes/projects compared to set objectives.

Health Education

Health education is defined as “any combination of learning experiences designed to facilitate voluntary adaptations of behavior conducive to health”. (ICWSSRA)

Hygiene Practices

Hygiene practices are routine habits associated with cleanliness. They can be considered in three categories: personal hygiene, domestic hygiene and environmental sanitation.

Hygiene Promotion

Hygiene promotion is “all activities aimed to change attitudes and behaviour in order to break the chain of disease transmission associated with inadequate hygiene and sanitation” (ICWSSRA). The focus of hygiene promotion is establishing links between water and sanitation facilities on the one hand and human practices on the other, especially with regard to use, care and maintenance of facilities. It is concerned with hygiene behaviours, which mainly relate to daily routine actions such as collection, transportation, storage and use of water, hand washing, disposing of rubbish and disposing of human waste.

Maintenance

Maintenance refers to the activities required to sustain the water supply facilities in a proper working condition. It includes preventive maintenance, corrective maintenance and crisis maintenance.

Monitoring

Monitoring is the regular and continuous checking of whether plans, activities and situations are being implemented as planned, and includes the provision of feedback to facilitate the taking of corrective measures by relevant stakeholders.

Operation

Operation refers to the day-to-day running and handling of water supply facilities in a manner that optimises their use and contributes to a reduction in breakdown and maintenance needs.

Preventive Maintenance

Preventive maintenance refers to an activity that includes checking the status of hand pump components at regular fixed time intervals.

Rehabilitation

Rehabilitation is the correction of major defects and the replacement of equipment to enable a facility to function as originally intended.

Reliable Water Supply

Reliable water supply is the supply of water on a continuous basis meeting the minimum demand per capita per day

Repair

Repair is the restoration of a defective component to return the facility to acceptable working condition.

Rural Area

The National Environment Sanitation Strategy for Rural and Peri-Urban Areas in Zambia (1998) defines rural as “Areas of population outside urban or peri-urban using point or surface water sources for which the community is responsible for the operation and routine maintenance and sanitation primarily through pit latrines for which the community is responsible for operation and maintenance”. In addition, low population densities characterise rural areas (usually less than 20 persons per square kilometre), with small houses isolated from each other.

Safe Water

Safe Water is water that is free from harmful quantities of physical, chemical and pathogenic matter and that meets the minimum Zambian standard (usually WHO guidelines).

Seed Money

Seed money is the initial sum of money disbursed to an organisation in order to create/start a revolving fund for undertaking a designed or designated programme.

Sustainable Supply Chain

Sustainable supply chain is a system of procuring and supplying spare parts that guarantees a continuous supply of spare parts.

1. INTRODUCTION

1.1. Background

The Government of the Republic of Zambia embarked on reforms in the early 1990s in an effort to alleviate poverty and improve the livelihoods of the people of Zambia. In the Rural Water Supply and Sanitation (RWSS) sub-sector, policies and strategies have been prepared to give a clear direction in the implementation of programmes. The ultimate goal of the formulation of various policies and strategies has been to attain higher coverage in the access to safe and adequate water supply and sanitation services.

The re-organisation of relevant Ministries in the RWSS sub-sector has also been effected, thereby facilitating an enabling environment in the delivery of service to the people.

The management of the nation's water resources and sector regulations is the responsibility of the Ministry of Energy and Water Development (MEWD) while the Ministry of Local Government and Housing (MLGH) has been mandated with the responsibility of facilitating the provision of water supply and sanitation services.

The MLGH has formulated and developed the National Rural Water Supply and Sanitation Programmes (NRWSSP) with the purpose of setting priorities and uniform approaches that will enhance the achievement of the Fifth National Development Plan (FNDP), the Millennium Development Goals (MDGs), and of meeting the National Vision of universal coverage. The NRWSSP consist of a set of investments, institutional and sector support activities aimed at facilitating the provision of Water Supply and Sanitation (WSS) services in the rural areas of Zambia.

One of the major problems being encountered in the provision of services in the RWSS sub-sector is the frequent breakdown of water supply facilities. The frequent breakdown of water lifting devices such as hand pumps is due to inappropriate construction and poor Operation and Maintenance (O&M) of the facilities. The poor operation and maintenance of facilities result into shorter period of working time than the expected life span.

In order to address frequent breakdowns, the move to formulate O&M guidelines has become a major component of the NRWSSP support activities.

In this light, the MLGH, in consultation and collaboration with key stakeholders, has formulated National Guidelines that will enhance the utilisation of water resources on a sustainable basis through effective O&M.

1.2. Concepts and Trends

The Government of the Republic of Zambia has shifted from the supply driven approach to a demand responsive approach in the delivery of WSS services. It has adopted the Community-based Management (CBM) concept to empower communities to make informed decisions, identify their needs and participate in the implementation of infrastructure development. This approach requires communities to operate and manage the water supply infrastructure and enhances the sustainability of the systems developed. In order to ensure that the CBM concept is sustained, it is important to monitor demographic trends to determine the benefit of investing in the provision of safe and adequate water supply services. It will be necessary to provide appropriate technological options depending on the population, among other factors. The investment for the construction of a borehole for a population of say less than 100 people, for example, is not appropriate, as the installation will be under-utilised. On the other hand, a water point designed and constructed for the recommended population of 250 people will be over-utilised if it is used to serve a population exceeding this number. It is therefore necessary to monitor demographic patterns prior to and after the construction of new water points.

1.3.Purpose of the Guidelines

These guidelines are intended to assist stakeholders at National, Provincial, District, Sub-District and Community levels in RWSS service provision to foster sustainability of the facilities through effective O&M. The roles and responsibilities spelt out for the various stakeholders will assist to streamline their functions. These guidelines also provide stakeholders with information on recommended construction procedures that will ensure trouble-free operation and maintenance. This information highlights factors that will help to control the quality of workmanship during the construction phase of the facilities.

The guidelines will be complimented by existing manuals on O&M, which include:

- Pumps Manufacturers' Installation and Maintenance Manuals for Standard Pumps.
- Maintenance Manuals for Water Facilities Developed by Japan Techno Co Ltd.
- The V-WASHE O&M Manual.
- The V-WASHE Financial Manual.
- Technical Training Manual.
- Monitoring Manual.
- Financial Management Manual. (District).
- Stock management Manual.
- Monitoring and Evaluation Manual (District).
- Criteria for Selection of Appropriate Water Technologies in Terms of Water Lifting Devices
- Other relevant manuals developed by other actors in the RWSS sub-sector.

Note: that these manuals must be authenticated and distributed by the Ministry of Local Government and Housing.

1.4.Intended Users

The targets for these guidelines are policy makers, administrators, and planners in Local Authorities, line ministries and other stakeholders at all levels. These guidelines are in line with the Guidelines for Implementing Community Water Supply and Sanitation in Rural Areas formulated by the MLGH in February 2007.

1.5.Requirements for Sustainable O&M

In these Guideline CBM shall be widely endorsed as the essential component of a sustainable O&M approach (SOMAp), with the following being in place:

- **Skills:** Capacity building of communities to ensure that they are effective in their participation at the various stages of the RWS programmes. Considerable investment should be made in terms of time and funding to effectively carry out capacity building initiatives.
- **Awareness:** User communities' appreciation of the advantages of reliable and adequate safe water supply. This will see the manifestation of economic and social benefits and improvement in their health status. This is achieved through public campaigns.
- **Availability of spare parts:** The necessary materials and equipment should easily be available for communities to keep the systems operational using the skills imparted during the capacity building process. Sustainable supply chains should be established at the district level for providing necessary spare parts and materials at a reasonable market price.
- **Adequate fundraising by communities:** Community financing towards O&M activities at the community level should be developed and enhanced. This should include accurate cost determination of O&M for different available technologies.
- **Making funds available for O&M:** Identification and facilitation of income generating activities will have to be undertaken by the Government and support agencies. The establishment of loan schemes could be a bridge towards community financial independence in effectively managing their RWS systems.
- **Legal provisions:** Appropriate legal provisions such as statutory instruments, by-laws, regulations and other similar initiatives should be introduced. This will prompt communities to be committed and to establish clear ownership of the facilities. Local Authorities may have to formulate by-laws to enforce these Guidelines.
- **Monitoring and evaluation:** There should be effective monitoring of the entire set up of the O&M systems to ensure sustainable O&M is achieved.

- **Mechanism of quality control:** Mechanisms should be developed that will ensure good workmanship of the water supply installations. Poor workmanship is a recipe for failure of efficient and effective O&M systems.

1.6. Institutional Options for O&M in Rural Water Supply

Management models for O&M for Rural Water Supply facilities in the country vary from centralised Government systems to localised management systems, as indicated in Appendix A. In Zambia different programmes have been supporting districts, sub-district and village administration involvement in O&M amounting to four options – one-, two- and three-tiers and a centralised system. Each option entails a different way of sharing costs and responsibilities.

For sustainable O&M, a three-tier system is currently considered appropriate and should be adopted by all stakeholders. In future programmes (five to ten years), stakeholders should aim to move from a three-tier to a one-tier system. These guidelines are based on the implementation of a three-tier system.

1.7. Principles

The National Water Policy aims to promote, among other aspects, sustainable water resources development by facilitating equitable provision of adequate quantities and quality of water for all competing groups of users at acceptable cost, and to ensure security of supply under varying conditions. For community water supply in rural areas, the CBM approach has been adopted in the O&M of water facilities. The majority of these facilities are hand pumps installed on either boreholes or hand dug wells. In ensuring the sustainability in O&M of these facilities, the following principles should be applied:

1.7.1 Cost sharing by Communities

- 100% cost for O&M
- 5% capital costs
- 5% of rehabilitation and replacement costs

1.7.2. Sustainable Supply Chains

- Spare parts should be available at outlets at all times
- Spare parts should be affordable
- Appropriate mechanisms should be set up for a sustainable supply chain

1.7.3. O&M Mechanisms

- Management of water facilities needs to be taken care of at the lowest appropriate level
- Devolved approach to RWS
- Involvement of stakeholders is required
- Striking a gender balance is essential

1.7.4. Choice of Appropriate Technology

- Satisfying hydro-geological conditions
- Affordability for capital and recurrent costs is considered
- Durability of the facility is considered
- Standardisation vis-à-vis research and development is applied

1.7.5 Capacity Building is the Key to Sustainability

- Supportive policies and a regulatory framework are provided
- An environment for awareness campaigns and public participation is created
- Management, financial and technical skills are developed for the effective operation and management of water facilities

2. OPERATION AND MAINTENANCE AT COMMUNITY LEVEL

The Decentralisation Policy of Zambia advocates for the need of the citizenry to exercise control over their own local affairs and to foster meaningful development. This entails that some degree of authority is decentralised to the province, district, sub-district and village levels. Through the principle of devolution the communities are required to take charge of the management of their developmental activities, which include RWS infrastructure, using the CBM concept, whose key aspects are:

- **Responsibility:** the community takes the ownership of and responsibility for the O&M of the facilities.
- **Authority:** the community has the legitimate right to make decisions regarding the RWS system.
- **Control:** the community is able to carry out and determine the outcome of its decisions.
- **Accountability:** the community accepts the consequences of its decisions and actions.

Considering the above key factors of the CBM concept, the communities should be active players in RWS at all stages of the project cycle, allocating roles and responsibilities to various actors in the communities. The Local Authorities shall create awareness on these key factors to facilitate community comprehension and acceptance of their roles and responsibilities.

2.1 Roles and Responsibilities of the Community

The allocation of roles and responsibilities is considered as one of the key initial steps in the involvement of communities in O&M. This is an endeavour to ensure that the O&M system will be effective during the post-construction phase.

The allocated roles and responsibilities according to the stages of RWS programmes, which are also reflected in the Guidelines for Implementing Community Water Supply and Sanitation in Rural Areas (ICWSSRA), are as follows:

(i) Pre-construction phase (referred to as stage one in ICWSSRA)

- **Selection of a technology:** A meeting or a series of meetings are held at which communities are provided with information on the benefits, constraints, management needs and financial implications of each technology.
- **Community assessment of its capacity:** After being availed with relevant information on the O&M requirements of the said technology or facility, the community makes an informed technology choice.
- **Formation of an organisational structure:** V-WASHE committees, which will operate and manage the facilities, are formed. Gender consideration should be taken into account when forming the V-WASHE committee.

There should be 50% representation for male and female committee members. Rules and Regulations on the usage and management of the facility should be clearly outlined and written down.

- Development of an operation and maintenance plan, including rules on community contribution.
- Orientation: Communities receive orientation in monitoring water facility construction flaws that would impede O&M (See item ii below).
- Siting: Communities give the general site where the water point should be constructed, after which technical siting is done by scientific methods such as geophysical siting.
- Creation of awareness: Efforts are made to create awareness among the various committees on the need for contributions towards O&M in order to sustain the facilities.
- Selection of trainees: Trainees are selected and provided with the different tasks to be performed during the post-construction phase (O&M phase). The selected trainees should where possible be attached to the pump installation units.

The communities should be oriented regarding observation on common borehole flaws that might affect O&M. Such flaws are as follows:

- Inappropriate location (non-yielding rocks, too far from user group, flood prone points, possible sources of pollution, etc.)
- Borehole depth causing non-sustainable/erratic yield (i.e. too shallow).
- Borehole diameter compromising functionality (i.e. too narrow).
- Poor water quality (e.g. high salt content, high iron content etc)
- Bent or twisted casings (causing premature wear on pump parts).
- Alien blockages (e.g. dropped drilling equipment, dislocated casings).
- Borehole silting-up caused by incorrect diameter, gravel pack or slot width
- Borehole silting up caused by inadequate development procedure

All these pre-construction phase activities are part of the process of building the capacity and awareness of the community with a view to providing managerial, technical and financial skills to carry out sustainable O&M of hand pump facilities.

It should be noted that poor design and technology choice create unnecessary O&M difficulties. Poorly designed and constructed facilities generally experience frequent breakdowns that in turn increase the cost of repairs and maintenance (costs that are borne by the communities). Therefore, the community should be oriented at the pre-construction stage in monitoring quality of construction. The Guidelines for implementing community water supply and sanitation in rural areas provide information that can be used in the orientation of the communities, enlightening them in monitoring the construction procedures for various water supply options.

Local Authorities should be obliged to avail information through the RWS and APM on approximately how much the water supply facility will cost to maintain in order to

provide reliable service. The cost of O&M of the facility would help the communities to calculate and agree on individual user contribution.

According to N-WASHE (1997) Supplementary Module 2d, replacement of hand pump parts begin after 2 years starting with piston seals. For details Appendix B outlines the frequency of replacement. It should be noted that after 5 years, spares worth approximately ZMK750,000 will be needed. This translates into not less than ZMK150,000 in contributions per year for spare parts alone. When transport and labour cost are considered, the community needs to raise not less than ZMK200,000 per year per water point. These costs are only approximations – much more information needs to be gathered by the Information Management System in the MLGH to assist in determining accurate costs.

(ii) During construction (referred to as stage two in ICWSSRA)

During the construction phase the community through the V-WASHE committee needs to:

- Organise labour, materials such as crushed stones for appurtenant facilities and sand, as well as other community inputs. Contributions such as commitment fees should be mandatory. Communities should therefore continue paying commitment fees in line with the Guidelines for Implementing Community Water Supply and Sanitation in Rural Areas (Section 2.7. Cost Sharing) that states that communities should provide materials, labour and management worth at least 15% of the project value, with at least 2% as cash. The cash contribution should be used as seed money for O&M.
- Monitor the quality of construction/installation in order to ensure specifications are adhered to. Community involvement in monitoring provides checks and balances and promotes transparency.
- Familiarise itself with the technology being developed.
- Prepare itself for O&M, the preparation, among other things, includes fundraising and the involvement of women in the respective well committees. The community should also be involved during hand pump installation as a way of training for post construction O&M.

(iii) Post-construction phase (referred to as stage three in ICWSSRA)

The following are the roles and responsibilities of communities during the post-construction phase:

- To correctly operate the water facility. It should not be assumed that the facility will be correctly handled, hence the need for awareness on the implications of misuse of the facility. The proper operations of a facility will result in its optimum use and contribute to a reduction in breakdowns and maintenance costs.
- To implement the O&M plan designed at the pre-construction stage.

- To undertake preventive maintenance (i.e. undertake regular inspection and servicing of the facility). For a hand pump, this might include tightening of bolts and greasing some parts, all meant to preserve the facility and minimise breakdowns (see 2.2.1). However, unnecessary dismantling of the hand pump can be risky.
- To undertake minor repairs and replace broken and worn out parts to sustain the facility. Funds should be contributed for repairs and replacement of worn out parts.
- To undertake self-supervision and monitoring in the implementation of the O&M plan.
- To prepare themselves for unplanned and emergency breakdowns as well as user complaints.

All major repair works (i.e. fishing of riser pipes, rods & pump cylinders, unblocking clogged boreholes, flushing out etc.) should be carried out by the Local Authorities using GRZ, District Authority and community funds as indicated in the table below. The V-WASHE should seek assistance from the District Maintenance Team or a well skilled and equipped private sector operator.

Table 1: Proposed Share of Funding NRWSSP

	GRZ	CPs	DLA	Community
National RWSS Unit	100%			
National Level TA		100%		
Programme support teams		100%		
Capex for water points	10%	85%		5%
DLA level OPex	70%		25%	5%
Community level OPex				100%

Source: NRWSSP

Capex: Capital Expenditure

OPex: Operational Expenditure

The communities should also be wary of flaws that could impede on O&M, these are:

- No O&M system or non-functional, poorly functional O&M systems
- Interference by non-qualified/non-authorised third parties (untrained mechanics).
- Alien blockages in casing (dropped pump or pump tools, bricks, stones etc.
- Poor or non-existent spare parts availability.

The transfer of roles and responsibilities to communities (in problem identification/assessment, planning, implementation and overall management of operation and maintenance of the facilities) requires the loosening of centralised control, including a well established supply chain at the lowest possible level where communities will procure/buy their own spare parts from spare parts dealers. There is an urgent need to move towards decentralisation that will require effective linkages

and collaboration between government departments, external support agencies and the communities who are the owners of the water facilities.

Once construction has been completed, a number of issues have to be addressed to ensure sustainability through effective O&M. These issues include:

- Ownership of the new facility: There is a tendency by communities to give nametags to facilities, which may affect the commitment to O&M. Communities need to cultivate a sense of ownership of the facility and only acknowledge support rendered by co-operating partners.
- Community acceptance of O&M responsibilities: Such acceptance is often not very clear or definite. Local Authorities should define the O&M responsibilities clearly and ensure that the communities accept the implementation of their roles by signing a Memorandum of Understanding (see Appendix C).
- The status and payment of incentives for the APM should be clarified in order to place them as either volunteers or local entrepreneurs to determine the approach under which they will be involved in O&M. In some cases, the APMs may be regarded as volunteers in their domicile localities, but can be private entrepreneurs in their non-domicile localities.
- Few water points exist in most districts, making spare part distribution and selling unattractive to the private sector. Local Authorities must ensure that rural water supply information management systems are created for all water supply installations to be able to effectively plan spare part distribution.

2.2 Preventive Maintenance of Hand Pumps

Undertaking preventive maintenance ensures that the benefits realised can be maintained. Efforts need to be made for communities to be aware of the benefits of undertaking preventive maintenance. Preventive maintenance enhances the continuity of functionality of a hand pump, which will result in user confidence that might affect their willingness to pay for water services. As such, routine inspection should be carried out by the communities

2.2.1 Tasks in Preventive Maintenance.

The specific preventive maintenance tasks applicable in a given situation will depend on the type of hand pump and technology used. The following are the generic tasks to be undertaken in preventive maintenance:

- Cleaning of the apron and surrounding of the water point everyday. Checking for any cracks around the pedestal, which should be rectified immediately in the event that they are found.
- Cleaning and unblocking the drain and soak-away pits at a rural water supply point/facility.

- Opening the pump head and greasing the chain regularly (specifically for the India MKII). Checking bolts and nuts to ensure they are intact and not in a loose condition.
- Tightening loose nuts and greasing moving parts of the water lifting device.
- Replacing worn out parts or repairing broken parts
- Re-installing the down-hole components and the pump head.
- Recording the details of the parts replaced or repair work carried out, and indicating the possible causes of the problem.
- Fencing of the water point to deter animals from getting to the appurtenant facility.

2.3 Community Contributions

2.3.1 The Need for Communities to Contribute

Recurrent funding for O&M has generally been absent or insufficient to protect the capital investments made in the water supply schemes. The result has been a high percentage of broken down water point facilities. As a consequence, funds have been spent on repairing or replacing rather than increasing the percentage of people being supplied with new safe water supply facilities.

The communities should contribute towards O&M of their facilities for the following reasons:

- The public funds that are currently made available are inadequate to meet the capital cost for new facilities and recurrent costs for sustaining existing facilities.
- Subsidies reduce the decision-making power of users. When users pay a higher percentage they will have a greater voice in decision-making.
- Subsidies discourage cost-efficiency and the development of low-cost solutions. If subsidised, communities may not be very careful in handling the facility and may choose higher technologies that they are unable to sustain.
- Properly regulated user charges allow the provision of better services at a lower cost to the poor.
- Community payment in most cases increases members' commitment to the sound management and use of the facility.

2.3.2. Awareness and Determining the Cost for O&M

The community needs to know the necessary cost to operate and maintain their facility. The cost is determined by the cost of spare parts and labour. Estimates may be made based on previous experience, or on manufacturers' guidance. Care must be exercised in using manufacturers' figures, as the needs for spare parts will vary

according to circumstances, such as how the communities handle the facility and the number of users. For example, a poorly handled pump will have a reduced life span.

2.3.3 Ability and Willingness to Pay

Communities can make contributions for O&M when they are able and willing to pay for water supply services. The issue of ability to pay is a complex issue as circumstances in districts and communities differ.

There are many factors that might influence communities' willingness to pay as indicated in Table 2.

Table 2: Factors Influencing Willingness to Pay

Factor	Influence
Income	If users cannot afford to pay they will clearly be unwilling to pay
Service level	Users may be able and willing to pay for a hand pump with a higher/reliable service level.
Standard of service	People are unlikely to pay for a poor service (frequent breakdown of facilities or facilities producing low yields).
Perceived benefits	Users may place a higher priority on more immediate social and economic benefits. Perceived benefits may vary within a community. For example, men may be attracted by commercial opportunities involving greater quantities while women may be more interested in convenience of supply.
Opportunity cost of time	Men and women may value the time saved in collecting water differently and women may be more willing to pay than men.
Acceptability of the existing source	If users perceive their existing source is better than the new constructed facility they may be unwilling to pay for a new supply.
Community cohesion	Individuals in a divided community may be unwilling to pay into a common fund.
Policy environment	Previous policies have encouraged the belief that access to safe water should be free. People may be unwilling to pay for something that they feel should remain free.
Perception of ownership and responsibility	People may be unwilling to pay for the upkeep of a facility that they feel belongs to the government. Such a feeling may persist even when a system has been formally handed over to a community.
Institutional framework	Community management structures that either bypass traditional authority or do not give users a reasonable say in the running of schemes may not be supported.

In order to solve the negative aspects of willingness to pay there should be awareness campaigns, promotion of productive use of water and conflict resolution

2.4 Financial Management by V-WASHE

2.4.1 Sources of Funds

The method of funding O&M must be appropriate to the type of supply and the socio-economic circumstances of the users. Methods of raising funds for O&M include voluntary fundraising, community income generation, co-operative funds, flat rate, etc.

The success of community fundraising depends on sensitisation and existing practices within the community, as well as leadership, trust and confidence in the management of funds. The timing of fundraising may be critical in agricultural communities that depend on seasonal income.

A community revolving fund can be used to replace direct charges for water. Initially, a maintenance fund should be established through a fundraising activity in the form of a commitment fee. Part of the fund could then be used to give loans to individuals or households. Replacement with interest increases the total value of the fund. Limiting the number of loans at any one time could help to put pressure on defaulters by members of the community who would also want to obtain loans. To be successful, a revolving fund must be responsibly used and well managed.

There are other informal methods of raising funds, from wealthier individuals, for example. Successful traders and farmers may be able to give loans (with or without interest) to fund O&M, which are to be paid back from community funds when they become available. This type of informal credit is not suitable for the regular funding of preventive maintenance but it may hasten the response to corrective maintenance needs.

2.4.2. Managing Funds

The Water Committee and users at large should be trained by the Local Authorities and D-WASHE in basic bookkeeping and other aspects of financial management. The Committee should ensure that the funds raised are kept in safe custody. With the current trend of commercial banks opening branches in most rural districts, funds collected should be banked in an account for RWS O&M that should be opened for this purpose.

Communities should be encouraged to invest funds raised in livestock production or community funds to raise more funds as well as safe guarding the funds against depreciation/inflation.

Local Authorities should facilitate group banking (composite banking). Local Authorities should ensure that the collection, transportation/transmission of the funds for banking is done by responsible persons based in the designated ADC boundaries. Transparency will be a key factor in the handling of the funds. There should be regular audits to ensure the funds contributed are not abused/misused.

2.5 Training of Caretakers

2.5.1 Roles and Responsibilities of Water Point Caretaker

The current trend of greater community involvement in management of water facilities has resulted in a shift in O&M responsibilities from skilled professionals to previously untrained community members who are expected to operate and maintain their facilities. Such a radical change of roles requires corresponding changes at the community level, hence the need for a water point caretaker. The caretaker will be in charge of day-to-day preventive maintenance of the water facility.

The selection of the caretaker is the responsibility of the community - it is crucial that the community reflects on gender in this regard for better utilisation and functioning of the facility. It should also be noted that it is usually the women who face extreme hardship whenever there is a breakdown of the facility. As such, women could work better as caretakers. The roles of caretakers are indicated below:

- Undertakes preventive maintenance of the hand pump.
- Ensures that the surroundings of the hand pump and platform are clean.
- Acts as a motivator to promote good hygiene practices, proper use of the hand pump and sanitation facilities in the village.
- Informs the V-WASHE regarding the maintenance and repair needs of the hand pump.

(Note that the caretaker is not a cleaner at water point but a facilitator who ensures that all is well at the water point).

For the caretaker to perform, she/he requires adequate knowledge and skills and hence should undergo training in her/his roles.

2.5.2 Objectives of Training

To develop skills for undertaking repair of hand pumps and effective execution of community-based hand pump maintenance.

2.5.3 Duration and Topics of Training

The water point caretakers should be given a one-and-a-half day theoretical and practical training. The topics to be covered include: the importance of safe water, O&M of a hand pump, anatomy of the hand pump (especially the head assembly), the role of the V-WASHE and APM, the role of the caretaker, tools, materials and parts needed for preventive maintenance of the hand pump, common problems with a hand pump, monitoring and record keeping, household sanitation and practicals on greasing the chain and tightening the nuts.

2.5.4 Organisation

Local Authorities with the support of the D-WASHE members and APMs should organise the training programme. All necessary logistics and training materials should be ready and given to the APM or extension worker who will undertake the training. All arrangement should be made before the arrival of participants at the training venue.

The training should be held at a village centre, church building, rural health centre or school. Practical training should be conducted at a nearby hand pump. Owners of the hand pumps should be informed in advance.

2.5.5 Training methodology

Participatory training sessions are held to allow participants to contribute fully. Group work/discussion sessions are also held to allow full participation. Hand pump accessories should be available for dismantling and assembling.

The dismantling and assembling of pump accessories will provide practical hands-on training. The visit to the nearest hand pump will provide additional practical experience. User manuals should be used and stakeholders should endeavour to simplify the training to suit the local situation.

3. O&M AT SUB-DISTRICT LEVEL

The Area Development Committee (ADC) is the main organisational structure at the sub-district level. The ADC's prime responsibility is to coordinate the development of community plans for socio-economic development including WSS and to submit them to the Council.

The ADC comprises of traditional leaders, elected representatives of the communities including a representative of the APMs and extension workers (i.e. Environment Health Technicians (EHTs), Agriculture Assistance and Community Development Assistance).

3.1 Roles and Responsibilities of the ADC

The following section outline the roles and responsibilities of the ADC:

(i) Facilitate community development through community participation

The ADCs should allow the majority of community members to fully participate and be involved in their programme. The participation and involvement of many people fosters cohesion within the community members and promotes ownership. Participatory approaches/methodologies are used. During the facilitation of community development by the ADC, gender should be considered.

(ii) Plan and co-ordinate all water and sanitation development programmes

In planning, the ADC should consider the existing conditions, in terms of the economic situation, and attitudes towards users contributing to the management of their water point. As the ADC is also responsible for other developments within their area they can easily be able to co-ordinate water development with other development programmes. The ADC should also co-ordinate extension support for the communities.

(iii) Promote hygiene and community management

ADCs should plan for the promotion of safe hygiene practices to ensure that communities do not go back to their alternative sources, as they will know the implications of using contaminated water. The promotion of community management will ensure a sustained sense of ownership of the facility.

(iv) Collect baseline data in the community

The baseline information will help ADCs in identifying local resources, existing skills and management structures that will help in planning. The information from the baseline survey also helps to identify or highlight the needs of the communities.

(v) Provide information on different technology options

ADC should support the APM in providing technical information to the communities. The information should include capital and recurrent costs, including how much communities should contribute in terms of local resources and cash.

(vi) Facilitate the formation of the V-WASHE

The V-WASHE is formed in order to have a group of people who can address the concerns of the majority of the community's members. The legitimacy of the V-WASHE depends on how transparent the elections were considered.

(vii) Train the V-WASHE and caretaker

The performance of the V-WASHE and caretaker will depend on the skills of the individual members within the committee. Training addresses issues of roles and responsibilities and the performance of these actors.

(viii) Facilitate the selection, training and equipping of the APM

The ADC has a good understanding of the prevailing situation within their area, and can therefore be able to give guidance on who could be selected as APMs. The ADC also has a good knowledge of the geographical and social boundaries of their areas and can provide information on where APMs stay. This would assist in designating the areas of coverage to the APMs. The ADC will also have information on the type of technologies that exists in that area, and can request the district to provide appropriate training and equipment for O&M.

(ix) Monitor and evaluate the performance of the APM

Corrective maintenance of the water points in most districts depends on the performance of the APM. The APM is a technical advisor as well as a mechanic for the management of water points.

(x) Keep field records and produce progress reports

The ADCs are required to keep and update records of the O&M systems.

(xi) Undertake monitoring and evaluation

The ADCs are required to monitor all the activities of O&M in their respective areas.

3.2 Support Services by the ADC

Communities need some support from the district and ADC after the construction phase, as they have not attained all the required knowledge and skills. A supportive ADC can help to develop a partnership with the community and a genuine desire to

work within the communities. This partnership is expected to assist communities to find solutions to their O&M problems. For this reason the ADC should continue to provide support services.

The support services should come from the ADC as a committee and skilled personnel within the ward. In addition to this, services provided by V-WASHE committees are also important. The break down of the support services is as follows:

(i) ADC as a committee

- Identify the priority development agenda of the ward.
- Support communities in development activities.
- Mobilise resources at a local level.
- Co-ordinate activities of different communities within the ward.
- Empower/train communities for self-help activities.
- Raise awareness/disseminate information on issues affecting the communities (e.g., programmes, policies, sustainability).
- Report results of activities to the District Development Coordinating Committee (DDCC).
- Monitor and evaluate projects in their area.
- Implement O&M system for RWSS that will ensure regular availability of funds, equipment and spare parts.
- Plan for the promotion of hygiene and community management.
- Provide the linkages between the community and district officials.
- Facilitate the training or re-orientation of APM and extension staff to ensure that they are fully equipped with skills to manage RWS facilities.
- Provide moral support to the V-WASHEs, caretakers and APMs through follow-up activities.

(ii) EHTs, Community Development Officers Agricultural Supervisors etc

- Promote hygiene and community management.
- Provide information on different technologies and management options.
- Provide the linkages between the community and district officials.
- Build communities capacity to manage their water points. The purpose of the capacity building initiatives is: to develop technical skills to carry out minor repair and routine works, financial skills for fund raising and management and organization skills to mobilise the communities for their inputs. In short, development of the community's management skills in leadership, accountability, technical issues, planning and monitoring.
- Facilitate the training or re-orientation of APMs and V-WASHEs to ensure that they are fully equipped with skills to manage RWS facilities.

(iii) APM

- Provide information on different technologies and management options.
- Provide technical support and advice to the V-WASHEs and caretakers regarding repair needs of the water lifting devices (i.e. spare parts and labour costs) through follow-up activities.
- Remove the pump head and extract the down-hole components using appropriate tools (standard and special tool kits specifically used in the India MKII), and re-install the down-hole components and the pump head.
- Dismantle/repair water lifting devices, loosen the rising mains and rods (following dismantling procedures) with the help of caretakers and V-WASHE members and replace worn out parts or repair the broken parts.
- Act as health and hygiene promoter on proper use of the hand pump.
- Monitor the status of water points. Maintain records of the hand pump repairs. Send a copy of repair work record to the rural health centre (Environmental Health Technologist). The recording format is provided in Appendix B & C. The APM should also complete the tool kit management form provided in Appendix D.
- Replace worn out parts or repair the broken parts.

(iv) V-WASHE committee

- Work closely with the EHT, other extension officers and the ADC on water and sanitation development in the village.
- Organise the community for improvement of water facilities.
- Supervise construction works including the drilling of the borehole.
- Mobilise community contributions (cash, material and labour).
- Account to the community on the use of commitment and maintenance funds.
- Keep records on money, meetings and water point maintenance.
- Carry out pump maintenance and repairs.
- Organise community members to clean the apron, drain and surroundings of the water facility.
- Promote hygiene and sanitation in the community.

For the ADC to provide support services to the communities, it should possess the necessary technical, social organisational and management skills. The ADC also requires funds for monitoring and follow-up activities.

3.3 Monitoring of Water Points

If water supplies are to be maintained in a satisfactory manner, it is essential to have an effective O&M management system. In order to be effective, O&M managers (whether they are from the public sector or community-based organisations) need to be able to measure the status of O&M functions through monitoring and evaluation (M&E).

The approach is firstly to define the key indicators that cover the field of O&M. Secondly, it is necessary to develop a framework that comprises O&M functions (See also section 4.1.3.5) using a checklist for assessment. The questionnaire for water points in Appendix D provides such a checklist.

The principle underlying the monitoring of water points is to improve the effectiveness and efficiency of the management of water facilities. In order to achieve this, M&E requires:

- The involvement of users in the target community or area
- Time and support to complete the activities
- Formulation of standards and guidelines
- Awareness campaigns in most communities that think that O&M is not their responsibility, but instead that of Local Authorities or Government

The general objective of monitoring the water points is to generate information that will help to maintain a functioning pump.

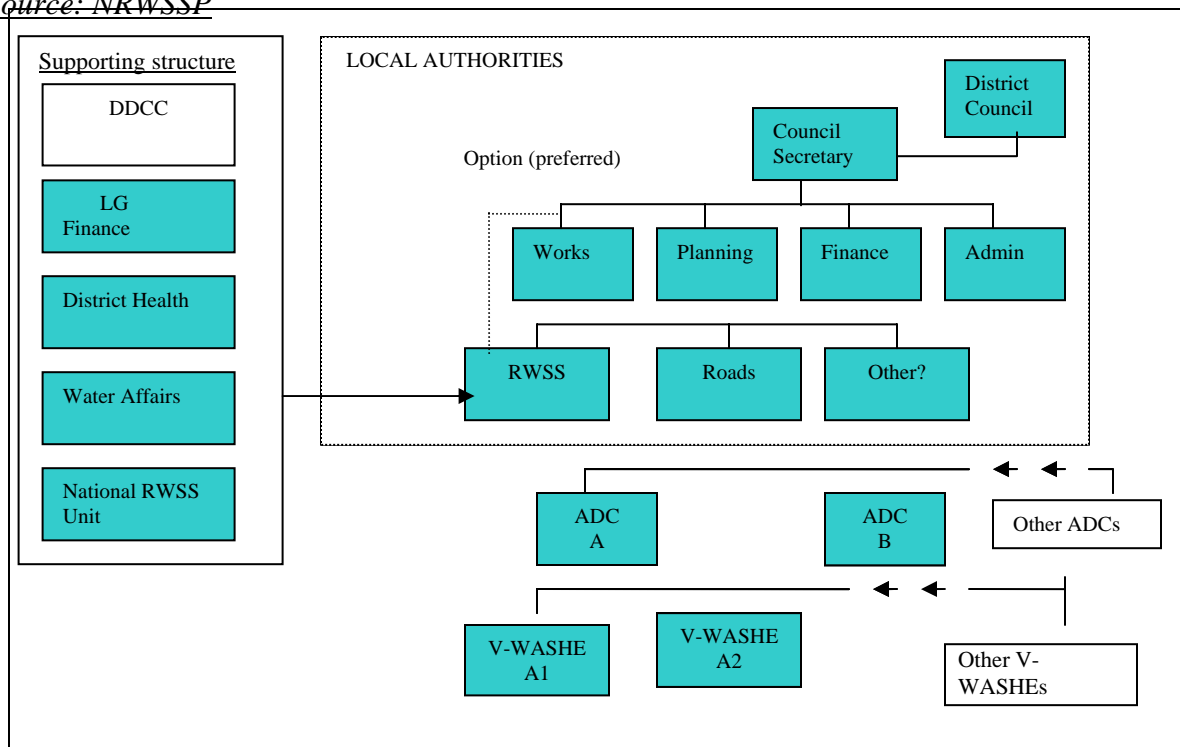
4. O&M AT DISTRICT LEVEL

4.1 Local Authorities

According to the new institutional set up, the Local Authorities are in charge of the development and management of all programmes/projects in the district, including those associated with water and sanitation. The management of water facilities includes O&M of water facilities. This is in line with the NRWSSP as indicated in section 5.5 of the document. See also the figure below.

Fig 1: District Level Arrangements

Source: NRWSSP



4.1.1 Roles and Responsibilities of the Local Authorities

The roles and responsibilities of the Local Authorities are to;

- Manage Information Management Systems for the district. The role includes analysis of data that can be used for identifying and prioritising areas (wards or rural health catchment area) as per coverage levels, among other things.
- Formulate and implement mechanisms and guidelines for resource allocation to the needy and priority areas and communities.
- Produce planning guidelines for ADCs. The planning guidelines should include the process for producing such plans.

- Scrutinise and approve ADC plans.
- Co-ordinate water and sanitation programmes in the district.
- Produce training guidelines and ensure compliance with such guidelines so that they address issues of sustainability.
- Supervise the implementation of water supply programmes in the district.
- Review and appraise ADC field reports and provide feed back.
- Monitor water supply programmes in the district.
- Write quarterly and annual progress reports as requested by the council and ministry in charge of water supply.
- Keep records of all relevant information and experiences.
- Undertake all major repair works (i.e. fishing of riser pipes, rods and pump cylinders, unblocking clogged boreholes, flushing out etc.) through the district RWSU or well skilled and equipped private sector operators.
- Determine and approve O&M costs and disseminate information to user communities.
- Produce annual and strategic district WASHE plans and budgets based on submissions from ADCs.

4.1.2. Monitoring of water points

Effective monitoring is needed for improving the performance of programmes and services as the information collected and analysed is used for checking, control and planning for corrective actions. The objectives of monitoring are as follows:

- To collect and analyse information to assess the frequency of breakdowns and record the downtime of hand pumps.
- To use monitoring results for problem identification, planning and action.
- To improve the performance of water points.

The implementation of an effective monitoring system will help to realise accurate cost estimates. The monitoring of the frequency of breakdowns and the costs of spare parts will assist in future budgeting and planning of O&M.

Water supplies can be satisfactorily maintained when there is an effective O&M management system. For O&M systems to be effective, communities, with support from the district, need to be able to know the status of water points. That can only be possible when there is an effective monitoring system.

Monitoring objectives can only be attained with the involvement of all stakeholders at all levels. At the community level, the users (who have an interest in having a reliable and sustainable service) can use the monitoring information to prevent the breakdown of hand pumps by undertaking preventive maintenance. At the district level, monitoring information can be used for providing support services to the communities and extension staff. Support services could include, among other things, the establishment of a spare parts supply chain that would ensure communities have easy access to spare parts.

4.1.2.1 Benefits of monitoring

The benefits of monitoring depend on the purpose of monitoring. In terms of O&M, the main purpose is to ensure that users have a sustainable service that will continue to provide a reliable quantity and quality of water supply. The other subsidiary benefits of an effective monitoring system are:

- Prevention of breakdown of water facilities by undertaking preventive maintenance.
- Repairs are carried out more quickly due to the quick identification of problems. Monitoring helps communities to plan for corrective maintenance and hence reduces downtime. For example, when communities monitor the yield of a hand pump, any reduction in yield serves as an indicator of a problem, hence they can start to prepare for eventual breakdown. Such preparation could be in the form of raising funds and communicating with the APM.
- Districts can prepare themselves with adequate support, and as such communities can easily get support from the district. Easy access to support services would in turn reduce the downtime of the facility.
- Realistic annual plans and budgets for O&M can be produced.
- Development of guidelines on O&M of facilities can be more easily done, and are more appropriate as they are based on the current situation.
- Appropriate hygiene education messages and campaigns can be developed.

4.1.2.2 Other Associated Benefits

- Improved health through the maintaining of reliable water supplies that continuously provide adequate levels of safe water.
- Easy access to reliable water supply helps to reduce the burden for water collectors. The saved time and energy can be used for other social and economic activities.
- Users' involvement in the monitoring exercise serves to broaden their understanding of the facility, resulting in reduced dependency on external support.

During the past decade, Zambia has developed a set of tools for collecting and analysing information. These tools include checklists, reporting forms, interviews, group discussions, and mapping, etc.

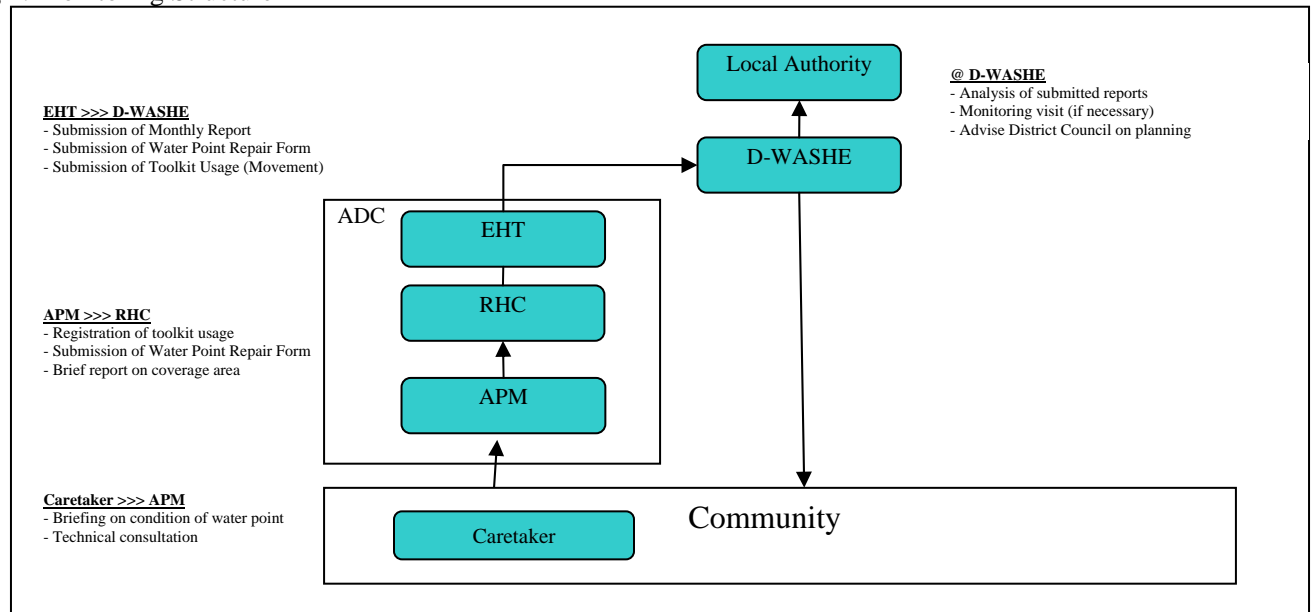
4.1.2.3 Structure for Monitoring Water Points

Local Authorities, as co-ordinators of activities in the district will receive reports from ADCs. ADCs, among other duties, are in charge of monitoring water points by undertaking sanitary surveys within their catchment area.

EHTs, with support from the APM, use checklists for monitoring (see Appendix E and Appendix F for assessment of the status of hand pumps and Appendix G for Tool Kit usage (movement)). The APM completes a checklist quarterly and submits the information to the EHT. In addition the APM also collects information compiled by caretakers.

EHTs compile all the information from APMs and submit it to the Local Authorities.

Fig 2: Monitoring Structure



Source: SOMAP (modified)

Monitoring systems require resources (i.e. human, material and financial) for the collection and analysis of information. Effective monitoring requires heavy reliance on local human resources such as APMs or V-WASHE secretaries. Inadequate transport facilities and poor infrastructure make the monitoring exercise more difficult to implement.

4.1.3 Monitoring and Management of a Sustainable Supply Chain

4.1.3.1 General Issues

A revolving spare parts system can only be successful when the principles stated in the monitoring guidelines are addressed. These state that:

- Spare parts should be sold at market price in the district.
- No spare parts should be given free to water facility users by any support agency (government, donors or NGOs).
- V-WASHE should encourage their members to regularly contribute towards maintenance, find and save enough money to purchase spare parts and pay for repair works.
- Proper stock control and revenue management should be maintained.

- A replacement plan should be accurately established and executed.

4.1.3.2 Problem Statement

One of the major problems being faced in implementing an O&M system is a lack of spare parts supply in most districts. User communities in some cases may have the money but are not able to access spare parts and hence the pump cannot be repaired.

4.1.3.3 The Need for Monitoring the Sustainable Supply Chain

Monitoring a revolving spare parts system is vital, as it will ensure that spare parts are available when water users have a problem with their water facility.

The availability of spare parts in the district enables communities to repair their water facilities by replacing worn out parts and thus restore the facility.

4.1.3.4 The Benefits of Monitoring the Sustainable Supply Chain.

The benefits of establishing and monitoring a revolving spare parts system are:

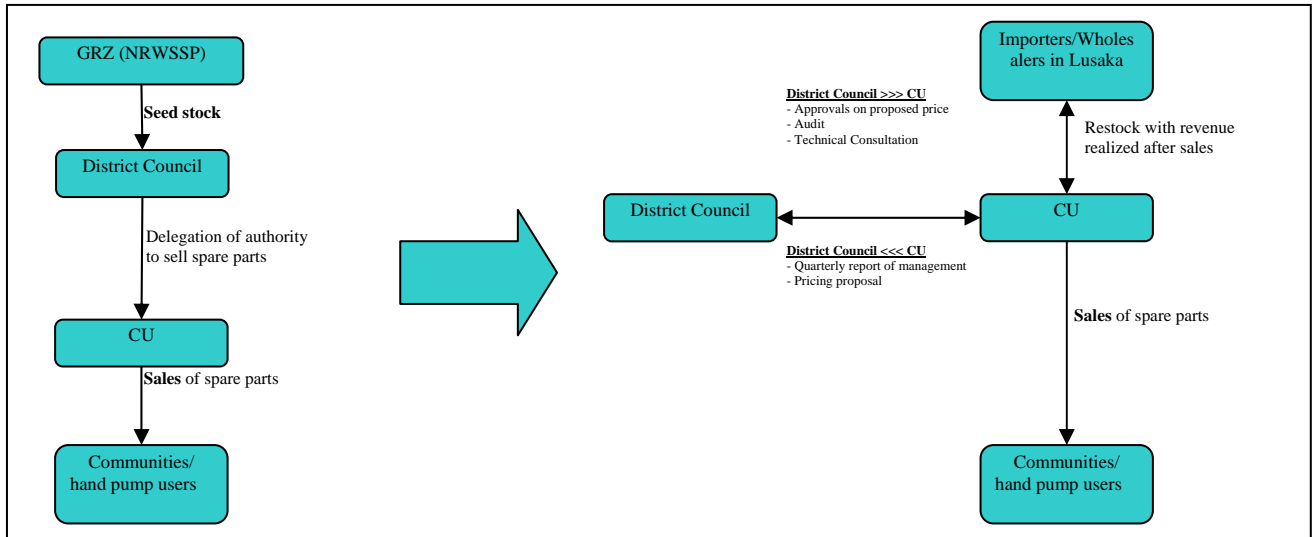
- A spare parts supply chain can be maintained.
- Spare parts can be readily available in the district and communities can purchase them when needed.
- Water facilities can be maintained, as spare parts can be easily accessed for repair work.
- Reliable water supply can be maintained.

4.1.3.5 Structure for the Management of the Sustainable Supply Chain

There are many stakeholders involved in the monitoring of a sustainable supply chain, these include:

- The communities, who should purchase spare parts at market price. Communities need to raise adequate funds for this purpose.
- The APMs, who should advise communities to purchase appropriate spare parts. APMs should record spare parts and repair work on specific water points.
- The ADCs, who should consolidate reports from APMs and submit the information to the Local Authorities. ADCs should also conduct awareness campaigns on fundraising for spare parts and labour costs.
- The Local Authorities, who should regulate the CU so that spare parts are replenished and funds are not misallocated.
- National level suppliers.
- Importers.
- Foreign manufactures.

Fig 3: Sustainable System Management Structure



Source: SOMAP

4.1.4 Monitoring of the Entire O&M Process

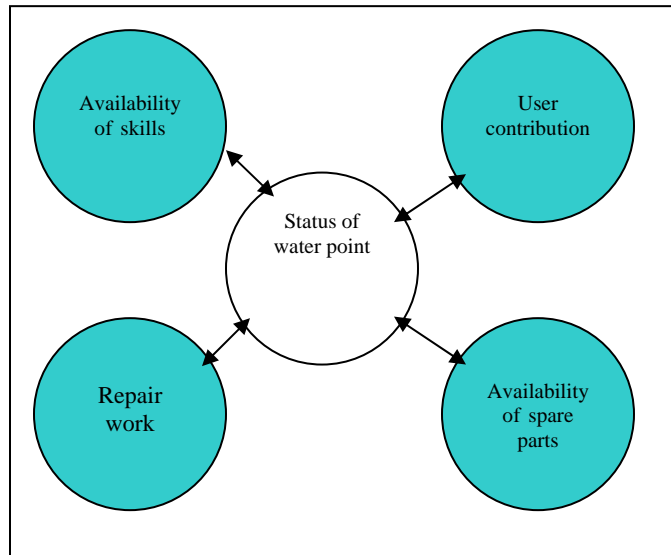
The entire O&M monitoring process should revolve around the status of the water point. The status of the water point will inform on how much work needs to be done and how much it will cost.

For the entire O&M monitoring system to be effective, the following parameters should be considered:

- User contribution: Users contribute agreed amounts towards O&M.
- Availability of spare parts: Spare parts should be readily available at designated shops/centres.
- O&M records: APMs prepare workbooks, caretaker maintenance books, treasurer’s record books, V-WASHE meeting minutes etc.
- Availability of skills: For all the components, skills are necessary to manage finances and to know the technical problems to effectively carry out O&M activities.

It is therefore important to monitor all the parameters as illustrated in the figure below.

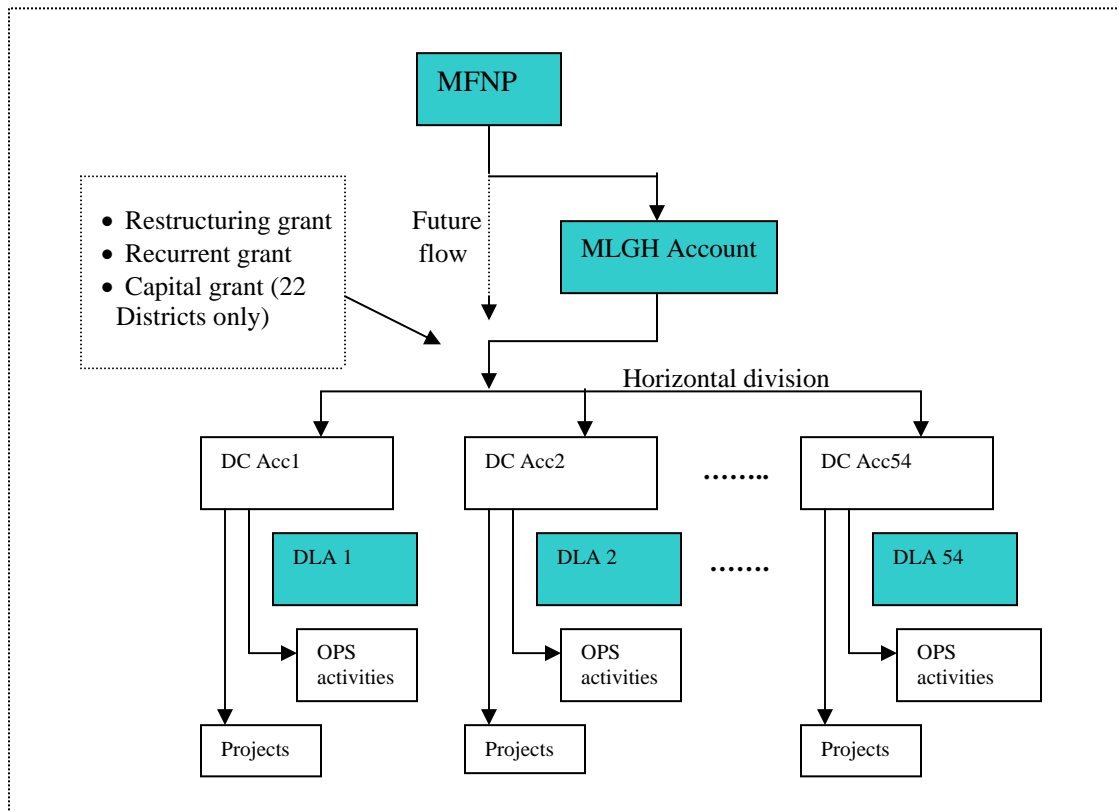
Fig 4: Parameters to be Monitored in the O&M System



4.1.5 Financing of O&M.

Funds are needed to maintain existing water facilities in order to provide sustainable services. There are also indirect costs that will be incurred at the district and sub-district levels to provide support services in order to have an effective O&M system. The Local Authorities receive grants from the central government, in addition to other sources of funding, for various programmes including water supply. The figure below illustrates the flow of grants to local government.

Fig 5: Grant Flow to Local Government



Source: NRWSSP

4.1.6 Basis for Budgeting for O&M

Budget information should originate from as close as possible to where the work will be performed – probably at the district council in conjunction with the community. The budget information in operation and maintenance will include:

- Unit cost of the most easily worn out parts of the pump.
- Labour cost for undertaking hand pump repair work.
- Frequency of breakdown of the pump.
- Transport costs including the cost of fuel.

It is a good practice to set a budget from scratch for the year. Where the past is used to help predict future costs, historic cost should be used (i.e. previous years' actual costs should be used). The cost of activities should be calculated and allocated between the sub-codes, with details of what exactly is budgeted for in each code (an example has been given in Appendix H).

Most districts will find budgeting for O&M difficult due to the absence of historic costs, information on frequency of breakdown of pumps and the most common worn

out parts, which forms the basis for an accurate budget. In the absence of such information, certain assumptions should be made, such as:

- 75% of water points are working at a given time – hence 25% are not functioning because of various reasons.
- 15% of those non-functional water points require minor repairs that could be carried out by APMs. The repair works would only need 50% of the spares in a standard repair kit.
- Support services such as attending to critical breakdowns and replacement of major parts for water lifting devices will be carried out quarterly at the district level. Extension level visits could be combined with other duties and will be limited to one day per month, knowing that extension staff could combine this task with other duties they carry out within their organisation.
- Transport and handling costs will depend on the prevailing situations in the area.

In districts where a sustainable supply chain is operational, their budget will be smaller than what has been estimated in the example. It should be noted that the example is based on a district that has not yet established a sustainable supply chain.

4.1.7 Sustainable Management System of Spare Parts

Local Authorities should be the holder of the O&M supply budget. Within the Local Authorities this responsibility could be delegated to the RWSS/WASHE focal person. The Local Authorities should employ a focal person if there is none.

The budget holder is responsible for the following:

- Setting the budget accurately.
- Ensuring no expenses are included or made against the vote unless it is properly authorised.
- Filling in required forms for all expenses for the activities, and noting the budget code and vote number on the requisition forms.
- Reviewing the activities against the expenses and ensuring that these are comparable.
- Reviewing the expenses and their code and ensuring that they are correct. If anything is miscoded etc., ensuring that corrections are requested.
- Ensuring that the accounts section receives budget information so that expenditure reports are prepared.

4.1.8 Training of APMs

The current trend in O&M is moving from a centralised maintenance system (where the district maintenance team undertakes all repair works) to a community-based

maintenance system, where repair works are carried out at the community level. Undertaking such repair works requires capacity building at that level.

In a community-based maintenance system, accountability for O&M of hand pumps shifts from the district maintenance team to the communities and their representatives (V-WASHE). In this system, the communities procure spare parts using their own funds. The APM undertakes the repair works, and thus the training of the APM should fit with the tasks that will be carried out in the community. The training will facilitate skills transfer from the district to community level.

4.1.8.1 Objective of Training

To develop skills for undertaking the installation and repair of hand pumps, and for the effective execution of a community-based hand pump maintenance system.

4.1.8.2 Duration and Topics of Training

The APMs undergo a one-week theoretical and practical training course. The topics to be covered include:

- The importance of safe water.
- O&M of hand pumps (India MKII and Afridev).
- Anatomy of hand pumps.
- Roles and responsibilities of V-WASHE and ADC.
- Roles and Responsibilities of APM and how to interact with the caretaker, V-WASHE, EHT and ADC.
- Tools, materials and parts needed for preventive maintenance of hand pumps.
- Common problems with the two hand pumps.
- Proper filling of forms and any other monitoring methodology.
- Collection and analysis of information.
- Documentation and information management.
- Household sanitation.
- Planning and budgeting.
- Practicals on greasing the chain and tightening the nuts.
- How to train caretakers.

4.1.8.3 Organisation of Training

The Local Authorities, in consultation with and with the support of the D-WASHE members, organise the training programme. All necessary logistics and training materials should be prepared before the arrival of participants.

The training should be held at an agricultural training institute or at a school. Practical training should be conducted in a village with a broken hand pump, hence the need to identify broken hand pumps that will be used for practical work. The trainer(s) should ensure that communities have raised the K50, 000 for repairing their hand pumps as a

repair fee is to be paid once the facility is repaired, although the repair fee will vary from place to place and will be an issue of arrangement by the Local Authorities, the APM and the community.

4.1.8.4 Training Methodology

Participatory training (theory) sessions are held in a manner that allows participants to contribute. Group work/discussion sessions are also held to allow for a relaxed atmosphere. Smaller groups would allow some participants that are reluctant to contribute in larger gatherings to fully and freely participate in the training session. User manuals are used in the theory session. These manuals should be revised to suit technological advances and RWS dynamics.

Complete water lifting devices (i.e. hand pumps) should be available for the demonstration of parts that will be dismantled and reassembled to provide practical hands-on training that will be applied to work on broken water lifting devices in the villages. At least two water lifting devices should be repaired.

4.2 D-WASHE

4.2.1 Roles and Responsibilities of the D-WASHE

The D-WASHE should operate within the council and its main role is to provide technical advice to the district council. The D-WASHE roles and responsibilities include:

- Facilitate baseline surveys and analysis of information.
- Support the district council in the formulation of WASHE annual plans and budgets.
- Advocate and lobby for more funds to the water sector.
- Train extension staff and APMs.
- Support the council to supervise the implementation of water and sanitation programmes.
- Provide technical support to the council and extension staff.
- Monitor water and sanitation programmes on behalf of the council.
- Analyse monitoring data collected at the ADC level for planning and evaluation.

4.2.1.1 Technical Support to Local Authorities

The D-WASHE is a committee comprising members from different institutions, and with varying levels of knowledge and skills in water and sanitation. Generally the majority of Local Authorities have inadequate staff with insufficient experience in rural water and sanitation. The D-WASHEs therefore supplement the efforts of the Local Authorities.

The technical support that the D-WASHE provides to the Local Authorities includes the following:

- Training of extension staff in participatory methodologies.
- Training of APMs in hand pump installation, operation and maintenance.
- Supervision of construction and repair works.
- Formulation of WASHE development plans and budgets.
- Formulation and implementation of community (including ADC) capacity building initiatives.

4.2.1.2 Technical support to the ADC and APM

Analysing the roles and responsibilities of D-WASHE reveals areas where they are able to support the ADC and APMs. The following technical support may be given:

- Identification of and finding solutions to community problems.
- Planning and budgeting for the ward.
- Community mobilisation and conflict resolution.
- Financial management of community contributions (capital and recurrent).
- Developing monitoring system in their area.

4.2.2. Training of the ADC and V-WASHE

4.2.2.1. Training of the ADC.

The overall objective of training ADCs is to ensure that they organise the wards effectively in regard to developmental activities. The training strengthens ADC coordinating and planning capacity. It also helps ADC members to better understand their roles and responsibilities, as well as concepts of decentralisation relevant to the O&M of water facilities.

4.2.2.2. Duration and Topics of Training

The training should take at the most three days and cover the following topics:

- Formation of the ADC.
- District support to the ADC.
- Community mobilisation and awareness campaigns.
- Participatory methodologies.
- Zoning of a ward.
- Reporting and record keeping.
- Roles and responsibilities of the ADC.
- ADC linkages with the district council, DDCC and D-WASHE.
- Decentralisation and planning structures.
- Baseline surveys, needs assessment and planning.
- Community participation and management.
- Monitoring and evaluation.

- Organisation of training.

4.2.2.3. Methodology

The training will consist of lecture presentations, plenary/group discussions, buzz pairs/groups and question and answer sessions.

This approach will require extensive preparation by the trainer in terms of documents that will be required to be handed over to participants.

4.2.2.4. Training of the V-WASHE

V-WASHE committees are an integral part of the ADC and are the lowest organs in the administration of RWSS facilities, and should therefore be trained to effectively manage these facilities. The objective of training is to increase the V-WASHE members' knowledge, skills and confidence to effectively undertake their roles and responsibilities.

The training will take four days covering three short training modules. The first training session (one day) is held soon after the formation of the V-WASHE committee, the second (one day) just before the start of the construction phase, and the third (two days) at the start of the O&M phase when the facility is completed and is in operation.

Topics to be covered during training can be found in the V-WASHE training modules.

4.2.2.5. Organization of Training

The Local Authorities, using management information systems, will mobilise financial and human resources for implementing training programmes after assessing how many water point facilities are going to be either rehabilitated or constructed. The D-WASHE conducts public campaigns so that ADCs and communities are aware and are ready to send participants.

ADCs conduct this training that will be monitored by the Local Authorities.

The training should be carried out in the specific village, especially for Module One. For Module Two and Three, two or three communities could be combined and hence a central location should be identified by the said villages. Combining villages for training in Module Two and Three will save time but will also give an opportunity for the two or three villages to share experiences and learn from each other.

4.2.2.6. Methodology

A simple, practical and participatory approach is used. The most effective method is discussions, and this can be done by asking V-WASHE members to give their ideas on the topics. The discussions could concentrate on how they have been managing to

date, what problems they might face, and how they could overcome such problems in future. In this way the trainer is able to build on existing ideas and experiences.

This process requires the trainer to ask appropriate questions to get V-WASHE members to think and find solutions. Group work in small groups makes it easier for most people to participate in a relaxed atmosphere.

5. O&M AT NATIONAL LEVEL

The Ministry of Local Government and Housing is the lead institution that shall ensure that O&M of RWSS facilities is sustainable. The roles and responsibilities of the Ministry shall be to:

- Provide policy direction and co-ordinate RWSS sector programmes and support agencies, as well as all sector stakeholders.
- Manage and disseminate RWSS information including the use of advocacy.
- Invest in sectoral planning, development and construction of RWSS infrastructure.
- Establish standards, guidelines and inspectorates to monitor the effectiveness of the RWSS O&M system.
- Promote private sector participation in O&M of RWSS facilities in liaison with line ministry involved in RWSS.
- Monitor the supply chain links for spare parts in liaison with line ministries involved in imports and export of goods to ensure *timely deliveries*.
- Undertake formation and reviews of policies and their enforcement.
- Facilitate training and capacity building within the RWSS sector at the national, provincial, district, sub-district and community levels.

The Ministry of Local Government and Housing will employ an O&M Officer to oversee the implementation of O&M activities.

6. SUSTAINABLE SUPPLY CHAIN

6.1 Principles of Sustainable Supply Chain

The revolving system for spare parts supply is essentially aimed at promoting sustainability in the provision of RWSS services by enabling users to procure spare parts on their own, facilitated by a revolving fund system. From a broader perspective, the following principles will enhance the sustainability of the revolving system of spare parts supply:

- **Availability:** Spare parts should be available at the outlets at all times. This can be achieved by establishing an effective supply chain to be coordinated by the Ministry of Local Government and Housing in collaboration with the Ministries of Commerce Trade and Industry, Works and Supply, Finance and National Planning (Zambia Revenue Authority) and the *National Water and Sanitation Council*. The collaboration will enhance the timely movement of the spare parts along the chain links down to the outlets.
- **Accessibility:** The spare parts should be made accessible to the users at all times. Appropriate and conducive spare parts shops/warehouses should be located in areas where customers can easily reach and procure the spare parts. Their existence can be publicised through the media or posters and billboards.
- **Affordability:** While it is a known fact that the ultimate aim of any business is to make profit, the issue of affordability by communities to procure the spare parts should be taken into consideration. This is particularly important considering the high poverty levels among user communities. A balance has therefore to be struck to make the spare parts affordable to the communities. This could be achieved by subsidising the spare parts by Government in the initial stages of establishing outlets and passing on the full costs to the user communities by gradual reduction in the subsidy. Alternatively, the Government should consider waving duty in order to make the spare parts more affordable.
- **Appropriateness:** The spare parts that are supplied should be those of the standardised technology in this country. In addition, the replenishment of stocks should be dictated by the rate at which particular spare parts are moving. The fast moving parts should frequently be replenished rather than having bulk replenishments that include non-fast moving spare parts. In short, the replenishment should be planned based on data that has been generated.

6.2 Management of a Sustainable Supply Chain

The management of the revolving system can be broken down into the following action-related components:

- Determining the demand for spare parts using data available in the country regarding the functionality of water facilities. The information generated will assist in estimating or determining the types of spare parts and quantities to be supplied as seed spare parts or seed money.
- Identifying a supply chain that will ensure spare parts are available at all times. Further developing regular communication with supply chain links will ensure the movement of stock does not have negative effects on the overall stocks at the outlets.
- Developing stock control mechanisms that include: stock coding, transaction, stocktaking and replenishment, as well as display and advertisement (details are in the stock control manual).

6.3 Stock Management

Stock management is the effective planning, control, review and improvement of the movement, handling and storage of material and the associated information.

Stock management includes these elements: stock control, stock records, stock replenishment, stocktaking, stock display, advertising for publicity and availability.

6.4 Financial Management.

Financial management in the revolving system for spare parts supply will be important in the sustainability of the system and the overall sustainability of O&M of RWS facilities. Financial management can be broken down into the following:

6.4.1 Community Level

At the community level all contributions received should be recorded in a cash register. It will be helpful to register the contributions by household names in alphabetical order. Contributions could be monthly, bi-annually or annually. A new register or book may be required for a new year, or alternatively a new page may be opened for a new year. Carried forward and brought forward entries can also be made.

Communities must ensure that they have a bank account to safeguard their funds. As such, each V-WASHE committee should open a bank account. The council should facilitate and give options for the opening of V-WASHE bank accounts.

6.4.2 Commercial Water Utility

Commercial water utilities (CUs) should be fully involved in the supply of spare parts in the decentralised scenario. Where CUs do not exist, Local Authorities should manage the revolving system for spare parts supply. CUs running WSS services in urban areas have been managing the revolving systems on behalf of the Local

Authorities in some instances. In managing the finances, the CUs should put in place financial management systems that include cash transactions, cheque management, payment and auditing procedures. Mandate should be given to CUs through a Ministerial Policy Statement.

6.5 Accountability and Transparency

All money realised through the revolving system of spare parts supply is deemed to be public funds and belongs to the community living in the area in which the system is operating. The community therefore has a right to know how the money is being used. Furthermore, the community needs to know how the system of spare parts supply is operating.

Some elements of stock and financial management can help in achieving accountability and transparency in the sustainable supply chain through stock control, store organisation and reporting.

Transparency can be achieved by following the principles of financial management. It requires the application of systems that can be clearly understood and appreciated by the stakeholders. Some aspects of good financial management systems include the following:

- Records and receipts of payments received.
- Price displays for all goods in the shops.
- Statements of accounts for the revolving system of spare parts supply. These should be provided to the stakeholders in order for them to be kept abreast with the financial performance of the system.
- Regular audits should be carried out by either internal or external auditors and reports circulated or presented to management and stakeholders. The stakeholders will have a right to query possible malpractices and receive feed back.
- Signatory panels should be from other institutions.

7. STANDARDISATION OF HAND PUMPS

7.1 Background

The major source of safe water in rural Zambia is ground water that is extracted from the aquifer by pumping. Pumping devices vary from simple bucket pumps and hand pumps to windmills and solar pumps. The uses of these pumping devices vary according to the service level and prevailing condition of the community or environment. The most common water lifting device is a hand pump.

The Community Management and Monitoring Unit (CMMU in 1995) undertook a survey of water points that showed that over 40 different types/models of hand pumps were in use throughout rural Zambia. The same survey indicated that 77% of the hand pumps were functioning. The high rate of functioning hand pumps was due to the drought mitigation intervention that was going on, even during the time of the survey. Further analysis of data indicated that those hand pumps that were not functioning were mainly because of poor operation and maintenance systems.

The poor performance of hand pumps was due to:

- An overly optimistic assumption that O&M costs would be borne by the state and Local Authorities.
- Lack of adequate community involvement (i.e. in planning, implementation and O&M), hence communities were not trained to operate and maintain their facilities.
- Lack of standardisation.

7.2 The Need to Standardise

The high number of different types of hand pumps in Zambia is thought to be related to the activities of different support agencies (donors and NGOs) and Government.

With such a variety of pumps there were difficulties in stocking spare parts and fixing the pump components as different tools and equipment were needed. Worse still, it was not possible to remove one type of pump and replace it with another unless you demolished the foundation and rebuilt it to fit the new pump type.

7.3 Criteria for Selecting a Hand Pump

7.3.1 Water Table Condition of an Area

The most useful criteria for selecting a pump is the water depth from which a particular pump can lift water. In most cases pumps will be classified according to the depth from which they lift water, such as low lift and high lift pumps.

Low lift pumps are pumps that lift water (suction and direct action) from a depth of 6 up to 12 metres. These pumps could be appropriate in most areas in Luapula, Northern, North Western and Western Provinces where water tables are at a depth of about 6 metres. The main advantage of low lift pumps is their mechanical simplicity and ease to repair, while their disadvantage is the pumping lift limitation, in terms of depth.

High lift pumps are pumps that lift water from a depth of up to 45 metres or, depending on the effort that users are willing to apply, for progressively less water as depth increases. In general, hand pumps are not appropriate for lifts in excess of 45 metres unless no other type of pump can be used. The main disadvantage of most of high lift pumps has been the difficulty in repairing below-ground components such as piston seals. In most cases it requires special lifting devices and tools. New pumps such as Afridev have been developed to try to overcome these problems. The table below shows some recommended water lifting devices/pumps for standardisation.

Table 3: Water Lifting Devices Selected for Standardisation

	Depth / protected	Technical consideration	Recommended hand pumps	Remarks
Borehole	6 ~ 12m	Low lift pump	Tara	Internationally produced and VLOM pump
			Malda	Internationally produced and VLOM pump
			Rope pump	Under research. It is a VLOM pump.
	12 ~ 45m	High lift pump	India Mark II	International, spare parts readily available.
			Afridev	International, but spare parts dealers uncertain.
Hand dug well	Protected	Low lift pump	Tara, Malda and Rope Pump	Internationally produced and VLOM pump
			Afridev and India Mark II	International, spare parts readily available
		High lift	Chain and bucket	VLOM device readily available.

7.3.2 Social and Economic Considerations

The social and economic considerations in selecting a type of pump are as follows:

- The number of people served will affect the quantity of water required per day and consequently the time it would take to satisfy that need. Calculations can be made assuming that the yield of a hand pump is 0.20

liters per second and that the per capita consumption is 30 litres per person per day. The higher the number of people served the longer the hours the pump has to work, as illustrated in the table below.

Table 4: Calculated Hand Pump Pumping Hours

No of user	Quantity (Cubic metres)	Hours of pumping
400	12,000	16 hrs
300	9,000	12 hrs
200	6,000	8 hrs

- The number of people to be served by one hand pump should not be less than 250 but not exceeding 400.
- The number of users will affect the contribution per household per year. Assuming that ZMK450,000 is the maintenance cost per year, consumers would pay as calculated in Table 6 below.

Table 5: Calculated Indicative Contribution

No of users	Number of Households	Contribution per HH/Month (ZMK)	Contribution per HH/year (ZMK)
400	67	560	6,720
300	50	750	9,000
200	33	1,136	13,632

Note: 6 persons constitutes a household (HH)

Check whether communities are able or unable to raise ZMK1,136 per household per month or 18 kg of maize per year. If they are able to raise ZMK13,632 per year then that community can afford to maintain the pump.

- Social cohesion within the community: Individual households in a divided community may be unwilling to pay for a maintenance fund. The indicators for a divided community are few people attending meetings or a weak V-WASHE committee. No hand pump should be installed in such a community as it will be vandalised or not maintained and consequently abandoned.
- Gender consideration: How easily can a pump be used by women, aged, the disabled and children. Any pump that gives difficulties to women and children should not be selected.
- The pump that violates cultural and traditional values should not be selected.

7.3.3 Selection of Hand Pumps Based on Availability of Spare Parts

Selection may be affected by existing suppliers and pumps as follows:

- The existing suppliers: A pump type that has existing companies supplying spare parts would have a better chance to be selected than a type that has no existing suppliers in the country.
- The existing pumps: The number of pumps already installed within an area would also affect the choice of a pump. People usually choose pumps that they are familiar with.

Some of the advantages of standardisation are therefore as follows:

- When one or two models are chosen there will be a large market that will facilitate spare parts distribution through private entrepreneurs.
- A high number of one pump type will encourage local manufacturers and suppliers to deal in the adopted pump and its parts.
- Standard designs mean uniformity in approach from which effective and longer lasting schemes can be expected. Standardisation of equipment also facilitates the simplification of training and the availability of training materials.

It is noted that each type of pump has its advantages and disadvantages, but experience has shown that there are enormous advantages to be gained through standardisation focusing on one or two pumps. This infers that support agencies (donors and NGOs) should only install adopted pumps.

7.3.4 Advantages and Disadvantages of Selected Pumps

Table 6: Advantages and Disadvantages of Selected Pumps

Type of pump	Advantages	Disadvantages
Tara	- Easy to operate and maintain	- Not easily available - Limited head
Malda	- Easy to install, operate and maintain - Within Region	- Not available in the country - Limited head
Rope pump	- Local material can be used - Easy to install and operate - Cheap to maintain	- Not widely tested - Durability is questionable
Afridev	- Easy to install and repair - High lift	- Durability is questionable - Spare availability uncertain -
India Mark II	- High lift - Spare parts readily available	- Not a VLOM pump - Expensive working tools

7.4 Water Point Inventory and Mapping

The inventory of water points and mapping helps to provide information on the following:

- The updated coverage levels of access to safe water supply at the national, province, district and ward levels. This information helps in priority setting and targeting the needy areas. Information on coverage levels also helps in determining investment estimates that are useful in lobbying for allocation to the sector.
- The number of each type of hand pump that exist in the country, province and district give a picture of how each technology has fared. This information is needed for assessment of performance and the number of non-standard pumps that should be replaced.
- The life span of the pumps. This information helps in deciding when to replace pumps that have reached their design life and require replacement.
- Existing structures and how they have performed, and what action needs to be taken.

This information is necessary to develop appropriate capacity building initiatives to assist in the future establishment and development of effective community-based organisations.

7.5 Research and development

In 1995 during the Water Sector Reforms, Afridev, India Mark II and Blair pumps were selected to be used as standard pumps in the country. The Blair pump, which was a low lift pump, was phased out and now only high lift pumps are being used. There are many places in Luapula, Northern and North Western provinces where low lift pumps would be appropriate as these pumps are much simpler to install and maintain than the two that are currently in use.

Analysis of the India Mark II indicates that the pump is not simple and a relatively high level of skills and expensive tool kits are required for its maintenance. Afridev is a simpler pump as experienced in Malawi. The Government through appropriate institutions needs to research on its application in the country.

In addition to these two pumps, simple pumps (such as the rope washer and Malda) are being piloted in the country. Further research and development need to be undertaken to reduce the number of existing high lift pumps to a few simple durable hand pumps. Research and development in these areas should be carried out. The following measures should be considered in this regard:

- Field monitoring of the performance of pumps to form an integral part of the maintenance system.

- Establishment of a sustainable mechanism for data collection, processing, analysis and dissemination of vital information related to rural water supply.
- Consideration of user views in choosing a technology.
- Involvement of education institutions (such as the University of Zambia - UNZA, particularly the Technical Development and Advisory Unit - TDAU) in continued research on hand pumps should be enhanced through the provision of adequate resources (i.e. human, material and financial)

7.6 Technical Aspects of a Well

The well has three distinct characteristics, which are: mode of construction (drilled or hand dug), the civil works and the pumping device. The design of the well will affect the life span of the pump. Tables 7 indicates the factors that will affect the hand pump installed on the borehole/augured well:

Table 7 : Technical Factors of a Machine Drilled/Augured Well

Component	Factors that affect the life span of the hand pump
Depth of the borehole	The depth should be such that the borehole depth is 10m beyond the lowest point of the water table (so that the well does not dry up). If the well dries up users will continue to pump and destroy some parts of the pump.
Installation of casings and screens as well as a bottom plug	To stop collapsing of the well walls that would allow dirt and sediments that are dangerous to pump parts. If the wall collapses the pump will be buried and cannot be retrieved.
Gravel packing and well development	To provide water free from sediments.
Static and dynamic water levels	To ensure installation of the pump at the right depth.
Civil works – good quality work	To have a rigid foundation and strong apron for maintenance and environmental protection. An appropriate height of pedestal to consider women and children who draw water.

Other guidelines are:

- The borehole should not be less than 30 metres deep.
- The borehole should not be smaller than 100mm in diameter for communities and 150 mm for institutions where future plans are to install bigger pump diameters.
- The yield should not be less than 0.30 litres per second.
- The borehole should be fully cased with appropriate screens at an appropriate depth that gives consideration to the quantity/quality of water.

- The borehole should be plugged at the bottom and appropriately gravel packed and backfilled. It should also be grouted from ground level to at least 3 metres depth to prevent intrusion of contaminated water.
- The borehole should be drilled not less than 30 metres from the nearest pit latrine or rubbish dump to reduce possible contamination.
- No sediment should come from the borehole, as this will reduce the life span of the hand pump.

Table 8 below outlines factors that will affect the hand pump installed on a protected hand dug well.

Table 8: Technical Factors of a Hand Dug Well

Component	Factor that affect the life span of the hand pump
Depth of the hand dug well	The depth should be such that the well depth is beyond the lowest point of the water table (so that the well does not dry up). If well dries up users will continue to pump and destroy some parts of the pump.
Installation of well liners (solid and porous) as well as a bottom plug	To stop collapsing of the well walls that would allow dirt and sediments that are dangerous to pump parts. If the wall collapses the pump will be buried and cannot be accessed.
Gravel packing and well development	To provide water free from sediments. Sand sediments could quickly destroy the pump.
Civil works – good quality work	To have a rigid foundation and strong apron for maintenance and environmental protection. An appropriate height of pedestal to consider women and children who draw water.
Installation of the pump	The intact pump should be such that it will not start pumping air. Priming is vital to reduce quick wearing of piston seals and rods.

Other guidelines are:

- The well should have not less than a 3metre column of water in the months of August to November.
- The well diameter should be adequate for people to work in.
- The well should be constructed not less than 30 metres from possible pollution sources.
- The well should not be constructed down hill from sources of pollution.
- Safety precautions should be one of the major aspects for hand dug well construction.
- Drains should have a length of at least 10 metres to the soak pit.

8. SECTOR INVESTMENT PROGRAMME

The NRWSSP in the Ministry of Local Government and Housing has prepared the first RWSS investment plan, which will be implemented under the Sector Wide Approach (SWAp). The plan has been subjected to consensus from the main actors on the need to co-ordinate investment activities in the sector.

The key players have agreed on key parameters in adopting the plan. These include the size of the additional population to be covered, current rate of coverage for safe water and adequate sanitation facilities, levels of service for each population group and consequently the range of unit costs to be expected.

The investment plan envisages to have over 24,000 new water points (NRWSSP).

With regard to the rehabilitation of existing water points, the NRWSSP will execute works based on the number of non-functional water points. It is estimated that approximately 27% of water points in the country are not functioning. With an estimated total of 25,624 water points according to analysis of district data, this amounts to 6,900 water points not functioning.

According to the plan, the expenditure on rehabilitation would be prioritised in order to sustain the coverage already achieved. It is assumed that 70% of the rehabilitation works will be executed progressively over the period from 2006 to 2015. It is further estimated that 2,000 boreholes that are non-functional due to poor hydro-geological conditions will not be rehabilitated.

Another assumption in regard to the rehabilitation of boreholes is that 2% of the estimated functioning boreholes will be failing every year, as they will be reaching the end of their life spans. These will require rehabilitation rather than maintenance.

8.1 Application of O&M Guidelines in the NRWSSP

The NRWSSP will be implemented over a period of ten (10) years, 2006 – 2015. This period encompasses the fifth National Development Plan (2006 – 2010), whose objectives with respect to water supply and sanitation are concurrent with those of the NRWSSP. Consequently the fifth National Development Plan constitutes the first implementation phase of the NRWSSP. The second phase will be implemented in the subsequent national development plan period.

The implementation plan for NRWSSP indicates that issues pertaining to O&M should be addressed within the period 2006 – 2008. It therefore implies that the O&M guidelines on hand pumps should be launched within this period and their implementation started. This provides an opportunity to assess and evaluate the effectiveness of the guidelines. This will further provide an opportunity to revise the guidelines to suit the developments in the subsequent years.

8.1.1 Provision of Spare Parts and Maintenance Tools

(i) Spare Parts

The MLGH, through the NRWSSP, should work out the mechanisms of providing the required seed spare parts to be procured by the user communities in various places. The concept of the sustainable system of spare parts supply will be applied.

For the areas where the system has already taken off, the NRWSSP will need to strengthen the system by injecting fresh stocks on a seed basis and apply the decentralisation concept to the fullest. Presently, spare parts shops are based at a district level (in Mumbwa and Monze, for example) where the sustainable fund system of spare parts supply has been started. It would be worthwhile to pilot sub-district outlets through local private sector entrepreneurship. This can be achieved under strong initiatives by the Local Authorities.

The seed spare parts will be procured either by using the community level minor maintenance cost budget line or through variations in the budget lines.

(ii) Maintenance Tool Kits

In order to ascertain the number of tools kits required to cover the entire country, the MLGH through the Local Authorities should undertake an audit of the tools now available and assess their condition. Once the assessment is completed, procurement for geographical areas without tool kits, as well as those that require replacement, would be undertaken. Assuming that sufficient capacity will be built to undertake O&M at a village level, and based on the fact that the total number of water points will be approximately 50,000 (i.e. existing points plus the projected new water points) by the year 2015, adequate numbers of tools kits should be procured.

The estimated number of APMs necessary to effectively manage O&M for 50,000 water points is 5,000, based on the current APM to water point ratio of 1:10. It is further assumed that by the year 2015 each APM should have a tool kit designated or allocated to him/her. Therefore, considering a scenario of 5,000 APMs, 5,000 tool kits would be required for effective execution of O&M by the year 2015.

The tools kits shall be procured gradually and corresponding to the increase in the number of water points up until the year 2015. With the CBM concept being promoted and encouraged, the user communities shall be encouraged to be part of the arrangement in procuring the tools kits. Once the APMs procure their own tool kits they will be responsible for taking care of them.

The MLGH through the NRWSSU, the Local Authorities and D-WASHE committees should encourage the APMs to procure their own tools kits. Their shift of

status to private local entrepreneurs would be made easy since they would own the tools themselves.

8.2 Orientation and Sensitisation of Stakeholders on O&M

The implementation of RWSS projects will be under the SWAp concept, as already alluded to under section 8.0, with key players having agreed on basic key parameters for the implementation process. In addition to these key players, there are also other notable stakeholders that will enhance an integrated approach in the implementation of RWSS projects/programmes. These include the Ministry of Energy and Water Development (MEWD), Ministry of Health (MoH), Ministry Community Development and Social Services (MCDSS), Ministry of Education (MoE), Ministry of Finance and National Planning (MFNP), Ministry of Commerce Trade and Industry (MCTI), CPs, NGOs, civil society, private sector, Local Authorities, the beneficiary communities etc.

The MLGH as lead institution should raise awareness among the stakeholders on the programmes that are being executed or planned for execution in future. Once awareness is created, the stakeholders will play their roles in ensuring that RWSS programmes achieve their objectives through effective O&M.

Awareness could be achieved through multi-stakeholder meetings at the national, provincial and district levels. At the sub-district and community levels, awareness can be achieved through community mobilisation and sensitisation. Other modes of orientation and sensitisation are workshops/seminars and use of mass media (electronic and print).

8.3 Training for Stakeholders on O&M

Section 8.2 has identified the stakeholders that need to be oriented and sensitised on O&M. Officers in the identified institutions who are linked to the RWSS programmes in one way or another would need some degree of training to fully comprehend issues to address O&M.

Table 9: Stakeholders to be Trained/Oriented at National, Provincial and Distinct Levels

No	Institution	Areas of involvement
1	MFNP and CPs	<ul style="list-style-type: none"> Facilitation of funding for O&M of RWSS.
2	MCTI	<ul style="list-style-type: none"> Monitoring/control of supply chain links for RWSS systems spares.
3	MEWD	<ul style="list-style-type: none"> Monitoring of hydro-geological conditions vis-à-vis effects on water lifting facilities. Water lifting technologies.

4	MCDSS	<ul style="list-style-type: none"> • Community-based management and local private entrepreneurship concept.
5	MoE	<ul style="list-style-type: none"> • Awareness, sensitisation through schools.
6	MoH	<ul style="list-style-type: none"> • Health/hygiene education, monitoring of water facilities and APM performance.
7	NGO/civil society	<ul style="list-style-type: none"> • Advocacy, creation of awareness and promotion of participation.
8	Private sector	<ul style="list-style-type: none"> • Supply chain issues.

The training for the sub-district and village level stakeholders (ADC, APM and caretakers) is addressed under section 4.1.6 and 4.1.7.

The modes of training would include workshops and seminars as alluded to under section 8.2. The MLGH will coordinate and collaborate the training of the identified institutions.

9. IMPLEMENTATION AND REVISION OF THE GUIDELINES

9.1 Dissemination of Guidelines

The MLGH will launch these guidelines as a national document that shall foster the sustainability of O&M of RWSS facilities. The guidelines shall be widely disseminated at a national level.

The dissemination of these guidelines to all levels shall be through the institutional framework adopted by the Government (i.e. MLGH) in 2004.

The Provincial Local Government Office (PLGO) shall ensure that Local Authorities receive the guidelines and that implementation at district level takes off without delay. The PLGO should also disseminate the guidelines at that level.

The Local Authorities, once in receipt of the guidelines, shall ensure that the sub-district and community levels receive the guideline and that sensitisation on their implementation is undertaken. They may have to undertake an extra function of translating the guidelines into local languages bearing in mind the literacy levels in the user communities. The MLGH must come up with an extract of the guidelines to be translated by the Local Authorities (as a minimum requirement).

9.2 Implementation of the Guidelines

These guidelines shall be implemented in parallel with policies and strategies that have been formulated and adopted to foster the sustainability of development projects/programmes in communities. Furthermore, their implementation shall be enforced by existing statutes. Some of the policies that are being implemented parallel to these guidelines include:

- The National Water Policy
- The National Decentralisation policy
- National Gender Policy

Statutes that might be relevant in the enforcement of the guidelines are:

- The Chiefs Act
- The Water Act, Cap 198
- Local Government Act No.22 of 1991
- Public Health Act of 1995
- Village Registration Act
- Environmental and Pollution Control Act

9.3. Revision of the Guidelines

The need for revising the guidelines might arise from the effects of the dynamics in the sector. After a certain period, it might be discovered that the principles in the guidelines are not addressing emerging issues, and thus arises the necessity for revision to be undertaken in conjunction with the Local Authorities.

9.3.1 Procedures for Revision

The MLGH, in conjunction with the Local Authorities, shall undertake an evaluation of the effectiveness of the guidelines. The evaluation shall address the following.

- (a) Goals/objectives: Assess if the objectives of the guidelines have been achieved – in this case whether or not O&M of RWSS facilities have been sustained through the application of principles spelt out herein.
- (b) Indicators: Measure progress towards achieving the Millennium Development Goals with regard to the increased number of people with continuous access to safe and clean water supply and sanitation services being fostered by the application of the guidelines. From this perspective, the MLGH shall assess the aspects of:
 - Inputs: Financial and physical inputs in to the implementation of the guidelines to achieve the goals. Review of whether or not investment on O&M is adequate to implement the guidelines.
 - Output: Determine if the application of the guidelines has increased the continuity in the functionality of water facilities.

The MLGH shall set up a technical committee to review and evaluate the Guidelines. If the evaluation proves that the intended objectives have not been achieved, the MLGH shall commission a study to look into how to address the shortcomings of the guidelines with a view to improving them.

Once the revised guidelines have been subjected to stakeholder consultations and consensus reached, the MLGH will launch the revised guidelines and subsequently disseminate them widely for their implementation.

APPENDIX A
Rural Water Supply
Operation and Maintenance
Systems

APPENDIX A

RURAL WATER SUPPLY OPERATION AND MAINTENANCE SYSTEMS

Repair and rehabilitation activities are undertaken to restore a failed water facility. Implementation of repair and rehabilitation activities could be classified or grouped according to the level at which the said activity is undertaken. In Zambia there are three levels (i.e. village, area or catchment and district) at which repair and rehabilitation activities take place.

There are four options for hand pump repair and rehabilitation systems.

System	Characteristics	Assumptions
One-tier system	Based on total community self reliance in operation and maintenance. In this system all repair works and costs are borne by the communities.	<ul style="list-style-type: none"> ▪ The users have the ability and are willing to bear the costs for O&M. ▪ The users will hire skilled persons and pay for the services.
Two-tier system	Based on total elimination of community responsibilities. In this system minor repairs are carried out by an area mechanic (APM) while major repairs are conducted by a District Maintenance Team.	<ul style="list-style-type: none"> ▪ The Government has adequate funds for APM and the district team. ▪ APMs are highly motivated. ▪ The District Maintenance Team is mobile and has funds to undertake all repair activities.
Three-tier system	Based on community sharing of responsibilities with the area mechanic and District Maintenance Team. In this system the community carries out preventive maintenance while the APM carries out minor/major repairs and the district mobile maintenance team carries out rehabilitation works.	<ul style="list-style-type: none"> ▪ The roles and responsibilities are well spelt out. ▪ The village has a caretaker who is well trained and equipped.
The centralised system	Based on total elimination of community and APM responsibilities. The district maintenance team tours the villages repairing and rehabilitating the facilities.	<ul style="list-style-type: none"> ▪ The district team is highly mobile and has adequate funds. ▪ Monitoring and flow of information systems are effective.

Each of these options entails different ways of sharing costs and responsibilities. Hence it is necessary to adopt the one system that is most appropriate to the communities being served and considering the support mechanisms that might be available.

Until recently the O&M of rural water supplies in Zambia has been a centralised system, one that has proven to be unsuccessful. The two- and three-tier systems have been practiced in some districts with support from donors or NGOs with some level of success. The three-tier O&M system has proved more viable and practical in the current scenario. However, as the decentralisation concept takes hold, the issue of devolution will apply and the one-tier system of O&M should be applied in the long run.

The following issues will need to be addressed and tackled in moving from the three-tier to the one-tier system:

- Acceptance of the system at all levels.
- Training in all areas of community-based management to achieve a sustainable O&M system.
- The integration of community-based management in all rural water supply and sanitation programmes.
- The considerable time spent on promoting community based management. This sometimes leads to delays in the construction of new water points, but can also result in extending the life of water facilities.
- Different disciplines, sociologists or community educators must be employed to promote community management.
- Extra costs per water point will be incurred (but should be beneficial in the longer term).
- Standardisation of hand pumps and construction techniques.
- Promotion of the concept in the private sector.
- Follow-up support and monitoring for rural communities

APPENDIX B
**Indicative Costs for Spares
Replacement**

APPENDIX B

INDICATIVE COSTS FOR SPARES REPLACEMENT

India Mark II – GI riser pipes

Item	Description	Unit	Unit cost US\$	Quantity	Amount US\$
1	Riser pipe (1/4) 3m	N0	9.0	10	90.00
2	Socket	N0	2.5	9	22.55
3	Socket plain	N0	10.98	1	10.98
4	Handle (1 /10)	N0	1.5	1	1.50
5	Connecting rod	N0	3.95	10	39.50
6	Chain (1 /3)	N0	1.30	1	1.30
7	Bolt and nut	N0	0.20	8	1.60
8	Food valve (1/4)	N0	0.80	1	0.80
9	Piston seals (1/2)	N0	0.40	1	0.40
10	Ball bearing (1/4)	N0	1.70	1	1.70
Total					170.28

Source: N-WASHE indicative cost-supplementary Module 2d.

- ¼ indicates that spare parts will be replaced once in four years.
- The cost does not include labour and transport.

APPENDIX C
Sample Memorandum of
Understanding

APPENDIX C

SAMPLE MEMORANDUM OF UNDERSTANDING (MOU) FOR WATER SUPPLY

Name of Water facility:

Ward NO:

Village:

District:

We, the undersigned members of the Village (V-WASHE) Committee served by our Water Supply System, agree to assume the following responsibilities:

- a. Operating, maintaining and protecting the water supply system.
- b. Supervising the caretakers and others members of the V-WASHE who should have been nominated and trained during the construction phase.
- c. Ensuring that tools and spare parts left on site after construction are stored and used properly by the community.
- d. Promoting and ensuring that community members contribute towards maintenance fees.
- e. Organising the provision of local materials and un-skilled voluntary labour.
- f. Resolving social disputes and preventing vandalism.
- g. Ensuring environmental protection of the source.
- h. Educating the community in their responsibility for ensuring proper system use and maintenance.
- i. Maintaining a water point file and keeping records of repair work and minutes of meetings.
- j. Requesting support for major repairs from the District Council.
- k. Each tapstand user group's representative on the VMSC shall be responsible for ensuring:
 - Maintenance of the tapstand and surrounding area.
 - Collection of money, materials and voluntary labour for tapstand repairs.
- l. Encouraging proper use and maintenance of latrines to reduce the risk of pollution and contamination of the water source.

Signed:
V-WASHE

.....
District Council

Date:

Date:

Members' signatures:

Secretary

Treasurer

Trustee

APPENDIX D

Water Point Questionnaire



Ministry of Local Government & Housing, DISS-RWSS Unit

Updated on 17 January 2007

Water Point Questionnaire

Date of completing data collection: _____ (day) _____ (month) _____ (year)

Name of data collector:

Type of settlement: Village () Rural Health Centre () School () Other, specify:

Name of settlement: _____ If school, its code:

Name of Chief: _____ Name of
Ward: _____

Name of District: _____ Name of Province:

Position of Respondent(s): Member of V-WASHE Committee () Not Member of V-WASHE Committee ()

GPS Readings for water point: South: _____ East:

(See the separate information on how to use a GPS)

Date of completion of the water point _____ (month)
_____ (year)

This is the date of handover to the community or the first day of use

REQUIREMENTS OF PROTECTED AND PARTLY PROTECTED WATER POINTS

The data collectors are given a list with requirements for each type of water point to be considered protected and for the traditional dug wells to be considered partly protected. It is important that ALL criteria are fulfilled for the water point to be considered protected or partially protected.

1. What is the type of water point?

()

a. Borehole, drilled by a mechanical rig

Only one option should be ticked

b. Tube well, drilled by a hand-augured rig

c. Jetted well

d. Protected hand-dug well

e. Hand-dug well with drilled-in borehole

f. Piped water supply

g. Protected spring

h. Rain water collection

i. Improved traditional well

2. For Water Point Types A-E:

What lifting devices are used?

Only one option should be ticked

a. Hand pump

b. Windmill driven pump

c. Solar driven pump

d. Electrical pump

e. Treadle pump

f. Rope pump

g. Bucket, chain and windlass

3. For piped water supply:

What type of supply:

More than one option can be ticked

a. House connection

b. Communal taps

c. Public taps

4. How many households, who live within a radius of 500 metres, use the water point?

5. How many households in total use the water point?

6. Is the water point functioning?

Yes ()

No ()

A water point is functioning when it is able to produce water

7. If the water point is NOT functioning:

What are the reason(s) why it is not functioning?

The pump is broken () The chain is broken () The bucket is broken () The tap is broken ()

Other, specify:

8. If the water point is NOT functioning:

How many days has the water point not been functioning within the last year?

Less than 1 week () 1 week -1 month () 1-6 months () 6 months or more ()

9. Is the water point used?

Yes ()

No ()

A water point can be functioning, but people still do not use it.

10. If the water point is NOT used, although it is functioning:

What are the reason(s) why the water point is not used?

Too far away () The quality of the water is not good () The technology is not appropriate ()

The yield is too low () Other, specify:

11. Did the water source go dry for part of the last year?

Yes ()

No ()

This means there is no water because of, for example, a low water level in the dry season.

12. If YES, how long in total did the water source go dry during the last year?

Sometimes it may go dry for the full day and sometimes only for part of the day (for example, in the afternoon).

Therefore tick as appropriate for the following:

A. Part of the day ()

Less than 1 month () 1 - 3 months () more than 3 months ()

List which months:

B. The full day ()

Less than 1 month () 1 - 3 months () more than 3 months ()

List which months:

13. Have households paid operation and maintenance costs for the water point?

Yes ()

No ()

14. If YES, how have households paid in the past?

A. Tick one of both of the following, as relevant:
In cash () In kind ()

B. One of the following has to be ticked:
On a regular basis () When repairs were needed () Every time they collect water ()
On a regular basis means that households pay at an agreed time, for example every month or every quarter and that payment is also made when the water point is functioning.

15. Is a Village WASHE committee responsible for the operation of this water point?
Yes () No ()

If YES, go to question 18

16. If there is no V-WASHE committee, who is responsible for the operation of the water point?

1-2 Caretakers () A water point committee () The Village Development Committee ()
Other, specify

17. Is there an Area Pump Mender in your area? Yes ()
No ()

18. If you have a pump, has it ever broken down? Yes ()
No ()

19. If YES, did you ask the Area Pump Mender to repair it? Yes ()
No ()

20. Were you satisfied with his/her services? Yes ()
No ()

21. If you did NOT ask the Area Pump Mender to make the repairs why not?
He/she is too busy () He/she is too far away () He/she is not good () Other

22. Has anyone other than the Area Pump Mender made repairs to your water point?
Yes () No ()

Specify whom (for example, the well digger)

If some of the following data cannot be collected at the water point level, some of the data may be available at the ward or district levels.

The following questions do NOT apply to piped water supply, protected springs and rainwater collection

23. Total depth _____ metres
_____ metres

24. Static water level

25. Dynamic water level (for boreholes and tube wells only)
_____ metres

26. Yield of water point _____ litres/ second
_____ metres

27. Length of plain casing

28. Length of screen casing/ lining _____ metres
_____ metres

29. Depth of cylinder installed

30. If the water point has a hand pump, what type is it?

31. Name of organisation that provided funds for the water point

32. Did households pay/contribute part of the costs for construction of the water point Yes () No ()

33. If YES, how did households pay/contribute? As cash () As labour () In local materials ()

Tick the type of payments/contributions made (more than one type of payment/contribution can be ticked).

34. What purposes is the water point used for? Several purposes can be ticked

Domestic water supply () Gardening/Irrigation () Watering of domestic animals ()

Other purposes, specify _____

35. Is there an adequate fence around the water point? Yes () No ()

36. Was a water quality test made before handing-over of the water point? Yes () No () Do not know ()

37. If YES, what year was this?

38. Have any water quality tests been made since handing-over of the water point? Yes () No () Do not know ()

39. If YES, what year was the last water quality test done?

40. Did the last water quality test show any problems with the water quality? Yes () No () Do not know ()

41. If YES, list the problems

Note: The answers for questions 36 – 41 are to be checked with the EHT for the ward and/or district RWSS staff.

42. Is the water treated at water point level? Yes () No ()

43. If YES, how is the water treated? Tick the appropriate categories (more than one can be ticked)

Using an iron removal filter () Adding chlorine ()

Other treatment, specify

44. What do households generally think about the water quality?

The taste is	Good ()	Bad ()
The colour is	Good ()	Bad ()
The smell is	Good ()	Bad ()

45. Have any of the following been established in connection with the water point:

A laundry slab () An animal trough () A garden ()

46. If YES, how far are they from the water point? _____metres

47. Where do you normally get your spare parts for the water point?

The local store () The district town () The provincial town () Lusaka ()

Other _____

APPENDIX E
Water Point Repair Form

APPENDIX E

WATER POINT REPAIR FORM Prepared by APM
--

Section A

Name of ward:

Name of water point:

Type of pump in use:

Nature of repair work carried out:
.....

Date breakdown reported: ... dd ... /...mm ... /...yy.....

Date repair works done:dd.../...mm...../..yy.....

Down time (number of days):

Date of previous repair:dd.../...mm...../...yy.....

Status of V-WASHE(e.g. Number of WASHE meetings, amount of servicing etc.):
.....

Section B

Number of protected wells working:

Number of defective protected wells:

Number of protected wells repaired:

Number of people accessing safe water:

Number of people using pit latrines:

Number of people using the water point:

Other remarks:
.....

Prepared by:

Designation:

Date:

APPENDIX F

Monthly Report

APPENDIX F

<p>MONTHLY REPORT Consolidated by Reporting Officer</p>

Name of ward:

No. of area pump menders:

No. of pump mender reports:

Total number of boreholes in catchment area:

Number of boreholes working:

Number of defective Boreholes:

Number of boreholes repaired:

Number of protected wells working:

Number of defective protected wells:

Number of protected wells repaired:

Number of people accessing safe water:

Number of people using pit latrines:

V-WASHEs meetings conducted:

Other remarks

.....

.....

.....

Prepared by:

Designation:

Date:

APPENDIX G

Tool Kit (Movement)

APPENDIX H

Sample O&M Budget

APPENDIX H

SAMPLE O&M BUDGET

Objective	Main activities	Sub activities	Materials/items	Unit cost	Quantity	Amount
To ensure that 90% of water points are working	Undertake baseline information gathering	Compile district information on existing water points	Available computers	0	0	0
		Analyse existing information	Available computers	0	0	0
		Produce plan and budget	Stationery	50,000	1	50,000
		Sub total				50,000
	Orientation of 20 APMs	Preparation of the workshop	Stationery	150,000	1	150,000
		Conducting two-day workshop	Food for participants	7,000	40	280,000
			Trainer's fee (2)	50,000	4	200,000
			Transport for the trainer	150,000	2	300,000
			Spares kit	350,000	1	350,000
		Sub total				1,280,000
	Repair 15% of total of 1,890 water points	Payment of APMs	Labour	50,000	284	14,200,000
		Purchase of repair kits	Repair kits	175,000	284	49,700,000
			Transport and handling charges	17,500	284	4,970,000
		Sub total				54,670,000
		Figure Highlighted	Not included in the subtotal			
District to provide support services	Conduct quarterly monitoring visits	Produce checklist	-	0	0	0

		Produce monitoring plan	-	0	0	0
		Conduct monitoring	Fuel for motor bike (14 days/quarter x 10 litres/day x K6,000/litre)	840,000	4	3,360,000
			Lunch allowance for the officer (14days/qtr)	50,000	56	2,800,000
			Production of quarterly reports	100,000	4	400,000
		Sub total				6,560,000
Sub-district support services	15 RHC to conduct monitoring visits	Conduct monitoring	Fuel for motor bike (1 day/month x 10 litres/day x K6,000/litre)	900,000	12	10,800,000
			Lunch allowance for 15 officers for 1 day/month	750,000	12	9,000,000
			Production of quarterly reports	750,000	4	3,000,000
		Sub total				22,800,000
		Grand total				85,360,000