



Ministry of Water, Irrigation and Electricity

OPERATION & MAINTENANCE MANUAL

RURAL WATER SUPPLY POINT SOURCES

(Parts A, B, C, D)

Technology and Management

Document 02

Addis Ababa 2018



FOREWORD and ACKNOWLEDGEMENTS



Her Excellency, Mrs Frenesh Mekuria, State Minister of the Ministry of Water, Irrigation and Electricity

Ethiopia has made great achievements during the last 10 years in providing improved water supply service for its rural population. As a result, Ethiopia achieved the Millennium Development Goal (MDG) target in water supply. The target was achieved mainly through the implementation of small community water supplies. Today the number of these small community water supplies is well over 200,000 and serving a population of 50 million rural people. In order to keep these water supplies operational, the National Rural Water Supply (RWS) Operation and Maintenance Management (O&MM) Manual and Strategic Framework was prepared.

The National RWS O&MM Strategic Framework for Ethiopia is an outcome of collective efforts carried out through a consultative process across the nine regional states by the Federal and Regional Governments and Development Partners (DPs).

I wish to acknowledge the invaluable inputs of Ministry of Water, Irrigation and Electricity staff Regional Water Bureaus, Zone and Woreda Water Offices, Community-Led Accelerated WASH Project (COWASH), Water Action, Action Aid, JICA, World Bank, African Development Bank, DFID, UNICEF, Ethiopian Catholic Church Social & Development Coordination Office of Harar, Millennium WASH Alliance, Ethiopian WASH Alliance, all visited rural piped system Water Boards and Water Administration Offices (WAOs), numerous WASHCO members, user communities and several key individuals who gave freely their time, provided data and information and arranged scheme visits. Special thanks go to Demewoz Consultancy Company in the development of this document.

I would like to underscore the technical and financial support and extensive assistance we received from the Government of Finland financed COWASH project in this strategic framework and manual preparation.

I therefore request that all decision-makers, water technical staff at federal, region, zone, woreda, kebele and community levels secure budget for maintenance management and make sure that continuous improved water supply is provided to all Ethiopians. I believe that this manual will make it possible.

Providing rural water services is irreducibly complicated; there is no single solution for sustainability. Sustainable services rely on an interlocking network of different actors and institutions – all of which need to function at least well enough. Sustainable rural water supply means that whole system from regulation through provision of adequately resourced support services is ensured with accountability.

Addis Ababa in March 2018

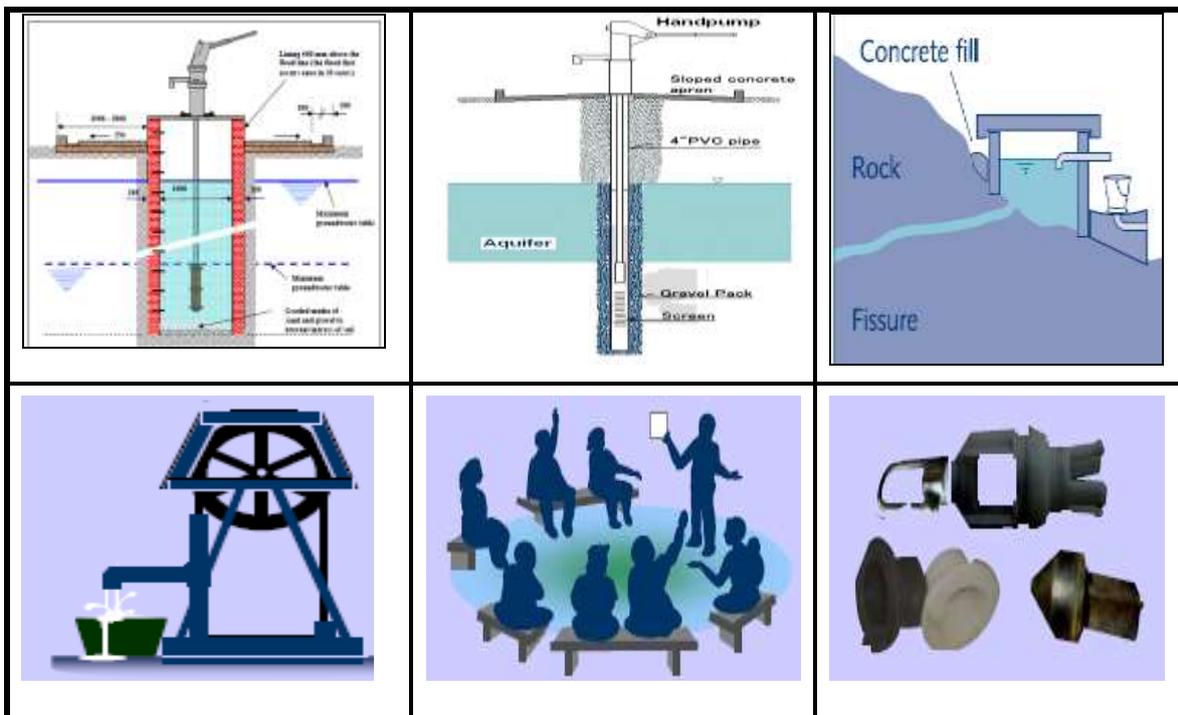


Frenesh Mekuria
State Minister
Ministry of Water, Irrigation and Electricity
Ethiopia

Frenesh Mekuria
State Minister

MINISTRY OF WATER, IRRIGATION AND ELECTRICITY

GENERIC OPERATION AND MAINTENANCE MANAGEMENT MANUAL FOR RURAL POINT WATER SUPPLY SCHEMES



RURAL WATER SUPPLY POINT SOURCES

(Parts A, B, C, D)

Technology and Management

PART – A: INTRODUCTION TO O&M

Document 2

RWS Point Sources, Technology and Management

Document 02 - Main Contents of Parts A, B, C and D

Module/Part	Title	No. of pages
Part A	Introduction to O&M Management	10
	General Aims and Objectives Selected Technologies for the Preparation of this Manual Target Users of this Manual Principle of O&M O&M Mechanism How to use the Manual Structure of the Manual Preparation of this Manual	
Part B	Description of Water Sources & Technologies	7
	Background Hand Dug Well Shallow Well Spring Development Technology Options	
Part C	Technical O&M requirements	91
	General Causes of Failures of Water Supply Schemes Factors Affecting Sustainable O&M Management Steps towards Sustainability of RWS Schemes O&M Requirements for Hand- Dug Well O&M Requirements of Shallow Well Hand Dug Well and Shallow Well fitted with Hand Pump Spring Collection Chambers Capacity Building and Training Preventive Maintenance Unscheduled Maintenance Support System of Operation and Maintenance Health and Environmental Requirements	
Part D	Rural Water Supply Schemes Management	47
	Introduction Objectives Community Managed WASH Systems	

PART – A: INTRODUCTION TO O&M

Table of Contents

List of Tables	v
List of Figures	v
Acronyms	vi
1 INTRODUCTION TO O&M MANAGEMENT	1
1.1 General	1
1.2 Aims and Objectives	2
1.3 Selected Technologies for the Preparation of this Manual	2
1.4 Target Users of this Manual	3
1.5 Principle of O&M	3
1.6 O&M Mechanism	3
1.7 How to use the Manual	4
1.8 Structure of the Manual	4
1.9 Preparation of this Manual	5

List of Tables

Table 1-1: Principle of Operation and Maintenance	3
---	---

List of Figures

Figure 1-1: O&M Mechanism to ensure sustainability	4
Figure 1-2: Components of O&M Manual	4

Acronyms

APM	Area Pump Mechanic
CAP	Community Action Plan
CBM	Community Based Management
COWASH	Community Led Accelerated WASH in Ethiopia
CSI	Credit and saving Institute
CTs	Caretakers
HDP	Hand Pump Density Breakpoint
HDW	Hand-Dug Well
HP	Hand Pump
HRD	Human Resource Development
IMS	Information Management System
M&E	Monitoring and Evaluation
MoWIE	Ministry of Water, Irrigation and Electricity
NGOs	Non-Governmental Organizations
O&M	Operation and Maintenance
O&MM	Operation and Maintenance Management
PIs	Performance Indicators
RWB	Regional Water Bureau
RWS	Rural Water Supply
SCM	Supply Chain Management Supply Chain Management
SP	Spare Part
SW	Shallow Well
TOR	Terms of Reference
TWS	Town Water Supply
VLOM	Village Level Operation and Maintenance
VRA	Vulnerability Reduction Assessment
WASH	Water Supply, Sanitation and Hygiene
WASHCO	Water Supply, Sanitation and Hygiene Committee
WWASHPP	Woreda WASH Program Plan
WEWs	Water Extension Workers
WIF	WASH Implementation Framework
WSG	Woreda Support Group
WSP	Water Safety Plan
WVO	Woreda Water Office
WWT	Woreda WASH Team
ZWO	Zone Water Office

DEFINITIONS OF TERMS:

Accessibility	Is having a functional and reliable water supply facility without any barriers within a radius of 1500 metres for Rural Water Supply
Access Coverage	Is the percentage of people with access to safe, adequate and reliable water supply within 1500m at 15 l/c/d for rural community.
Adequate Water	Is the quantity of water required to meet the minimum demand per capita per day. The standard being 15l/capita/day by 2015 for Rural people.
Community	Refers to a group of 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 benefit regardless of geographical and social boundaries
Community Based Management	Is the process of empowering community members to assume the lead role in decision making about the levels of services they require, whilst organizing themselves to plan, implement, operate and maintain their water supply and sanitation facilities.
Community Management	Is a form of community participation in which the community takes the final decision on all aspects of planning, implementation, management, monitoring, evaluation, O&M of the water supply facility
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 the set objectives.
Maintenance	Refers to activities required to sustain the water supply facilities in a proper working condition. It includes preventive maintenance, corrective maintenance and crisis maintenance.
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	Refers to the day to day running and handling of the water supply facilities in a manner that optimizes their use and contributes to a reduction in breakdown and maintenance needs
Preventive Maintenance	Refers to an activity that includes checking the status of hand pump components at regular fixed intervals
Rehabilitation	Is the correction of major defects and the replacement of equipment to enable the facility to function as originally intended.
Reliable Water Supply	Is the supply of water on a continuous basis meeting the minimum demand per capita per day
Repair	Is the restoration of a defective component to return the facility to acceptable working condition. The cost of the repair should be borne by the community.
Rural Area	“Areas of population outside urban and peri-urban using point or piped water supply system for which the community is responsible for the O&M” in addition, low population densities characterize rural areas, with small houses isolated from each other.
Safe water	Is water that is free from harmful quantities of physical, chemical and pathogenic matter and that meets the minimum Ethiopian standards (usually WHO Guidelines)
Seed Money	Is the initial sum of money disbursed to an organization in order to create/start a revolving fund for undertaking a designated programme

Scheme (Water)	The entire facility (concrete works, pipes, pumps) established to extract water from a water source, and distribute it to (close to) people's homes
Sustainable Supply Chain	Is a system of procuring and supplying spare parts that guarantees a continuous supply of spare parts.
Source (Water)	The natural water source only, i.e. spring, groundwater, river, etc
Supply chains	Is the term used for the process that relates all activities involved with the flow and transformation of goods from the raw materials stage through to the end-user, as well as the associated information flows
WASHCO	Is a committee of representatives from a number of Water, Sanitation and Hygiene Point Committee of the same village. Sometimes WASHCO committee may refer to 2 or more village representatives benefitting from a water and sanitation point.

1 INTRODUCTION TO O&M MANAGEMENT

1.1 General

This operation and maintenance management Manual is intended to cover all rural point water supply schemes of low technologies options such as hand dug wells fitted with handpumps, shallow wells fitted with handpumps and On-spot springs.

Prior to this generic Manual, the Consultant performed assessment and review of existing O&M Manuals in MoWIE, Amhara, Oromia, SNNP and Tigray Regions Water Bureaus. This generic O&MM Manual is prepared based on the existing manuals collected and literatures review made.

This O&MM Manual is prepared so as to:

- Guide the existing O&M team of the rural water supply schemes service
- Help operation personnel to keep handpumps and other equipments in satisfactory operating condition
- Provide Manual for systematically detecting and correcting potential failures before they occur or develop into major defects
- Provide routine and preventive maintenance services.
- WASHCOs managed the O&M of the Schemes

In order to make easier utilizing this Manual, it has been organized according to the functional components of the O&M framework and major O&M activities.

This generic Manual is organized in to eight parts as follows:

Part - A	Introduction to Operation and Maintenance MANAGEMENT
Part - B	Description of Water Sources and Low Technolgies
Part - C	Technical Operation and Maintenance Requirments
Part - D	Rural Water Supply Scheme MANAGEMENT
Part - E	Rural Water Supply Spare Parts MANAGEMENT
Part - F	Monitoring and Evaluation and Reporting System
Part - G	Introduction to Rural Water Supply Safety Plan
Part - H	O&M Implementation Strategy and Action Plan

- Part – A: Briefly describes the background information of O&M MANAGEMENT, its objectives, principle of O&M and the mechanism, and structure of the Manual.
- Part – B: Describes different water sources and low technologies such as HDW, SW which fitted with hand pumps, and On-spot spring development for which this Manual is developed.
- Part – C: This part focuses on the technical requirements of O&M for Afridev, Indian Mark – II, Rope pump and on-spot spring development types of technologies. It describes the routine & preventive maintenances and the frequency of the repair.
- Part – D: Deals with the Community based MANAGEMENT of the schemes through WASHCOs, Caretakers and area mechanics. It also describes the financial sources and MANAGEMENT. The roles and responsibilities of various actors in the O&M MANAGEMENT explained.
- Part – E: It describes the Spare Parts MANAGEMENT of the rural water supply schemes. The roles and responsibilities of various actors, various optional SPs outlet models and the recommended part.
- Part – F: Gives a brief descriptions of monitoring, evaluation, reporting and documentation system of the O&M MANAGEMENT system.
- Part – G: Introduces the rural water supply system safety plan as an integral part of O&M activities like catchment protection.
- Part – H: Deals with the implementation strategy and preparation of action plan for O&M.

1.2 Aims and Objectives

The primary aims of the Manuals are:-

- To raise awareness of issues that affect rural water supply sustainability, provide options for addressing these, using examples, and describe how these options can be implemented.
- To provide basic and practical knowledge & skills on how to manage and maintain the completed water schemes which are necessary as daily water scheme management.

The overall objective of the Manual is to enable the reader to appreciate the interrelationship between different issues that affect sustainability and the importance of adopting a holistic approach to planning and implementation, in order to achieve sustainable outcomes.

1.3 Selected Technologies for the Preparation of this Manual

Rural water supply provision in Ethiopia is typified by low-cost and simple technologies which can be financed, operated, maintained and managed by rural communities. The choice of technology for improved water supplies, dependent on environmental, socio-economic and political conditions, includes:

- Hand-dug wells fitted with Hand pump,
- Shallow Well fitted with hand pumps
- On-spot protected springs;

1.4 Target Users of this Manual

The primary target users of this Manual are those responsible for planning, implementing and supporting rural water supply programmes and projects. The Manual is designed for WASHCO, Woreda, Zone and Regional government personnel, non-governmental organization (NGO), suppliers and private service providers. The Manual should also provide a useful overview of rural water service sustainability for policy-makers, senior technical staff within line ministries, donors and their advisors.

1.5 Principle of O&M

The Water Resources Policy stipulates that the rural water facilities should be managed using the Community Based Management (CBM) approach for O&M. The majority of such facilities are hand pumps installed on shallow wells or hand dug wells. In ensuring sustainability in O&M of these facilities, the following principles should be applied:

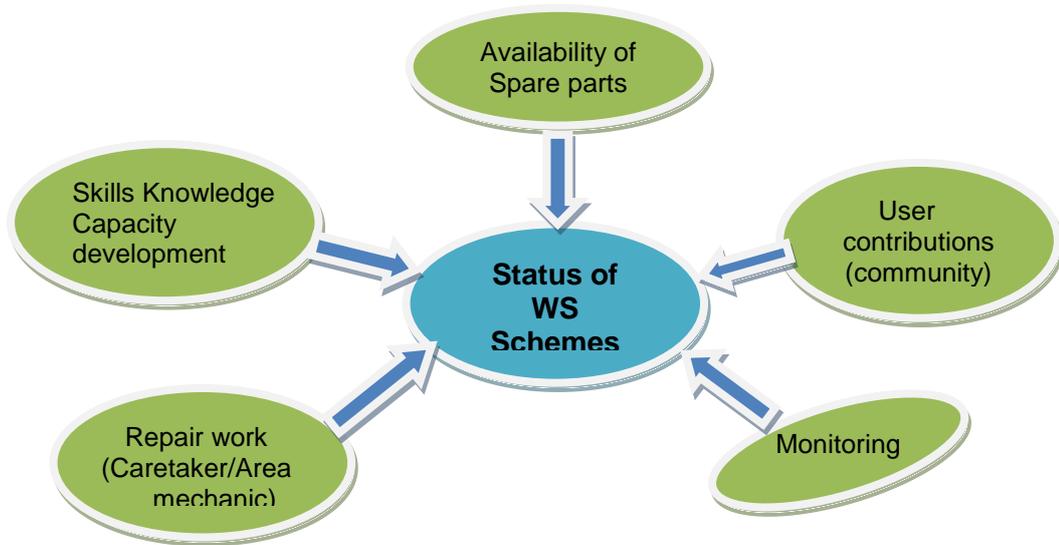
Table 1-1: Principle of Operation and Maintenance

No.	Principles	Details
1	Cost sharing by Communities	<ul style="list-style-type: none"> ▪ 100% cost for O&M ▪ Repair works beyond cost of ETB 4,000.00 should be considered as rehabilitation, and the WWO should facilitate necessary assistance required by community for hand pump to be rehabilitated
2	Sustainable supply Chains	<ul style="list-style-type: none"> ▪ 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
3	O&M Mechanisms	<ul style="list-style-type: none"> ▪ 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
4	Choice of Appropriate Technology	<ul style="list-style-type: none"> ▪ Satisfying hydro-geological conditions ▪ Affordability for capital and recurrent costs is considered ▪ Durability of the facility is considered ▪ Standardization vis-à-vis research and development is applied
5	Capacity Building is the Key to Sustainability	<ul style="list-style-type: none"> ▪ Supportive policies and a regulatory framework are provided ▪ An environment for awareness raising campaigns and public participation is created ▪ Management, financial and technical skills are developed for the effective operation and management of water facilities

1.6 O&M Mechanism

Operation and Maintenance (O&M) mechanisms refers to a series of operation and maintenance structural systems that are required to be established and conducted by various stakeholders in order to maintain water supply schemes in a sustainable manner. Therefore the establishment of an O&M mechanism appropriate to sustaining hand pumps and reducing downtime is based on the recognition and understanding of factors that affect the status of hand pumps as these factors inform both the users and the person repairing (Area Mechanic/caretaker) on how much work needs to be done and how much it will cost. For the entire O&M system to be effective, the following 5(five) parameters should be considered.

Figure 1-1: O&M Mechanism to ensure sustainability



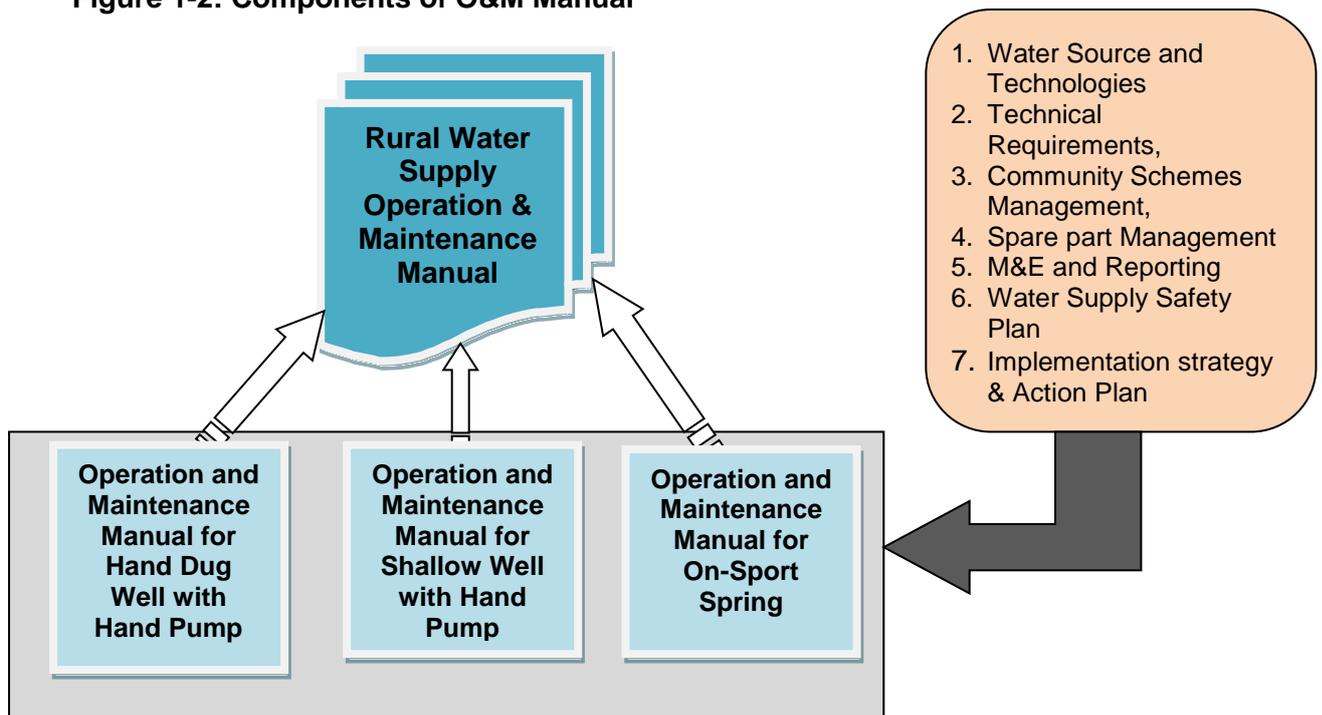
1.7 How to use the Manual

The Manual presents a total package for the O&M Management in sustainable O&M. Each parts of the Manual are to be used together as they complement each other. Each of the parts linked to one another in order to a complete Operation and maintenance management framework.

1.8 Structure of the Manual

This “Community Operation and Maintenance Manual for O & M consists of 3 schemes as presented in Figure 1-2 below. Each of the three core manual covers all of the eight parts of the Manual.

Figure 1-2: Components of O&M Manual



1. Water Source and Technologies
2. Technical Requirements,
3. Community Schemes Management,
4. Spare part Management
5. M&E and Reporting
6. Water Supply Safety Plan
7. Implementation strategy & Action Plan

1.9 Preparation of this Manual

This Rural Point Water Supply Schemes operation and maintenance management manual has prepared to the Ministry of Water, Irrigation and Electricity, which was financed by the Government of Finland with the collaboration of COWASH. COWASH offered the assignment to DEMEWOZ Consultancy, and DEMEWOZ Consultant has prepared this O&M Management Manual as per the scope of the assignment stipulated in the TOR.

RURAL WATER SUPPLY POINT SOURCES

(Parts A, B, C, D)

Technology and Management

Part – B: Water Sources and Technology Options

Document 2

Part – B: Water Sources and Technology Options

Table of Contents

List of Tables	ii
List of Figures	ii
2. DESCRIPTION OF WATER SOURCE AND TECHNOLOGIES	1
2.1 Background	1
2.2 Hand Dug Well	1
2.3 Shallow Well	3
2.4 Spring Development	4
2.4.1 On- spot Spring Development	4
2.4.2 Pumping and Gravity Feed System	6
2.5 Technology Options	6

List of Tables

No table of figures entries found.

List of Figures

Figure 2-1: Hand Dug Well fitted with Hand and Rope Pumps	2
Figure 2-2: Elements and Layout of Hand Dug Well	2
Figure 2-3: Typical Shallow well fitted with Hand Pump	3
Figure 2-4: typical spring development plan and section	5

2. DESCRIPTION OF WATER SOURCE AND TECHNOLOGIES

2.1 Background

A number of global technology options are available for improved rural water supply systems. However, not all can be applied everywhere. In most rural parts of Ethiopia, the common choices are boreholes equipped with hand pumps or motorized pumps; hand dug wells (with hand pumps), shallow wells (with hand pump), and developed springs. This operation and maintenance management guideline focuses on these three types of technological options.

2.2 Hand Dug Well

The traditional method of obtaining groundwater in rural areas is still the most common by means of hand-dug wells. However, because they are dug by hand their use is restricted to suitable types of ground, such as clays, sands, gravels and mixed soils where only small boulders are encountered.

Hand-dug wells provide a cheap, low-technology solution to the challenges of rural water supply. It is excavated and lined by human labor, generally by entering the well with a variety of hand tools. Depths of hand-dug wells range from 5 meters deep, to over 20 meters. It is impractical to excavate a well which is less than a meter in diameter; an



excavation of about 1.5 meters in diameter provides adequate working space for the diggers and will allow a final internal diameter of about 1.2 meters after the well has been lined.

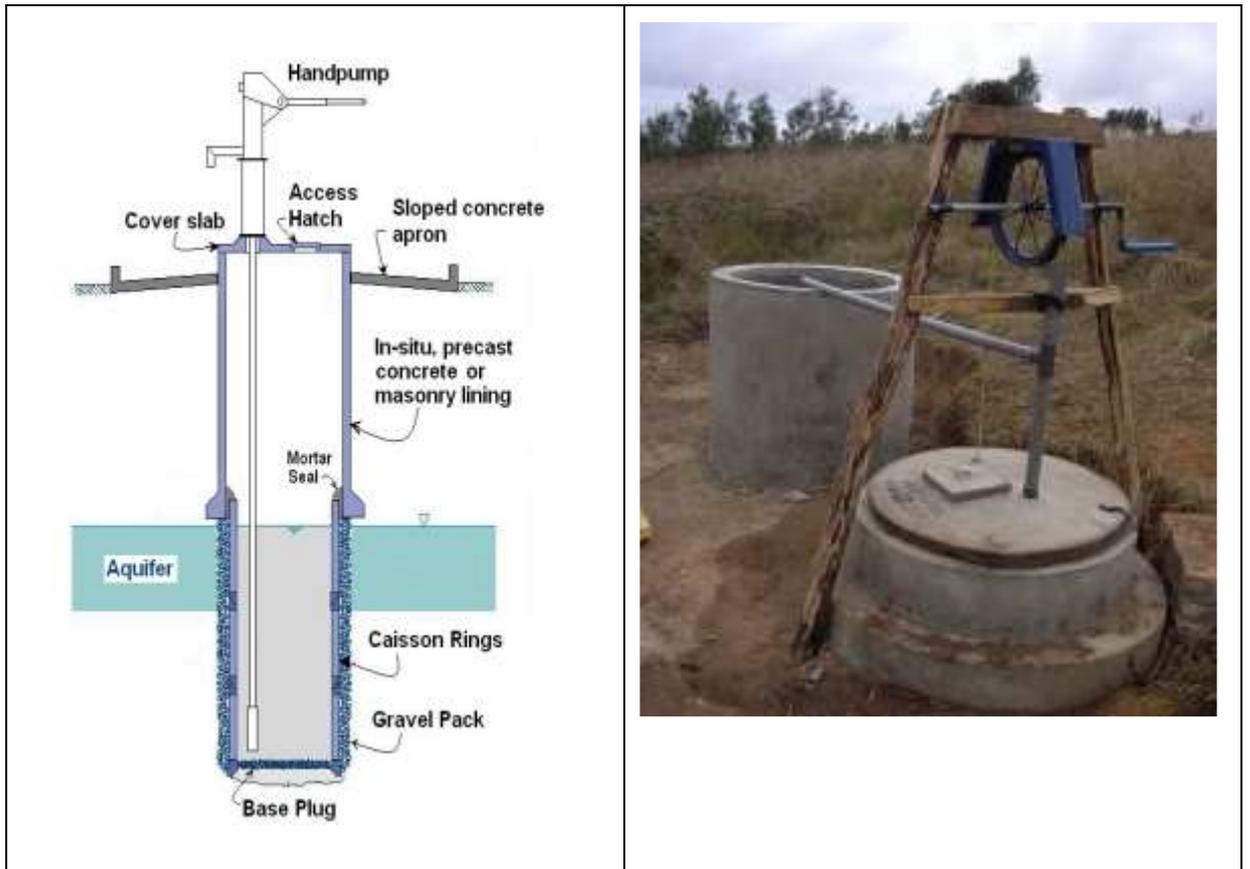
Hand Dug Wells can be lined, unlined or a combination. In all wells, however, at least the top 3 metres should be lined to prevent (potentially dirty) surface water seeping in.

There are several options available for lining a well shaft. These are: 1) Precast concrete ring (caisson), 2), in-situ concrete,3) Masonry lining, 4) ferro-cement lining.

With suitable design, windlass, bucket pumps, or a variety of other low technology pumps can be used in place of a commercial hand pump (Afridev, Indian Mark-II, Rope Pump etc).

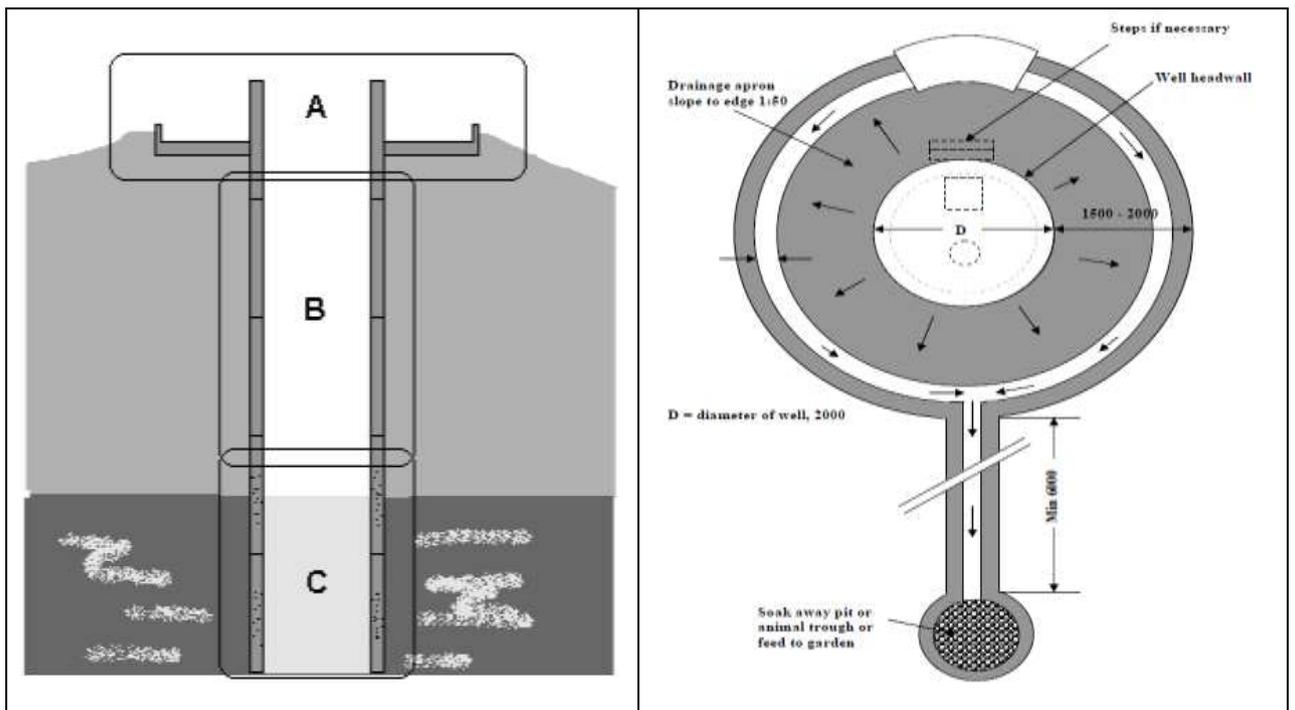
This water supply technology is recommended where there are no spring resources, and where the water table is close to the surface. Hand dug wells can serve up to 350 people.

Figure 2-1: Hand Dug Well fitted with Hand and Rope Pumps



The elements of hand dug well are A) The Well Head, B) The well shaft and C) The intake as illustrated in Figure below.

Figure 2-2: Elements and Layout of Hand Dug Well



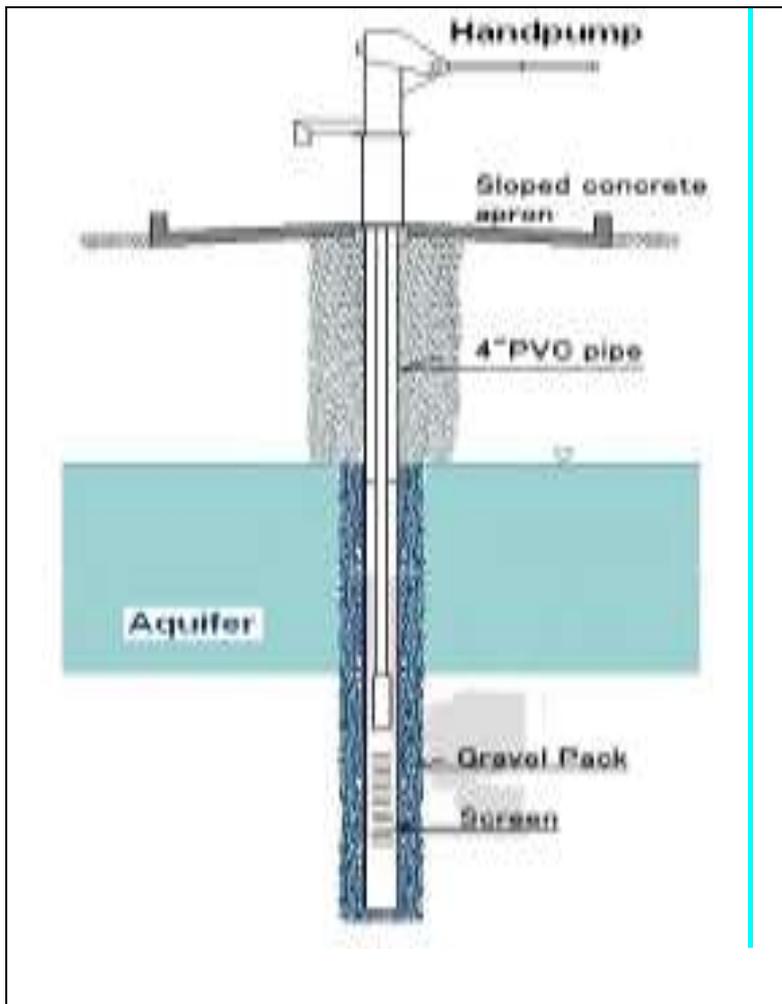
2.3 Shallow Well

This system is an advanced type of hand-dug well which is constructed in accessible area by a medium drilling rig which can reach greater depth than hand-digging. The major advantage of using shallow wells over hand-dug wells is: 1) they can be reaching up to 60 meters depth, 2) they are not risky during the dry season, and 3) they cannot be polluted easily.

Shallow drilled wells are wells which have been drilled with drilling machine and lined with uPVC or steel casing. This type of wells could be fitted with Village Level Operation and Maintenance (VLOM) type hand pumps and the diameter of the wells is usually 4 to 6 inch.

Cleaning of such well is not done manually but with the use of pumps, surging and or bailing. Thus it requires drilling machine, pumps and accessories and trained personnel. To this effect cleaning and developing of such well is done by drilling company or by the Regional Water Bureaus. Therefore, when there is a need to do such work the Water Sanitation and Hygiene Committee (WASHCO) should contact the WWO. Regarding the maintenance of the well head and the hand pump it is identical with the hand dug well. However, if the well is fitted with pumps such as Indian Mark II a tripod, chain block and pipe clamp is required for maintenance of the pump as one should remove all the riser pipes. Hence, it should only be done by qualified technician. A typical shallow well is presented in Figure 2-3.

Figure 2-3: Typical Shallow well fitted with Hand Pump



2.4 Spring Development

Springs are outcrops of groundwater that often appear as small water holes or wet spots at the foot of hills or along river banks.

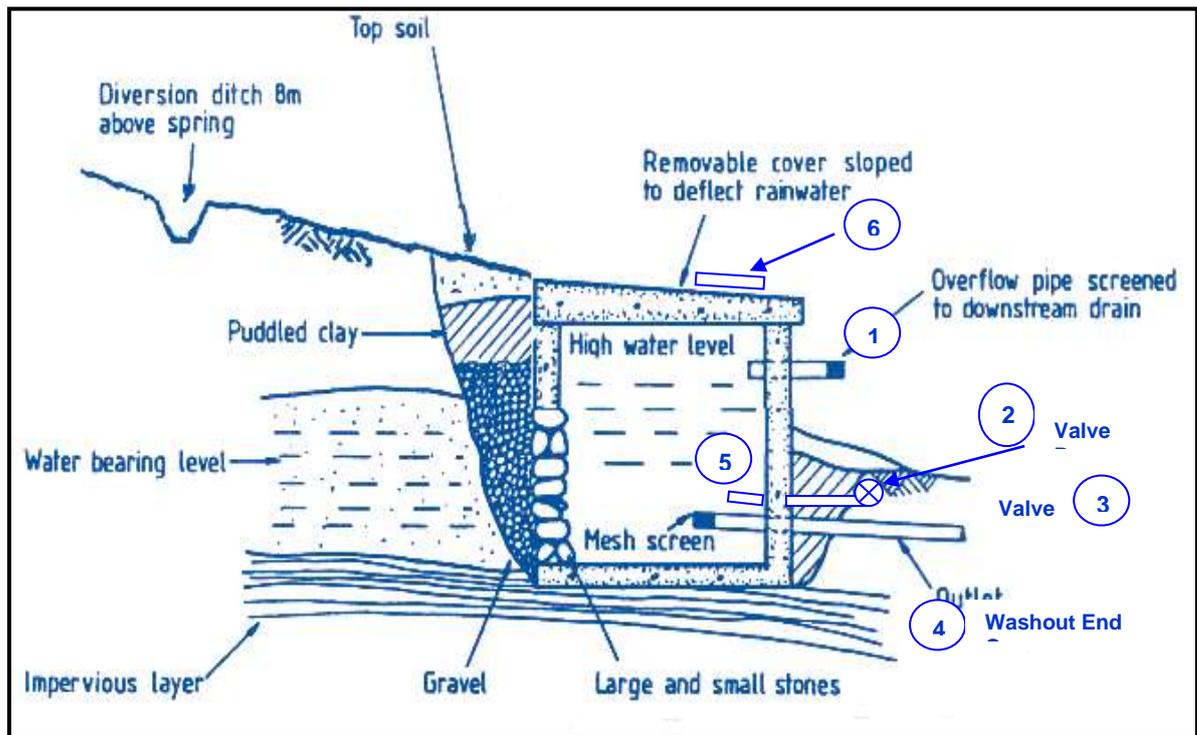
Springs are classified according to the conditions under which water flows to them. 1) gravity depression spring, 2) gravity overflow spring, 3) Artesian depression spring, 4) Artesian fissure spring, 5) Artesian overflow spring. All these types of springs require different types of development structures.

The main parts of a spring protection are a drain under the lowest natural water level, a protective structure providing stability and a seal to protect surface water leakage. The drain usually is placed in a gravel packed and covered with sand & may lead to a conduit or a reservoir as can be seen in the figure below.

A spring source can be used either to supply a gravity scheme or just to provide a single outlet, running continuously. To prevent waste, any flow which is surplus to that required for domestic use can be used to irrigate kitchen gardens.

2.4.1 On- spot Spring Development

This involves protecting the spring and then guiding the water to a collection chamber. This is then connected to a water point or on-spot uses, and if needed a cattle trough. Each spring capping can serve up to 1000 beneficiaries.



If the flow from the spring is not sufficient to meet peak demands during the day, a storage tank can be incorporated into the structure of the spring protection. This enables the flow from the spring over the full 24 hours to be stored, and then used throughout the day to meet intermittent demands by means of a tap in the structure.

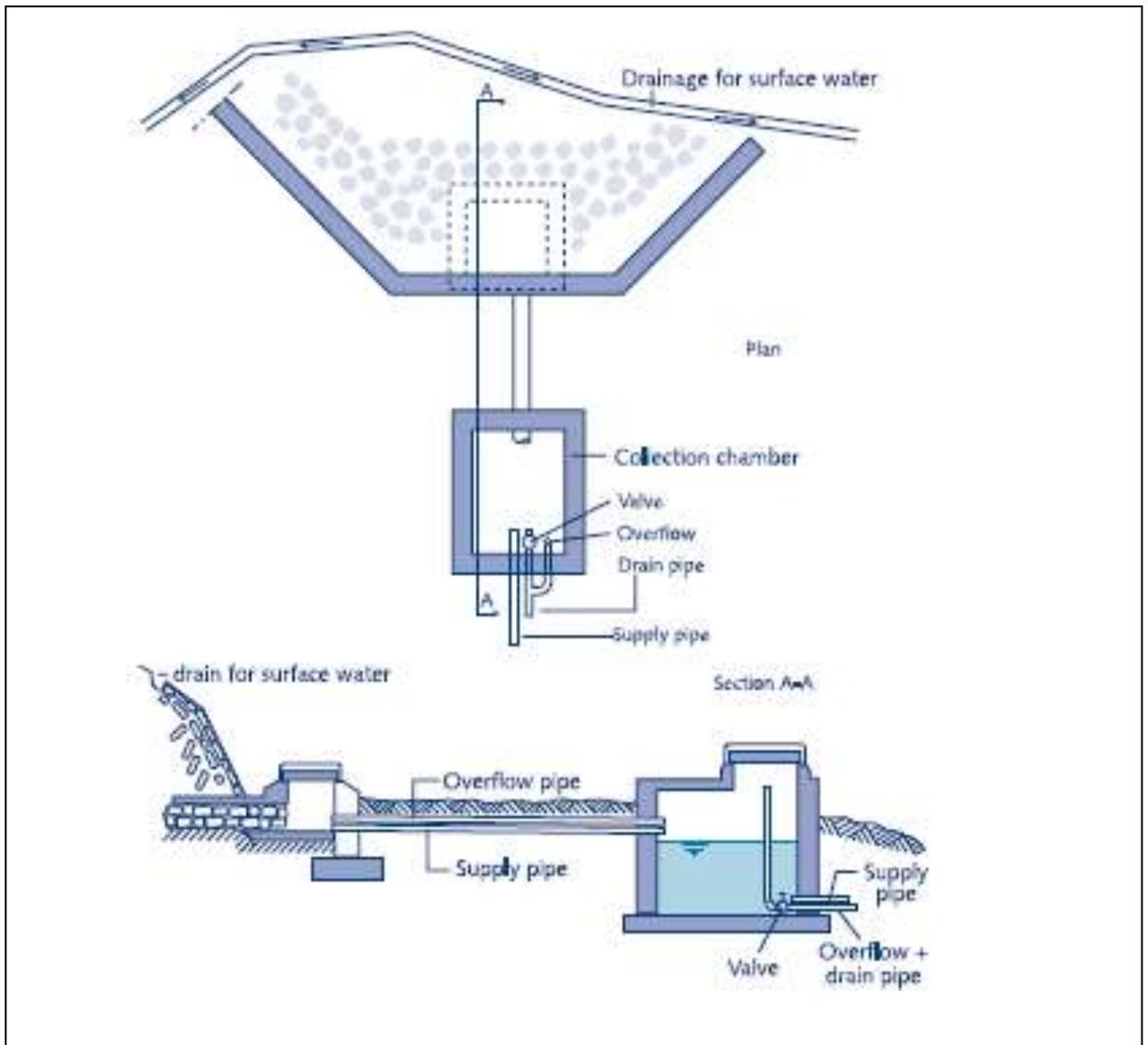
A flow in excess of 0.1 liters per second is sufficient to fill a 20 liter container in just over 3 minutes, which is an acceptable waiting time. From such a spring a daily useful yield of about 3000 liters can be expected, which is enough water for about 150 people.

If the flow were to be only 0.05 liters per second it could still be made to supply the same population by incorporating a storage tank of one cubic meter capacity.

If the flow were to be 0.5 liters per second or more the source would be suitable to supply multiple outlets or a piped gravity scheme.

In all cases, a spring should be protected from surface-water pollution by the construction of a deep diverting ditch or equivalent above and around it. The spring and the collecting basin should have a watertight top, preferably concrete, and water obtained by gravity flow. Covers for inspection manholes, when provided, should be tightly fitted and kept locked.

Figure 2-4: typical spring development plan and section



2.4.2 Pumping and Gravity Feed System

This part is not the scope of the assignment.

2.5 Technology Options

As per the TOR, this guideline focuses on low technology options such as handpumps. Among many types of handpumps, the adaptation of handpumps in Ethiopia is specific. These are Afridev, Indian Mark-II and Rope pumps. Standardization of handpumps is required based on site specific. Details of the selected options of technologies are presented in part-c of this guideline.

RURAL WATER SUPPLY POINT SOURCES

(Parts A, B, C, D)

Technology and Management

Part-C - Technical O&M Requirements

Document 2

Part-C - Technical O&M Requirements

Table of Contents

List of Tables	iii
List of Figures	iv
List of Annexes	iv
3. TECHNICAL REQUIREMENTS FOR OPERATION AND MAINTENANCE	1
3.1 General	1
3.2 Causes of Failures of Water Supply Schemes	1
3.3 Factors Affecting Sustainable O&M Management	2
3.4 Steps towards Sustainability of RWS Schemes	4
3.4.1 Technical Aspect	4
3.4.2 Spare part Supply Aspect	4
3.4.3 Institutional Aspect	5
3.4.4 Social Aspect	6
3.4.5 Monitoring Aspect	8
3.5 O&M Requirements for Hand- Dug Well	8
3.5.1 Maintaining Well Sites	8
3.5.2 Involving the Community	9
3.5.3 What to Do If Your Well Dries Up	10
3.5.4 Make Sure the Well is Clean	12
3.6 O&M Requirements of Shallow Well	12
3.7 Hand Dug Well and Shallow Well fitted with Hand Pump	12
3.7.1 The Hand Pumps	12
3.7.2 Types of Hand Pumps	13
3.7.3 O&M Activities for Hand Pumps	14
3.7.4 Maintenance of Afridev Hand Pump	14
3.7.4.1 Components of the Hand Pump & their Functions (AFRIDEV)	14
3.7.4.2 Steps in Maintenance of Afridev Hand Pump	17
3.7.4.3 TASKS OF CARETAKERS	17
3.7.4.4 Routine Maintenance of Afridev Hand Pump	24
3.7.4.5 Tools and Spare Parts required for Handpump Maintenance	25
3.7.4.6 SOLVE MINOR PROBLEMS	26
3.7.4.7 Keep Tools and Parts	27
3.7.4.8 Keep Records	28
3.7.4.9 Use the Pump Properly	29
3.7.4.10 Everyone is a CARE-taker	30
3.7.5 Indian Mark – II Hand Pump	31
3.7.5.1 Components of the Hand Pump & their Functions (India Mark II)	31
3.7.5.2 General Maintenance Schedule	34
3.7.5.3 Maintenance Procedure	38
3.7.5.4 Routine Maintenance	39
3.7.5.5 SOLVE MINOR PROBLEMS	39
3.7.5.6 GET HELP WITH MAJOR PROBLEMS	40
3.7.5.7 KEEP TOOLS AND PARTS	41
3.7.5.8 KEEP RECORDS	41
3.7.5.9 Use the Pump Properly	42
3.7.5.10 Everyone is a CARE-taker	43

3.7.6	Troubleshooting – Causes and Remedies	45
3.7.7	Rope Pump	47
3.7.7.1	The advantage and disadvantage of the Rope pump	48
3.7.7.2	Various Rope pump models	48
3.7.7.3	General data of the Rope pump	49
3.7.7.4	Operation of Rope Pump	49
3.7.7.5	Regular maintenance	50
3.7.7.6	Other Maintenance Requirements	51
3.7.7.7	Operation- and Maintenance sheet	51
3.7.7.8	Description of O&M Activities for Rope Pump HDW	52
3.7.8	O&M Resources for Had Dug Well	53
3.8	Spring Collection Chambers	54
3.8.1	Description of O&M requirement for On-Sport Spring	54
3.8.2	Maintenance Schedule	54
3.8.2.1	Organise Your Work	54
3.8.2.2	Work with the WUC/WASHCO	55
3.8.2.3	Inspect the Spring Box, Reservoir, Tap Stand and Site	56
3.8.2.4	Routine Maintenance	59
3.8.2.5	Solve Minor Problems	60
3.8.2.6	Get Help with Major Problems	61
3.8.2.7	Keep Tools and Parts	61
3.8.2.8	Keep Records	62
3.8.3	Proper Use of the Developed Spring	63
3.8.4	Get the Community Involved	63
3.9	Capacity Building and Training	64
3.10	Preventive Maintenance	64
3.11	Unscheduled Maintenance	64
3.12	Support System of Operation and Maintenance	65
3.12.1	Government Support	65
3.12.2	NGOs Support	65
3.12.3	Financers Agencies Support	65
3.12.4	The Private sector Support	65
3.13	Health and Environmental Requirements	66
3.13.1	Hygienic Operation and Use	66
3.13.2	Household Hygiene	67
3.13.3	Environmental Hygiene	67
Annexes		68

List of Tables

Table 3-1: Critical factors affecting O&M Management	2
Table 3-2: Comparison between Indian Mark-II and Afridev Hand Pumps	13
Table 3-3: Component of an Afridev Hand Pump	15
Table 3-4: Example of maintenance record keeping format	29
Table 3-5: Feature of an Indian Mark-II Hand Pump	31
Table 3-6: Schedule of spare parts for Indian Mark-II handpump	41
Table 3-7: Example of Maintenance record keeping format for Indian mark-II handpumps	42
Table 3-8: Trouble shooting for Afridev	45
Table 3-9: Trouble shooting for India Mark II	46
Table 3-10: others rope pump maintenance requirements	51
Table 3-11: Summary of O&M Requirement for Spring Protection	58
Table 3-12: Solving Minor Problems for Spring Box	60

Table 3-13: Spring Chamber Maintenance Sheet	63
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List of Figures

Figure 3-1: Conceptual Framework for Sustainable O&M Management	3
Figure 3-2: Components of Well Site to be cleaned	9
Figure 3-3: Involvement of Community in Site Cleaning	10
Figure 3-4: Deepening the Hand-Dug Well	11
Figure 3-5: 3-D of Hand-Dug well fitted with Hand Pump	11
Figure 3-6: Cross-section of the upper and the Cylinder of the Afridev Pump	16
Figure 3-7: Details of Afridev Hand Pump	17
Figure 3-8: Pictorial demonstration of Weekly hand pump inspection	21
Figure 3-9: Pictorial shows stroke test	23
Figure 3-10: Lists of Fast moving spare parts	25
Figure 3-11: Basic Tools required for handpump maintenance	26
Figure 3-12: schedule of spare parts for Afridev handpump	28
Figure 3-13: Cross-section of the upper part of Indian Mark-II	33
Figure 3-14: Details of Indian Mark -II Hand Pump	34
Figure 3-15: graphic demonstration of the weekly Inspection of the pump	35
Figure 3-16: Pictorial demonstration for stroke test for Indian Mark-II handpump	36
Figure 3-17: Pictorial demonstration for bucket test for Indian Mark-II handpump	37
Figure 3-18: Typical Rope Pump	47
Figure 3-19: AB and AH Model Rope Pump	49
Figure 3-20: Typical Feature of On-Spot Spring Box	58

List of Boxes

Box 1: Procedures for organizing the community for site cleaning by the caretakers	10
Box 2: Major Tasks of Caretakers	18
Box 3: Caretakers Report content	19
Box 4: Checklist for Weekly Inspection of hand pumps	20
Box 5: Checklist for monthly inspection of handpumps	22
Box 6: Procedure for stroke test	22
Box 7: Procedure for bucket test	23
Box 8: Rules for proper utilization of schemes	29
Box 9: Checklist for weekly inspection of Indian Mark-II hand pump	35
Box 10: Checklist for Monthly Inspection of Indian Mark-II hand pump	36
Box 11: Checklist for Annual Inspection of Indian Mark-II hand pump	38
Box 12: Daily Activities for rope pump HDW	52
Box 13: Monthly Activities for rope pump HDW	53
Box 14: Annual Activities for rope pump HDW	53
Box 15: Caretakers task for the spring water sources	54
Box 16: Caretaker report contents to WASHCO	55
Box 17: Lists of Spring Box, Reservoir and Public Water point Inspection	56
Box 18: Procedures for Routine Maintenance of Spring Box	60
Box 19: Typical hygienic rules for users	66

List of Annexes

Annex A: Afridev Hand Pump Maintenance and Repair Sheet	68
Annex B: Weekly and monthly Inspections Sheet	73
Annex C: Maintenance Record Sheet	75
Annex D: Details of Indian Mark-II, Extra Deep and Mark-III	76

Annex E:	Indian Mark-II Hand Pump Maintenance and Repair Sheet	77
Annex F:	Monthly check sheet for spring Type-1	85
Annex G:	Monthly check sheet for spring Type-2	86
Annex H:	Monthly check sheet for spring Type-3	87

3. TECHNICAL REQUIREMENTS FOR OPERATION AND MAINTENANCE

3.1 General

This part deals with what is required for a water supply to function in the long term. The requirements are broader, but this guideline focuses on the hand dug well, shallow well fitted with handpumps and on-spot spring.

The purpose of this guideline is to give an overview of the roles and responsibilities of various stakeholders in O&M management of inspection, day to day operation and preventive maintenance to be carried out for low technology options.

This guideline is divided into three sections. The first section covers operation and maintenance of Hand Dug Wells fitted with Afridev, Indian Mark-II and Rope Handpumps, and the second section covers operation and maintenance of Shallow wells fitted hand pumps and the third section deals with the operation and maintenance of Spring Developments.

3.2 Causes of Failures of Water Supply Schemes

Assessment of existing situation of the rural water supply schemes was conducted prior to the preparation of this manual. One of the methods of the assessment was conducting key informant interviews at MoWIE and four major regional Water Bureaus. According to the findings, the causes of failure of the rural water supply schemes are the following:

- Inappropriate design of water supply schemes: Poor design is often compounded by inadequate supervision of construction, Poor construction quality and workmanship. Digging HDW in wet season mislead the yield of the wells, consequently, it would dry up during the dry period,
- A focus on new schemes construction and expansion by government and NGOs and Donors that neglects the maintenance of existing water supply schemes,
- There are often inadequate data recording for planning O&M. Data are required, for example, on the cause of breakdowns and the maintenance and repair costs involved. O&M can then be planned based on field experience,
- A lack of training and understanding of maintenance procedures leads to the poor performance of O&M staff (operators, mechanics, caretakers, etc.),
- The lack of human resources capacity at all level and poor financial management, this issued pronounced in Woreda level,
- Lack of contribution of money by the community. Communities, especially who use low technology facilities do not pay for the water they use,
- Lack of community involvement and subsequent sense of ownership,
- Poor community organization or cohesion; lack of follow-up support and/or training; the unavailability or high cost of spare parts,
- No functional supply chain exists. The existing supply chain is in fragmented way. World Bank was commenced a comprehensive supply chain for hand pumps supply but still not functional,

- Although various O&M manuals, exists, which developed by GTZ, UNICEF, ESRDF, UNDP, World Bank, WaterAid and other NGOs, most of the water supply schemes managed without adapting those already developed manuals,
- Private sectors involvement in spare part provision is very less even if the water policy stated their participation. The World Bank financed WaSH program was tried to address the private sector involvement like LSP, WSG, CFT etc, but now is not functional,
- Provision of incentive for WASHCOs is absent to encourage the members to work actively,
- The Health and Agricultural sector established link among the kebele and federal level, like Health Extension Workers (HEWs) and Development Agents (DAs), but for the water sectors such set up does not exists, which have negative implication in sustainability of the schemes. People came from TVET, do not get further training to capacitate them.
- Appropriate budget do not allocated for O&M.
- Money management by the WASHCOs is poor, they have not audited, as a result the collected money abused,
- Region/Zone/Woreda water offices execute maintenance work upon request and provide back up support when funding is available. It is difficult to prioritize O&M given that financial resources are so limited particularly for multi village and motorized schemes,
- Legal framework for local community for establishing WASHCO association, putting in place enabling laws is a good start to reinforce community management and accountability,

3.3 Factors Affecting Sustainable O&M Management

The most appropriate operation and maintenance strategy for a particular supply will depend on a range of factors:

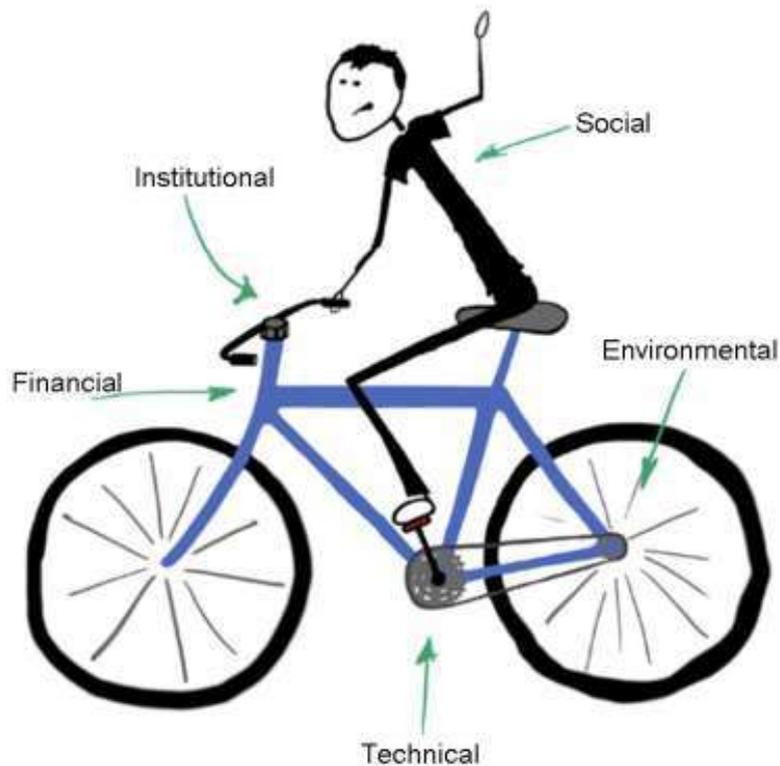
Table 3-1: Critical factors affecting O&M Management

No.	Factors	Description
1	Technology	complexity, familiarity, standardization, spares availability and skills required
2	Demography	scattered or dense population; numbers of people served
3	Environment	effect on the water source; effect on materials and equipment
4	Accessibility	main road or remote water supplies
5	Cost	Total cost of O&M and the cost per individual user - what are users willing and able to pay?
6	Management	level of community organization and cohesion; existing management structures and skills; efficiency of support agency management

No.	Factors	Description
6	General economy and level of development	inflation; stability of prices; fluctuation in incomes; availability of skills, tools, equipment and services
7	Government policy and legal framework	Government-promoted O&M strategies; legal ownership; accountability and the allocation of responsibilities.

The above listed bullets are the major constraints for the sustainable O&M management. In conceptual framework it can be demonstrating with the following picture.

Figure 3-1: Conceptual Framework for Sustainable O&M Management



A bicycle has been used to illustrate that components of sustainability depend upon each other; for a bike to work effectively, it needs a frame, handle bars, wheels, a crank and chain, and someone to ride it. Without any one of these, the bike will not work as it should.

For sustainability, the social, financial, technical, institutional and environmental components must also be in place and working effectively. If there are deficiencies or failures in any of the components, sustainability of the water supply schemes will be compromised. Components of the bike are not analogies for components of sustainability; there are not particular characteristics of a wheel that make it inherently more representative of the environmental component than any other. What the conceptual framework portrays is the importance that all components depend upon each other in order for the system to work effectively

3.4 Steps towards Sustainability of RWS Schemes

3.4.1 Technical Aspect

One of the technical issues of sustainability raised was the lack of appropriate study, design and construction quality. Thus, in order to ensure the sustainability of the scheme, the following step should be taken in to considerations. These are 1) water demand assessment (quantity, quality and distance from the water sources, 2) water sources assessment (a single or two or more sources in the vicinity of the community, 3) review of technical options (a range of technological choices exists, and select the appropriate one, 4) review of O&M requirements (These will include the tools, spare parts, skills, management needs and finances required to sustain operation and maintenance and 5) Technology options.

3.4.2 Spare part Supply Aspect

It was indicated that one of the problem of non-functionality of schemes is the lack of proper supply chain management and provision of spare parts. The following steps are crucial to provide spare parts sustainably.

It was indicated that one of the problem of non-functionality of schemes is the lack of proper supply chain management and provision of spare parts. The following steps are crucial to provide spare parts sustainably.

Step-1: Review of technology

The National WaSH Inventory is a good opportunity to identify the existing available technologies. This will help to determine which items of equipment and which components the supply chain must deliver.

Step 2: Demand assessment

Following on from the technology review a demand assessment exercise must be conducted. The aim of this is to assess the respective demands for different components and related tools and equipment. This can be conducted by combining a series of visits to user communities and interviews with existing distributors and suppliers.

Step 3: Profit forecast

Once the demand has been estimated the annual profit that is likely to be generated through stocking and selling each component can be forecast. If there are no local retailers, figures for the nearest retailer (for example in the capital city) will need to be adjusted for local application.

Step 4: Incentive review

Once the annual profit for a given area has been estimated it is necessary to evaluate whether this profit would provide sufficient incentive for private sector (commercial) participation.

Step 5: Procurement practice review

Following the incentive review it is necessary to undertake a review of how equipment and pumps are currently procured and what procurement measures could be undertaken to increase incentives and strengthen the supply chain.

Step 6: Stakeholder consultation

The penultimate step in the process is to conduct a consultation exercise involving all relevant stakeholders. This will establish firmly the supply chain option that should be adopted based on incentive levels, stakeholder capacity and stability.

Step 7: Action plan

Once agreement has been reached about the supply chain to be set up and the respective roles and responsibilities for each stakeholder, an action plan should be formulated which defines how and when the supply chain will be set up and the stages involved in this.

3.4.3 Institutional Aspect

In order to ensure that institutional aspects have an optimum positive effect on water service sustainability there are six key steps:

Step -1: Programme approach:

The first step is to recognize that rural water supply should be delivered as a **service and managed as a programme**. Any programme should last indefinitely and include provision for ongoing regulation and monitoring. Programmes should incorporate the provision of new water systems, upgrade and expansion of existing systems, and ongoing operation and maintenance of all systems. Like the WaSH Program formulated by the World Bank financed 5 years program. The developing WaSH Implementation Framework (WIF) is a good opportunity to adapt the planning, implementation and Operation and Maintenance as a Program that Government, Donors, NGOs and other guided by this “one WASH framework”.

Step – 2: Stakeholder participation analysis:

The second step is to investigate the interests, incentives, disincentives and capacity of each relevant stakeholder, in order to assess their willingness and ability to be involved.

This is likely to be carried out at Woreda, Zone and Regional levels, although findings should be reported at national level to influence national institutional strategies. The analysis will help to define stakeholder roles and lead to the selection of the most suitable institutional model. Stakeholders to be considered are government institutions at all levels,

Step – 3: Selection of partnership model:

Once the particular incentives and capabilities of different stakeholders have been assessed these can then be matched to the requirements for different partnership models.

Firstly, the dominant partnership model(s) that exist in the country should be assessed to examine where and why they might be inadequate. Subsequently a decision can be made as to whether to improve the existing model(s) or opt for something new. The SNNP and Amhara cases can be applied as a model but need to upgrade it.

If any stakeholder is unable or unwilling to undertake their responsibilities for a particular model then an alternative should be sought. The final choice of institutional model should be made through a consultation exercise in which all relevant stakeholders actively contribute.

Step – 4: Capacity building

It was confirmed during the key informant interviews made at MoWIE and the four regional water bureaus that there has not been continuing capacity building, even it has been there, is not effective to manage the rural water supply schemes so there is still likely to be a need for capacity building. Once roles and responsibilities are clearly defined the necessary skill gaps should be identified for all stakeholders to identify obstacles that may prevent them from fulfilling their respective roles. Appropriate capacity building measures should then be implemented to rectify any shortcomings.

These may include training of community members in book-keeping, financial investment options or maintenance activities; training of government staff in financial and contract management and monitoring and evaluation; or training private sector organizations in community liaison. These activities take time, especially those involving communities. Communities should not be rushed just because the implementing agency wants to construct facilities quickly in order to meet targets.

Step – 5: Financial planning

It is essential that governments and donors make adequate budgetary allocation for regulatory and support activities. The cost of quarterly monitoring visits to all communities, including social and technical assessments, should be budgeted for, as should all costs associated with capacity building activities. Financial models should also be developed for long-term rehabilitation and upgrading.

Lesson was learnt that appropriate budget has not been allocated for O&M, like what proposed in WIF, the allocation of budget by various stakeholders should be in place.

Step- 6: Performance improvement plan

The final step is to develop a performance improvement plan which takes the key outputs of all the steps so far to form a time-bound action plan to improve performance of stakeholders and the effectiveness of institutional partnerships.

This plan can be developed through a problem-tree approach whereby the key problems or barriers to sustainability related to institutional issues are identified, and objectives are then developed to overcome these. Refer Part – H of this manual.

3.4.4 Social Aspect

Community and social issues undoubtedly have a considerable influence on the sustainability of water systems and services regardless of what management system is used. The following steps should be taken in to consideration to ensure that social factors have the maximum beneficial impact on service sustainability. This process should be carried by the implementing agency at community level.

Step – 1: Demand assessment

The first step in the process is to measure community demand for an improved water supply. This can be achieved by conducting a series of consultations with different groups and individuals within the target community to identify the reasons that community members desire an improved water supply. From the consultation process a range of incentives and priorities can be determined and the expected 'added value' that a new water supply will bring can be measured. At this stage it may be possible to determine whether there is adequate demand for a water supply although this will be more firmly

established after Step 3. In fact this approach applied by the NGOs through baseline survey but little done by the Woredas even if the system in place. In the World Bank financed WaSH Program, it was applied through establishment of Community Facilitation Team (CFT), Woreda Support Group (WSG) and Local Service Provided (LSP), but this has not working longer, but the Consultant recommend to maintain it.

Step – 2: Option identification

The next step is to present a range of water supply options to the community. The options available will depend primarily on environmental conditions, existing water sources, financial feasibility and community priorities expressed during the demand assessment.

Step – 3: Analysis of willingness to pay

A simplified willingness to pay survey should then be conducted to assess the maximum amounts that community members would be willing to pay for each of the different technology options presented to them, both towards initial costs and ongoing O&M costs. O&M costs must be estimated as accurately as possible and this is easiest where detailed records are kept of O&M requirements. Expressing willingness to pay for the water that the community uses is one of the measurements to ensure sustainability.

Step – 4: Technology selection

The information collated in Steps 2 and 3 should then be combined so that the community members are able to select their preferred water supply technology from a range of options, based on the advantages and disadvantages and related sustainability issues for each. The stated willingness to pay should be matched against the projected costs of O&M to determine which options the community can afford. The final choice of technology should be made by the community as a whole and a consensus of opinion should be sought. The key determining factors are generally low cost and the environmental conditions.

Various options are available but most of the existing O&M manuals use specific technological options. These are mainly Afridev, Indian mark-II and Rope pumps. The utilization of these pumps is depending on various issues such as number of users per water point, water sources availability like depth. So that option choice should be site specific.

Step – 5: Analysis of willingness and ability to manage

Once the technology has been selected the willingness and ability of the community to manage their chosen system should be assessed. In order to do this the management requirements for the selected technology should be presented clearly to the community.

This should include a projected breakdown of requirements for operation, maintenance, tariff collection and financial management. Evidence of other community based activities or organizations should be reviewed and it should be made clear that if they are unwilling or unable to manage their selected system this does not mean that the community will not get an improved water supply. Practically such approach was implemented in World Bank financed WaSH Program and that need to be strengthening and continuing.

Step – 6: Selection of management system

The management system selected will depend on the willingness and ability of the community to take on responsibility for management and the range of options available.

This may be influenced by the location of the community with respect to private sector organizations, and by existing management systems in operation in the surrounding area.

Step – 7: Action plan

The final step in the process is to develop an action plan in conjunction with the community to determine a time frame of activities to implement the improved water supply, select individuals/groups to be involved, and develop an appropriate management system as indicated in Part – H of this manual.

3.4.5 Monitoring Aspect

The following outlined steps are recommended to set up an appropriate monitoring system and strategy for sustainable O&M management. The detail is provided in Part F of this manual.

1. Selection of performance indicators to monitor the rural water supply system. These can be management, operation, maintenance and Environmental,
2. Monitoring schedule: Once it has been decided what information the monitoring system should be collecting, the next step is to determine how often this information should be collected,
3. Role allocation: Monitoring activities do not all have to be conducted by the same individual or even the same organization, Roles and responsibilities must be clearly defined, both in terms of who collects the information and also who collates, analyses and uses this information for programme activities. Responsibilities for training and supervising monitoring staff should also be clearly defined.
4. Tool selection and design: It is then necessary to select the particular monitoring tools to be used and to refine these or to design alternatives,
5. Training of staff: Having established the monitoring goals, schedule, tools and roles it is then necessary to ensure that the organizations and individuals given responsibility for monitoring activities are trained effectively,
6. Evaluation and review:
7. Information sharing

3.5 O&M Requirements for Hand- Dug Well

3.5.1 Maintaining Well Sites

A hand dug well/shallow well sites that is in good condition will ensure that handpump users can get water easily and safely. On the other hand, if the site is in bad condition, the handpump will become damaged, the water in the well could become contaminated from external pollutants and people could become sick from using the water from the well.

There are a number of things that can be done to keep the hand dug well site in good condition. All the handpump users can help you to do these things.

A. Keep the Well Site Clean

- ☞ Keep the site free from mud, weeds and excess water. Sweep the concrete apron around the pump every day. Weed it when necessary, and scrub the apron and pump stand to remove green slime when it appears.

B. Drain Spilled Water away from the Well Site

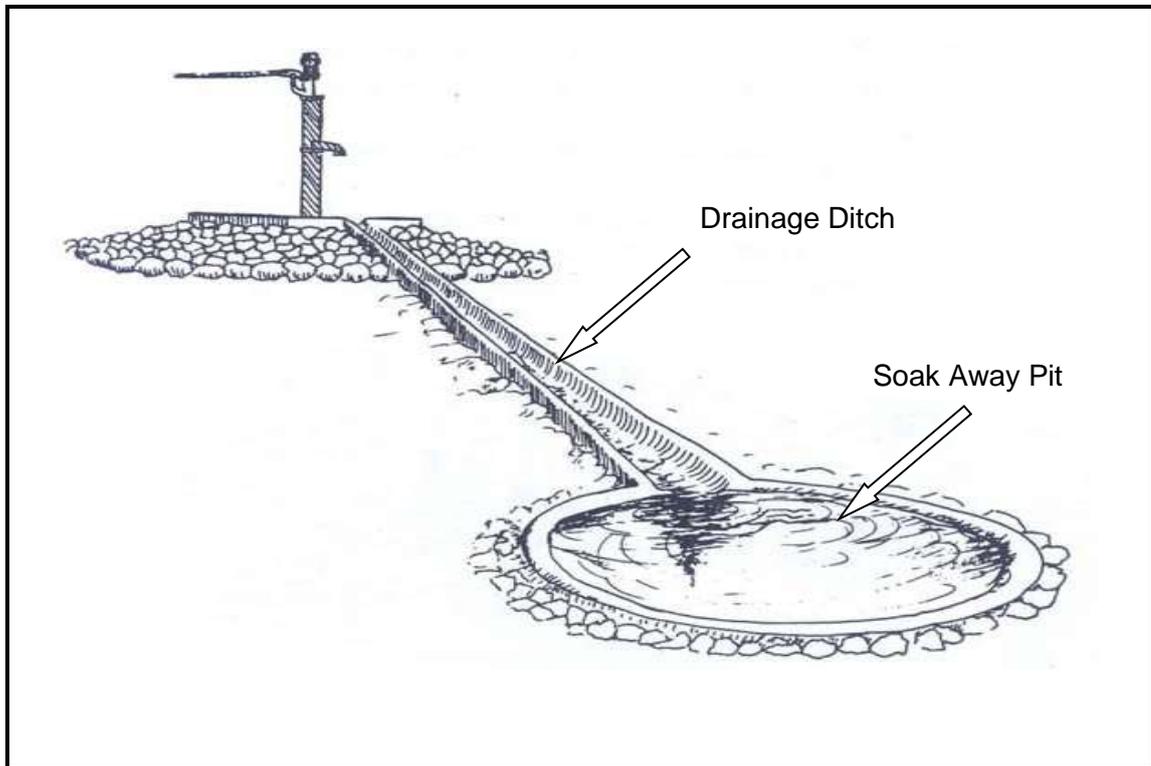
- ☞ Make sure there are no pools of water around the handpump. Stagnant water will cause the area to become muddy, attract mosquitoes and pollute the well.
- ☞ Keep the drainage channel clean and open so that spilled water can drain away to the soakage pit, garden or animal trough.

C. Protect the Concrete Apron and Drainage

- ☞ When the apron and drainage channel are not protected, they will crack and disintegrate. Make sure that they are protected against animals by properly maintaining the fence. If there is a sign of erosion around the apron, protect it by piling stones around it.

Figure below shows the components of the well site that is maintained by caretaker and community.

Figure 3-2: Components of Well Site to be cleaned



3.5.2 Involving the Community

Maintaining the pump site is the responsibility of the **WHOLE COMMUNITY**, not just the caretakers. Your job is to organize the work, not do it all yourself!

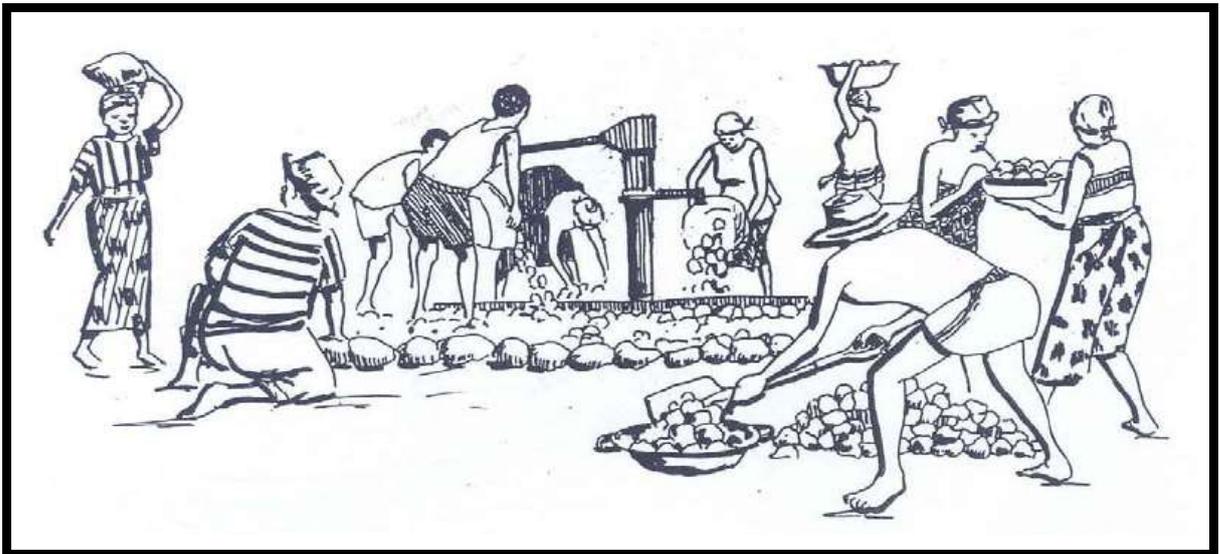
Box 1: Procedures for organizing the community for site cleaning by the caretakers

Here are some ideas for how to organize the community:

- ☞ Call a community meeting and get everyone's view about how best to organize pump site maintenance and rules about pump use.
- ☞ Divide the work of sweeping and scrubbing the apron amongst the women
- ☞ Divide the work of weeding the pump site amongst the men from different sections of the community on a rotating basis.
- ☞ Get children involved in sweeping, scrubbing and weeding.
- ☞ Organize a maintenance day at the end of the rainy season

The following pictures demonstrate the involvement of the community in site cleaning.

Figure 3-3: Involvement of Community in Site Cleaning



3.5.3 What to Do If Your Well Dries Up

During the first few years following the construction of the well, it is possible that it might dry up during the dry season. If this happens, it will need to be deepened.

If the well dries up or is drying up, you should:

- Contact the Woreda Water Resources Office and inform them
- Talk to the Contractor or otherwise the one who constructed the well. If it happens in the first year after construction, the one who constructed the well will return to your community and deepen the well for you at no cost.

- Assist with the deepening of the well under the direction of the Contractor.

If the well dries up more than 1 year after construction, your community may have to pay for the well to be deepened by the Contractor. You should discuss this with the Woreda Administration.

Figure 3-4 shows deepening of well when the static water level drops and lowering of the hand pump.

Figure 3-4: Deepening the Hand-Dug Well

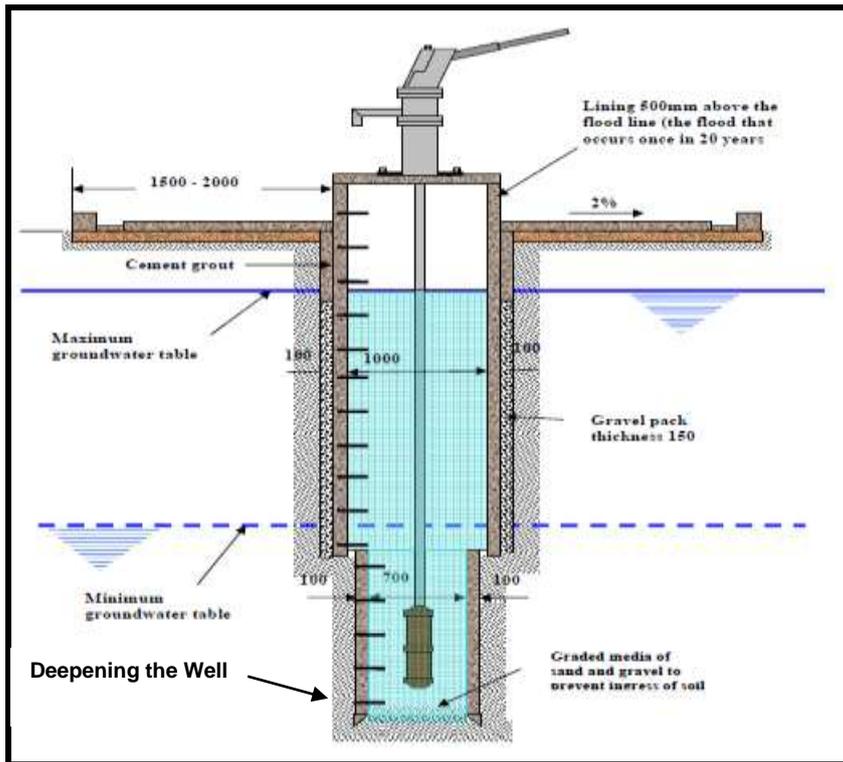
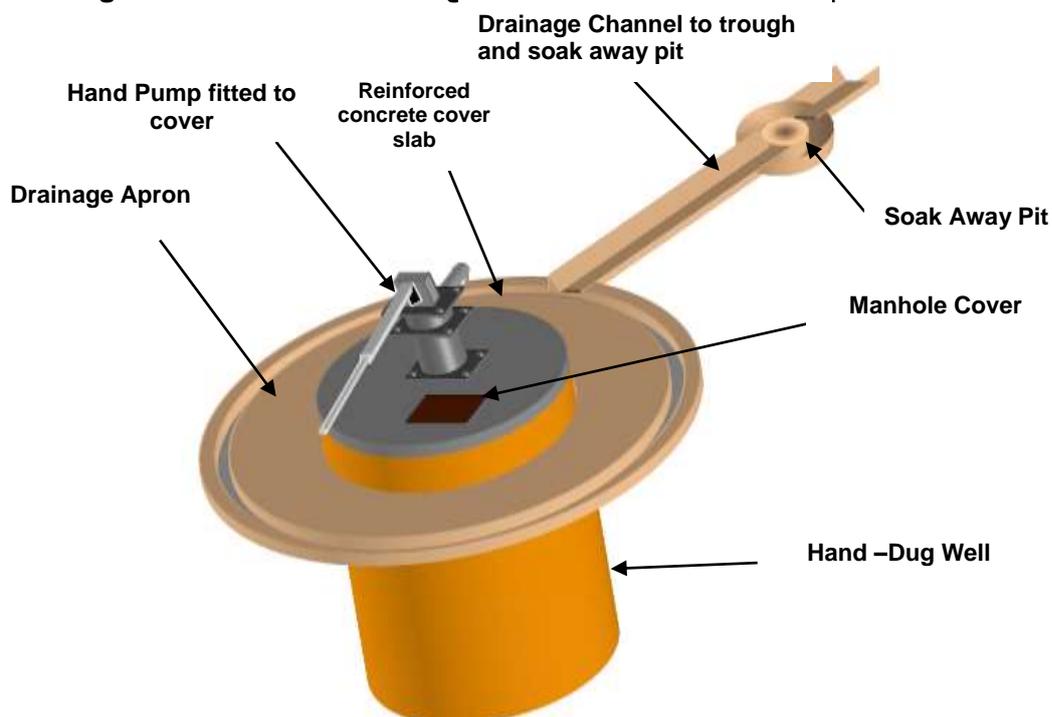


Figure 3-5: 3-D of Hand-Dug well fitted with Hand Pump



3.5.4 Make Sure the Well is Clean

If the well is deepened, or if anyone enters the well for any reason (such as cleaning it or repairing cracked well lining etc) then the well MUST be cleaned and disinfected before it can be used again.

The Contractor and the Woreda Water Resource Office can assist you with this.



3.6 O&M Requirements of Shallow Well

Shallow drilled wells are wells which have been drilled with drilling machine and lined with uPVC or steel casing. The maximum depth of such wells is in the range of 60 m. This type of wells could be fitted with VLOM type hand pumps and the diameter of the wells is usually 4 to 6 inch. Cleaning of such well is not done manually but with the use of pumps, surging and or bailing. Thus it requires drilling machine, pumps and accessories and trained personnel. To this effect cleaning and developing of such well is done by drilling company or by the Regional Water Bureaus. Therefore, when there is a need to do such work the WASHCO should contact the Bureaus. Regarding the maintenance of the well head and the hand pump, it is identical with the hand dug well. However, if the well is fitted with pumps such as Indian Mark II a tripod, chain block and pipe clamp is required for maintenance as during maintenance one should remove all the riser pipes. Hence, it should only be done by qualified technician.

3.7 Hand Dug Well and Shallow Well fitted with Hand Pump

3.7.1 The Hand Pumps

The hand pump is defined as a mechanical water lifting device that uses the pumping motion to extract water from the borehole or well to the surface.

Hand Dug wells and Shallow wells drilled for the use of Hand Pump is generally of 125 mm diameter size, which may be fitted with variety of Hand Pump. Boreholes may be fitted with a variety of pumps. The Afridev, India Mark II and Rope hand pumps are the most common hand pumps used in Ethiopia. The technical requirement for operation and maintenance of these hand pumps is described in this section.

Such type of pumps could be installed in wells which have a depth up to 45 m. Maintenance of such pump does not need crane as there is no need to pull out the riser pipe during maintenance. To maintain and operate the hand pump, Caretakers should know the parts of the hand pump and their functions.

3.7.2 Types of Hand Pumps

Different types of hand pumps installed in Ethiopia. However, for the purpose of this manual focuses on the AFRIDEV, India Mark - II and Rope which are the most popular hand pump in Ethiopia.

Comparison of the most popular Indian Mark-II and Afridev is illustrated in table below.

Table 3-2: Comparison between Indian Mark-II and Afridev Hand Pumps

Criteria	India Mark II	Afridev
International Specification	Specified through Indian Standards. The pump is produced in several countries to these standards. The design is in the public domain and the specifications are available to everybody.	Specified through an International Standard. The pump is produced in several countries to these standards. The specifications are in the public domain and the specifications are available to everybody.
Ease of installation	19 different tools are required for installation. Skilled crew is needed.	8 different tools are needed for installation. Skilled crew is needed.
Ease of repair (major repairs)	A trained village mechanic equipped with special tools is required. For fishing dropped components special equipment is needed.	A skilled mechanic is required for the replacement of perforated riser pipe and fishing of dropped rods. Retrieval of PVC pipes and rejoining them in the field needs proficiency and special equipment
Reliability	Reliable in non-corrosive water with few breakdown interventions.	Reliable, but frequency of maintenance interventions will be comparatively higher due to preventive maintenance requirements. Reliability can suffer badly if used in unlined borewells. When breakdowns occur, in most cases, it can be repaired quickly by the village mechanic. However results from the field indicate that the PVC rising main can fail if they are in contact with the rods.
Corrosion resistance	Galvanized rising mains and carbon steel galvanized rods are not corrosion resistant in water with pH values below 6.5. Stainless steel pipes are available but at a very high cost and are not standard to the specification. Corrosion resistant stainless steel rod option available is standard to the specification.	All below ground components including rising main are corrosion resistant with the exception of galvanized pump rods. Corrosion resistant stainless steel rod option available is standard to the specification.
Abrasion resistance	Riser main and rods have shown excellent abrasion resistance in non-corrosive water. The ball bearings generally last for 3-4 years. The introductions of nitrile rubber cup seal in place of leather cup seals reduce the frequency of below ground repairs by over 50%.	The bearings and the seal have a service life of about one year, but they are less expensive and easy to replace. Rubber centralizers prevent the rods coming in contact with the PVC pipes. They need regular replacement. Hook and eye connectors on the rods are subject to wear and frequent replacement of rods may be expected. Riser main perforation can reach

Criteria	India Mark II	Afridev
		unacceptable levels when used in unlined bore wells.
Suitability for unlined borewells	Can be installed in unlined bore wells.	Should not be installed in unlined bore wells because to avoid corrosion and clogging of foot valve.
Suitability for local manufacture	Asia. Can be produced in a country where industrial infrastructure for steel fabrication, hot dip galvanizing, electro-galvanizing, ferrous and nonferrous foundry and galvanized steel pipes and familiarity with quality control practices and mass production techniques exist. A substantial investment has to be made in tooling.	It is manufactured in Africa and Asia. Can be produced in a country where industrial infrastructure for steel fabrication, hot dip galvanizing, electro-galvanizing, extrusion of uPVC pipes and molding of nylon/polyacetal components and familiarity with quality control practices and mass production techniques exist. A substantial investment has to be made in tooling. The production of the plastic components requires special skills and extensive tooling.
Pumping lift	Can be used up to 45m, extra deep well version for over 45m available.	Can be used up to 45m.

3.7.3 O&M Activities for Hand Pumps

The maintenance of hand pump is identified in two categories.

a) Minor Repairs

The repairing of hand pump which does not require lifting of hand pump assembly is treated as minor repair. The minor repairs of hand pump may be made by a semi-skilled care taker/WASHCOs. This type of repairing involves replacement of handle nut & bolts, repairing of chain, bearing etc.

b) Major Repairs

The repairing of hand pump which involves un-lowering of hand pump assembly is treated as major repairing; this type of repairing cannot be made by WASHCOs and Caretakers and will be carried out by area mechanics/private sectors wherever available. Wherever these area mechanics/private sectors are not available either special training shall be organized by Woreda/Zone/Region Water Bureaus or out sourced.

3.7.4 Maintenance of Afridev Hand Pump

The Afridev Hand Pump is suitable for lifting water up to depth of 45 m very easily. Though, it also works as more as up to 60m but it needs then more maintenance and care. It is suitable for boreholes with casing size of nominal 100mm, 127mm or 200 mm of internal diameter and hand Dug Well.

The AFRIDEV is a true Village Level Operation and Maintenance (VLOM) pump. All the internal moving components can be withdrawn without the necessity of removing the rising main. Pump Caretakers are trained to remove the internal components and replace fast wearing parts.

3.7.4.1 Components of the Hand Pump & their Functions (AFRIDEV)

Table 3-3 below describes each component of the AFRIDEV pump. Please refer to the illustrations after the table for ease of understanding:

Table 3-3: Component of an Afridev Hand Pump

Components	Features
Pump Head	<ul style="list-style-type: none"> ▪ The mechanism above pump stand ▪ Sturdy mild steel box containing the handle pivot ▪ Spout length option of 580 mm to 300 mm ▪ Pump handle made from telescopic handle (hot dip galvanized) pump with special hexagonal bolt. Adjustable T-bar handles to reduce pumping effort. ▪ Welded and hot dip galvanized removable steel cover to protect bearing and object from falling in ▪ Tamper-proof, captive fasteners. Prevents loss and unauthorized interference
Pump Stand	<ul style="list-style-type: none"> ▪ Three pump stand options <ol style="list-style-type: none"> 1. Pump stand with bottom flange 2. Pump stand with 3 legs 3. Pump stand with ISO flange arrangement ▪ Provides hygienic seal and robust design
Rising Main Pipe	<ul style="list-style-type: none"> ▪ uPVC rising main Lightweight, corrosion ▪ uPVC rising main diameter 63 mm OD with bell sockets in 3 m lengths ▪ Other option is uPVC rising main with “Bell end” in 2.9 m lengths ▪ Carries water from cylinder to the water tank ▪ The uPVC pipes are solvent cement joint ▪ Rubber stabilizer to centralize Rising main ▪ Rubber Centralizer to Cement pump rod in rising main reduces wear of rising main ▪ Rope to hold up riser pipes to the steel cone
Cylinder Arrangement	<ul style="list-style-type: none"> ▪ Brass plunger with brass foot valve or brass plunger with plastic foot valve ▪ Plastic plunger with stainless steel fitting for corrosive resistant ▪ uPVC cylinder with brass liner to provide resistance to wear ▪ Foot valve. Easily removable without disturbing the pump head cylinder, cylinder or rising main
Pump Road Arrangement	<ul style="list-style-type: none"> ▪ The pump rod made from three option pipe materials – mild steel, stainless steel or fibre reinforced plastic ▪ Mild steel pump rods with threaded connection ▪ Stainless steel pump rods with threaded connectors ▪ Large bore suction tube reduces inlet velocity and intake of sand

Figure 3-6 indicates basic parts of the hand pump, thus; Caretakers can use the pictures below and match it against the actual parts of the pump itself. Figure 3-7 is also shown detail parts of the Afridev pump.

Figure 3-6: Cross-section of the upper and the Cylinder of the Afridev Pump

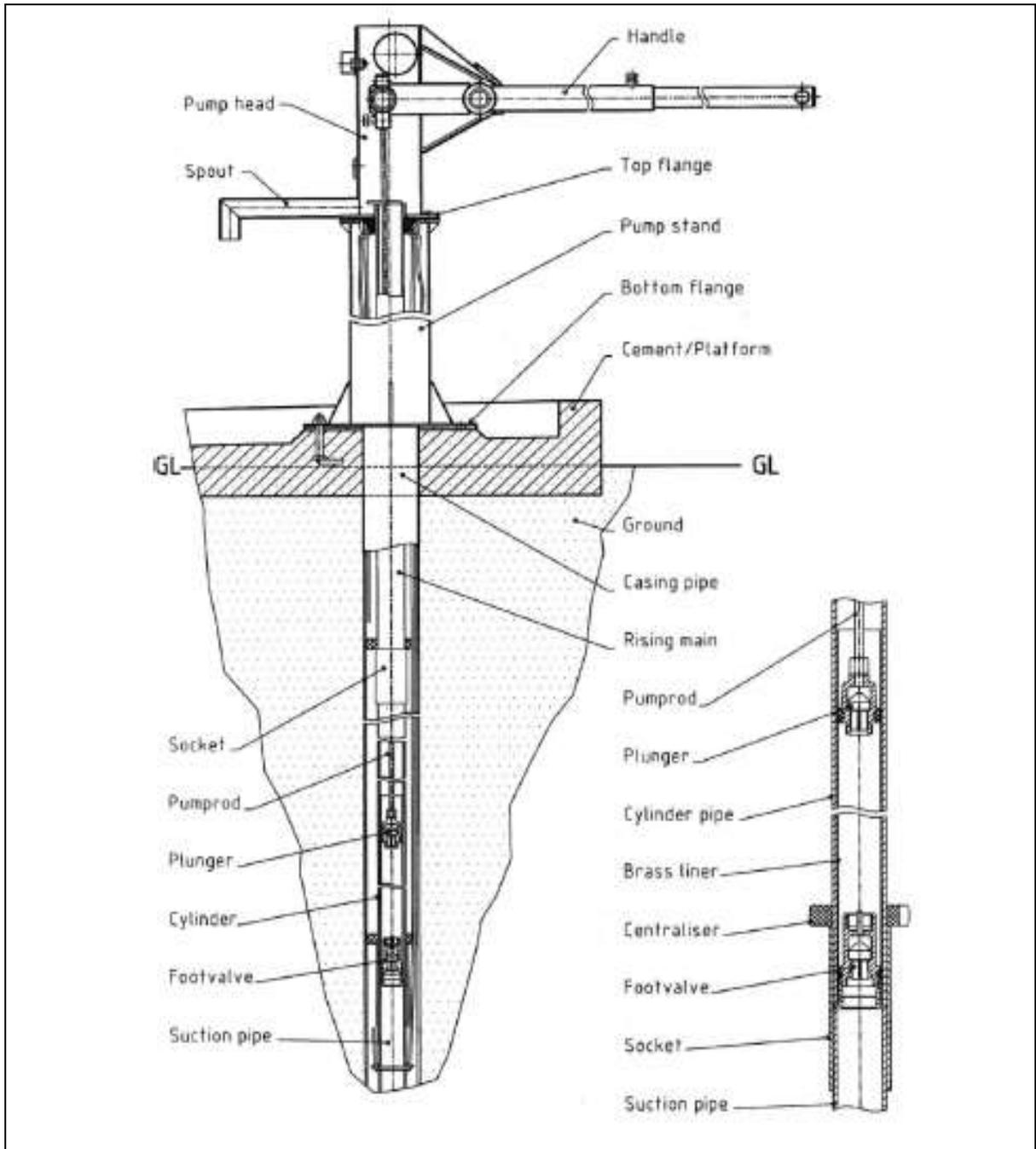
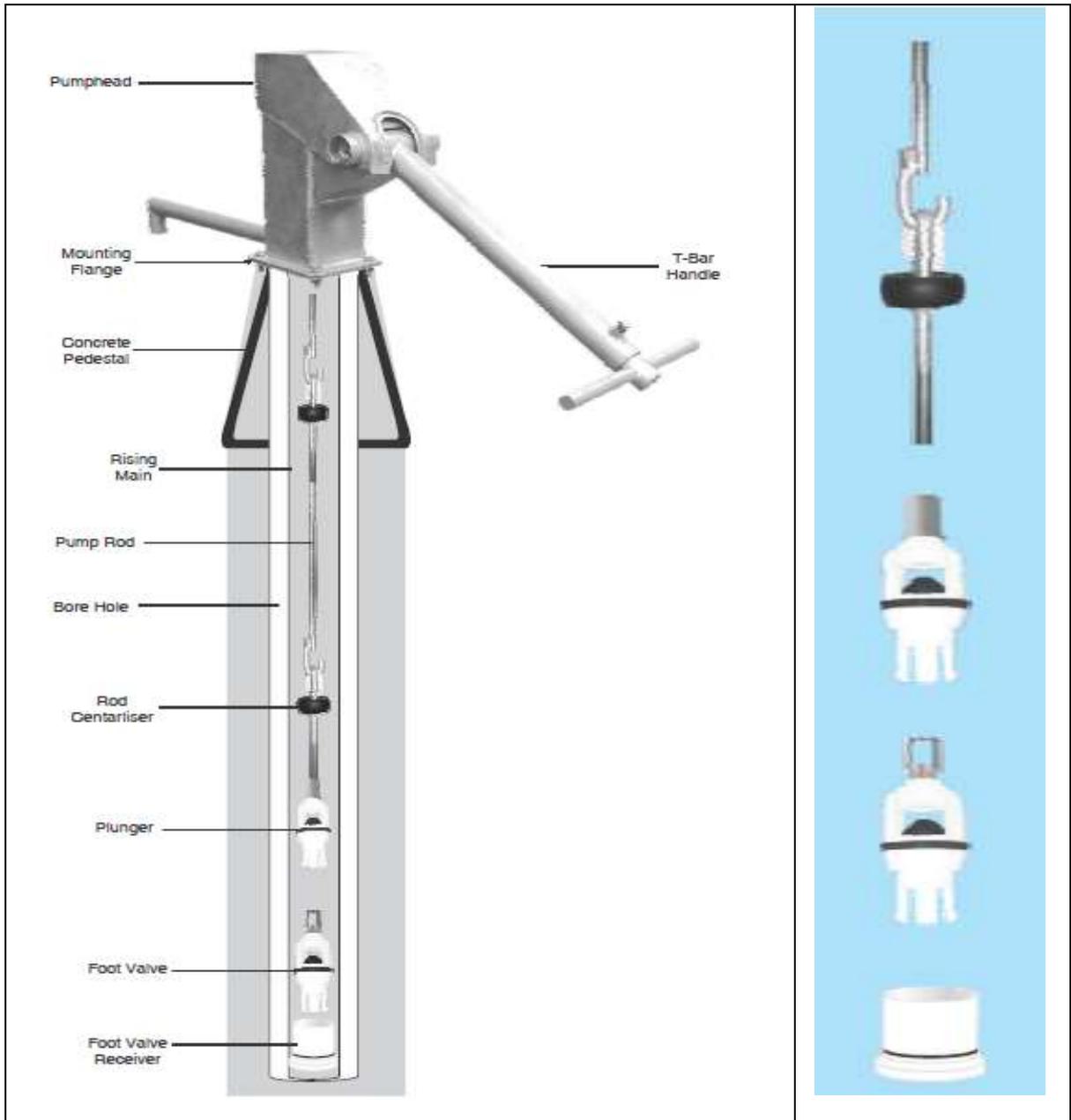


Figure 3-7: Details of Afridev Hand Pump



3.7.4.2 Steps in Maintenance of Afridev Hand Pump

The steps involved in maintenance are to:

- a) Understand the cause for a problem and determine the remedy need,
- b) Dismantle the pump as necessary,
- c) Assemble the pump after replacing defective components,
- d) Record details in the "Maintenance card"

3.7.4.3 TASKS OF CARETAKERS

The following 10 points are the major tasks of the Caretaker of your wells and pumps:

Box 2: Major Tasks of Caretakers

- ☞ **ORGANISING THE WORK.** Talk to and work with the other caretaker(s) so that you help each other and share the work load.
- ☞ **WORKING WITH THE WUC/WASHCO,** so that your work and theirs help keep the pump operating
- ☞ **INSPECTING THE PUMP** every week and every month
- ☞ **CONDUCTING ROUTINE MAINTENANCE** – tightens nuts and replaces worn out parts such as the U-seal, the O-ring and the bearings.
- ☞ **IDENTIFYING AND SOLVING MINOR PROBLEMS.**
- ☞ **GETTING HELP FROM THE WOREDA WATER RESOURCE OFFICE TO SOLVE MAJOR PROBLEMS**
- ☞ **KEEPING TOOLS IN GOOD CONDITION, AND BUYING & STORING SPARE PARTS**
- ☞ **KEEPING RECORDS** – of parts and repairs
- ☞ **ENSURING THE PROPER USE OF HAND PUMP and WELL**
- ☞ **INITIATING AND OR ORGANISING THE COMMUNITY FOR GENERAL SITE MAINTENANCE.**

Organise Your Work

The benefiting community has to select at least two caretakers to do the job of maintaining and caring of your hand pumps.

You should meet and decide how you are going to work together. You should decide which of you will do each task. For example, one caretaker can look after the tools and spare parts and the other caretaker can look after the records

On some tasks you should work together. For example, you should inspect the pump together on a weekly and monthly basis, and carry out repairs together. This way you can help each other.

If one of you has to go down the well to inspect the well shaft or well bottom, the other should stay at the top and make sure everything is ok.



Work with the WASHCO

As scheme Caretaker, **YOU ARE NOT ALONE**. You don't need to do everything yourself. You are a member of the WUC/WASHCO and you can get other members to help you.

You should attend WUC/WASHCO meetings and let the other members know what you are doing. If they know what you are doing, they will support you when you need help.

Box 3: Caretakers Report content

At every WUC/WASHCO meeting you should give a report on:

- **The PUMP:** Is it working okay? What have you found when you have done your regular inspections? How is the water flow?
- **SPARE PARTS:** Do you have enough spare parts? Is it time to buy more spare parts?
- **REPAIRS:** Are there any problems with the pump? Can you repair it yourself or do you need help from the Woreda?
- **PUMP SITE:** How is the area around the pump? What needs to be done? How can it be organized?

Let the other WASHCO members know how they can help you. For example they could buy the spare parts that are needed, arrange for other community members to clean the pump site or help you remove the pump for repair.

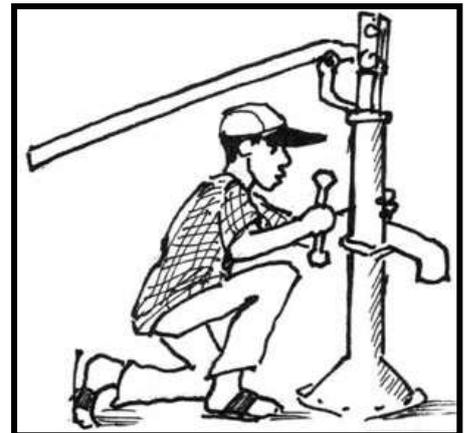


Inspect the Pump

You should inspect the pump regularly so you see problems and solve them before they become too big. Regular checking will help to keep the pump in good working order and avoid big expenses for repairs.

You should inspect the pump every **WEEK** and every **MONTH**.

Box 4: Checklist for Weekly Inspection of hand pumps



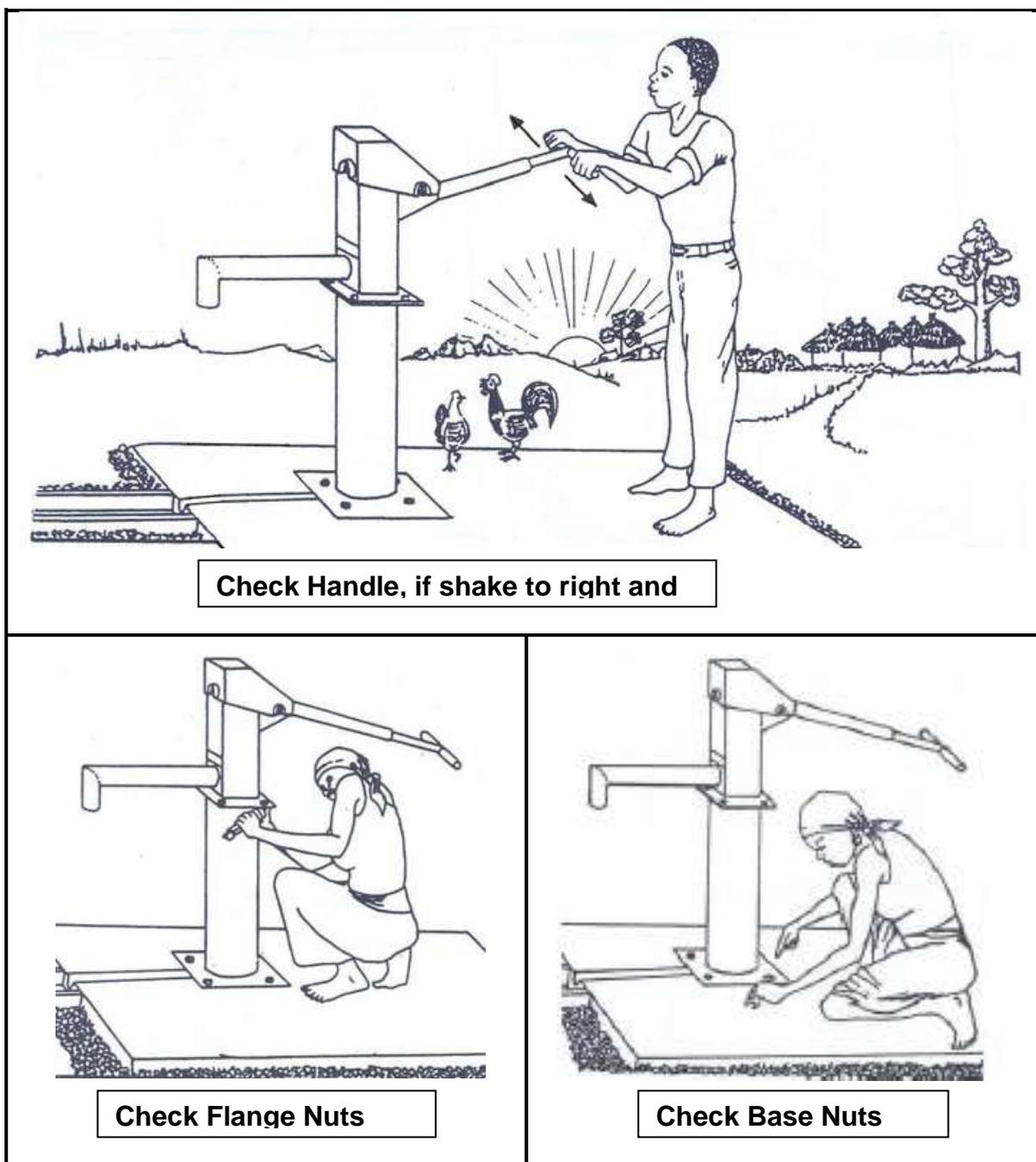
1. Weekly Inspections

Every WEEK you should check the parts on the head of the pump

- Check that the flange bolts and nuts are tight.
- Check that the Fulcrum Pin nuts and Hanger Pin nuts are tight

The following pictures demonstrate how caretakers do the weekly inspection of handpumps.

Figure 3-8: Pictorial demonstration of Weekly hand pump inspection



Box 5: Checklist for monthly inspection of handpumps

2. Monthly Inspections:

- ☞ STROKE TEST – how many strokes of the pump handle until water comes?
- ☞ BUCKET TEST – how many strokes of the pump handle to fill a bucket?
- ☞ CHECK BEARINGS – are the bearings worn or broken?
- ☞ Check if any fasteners or parts in the pump head are missing. If so, replace the parts
- ☞ If any unusual noise is noticed, check reason for the same and take corrective actions.
- ☞ Check if the pump stand is shaky during operation. If yes, the stand is loose in the foundation and contamination of the well can take place. Take corrective measures to repair the foundation.
- ☞ Check if there is leakage in the pump. If more than 5 strokes are required before water comes out from the spout, it means the pump is leaking beyond an acceptable limit.
 - This needs to be attended to. It may be necessary to replace bobbin / foot valve, O-ring or attend to a leaking joint in the rising main. For attending to a defect in the rising main you may need the help of a skilled mechanic. The special leakage test can be conducted as described below.
- ☞ Carry out a “Leakage- and Discharge Test”.

STROKE/LEAKAGE TEST

Do this test early in the morning before anyone has used the pump. Count the number of full strokes before water comes. If the number of strokes increases from last month, or it takes longer than a few minutes for water to come, you should check the foot-valve.

Box 6: Procedure for stroke test

Proceed as follows:

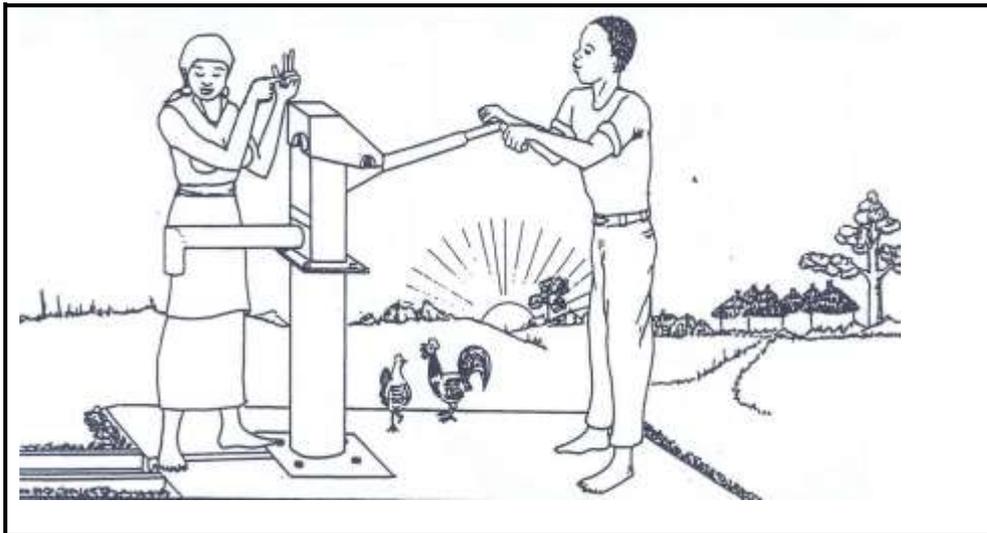
1. Operate the pump handle until water is flowing from the spout
2. Stop operating the pump handle for approximately 30 minutes
3. Then operate the handle and count exactly how many strokes required until the water is starting to flow again.

If more than 5 full handle strokes are required to make the water flow again, there must be a leakage in the rising main or the footvalve.

Leakage mostly occurs because of worn bobbin or o-ring of the footvalve, disconnected rising main joints or perforated or cracked riser pipes.

☞ Report this problem immediately to the pump mechanic and ask for rectification!

Figure 3-9: Pictorial shows stroke test



How many full strokes does it take for water to come first thing in the morning?

BUCKET/DISCHARGE TEST

Count the number of strokes to fill a bucket. You should always use the same size bucket for this test. If the number of strokes increases a lot, then change the U-seal.

Box 7: Procedure for bucket test

Proceed as follows:

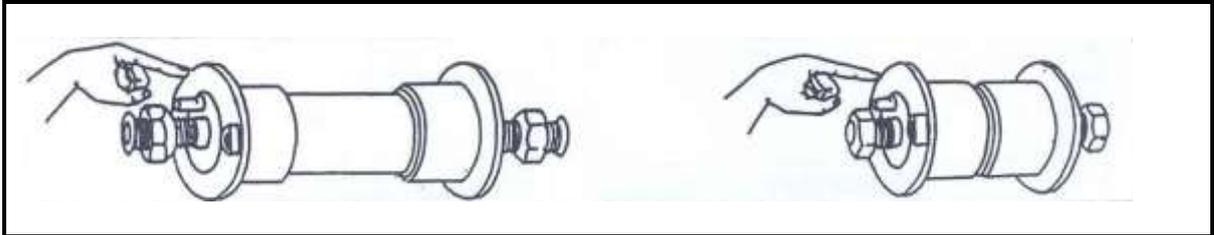
1. Operate the pump handle until a continuous water flow has been achieved (pump ratio approximately 40 full strokes per minute).
2. Place a bucket in the continuous water flow for exactly one minute
3. Take the bucket off the water flow and check the amount of water drawn.

The water collected should be generally not less than 15 liters. If the discharge is less than 10 liters for 40 full strokes, there might be a problem with the bobbins or the cup seal.

☞ Report this problem immediately to the pump mechanic and ask for rectification!

CHECK BEARINGS

Remove the bearings to see if they are worn. Good bearings are smooth and turn easily. Worn bearings are scratched and loose. Replace worn bearings.



Are the bearings Spoiled?

3.7.4.4 Routine Maintenance of Afridev Hand Pump

You should do **ROUTINE MAINTENANCE** to identify and solve problems before they become big and expensive. This means tightening loose nuts, welding locker pins back on (if they have fallen off) and replacing worn out parts.

NUTS: Check that nuts are tight. However do not over tighten them – if you tighten too hard you may damage them.

LOCKER PINS: If the locker pins have fallen off, weld them back on. You may need to get help from the Woreda for this.



BEARINGS: Remove the bearings and check their condition. IF scratched, loose or uneven, replace them with new bearings. If they are okay, clean them with a rag before putting them back.

STROKE TEST: If it takes a lot of pump strokes before water comes, check the foot valve. Replace the bobbin or O-ring if they are worn. Make sure the footvalve is properly seated.

BUCKET TEST: If it takes more strokes than usual to fill a bucket, remove the plunger and check the condition of the U-seal. Change the U-seal if it is damaged or worn.

REMEMBER: If you solve a problem early, you will avoid a bigger problem later. This will save you and your community lots of time, effort and money in difficult and expensive repairs.

3.7.4.5 Tools and Spare Parts required for Handpump Maintenance

FAST MOVING SPARE PARTS

Some parts, which need to be replaced regularly, are known as FAST MOVING SPARE PARTS. These include:

- ☞ The U-Seal
- ☞ The O-ring
- ☞ The Bobbin
- ☞ The Bearings

You should buy and keep some of these parts in your village so that when they wear out or break you can replace them straight away without having to wait until someone can go and buy them.

Figure 3-10: Lists of Fast moving spare parts

2 Bearings		'U' Seal	
Bobbin		'O' Ring	

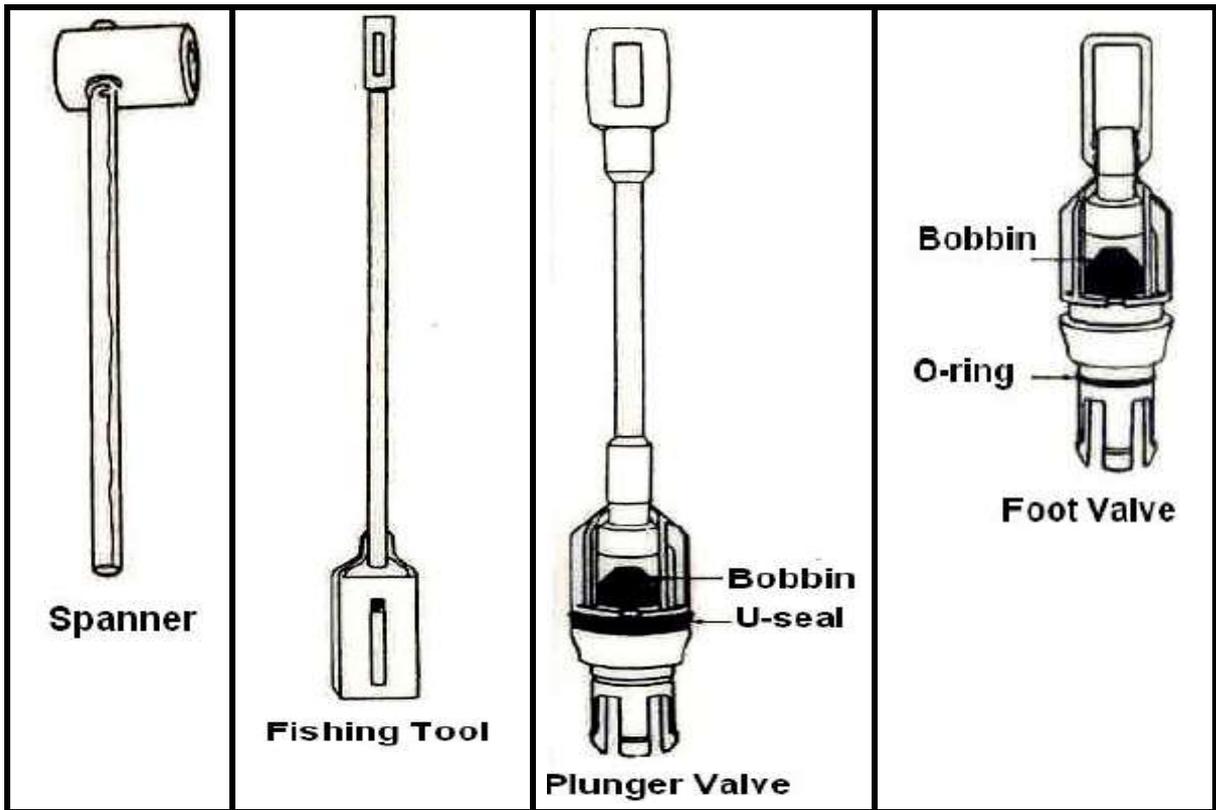
The basic tools required for hand pump maintenance are:

- a) Spanner for M16 hexagonal bolts and nuts,
- b) Fishing tool for retrieving the footvalve

For deep installations (between 30 to 45 m) with a heavy load of the pumprod assembly, the use of the Resting tool & connecting tool is advisable (this is for threaded rods only)

Figure 3-11 presents basic tools that are required for maintenance of hand pumps.

Figure 3-11: Basic Tools required for handpump maintenance



3.7.4.6 SOLVE MINOR PROBLEMS

If there are problems with your pump, you should try to solve them quickly so that they don't become bigger problems. A delay may cause more damage to your pump and cost you more to repair and the community cannot use the pump for a while. Some problems you can solve yourself. Others you may need to get help from the Woreda (Water, Mining and Energy Office) to fix.



Some common problems that you may have include:

WATER DOES NOT FLOW AT ALL

Cause	Solution
Foot valve is not in place	Check and re-seat foot valve
Bobbin is stuck or missing	Check and replace bobbin
Broken pump rods	Replace pump rods
Low water yield	Limit use of pump – deepen well

THERE IS DELAYED FLOW

Cause	Solution
Foot valve is not in place	Check and re-seat foot valve
O-ring is worn	Check and replace O-ring
Broken or leaking pipe joint	Repair joint (contact Woreda for help)

THERE IS WEAK FLOW

Cause	Solution
U-seal is damaged or worn	Check and re-seat U-seal
Broken or leaking pipe joint	Repair joint (contact Woreda for help)
Low water yield	Limit use of pump – deepen well.

THE HANDLE IS LOOSE

Cause	Solution
Fulcrum nut is loose	Tighten nut. If necessary replace fulcrum pin
Locking pin missing	Weld new locking pin on fulcrum pin (contact Woreda for help)
Worn bearings	Replace bearings

3.7.4.7 Keep Tools and Parts

One of your other jobs is to keep and look after the tools. You should keep them in a safe place so that they are available when they are needed for maintenance or repair. If you lose or damage them, then the community will have to replace them.

You will also be asked to buy and store spare parts. Let the WASHCO know when you will need more spare parts, so that they can raise the money in time.

Table 3-12 below is a schedule of the spare parts you will need and how often you will need them. You will stock spare parts at least for one year spares.

For Afridev:

Figure 3-12: schedule of spare parts for Afridev handpump

Part	Months					
	6	12	18	24	30	36



U-seal	1	1	1	1	1	1
O-ring		1		1		1
Bobbin		1		1		1
Rod Centralizer		2		2		2
Bearing bush	2	2	2	2	2	2
Hanger Pin				1		
Fulcrum Pin				1		
Foot Valve				1		

3.7.4.8 Keep Records

You will need to keep records so that you know what you have done with your pump including parts that you have replaced and repairs that you have done.

Keeping records will make it easier for you to report to the WASHCO about the condition of the pump. It will also make it easier to let an outside contractor or technician know what has already been done to the pump.

A MAINTENANCE RECORD SHEET is included with this manual. Whenever you carry out a repair or replace a part you should record it on this sheet.

More sheets are available from the Woreda if you fill up the first sheet. If you cannot write, ask the WASHCO secretary to help you.

An example of this form and how to fill it in is shown below.

Table 3-4: Example of maintenance record keeping format

DATE	PROBLEM	REPAIR DATE	PARTS USED	REPAIR BY
8/08/13	Water did not come U-seal worn	9/08/13	U-seal	Tegenew
17/10/13	Handle Loose Bearing worn	17/10/13	Bearings	Tegenew
1/8/13	Water did not come Broken Joint	14/12/13	Pipe Socket	External Support & Tegenew

3.7.4.9 Use the Pump Properly

Teach everyone, including children, how to use the pump properly. This will prevent the pump from becoming damaged and will save your community lots of money on parts and repairs.

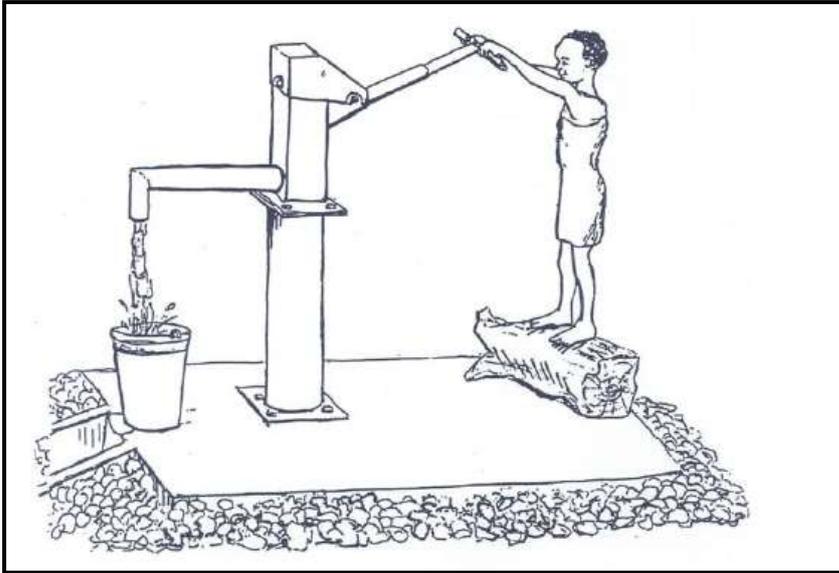
Call a community meeting and agree on the rules for how the pump should be used.

Box 8: Rules for proper utilization of schemes

The following is an example of some of the rules you should agree to:

- ☞ Operate the pump handle until a continuous water flow has been achieved (pump ratio approximately 40 full strokes per minute).
- ☞ When pumping, stand directly behind the pump
- ☞ Use full strokes, not short strokes
- ☞ Don't bang the handle
- ☞ Do not let children play on or around the pump
- ☞ Do not let animals near the pump. Fence around the pump to prevent animals getting near.
- ☞ Do not allow clothes washing at the pump. This should be done away from the pump.
- ☞ Do not allow people to wash themselves at the pump. This should be done somewhere else.
- ☞ If children are going to collect water, then put a block for them to stand on when pumping.
- ☞ If the pump is showing signs of a problem, stop using it until the problem is identified and solved.

These are just some of the rules you should discuss with water users community. Make sure everyone understands and agrees to the rules.



3.7.4.10 Everyone is a CARE-taker

The pump belongs to everyone in the community and so everyone is responsible for its care. If it breaks down, everyone suffers.

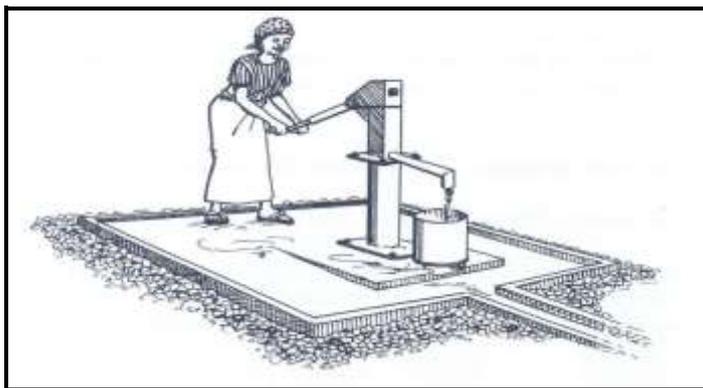
Everyone who uses the pump should help you care for it. They should do:

- ☞ Use the pump properly
- ☞ Inform the caretakers when they see a problem
- ☞ Help the caretakers solve the problem
- ☞ Help to clean and maintain the pump site

You can get the pump users – especially the women - to check the pump everyday when they collect water. Some things they can **LOOK** and **LISTEN** for include:

Everyone who uses the pump should help you care for it. They should do:

- ☞ REDUCED WATER FLOW
- ☞ DELAY IN WATER COMING FIRST THING IN THE MORNING
- ☞ LOOSE HANDLE
- ☞ PUMP DIFFICULT TO OPERATE
- ☞ LOOSE NUTS



3.7.5 Indian Mark – II Hand Pump

The India Mark - II is suitable for a depth of up to 50 meters. The pump body parts are extremely durable over the years. The pump achieves high discharges in the range 25-45 meters. To service an Indian Mark II, higher skills and special tools are needed which require help from qualified mechanics at village.

3.7.5.1 Components of the Hand Pump & their Functions (India Mark II)

Below is a table explaining each component of the India Mark II pump. Please refer to the illustrations after the table for ease of understanding:

Table 3-5: Feature of an Indian Mark-II Hand Pump

Components	Features
Head Assembly	<ul style="list-style-type: none"> ▪ The mechanism above ground level and operating the plunger ▪ Sturdy mild steal box containing the handle pivot ▪ Heavy duty handle stop ▪ Simple inspection cover secured by a single bolt

Components	Features
	<ul style="list-style-type: none"> ▪ Flange mounts to water tank with third plate
Handle Assembly	<ul style="list-style-type: none"> ▪ Solid bar handle to counter-balance connecting rods ▪ Ball bearings ▪ Chain linkage for gravity return of the piston
Water Tank	<ul style="list-style-type: none"> ▪ Angled spout makes ingress of debris to water tank difficult ▪ Heavy duty riser pipe holder raised above the spout to prevent ingress of debris to cylinder ▪ Flange mounts to pedestal
Pedestal (Stand)	<ul style="list-style-type: none"> ▪ 150 mm B.B. pipe pedestal fits over borehole ▪ 125 mm B.B. casing pipe ▪ Angle iron legs to ensure firm bound to a concrete base ▪ Sanitary seal created between OD of well casing and pedestal to prevent infiltration of polluted water to well
Connecting Rods	<ul style="list-style-type: none"> ▪ Provided linkage between pump head and cylinder ▪ Mild steel brighter bar, electro-galvanized for surface protection ▪ Threaded rods with hexagonal coupling and check nut ▪ 3 meter length for ease handling
Cylinder Assembly	<ul style="list-style-type: none"> ▪ Contains plunger, valves, etc lifting water upward in each stroke ▪ Cast iron case for low cost and to protect brass liner ▪ Brass liner with smooth finish to prolong Nitrile Rubber bucket washer life ▪ Nitrile Rubber seated valve poppet's for effecting sealing
Riser Pipes	<ul style="list-style-type: none"> ▪ Carries water from cylinder to the water tank ▪ 32 mm NB medium grade galvanized pipe in 3 meter lengths to facilities ▪ Installation and repair using hand tools

Figure 3-13: Cross-section of the upper part of Indian Mark-II

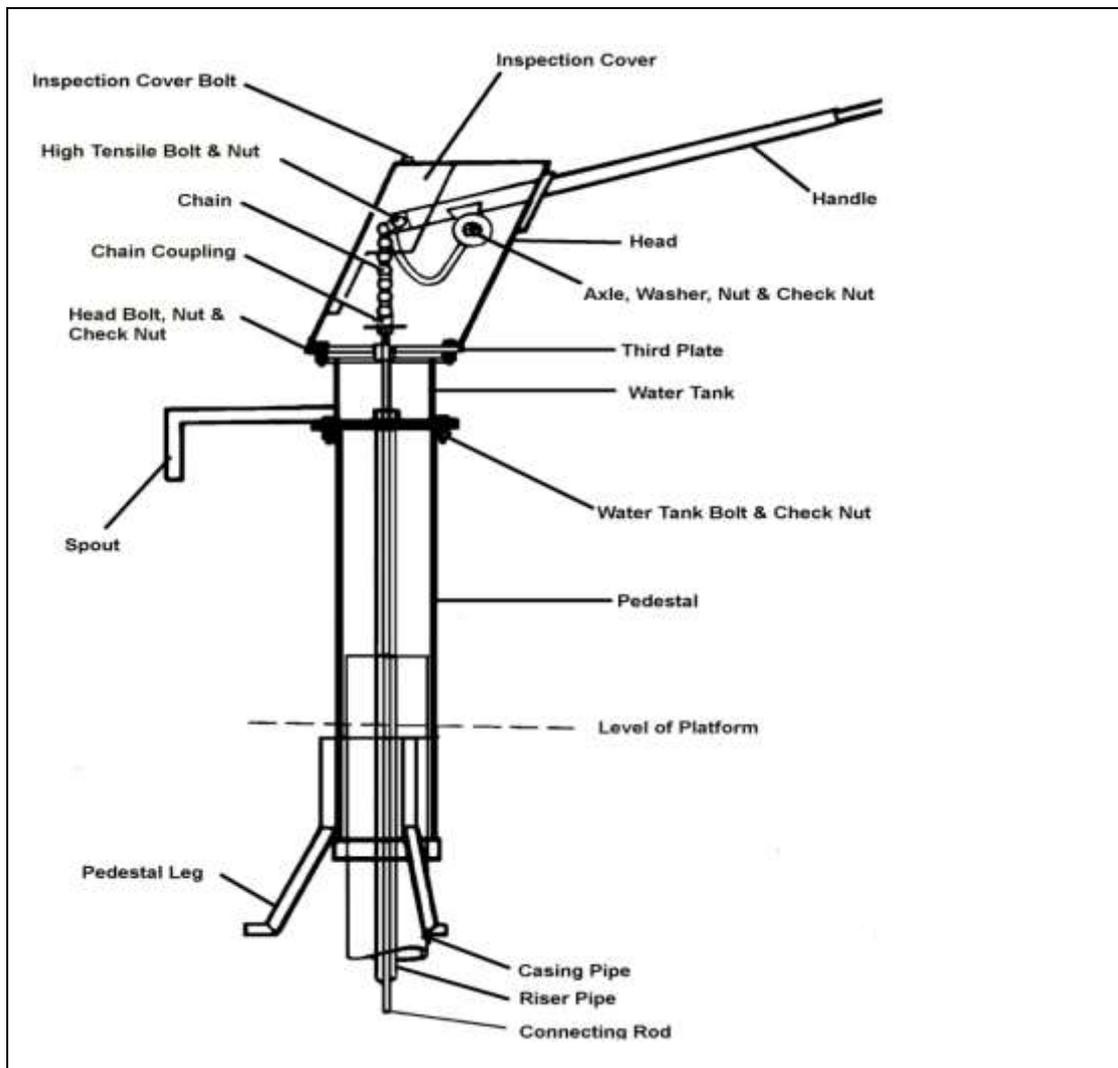
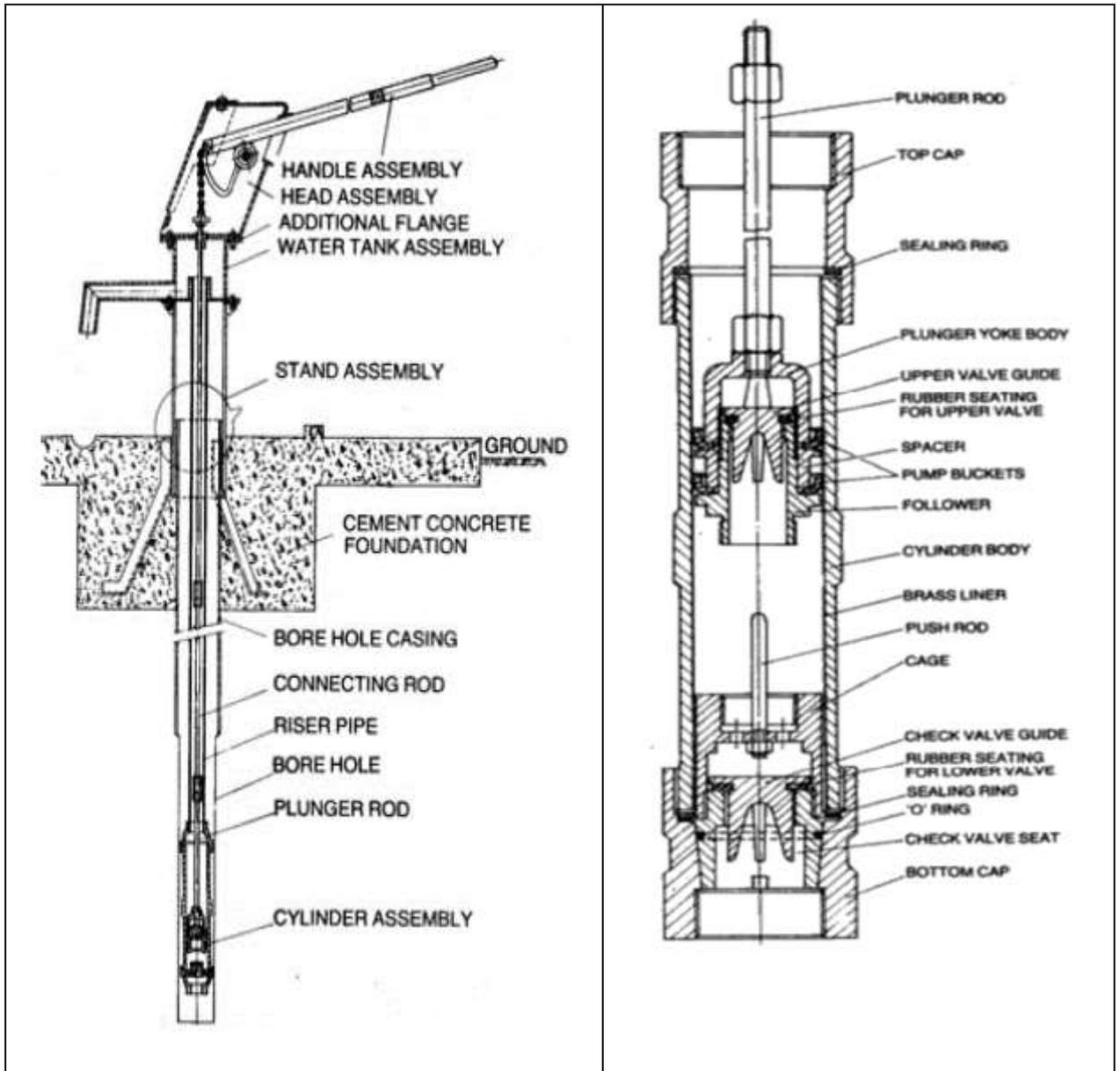


Figure 3-14: Details of Indian Mark -II Hand Pump



3.7.5.2 General Maintenance Schedule

The India Mark II hand pump is to be properly maintained to ensure safe potable drinking water. Maintenance will prevent breakdowns and ensure continuous working of the hand pump.

India Mark II hand pump is like any other mechanical machine. Any machine should be kept clean, if for no other reason than that in cleaning all parts are inspected for formation of rust, insufficient lubrication, loose, bolts, nuts, etc., and also for missing parts in time to prevent major failures.

As a Caretaker you should inspect the hand pump regularly, so you identify problems and solve them before they become too big. Regular checking will help to keep the pump in good working order and avoid big expenses for repairs Weekly, Monthly and Annual inspection activities should include the following O&M activities:

Box 9: Checklist for weekly inspection of Indian Mark-II hand pump

- 1. Weekly Inspections:**
- ☛ Check the fittings such as nuts, bolts and handle assembly and tighten them.
 - ☛ Check the axle bolt and tighten as needed.
 - ☛ Make sure the lock nut is tight.
 - ☛ Make sure the hand pump is firm on its base.
 - ☛ Check the flange bolts fastening the water chamber to the pedestal are tight.
 - ☛ Testing water quality using a Field Test Kit.
 - ☛ Problems reported to the WASHCO's

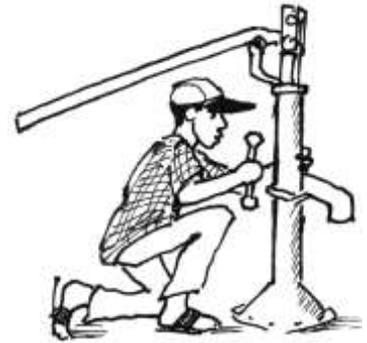
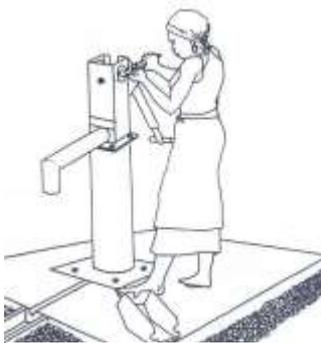
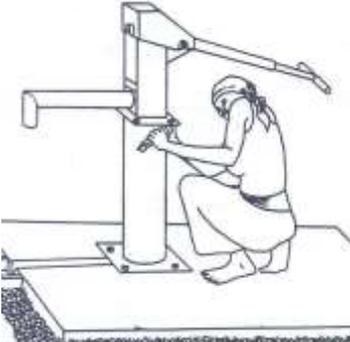
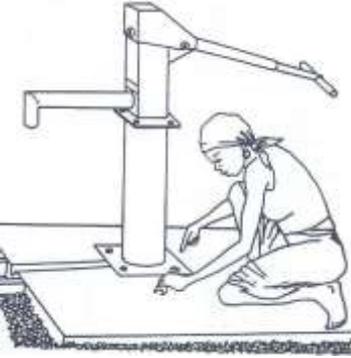


Figure 3-15: graphic demonstration of the weekly Inspection of the pump

 <p>Check Fulcrum Nuts</p>	 <p>Check Hanger Nuts</p>
 <p>Check Fulcrum Pin Locker</p>	 <p>Check Hanger Pin Locker</p>
 <p>Check Flange Nuts</p>	 <p>Check Base Nuts</p>

Box 10: Checklist for Monthly Inspection of Indian Mark-II hand pump

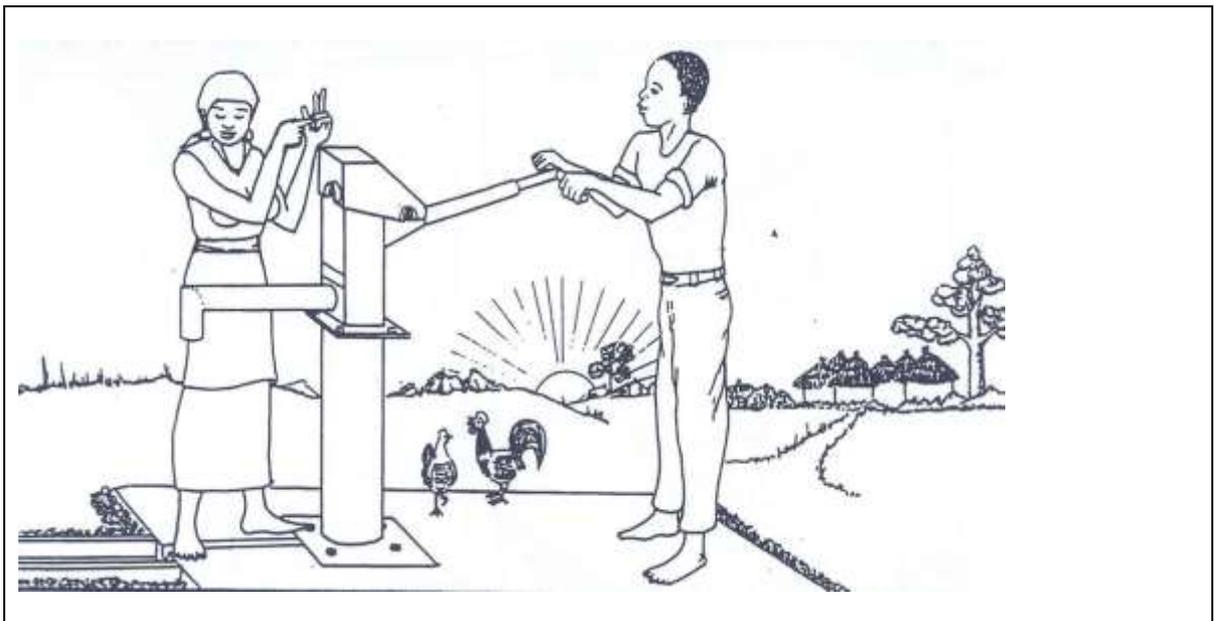
2. Monthly Inspections:

- ☞ STROKE TEST – how many strokes of the pump handle until water comes?
- ☞ BUCKET TEST – how many strokes of the pump handle to fill a bucket?
- ☞ CHECK BEARINGS – are the bearings worn or broken?
- ☞ Tighten the handle axle nut and lock nut.
- ☞ Check for loose or missing flange bolts and nuts and tighten as needed.
- ☞ Open the cover and clean inside the pump.
- ☞ Check the chain anchor bolt for proper position and tighten if needed.
- ☞ Look for rusty patches, clean with a wire brush and apply anticorrosive paint.
- ☞ Find out whether the hand pump base is loose and arrange for repair of the foundation as needed.
- ☞ Measure the static water level.
- ☞ Greasing of all components.

STROKE TEST

Do this test early in the morning before anyone has used the pump. Count the number of full strokes before water comes. If the number of strokes increases from last month, or it takes longer than a few minutes for water to come, you should check the foot-valve.

Figure 3-16: Pictorial demonstration for stroke test for Indian Mark-II handpump

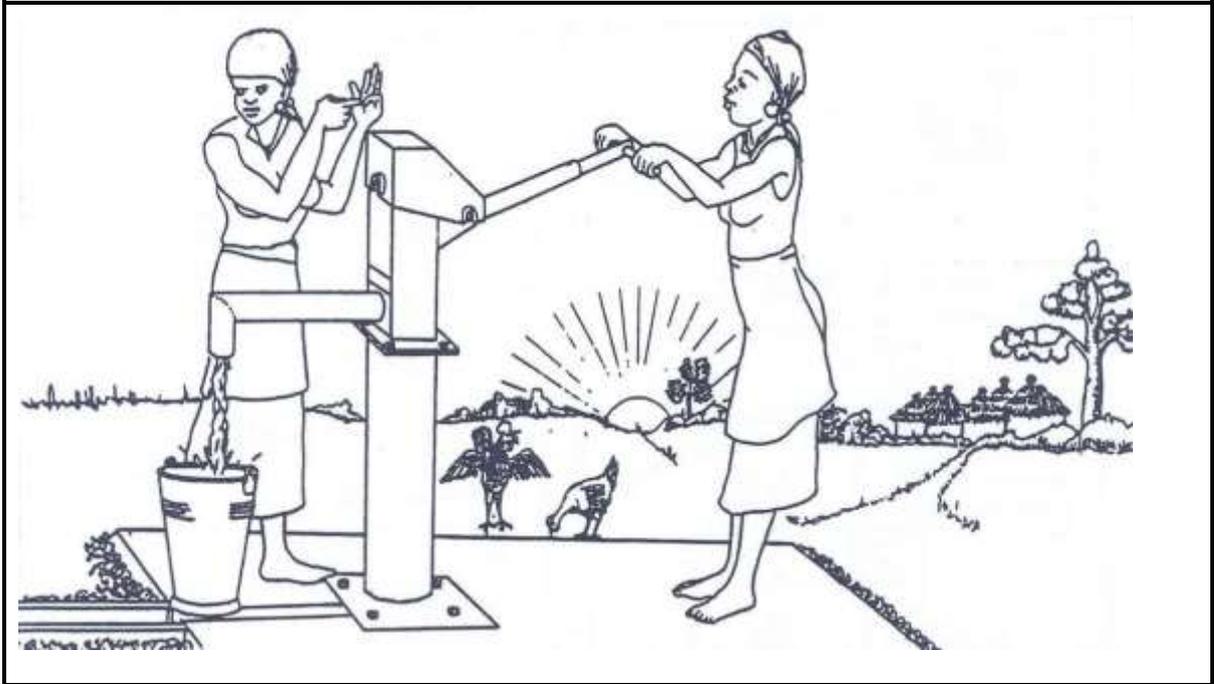


How many full strokes does it take for water to come first thing in the morning?

BUCKET TEST

Count the number of strokes to fill a bucket. You should always use the same size bucket for this test. If the number of strokes increases a lot, then change the U-seal.

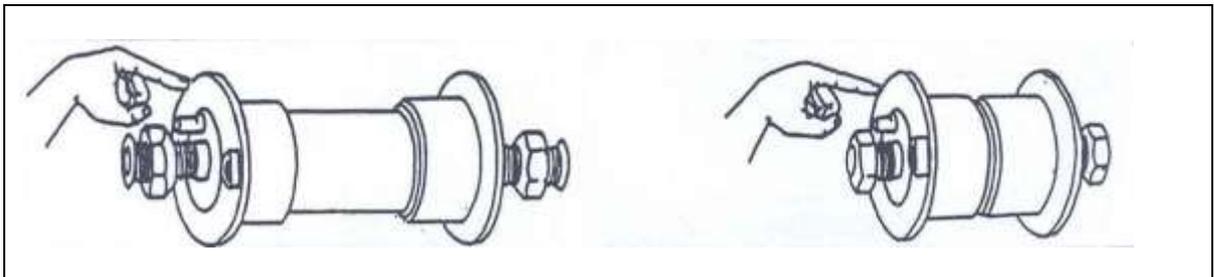
Figure 3-17: Pictorial demonstration for bucket test for Indian Mark-II handpump



How many full strokes does it take to fill the same bucket with water?

CHECK BEARINGS

Remove the bearings to see if they are worn. Good bearings are smooth and turn easily. Worn bearings are scratched and loose. Replace worn bearings.



Are the bearings Spoiled?

Box 11: Checklist for Annual Inspection of Indian Mark-II hand pump

3. Annual Inspections:

a) Examine the hand pump carefully and check whether: -

- ☞ Discharge is satisfactory
- ☞ Handle is shaky
- ☞ Guide bush is excessively worn out
- ☞ All bolts, nuts and washers are in position
- ☞ Chain has worn out
- ☞ - Roller chain guide is excessively worn out

b) Pull out the hand pump and follow the instruction given below:-

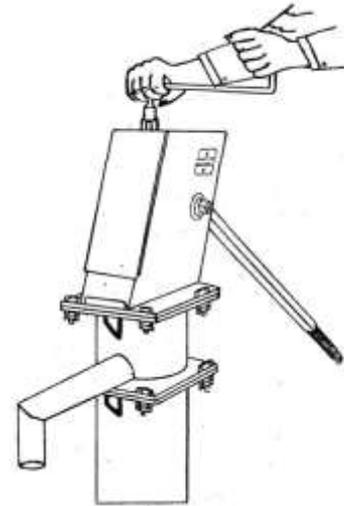
- ☞ If chain, bearing and spacer are damaged, replace them
- ☞ If roller chain guide is badly worn out replace handle assembly
- ☞ If any pipes are damaged replace them
- ☞ Open out cylinder assembly and replace cup washers, sealing rings and also any other part found defective
- ☞ Check the condition of water tank riser pipe holder. If threads are worn out, replace water chamber.
- ☞ Check all sub assemblies for crack in weld and other visual defects. If defects are serious replace sub assemblies
- ☞ Reinstall the hand pump as per instructions given in the manual. Paint the pump head inside/ outside with the recommended colour after cleaning/ sanding the surfaces.

3.7.5.3 Maintenance Procedure

The above maintenance schedule is applicable to the AFRIDEV pump as well and the following is the maintenance procedure:

- Remove the pump head.
- Loosen the hanger and the fulcrum nuts.
- Pass spanner handle through rod hanger eye.
- Slowly move the handle upwards and take it out.
- Remove the plastic bushes and hanger pin.
- Lift the spanner handle and hold the pump rods by hand then remove the spanner.
- Withdraw all connecting rods and plunger by disengaging eye and hook connectors.
- Connect fishing tool with pump rod.

- Lower the fishing tool into the rising main pipe by engaging connecting rods till it (fishing tool) touches the foot valve.
- Slowly rotate the pump rod till you get a feeling of the fishing tool hooking the pickup hook.
- Pull it with force to disengage foot valve from its position.
- Hold the pump rods till the water column drains.
- Take out all the pump rods one by one along with foot valve.
- Service the plunger & foot valve by replacing worn out rubber parts with new parts.
- Hold the foot valve from the hook and drop it in the riser pipe.



3.7.5.4 Routine Maintenance

You should do **ROUTINE MAINTENANCE** to identify and solve problems before they become big and expensive. This means tightening loose nuts, welding locker pins back on (if they have fallen off) and replacing worn out parts.

NUTS: Check that nuts are tight. However do not over tighten them – if you tighten too hard you may damage them.

STROKE TEST: If it takes a lot of pump strokes before water comes, check the foot valve. Replace the bobbin or O-ring if they are worn. Make sure the footvalve is properly seated.

BUCKET TEST: If it takes more strokes than usual to fill a bucket, remove the plunger and check the condition of the U-seal. Change the U-seal if it is damaged or worn

INDIA MARK II EXTRA DEEP: If the handle axle and chain have unusual sand/trembling, and stroke/bucket test is not usual, you may need to get help from the Woreda for these.

REMEMBER: If you solve a problem early, you will avoid a bigger problem later. This will save you and your community lots of time, effort and money in difficult and expensive repairs

3.7.5.5 SOLVE MINOR PROBLEMS

If there are problems with your pump, you should try to solve them quickly so that they don't become bigger problems. A delay may cause more damage to your pump and cost you more to repair and then the community cannot use the pump for a while.

Some problems you can solve yourself. Others you may need to get help from the Woreda (Water, Mining and Energy Office) to fix.

WATER DOES NOT FLOW AT ALL

Cause	Solution
Broken chain	Replace chain
Broken pump rods	Repair rods (contact Woreda for help)
Footvalve/plunger is not in place	Repair Cylinder (contact Woreda for help)
Low water yield	Contact Woreda for help

THERE IS DELAYED FLOW

Cause	Solution
Footvalve/plunger is not in place	Repair Cylinder (contact Woreda for help)
Broken or leaking pipe joint	Repair joint (contact Woreda for help)

THERE IS WEAK FLOW

Cause	Solution
Footvalve/plunger is not in place	Repair rods (contact Woreda for help)
Broken or leaking pipe joint	Repair rods (contact Woreda for help)
Low water yield	Contact Woreda for help

THE HANDLE IS LOOSE

Cause	Solution
Broken pump rods/chain	Repair rods/chain (contact Woreda for help)

3.7.5.6 GET HELP WITH MAJOR PROBLEMS

After three or four years, your pump will begin to have some major problems which you will need assistance to solve and repair. These problems will be too difficult for you to deal with on your own so you should contact the Woreda to get assistance with them.

If you can't solve or fix a problem yourself, report the problem to the WASHCO. The WASHCO will hire a Contractor or other technician to come and do the repair. He/she will be paid for his/her transport, his/her time and any materials and spare parts he/she uses.

You should be available to help him/her when he/she comes to do the repair. If you help



then you can make sure he/she does a proper job and also you can learn how the problem is solved so that you can do it yourself next time.

3.7.5.7 KEEP TOOLS AND PARTS

One of your other jobs is to keep and look after the tools. You should keep them in a safe place so that they are available when they are needed for maintenance or repair. If you lose or damage them, then the community will have to replace them.

You will also be asked to buy and store spare parts. Let the WASHCO know when you will need more spare parts, so that they can raise the money in time.

The table below is a schedule of the spare parts you will need and how often you will need them. You will stock spare parts at least for one year spares.

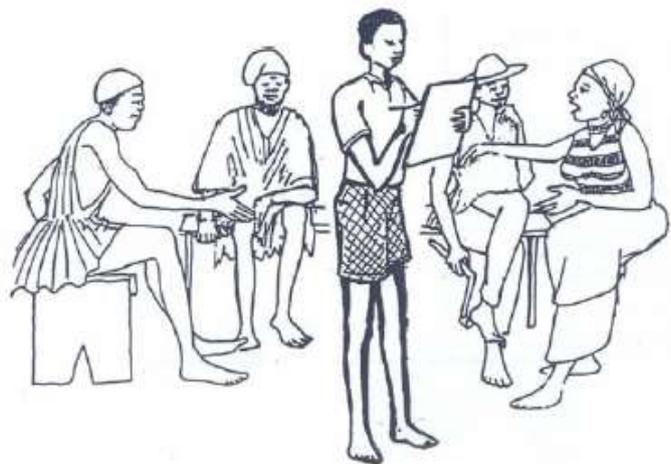
Table 3-6: Schedule of spare parts for Indian Mark-II handpump

Part	Months					
	6	12	18	24	30	36
Chain assembly		1		1		1
Ball bearing		1		1		1
Rubber seating		2		2		2
Cup seal		3		3		3
Sealing ring		3		3		3

3.7.5.8 KEEP RECORDS

You will need to keep records so that you know what you have done with your pump including parts that you have replaced and repairs that you have done.

Keeping records will make it easier for you to report to the WASHCO about the condition of the pump. It will also make it easier to let an outside contractor or technician know what has already been done to the pump.



A MAINTENANCE RECORD SHEET is included with this manual. Whenever you carry out a repair or replace a part you should record it on this sheet.

More sheets are available from the Woreda if you fill up the first sheet. If you cannot write, ask the WASHCO secretary to help you.

An example of this form and how to fill it in is shown below.

Table 3-7: Example of Maintenance record keeping format for Indian mark-II handpumps

DATE	PROBLEM	REPAIR DATE	PARTS USED	REPAIR BY
8/08/13	Water did not come. Chain broken	9/08/13	Chain	Tegenew
17/10/13	Handle Loose Bearing worn	17/10/13	Bearings	Tegenew
1/8/13	Water did not come Broken Rod	14/12/13	Pipe Socket	External Support & Tegenew

3.7.5.9 Use the Pump Properly

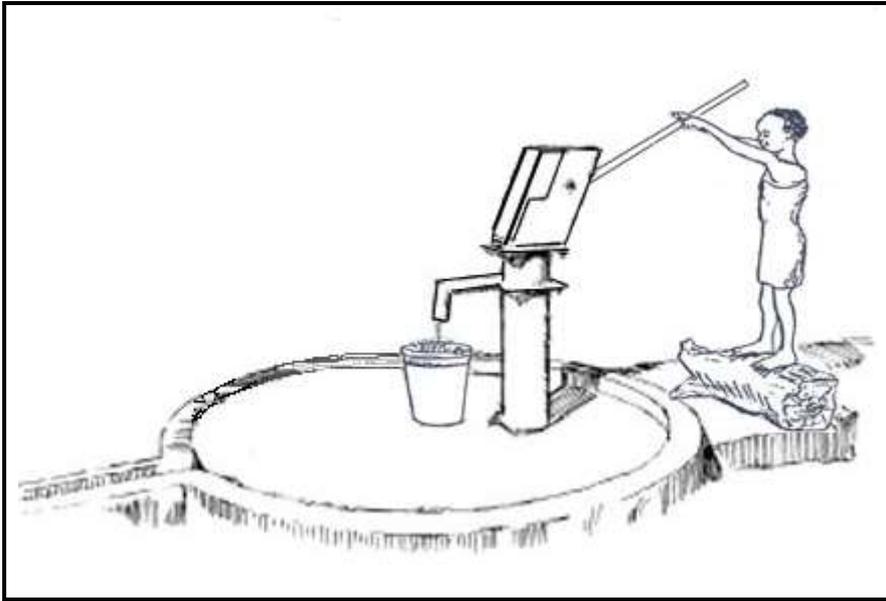
Teach everyone, including children, how to use the pump properly. This will prevent the pump from becoming damaged and will save your community lots of money on parts and repairs.

Call a community meeting and agree on the rules for how the pump should be used.

The following is an example of some of the rules you should agree to:

- ☞ Operate the pump handle until a continuous water flow has been achieved (pump ratio approximately 40 full strokes per minute).
- ☞ When pumping, stand directly behind the pump
- ☞ Use full strokes, not short strokes
- ☞ Don't bang the handle
- ☞ Do not let children play on or around the pump
- ☞ Do not let animals near the pump. Fence around the pump to prevent animals getting near.
- ☞ Do not allow clothes washing at the pump. This should be done away from the pump.
- ☞ Do not allow people to wash themselves at the pump. This should be done somewhere else.
- ☞ If children are going to collect water, then put a block for them to stand on when pumping.
- ☞ If the pump is showing signs of a problem, stop using it until the problem is identified and solved.

These are just some of the rules you should discuss with water users community. Make sure everyone understands and agrees to the rules.



3.7.5.10 Everyone is a CARE-taker

The pump belongs to everyone in the community and so everyone is responsible for its care. If it breaks down, everyone suffers.

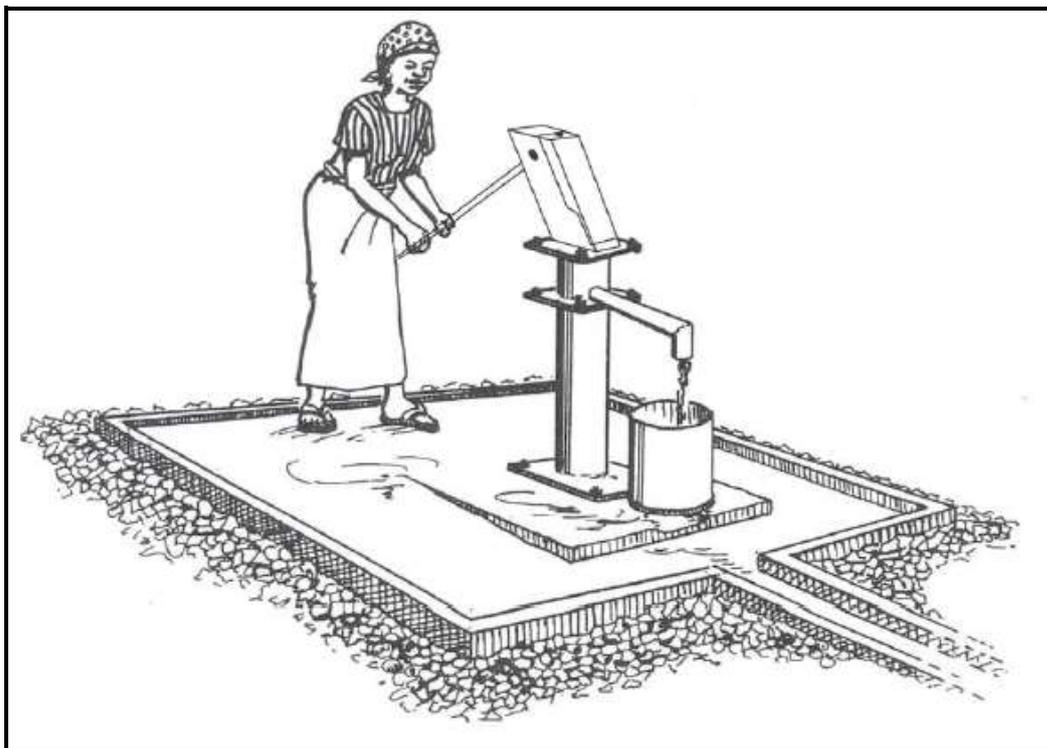
Everyone who uses the pump should help you care for it. They should do:

- ☞ Use the pump properly
- ☞ Inform the caretakers when they see a problem
- ☞ Help the caretakers solve the problem
- ☞ Help to clean and maintain the pump site

You can get the pump users – especially the women - to check the pump everyday when they collect water. Some things they can **LOOK** and **LISTEN** for include:

Everyone who uses the pump should help you care for it. They should do:

- ☞ REDUCED WATER FLOW
- ☞ DELAY IN WATER COMING FIRST THING IN THE MORNING
- ☞ LOOSE HANDLE
- ☞ PUMP DIFFICULT TO OPERATE
- ☞ LOOSE NUTS



3.7.6 Troubleshooting – Causes and Remedies

a) Afridev Hand Pump

Below is a table illustrating the common causes and their respective remedies for the Afridev handpump.

Table 3-8: Trouble shooting for Afridev

Trouble		Cause	Remedy
No Water	Handle operation is easy	<ul style="list-style-type: none"> Pump rods are disconnected 	<ul style="list-style-type: none"> Pull out all pump rods and replace broken and corroded rods
	Handle operation is difficult	<ul style="list-style-type: none"> Riser pipe disconnected, 	<ul style="list-style-type: none"> Pull out complete rising main repair/replace pipes (solvent cement) joints
	Handle operation is normal	<ul style="list-style-type: none"> U-seal or cup seal is defect Borehole is clogged (split or sand), Water level dropped below cylinder 	<ul style="list-style-type: none"> Replace seal, Rehabilitation of borehole (cleaning with compressed air or by bailing) Add riser pipes Bobbins (plunger and Foot valve)
Delayed water flow	Handle operation is normal	<ul style="list-style-type: none"> Leaking of valve Bobbins, Leaking of Foot valve O-ring Leaking in pipe joint or rising main pipe is perforated, 	<ul style="list-style-type: none"> Check and replace Bobbins (Plunger and Foot valve), Replace O-ring, Pull out complete rising main, repair/replace pipes (solvent cement joints),
Reduced Discharge	Handle Operation is difficult	<ul style="list-style-type: none"> U-seal or Cup seal is too tight 	<ul style="list-style-type: none"> Replace with seal correct size
	Handle operation is normal	<ul style="list-style-type: none"> Full stroke is not possible U-seal or Cup seal is worn Leaking or valve Bobbins Leaking of the cylinder (cracked) 	<ul style="list-style-type: none"> Check and adjust length of the top rod Replace seal Check and replace Bobbins (plunger and Foot valves) Pull complete rising main, repair/replace cylinder (solvent cement joints)
Abnormal Operating Noise	Handle operation is normal	<ul style="list-style-type: none"> Pump rods rubbing on riser pipes Pump rod centralizer worn 	<ul style="list-style-type: none"> Check and replace worn pump rod centralizers Check and straighten bent pump rods, replace worn pump rod centralizers
	Handle operation is inconvenient	<ul style="list-style-type: none"> Pump rods are toughing riser pipes Bearing are worn, handle fork touching the sides of pump head 	<ul style="list-style-type: none"> Straighten or replace bent pump rods, replace worn pump rod centralizers Check and replace bearing sets (4 off)

Trouble		Cause	Remedy
Pump handle Shaky	Handle is shaky when operated	<ul style="list-style-type: none"> ▪ Bearing are worn ▪ Fulcrum pin is loose <p>Hanger pin is loose</p>	<ul style="list-style-type: none"> ▪ Check and replace bearing sets (4 off) ▪ Check Fulcrum pin (and Bearing sets tighten both nuts fully) ▪ Check hanger pin (and bearing sets) tighten both nuts fully
	Pump head shaky	<ul style="list-style-type: none"> ▪ Flanges are loose 	<ul style="list-style-type: none"> ▪ Tighten all bolts and nuts of the flanges
	Pump stand is shaking	<ul style="list-style-type: none"> ▪ Pump platform is cracked 	<ul style="list-style-type: none"> ▪ Repair pump platform or well cover (for dug wells)

b) Indian Mark-II Hand Pump

Below is a table illustrating the common causes and their respective remedies for the India Mark II

Table 3-9: Trouble shooting for India Mark II

Trouble	Cause	Remedy
Pump hand works easily but no flow of water	<ul style="list-style-type: none"> ▪ Water level gone down below the cylinder assembly, ▪ Worn out cylinder leather cup washer, ▪ Connection rod joint disconnected ▪ Valve seats worn out, ▪ Pump cylinder cracked 	<ul style="list-style-type: none"> ▪ Add more pipes and roads, ▪ Overhaul the cylinder and replace the leather cup washer, ▪ Pull out the pump and join the connecting rod where necessary, ▪ Replace valve seats
Delayed flow or small flow	<ul style="list-style-type: none"> ▪ Damaged/leaking rising main, ▪ Leaking in cylinder check valve or upper valve, ▪ Rubber cup washers worn out. 	<ul style="list-style-type: none"> ▪ Replace the damaged/leaking pipe or disconnect the affected rising main, ▪ Overhaul cylinder. Replace worn out rubber seats or bend check valve seats.
Folding of chain during return stroke	<ul style="list-style-type: none"> ▪ Improper erection. Top rod above water tank flange level (Top flange) ▪ Rubber cup washers getting jammed inside the cylinder, 	<ul style="list-style-type: none"> ▪ Adjust the length of top connecting rod suitably, ▪ Overhaul the cylinder and replace rubber cup washers if damaged or replace the cylinder body if deformed.
Noise during operation	<ul style="list-style-type: none"> ▪ Stand assembly flange not leveled properly, ▪ Bearing worn out ▪ Bent connecting rod, ▪ Hexagonal coupler welder offset 	<ul style="list-style-type: none"> ▪ Level the flange using spirit level, ▪ Replace ball bearing, ▪ Straighten the rod, ▪ Replace spacer
Shaky Handle	<ul style="list-style-type: none"> ▪ Loose handle axle nuts, ▪ Worn out ball bearing, 	<ul style="list-style-type: none"> ▪ Tighten handle axle nuts, ▪ Replace ball bearings,

Trouble	Cause	Remedy
	<ul style="list-style-type: none"> ▪ Spacer damaged or short in length, ▪ Bearing loose in the bearing housing 	<ul style="list-style-type: none"> ▪ Replace spacer, ▪ Replace the handle assembly

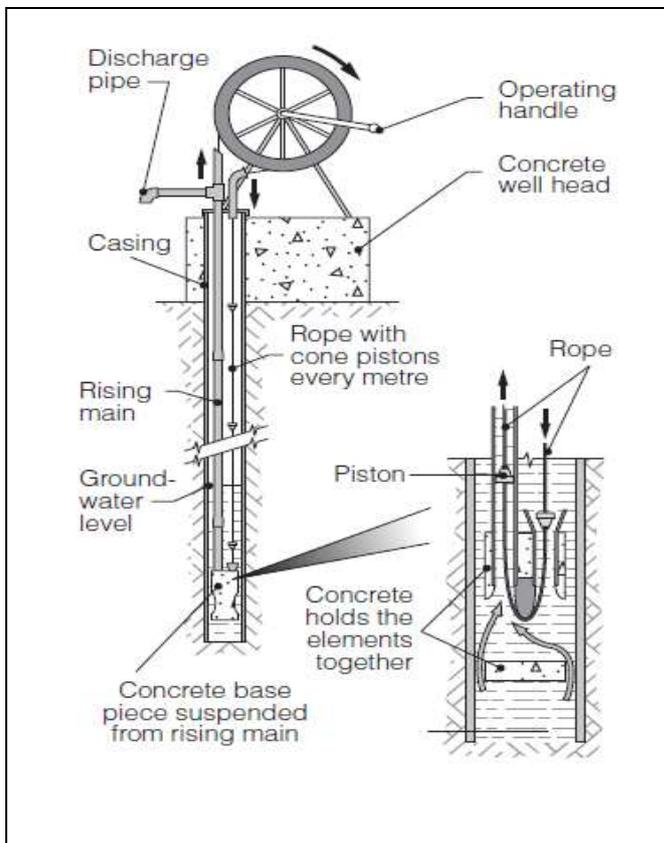
3.7.7 Rope Pump

The Rope pump is a lift pump with continuous upward movement of a rope and a number of pistons in a tube. The Rope pump has a relative lightweight construction and is made of locally available materials and can be produced and repaired locally.

The basic parts of a rope pump are a pulley wheel above the well, a riser pipe from under the water level to an outlet just under the wheel, and a rope with rubber or plastic washers. The rope comes up through the pipe, over the wheel; back down into the well and into the bottom of the pipe, completing the loop. When the wheel is turned, the washers move upwards and lift water into the pipe towards the outflow. Other important parts are an underwater rope guide that directs the rope and washers back into the pipe, and a frame that holds the pulley wheel. The rope pump can be made at village level using wood, rope and PVC tubing (or bamboo canes with the centers bored out).

Water can be lifted from as deep as 50 m and raised to 5 m above ground level. Special models with 3-inch boreholes, and powered by windmills, bicycles, animal traction, electric motors or small gasoline engines, give good results.

Figure 3-18: Typical Rope Pump



3.7.7.1 The advantage and disadvantage of the Rope pump

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Low cost, a cheap pump on household level (<10 households). • Absence of dynamic forces (rotating movement). • Tubes can be made of low pressure PVC tubing. • The total weight of pump parts is approximately 15 Kg (which is 5 to 10 times less than piston pumps). The pump can be taken from the well without any lifting tool. • No valves, valve seats, and ball bearings. Therefore less 'critical' parts, resulting in higher reliability. • High overall efficiency 80 – 85% (if well made). • Technology, without 'black box', is easy to understand, produce and maintain. 	<ul style="list-style-type: none"> ▪ The Rope pump is not 100% closed. At the discharge and return tube, the pump is open to the air and contamination of the rope is possible via contact by hand. ▪ The Rope pump is not a pressure pump (no pressure in outlet). ▪ Especially with deep wells, it takes some time before the Rope pump delivers water. (When not in use, the water level in the pump falls back to the water level in the well). ▪ The Rope pump is NOT designed for communal use by more than 10 households. ▪ "Stone age" image. Many people know the Rope pump as a self made, low lift pump. This image hampers acceptance by water organizations, institutes and users.

3.7.7.2 Various Rope pump models

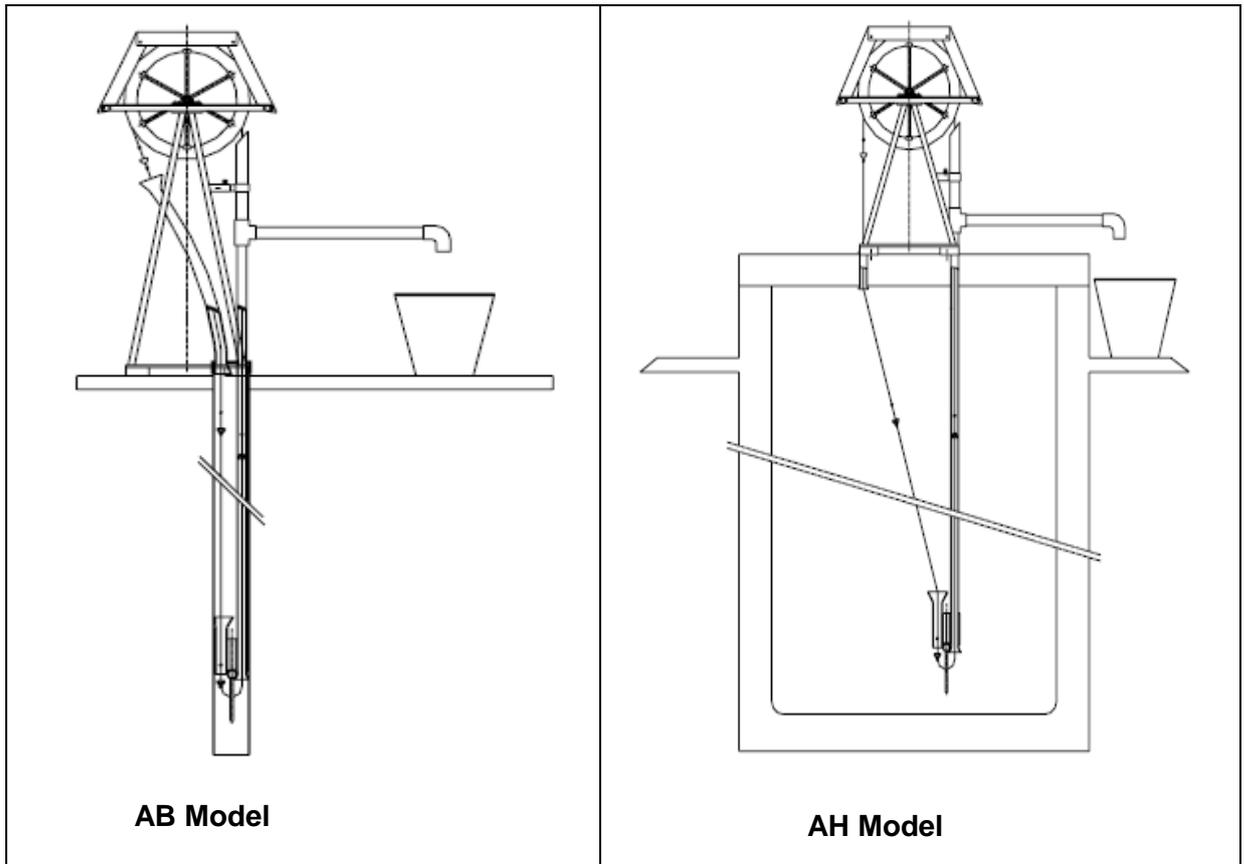
a) The manually operated pump models

The manually operated Rope pump models can be divided in options for boreholes (tube wells) and hand dug wells. The choice for the model to be used depends on the well type and the budget of the owner.

The following three models are available:

- The **AB Model** is designed for boreholes (tube-wells).
- The **AH model** is designed for hand dug wells and preferably includes a concrete well cover.
- The **Pi Model** is sometimes used on hand dug wells on household level.

Figure 3-19: AB and AH Model Rope Pump



3.7.7.3 General data of the Rope pump

No.	Parameters	Description
1	Discharge ¹	Water level: up to 10 m depth: 35 liter/min up to 20 m depth: 20 liter/min up to 35 m depth: 10 liter/min
2	Maximum depth	35 meter (water level)
3	Input power ¹⁾	approx. 50 Watt
4	Discharge level	1 m above ground level (no pressure) (with an additional wheel and structure up to 6 m above ground level)
5	Application	1 – 10 households (approximately 75users maximum)
6	Cost	€ 60 - € 120 (depending on model and country)

Note 1): The discharge is based on an input power of approx. 50 Watt, which is the power that women and children can deliver for longer periods.

3.7.7.4 Operation of Rope Pump

Functioning and life time of the pump will be increased when care is taken during operation of the pump.

Guidelines:

- ☞ Only rotate the pump clockwise, never turn the pump reverse direction.
- ☞ Always use the pumping lock when pumping is stopped.
- ☞ Don't let very small children operate the pump. If the handle slips out of their fingers, the pump will turn in backwards direction and the handle could hurt the children.
- ☞ Don't operate the pump with more than one person at the time. Avoid children hanging on the handle.

3.7.7.5 Regular maintenance

Regular maintenance is necessary to keep the pump in good shape and guarantee a long running time.

Regular Tasks:

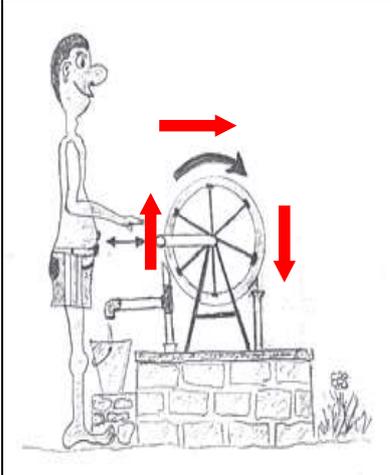
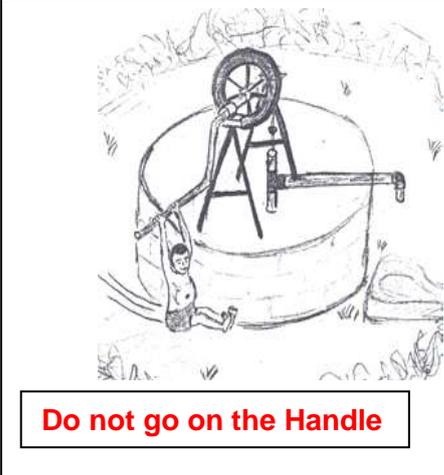
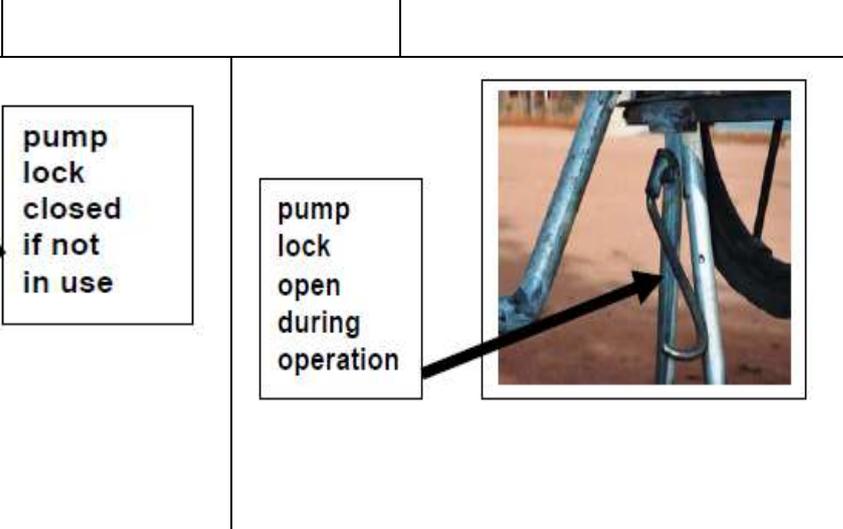
- ☞ Checking the tension of the rope and adjusting when needed.
- ☞ Lubricating the bushings every 2 weeks or when the bushings are running dry
- ☞ If the bushings start to make a shrieking noise oiling is URGENTLY needed. Add a few drops of NEW motor oil. (In case motor oil is not available, cooking oil can be used for emergency).
- ☞ Carry out repairs when needed.

3.7.7.6 Other Maintenance Requirements

Table 3-10: others rope pump maintenance requirements

Potential repairs	Descriptions
Replacement of the rope	<ul style="list-style-type: none"> ▪ Pistons usually last about twice as long as the rope. When the rope shows a lot of damage, the rope should be changed preferably before it breaks. ▪ Tie the new rope (with the pistons) to the old rope (be sure pistons are running in the right direction) and pass it through the tubing. It is not necessary to take out the tubing.
Replacement of pistons	<ul style="list-style-type: none"> ▪ The pistons should be changed, when the user has noted a reduction output. ▪ Before changing the pistons, check the clearance in a piece of riser main to check whether a reduced output is due to worn-out pistons
The bushings	<ul style="list-style-type: none"> ▪ If bushings are worn out, dismantle and replace them. (If properly oiled, bushes last for 10 years or more!)
PVC tubing	<ul style="list-style-type: none"> ▪ If a pump is placed in direct sunlight, the ultra-violet rays will affect the PVC parts, causing cracks. (To prolong life of PVC, paint it!) ▪ If the well contains fine sand, the sand will wear out PVC parts as well. In case wear is excessive, replace tubing.

3.7.7.7 Operation- and Maintenance sheet

 <p>Pump Direction</p>		 <p>Do not go on the Handle</p>
 <p>pump lock closed if not in use</p>	 <p>pump lock open during operation</p>	

 <p>Lubricate the bushing</p>		
 <p>Check rope play</p>	 <p>Making a loop</p>	 <p>The loop/ seam end of the loop</p>

3.7.7.8 Description of O&M Activities for Rope Pump HDW

The daily, Monthly and Annual activities should include the following O&M activities:

Box 12: Daily Activities for rope pump HDW

1. Daily Activities:

- ☞ Check for any debris in the well by regular visual inspection
- ☞ Clean the concrete apron
- ☞ Clear the drains
- ☞ Check that the gate is closed
- ☞ Check the condition of the rope, pulley, bucket and fence by regular visual inspection

Box 13: Monthly Activities for rope pump HDW

2. Monthly Activities:

- ☞ Replace the bucket and other parts as needed
- ☞ Check the concrete apron and well seal for cracks and repair them with cement mortar
- ☞ Record the water level with a rope-scale and report to the WASHCOs
- ☞ Lubricate the components with grease periodically.
- ☞ De-silting of dug wells periodically as required

Box 14: Annual Activities for rope pump HDW

3. Annual Activities:

- ☞ Dewater the well and clean the bottom
- ☞ Inspect the well walls and lining and repair as needed
- ☞ Check the water level and deepen the well as needed
- ☞ Check the support posts for the pulley and repair as needed
- ☞ Record the depth of water level & depth of well with a rope scale and report the WASHCOs

3.7.8 O&M Resources for Had Dug Well

Unskilled labor is required for daily tasks and for collecting user charges. Semi-skilled labor (well caretaker) is needed to carry out weekly and monthly O&M tasks; a private fitter may be needed to repair the well pulley. Skilled labor (mason) is needed to work with the caretaker on yearly O&M tasks and to repair the concrete apron and support posts for the pulley.

Materials and equipment include the bucket and rope, fencing, support posts, brush, digging and hand tools, cement, pulley and pulley shaft and bearings, and masonry tools to be provided to the caretakers.

3.8 Spring Collection Chambers

3.8.1 Description of O&M requirement for On-Sport Spring

The main parts of a spring protection are a drain under the lowest natural water level, a protective structure providing stability and a seal to protect surface water leakage. The drain usually is placed in a gravel packed and covered with sand & may lead to a conduit or a reservoir.

The protective structure may be made of paddled clay and sometimes plastic. A screened overflow pipe guarantees that excess water can flow freely out of the spring at all times. To prevent contamination from surface water infiltrating, a ditch, known as the interceptor drain, diverts surface water away from the spring box and a fence keeps animals out of the spring area.

There are many types of spring protections, ranging from a simple head wall with backfill to more complicated structures like tunnel systems for collecting water from large areas.

3.8.2 Maintenance Schedule

Box -15 below indicates the lists of caretaker tasks for spring water sources development.

Box 15: Caretakers task for the spring water sources

CARETAKER TASKS for community spring source schemes

- 3. ORGANISE THE WORK.** Talk to and work with the other caretaker(s) so that you help each other and share the work load.
- 4. WORK WITH THE WUC/WASHCO,** so that your work and theirs help keep the water flowing for the community
- 5. INSPECT THE SPRING BOX, RESERVOIR AND TAP STAND AND SITE** Every Month
- 6. DO ROUTINE MAINTENANCE –** check for leaks, check washers in taps, pipe joints etc
- 7. IDENTIFY AND SOLVE MINOR PROBLEMS**
- 8. GET HELP FROM THE WOREDA TO SOLVE MAJOR PROBLEMS**
- 9. KEEP YOUR TOOLS IN GOOD CONDITION, AND BUY & STORE SPARE PARTS**
- 10.KEEP RECORDS –** of parts and repairs
- 11.MAKE SURE THE DEVELOPED SPRING IS USED PROPERLY**
- 12.ORGANISE THE COMMUNITY FOR GENERAL SITE MAINTENANCE**

3.8.2.1 Organise Your Work

The benefiting community has to select at least two caretakers to do the job of maintaining and caring for the developed spring water source.

You should consult with other scheme caretaker and decide how you are going to work together. You should decide which of you will do each task. For example, one caretaker can look after the tools and spare parts and the other caretaker can look after the records

On some tasks you should work together. For example, you should inspect the spring box and tap stands together on a monthly basis, and carry out repairs together. This way you can help each other.

If one of you has to enter the spring box or reservoir to check the condition, the other should stay outside and make sure everything is ok



3.8.2.2 Work with the WUC/WASHCO

As scheme Caretaker, YOU ARE NOT ALONE. You don't need to do everything yourself. You are a member of the WUC/WASHCO and you can get other members to help you.

You should attend WUC/WASHCO meetings and let the other members know what you are doing. If they know what you are doing, they will support you when you need help.

Box 16: Caretaker report contents to WASHCO

At every WUC/WASHCO meeting you should give a report on:

- The **SPRING BOX:** Is it in good condition? What have you found when you have inspected it? Are there leaks or cracks? Does water flow out of the overflow pipe? Is the manhole cover in good condition?
- The **TAP STAND:** Are any of the taps leaking? How is the drainage around the tap stand? Is there any stagnant water? Do you need any spare parts for taps or other parts of the system?
- **REPAIRS:** Are there any repairs that need to be carried out?

Can you do them yourself or do you need help from the Woreda?
- **SITE CONDITION:** How is the fencing and drainage around the spring? Is there need for some general site maintenance (clearing vegetation, cleaning drainage etc)? Can you get help from other community members to do this?

Let the other WUC/WASHCO members know how they can help you. For example they could buy the spare parts that are needed, arrange for other community members to clean the site or help you repair the spring box, taps or reservoir.



3.8.2.3 Inspect the Spring Box, Reservoir, Tap Stand and Site

Every month you should do a general inspection of the whole system. This includes:

Box 17: Lists of Spring Box, Reservoir and Public Water point Inspection

A. The Spring Box

- Check the general condition. Are there cracks in the concrete or signs of leaks?
- Is there wet ground around the spring box? This may indicate a leak.
- Is water flowing out of the overflow pipe? If so this may indicate a blocked outlet pipe.
- Is there stagnant water around the spring box? If so proper drainage must be provided,
- Is the spring box having algae? If so clean and disinfect the spring box
- Is the spring box properly protected from external pollutants? If so properly protect the spring box.
- Open the manhole cover and look inside. Does it look clean and in good condition? Is there anything in there such as leaves, sticks or other vegetation?

B. The Reservoir

- Check the general condition. Are there cracks in the concrete or signs of leaks?
- Is there wet or boggy ground around the reservoir? This may indicate a leak.
- First thing in the morning before people have started collecting water, and with all the taps off, is there water flowing out of the overflow? Check how full the reservoir is. How does it compare with when the spring was first constructed? If there is less water, there may be a blockage or leak in the spring box or connecting pipe.
- How is the drainage from the overflow pipe?.
- Open the manhole cover and look inside. Does it look clean and in good condition? Is there anything in there such as leaves, sticks or other vegetation?

C. The Tap Stand / Public Fountain

- Check all the taps. Are any of them leaking or broken? Do they all work properly (do they turn on and off)?
- What is the condition of the apron and drainage? Is there any water ponded or boggy ground? Does spilt water flow away to a soakage area?
- Check the condition of the concrete. Are there any cracks or signs of deterioration?

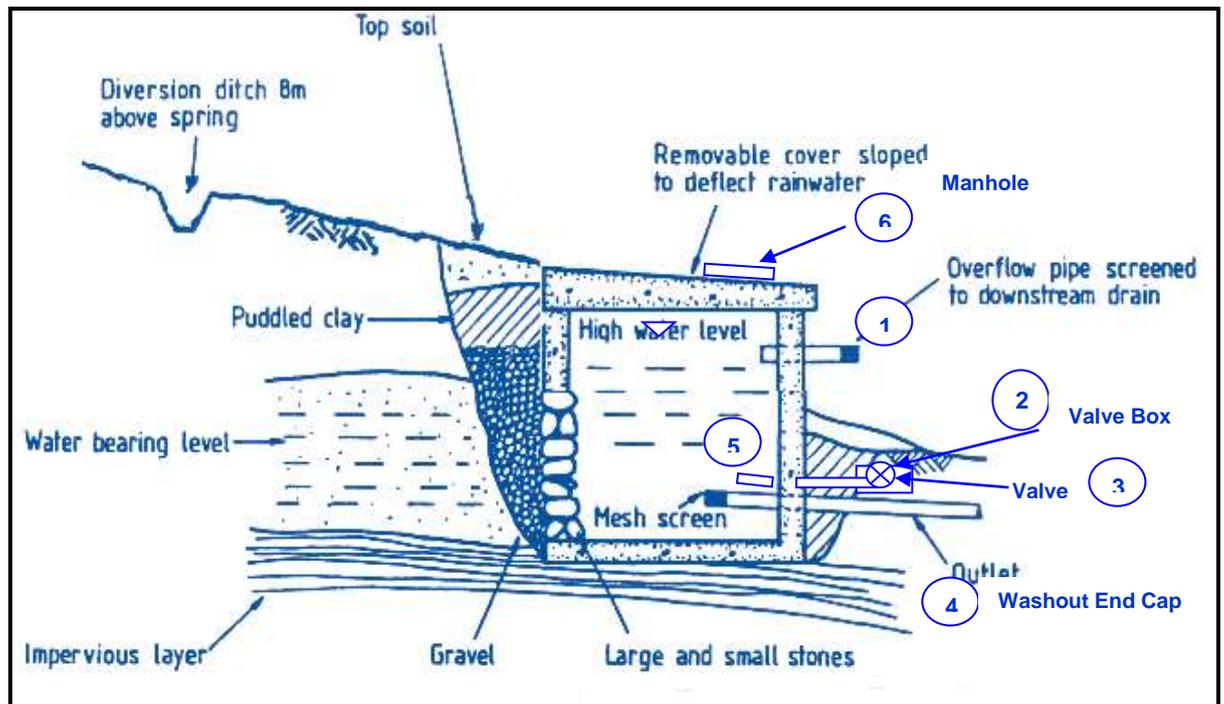
D. The Site

- Check the condition of the fence. Walk all around the fence and make sure that it is in good condition and there are no holes or places where animals can get in.
- Check the surface water diversion ditch. Is it clear? Is there any water sitting in it?
- What is the general condition of the site? Does it need to be cleaned of excess vegetation or other materials?
- Walk along the pipelines connecting the spring box to the reservoir and the reservoir to the tap stand (and any other pipelines if they exist – for example to clothes washing area or an animal watering trough). Are there any wet patches? These may indicate leaking pipes or pipe joints. Check any gate valves to make sure they are in good condition and are not leaking.

Table 3-11: Summary of O&M Requirement for Spring Protection

Activity	How Often	Who by	Materials & Spare Parts	Tools & Equipment
Clean Spring surroundings	Weekly	Community		Broom, bucket, hoe, machete
Repair fence and clean surface drains	Monthly	Caretakers & Community (as necessary)	Wood, rope, wire	Machete, axe, knife, hoe, spade, pickaxe
Repair pipes and taps	As needed	Caretakers & Contractor (as necessary)	Spare pipes, valves, joints, taps, washers, cement, sand, gravel	Bucket, trowel, spanner (wrench), flat spanners
Check water quantity	Monthly	Caretakers		Bucket, watch
Check water turbidity	After each heavy rain or flood	Caretakers		
Check water quality	Annually or after repair	Contractor &/or Woreda	Laboratory supplies	Laboratory
Wash and disinfect spring	Annually or after repair	Contractor &/or Woreda	Chlorine	Bucket, wrench, brush
Repair faucets	When the need arises	Caretakers	Spare faucet and thread.	Wrench
Repair cracks	When the need arises	Caretakers	Cement, sand gravel	Bucket, trowel, hoe, spade, wheel barrow

Figure 3-20: Typical Feature of On-Spot Spring Box

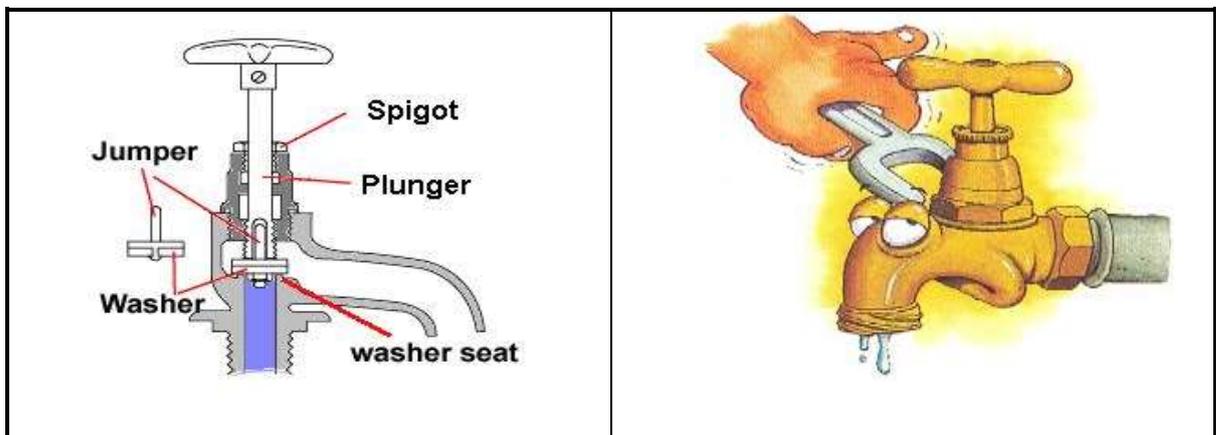


Part	Function	Operation	Maintenance
1 Over Flow	To keep the maximum pressure balanced, in order to protect the spring protection	Over flow will withdraw automatically	No maintenance required
2 Valve Box	To protect the Outlet Valve	Open and Close by steel cover with padlock	Always keep it locked. <u>Keep Children away</u> Clean the sediment
3 Outlet Valve	Controls the water flow which goes in to collection chamber/users	Always stay open, should be closed only when collection chamber is going to be cleaned up	Don't force the valve to be opened to the maximum or closed tight
4 Washout End Cap	To extract the sediment from the spring protection	It should be opened at least once a month to clean spring protection	When tighten the cap, clean up the screw by water
5 Strainer	It filter the water which goes into the collection chamber/users from sand and other external substance	Strainer operates automatically	Wash the silt on the strainer by water, when it's needed
6 Manhole	An entrance, to check and clean the spring protection when it's needed	Open the lock to enter in the spring protection to clean and maintain	Always keep it locked. Keep children away from it.

3.8.2.4 Routine Maintenance

You should do **ROUTINE MAINTENANCE** to identify and solve problems before they become big and expensive. This means replacing tap washers, repairing broken taps and pipe joints and fixing any leaks in the spring box or reservoir.

a) How to Change a Tap Washer



Box 18: Procedures for Routine Maintenance of Spring Box

- Turn off the water supply from the reservoir using the gate valve
- Open the tap to release any water pressure and release the force on the tap plunger and spigot
- Using a spanner, undo the tap spigot and remove the plunger and spigot assembly, with the washer
- Replace the washer with a new one
- Replace the plunger and spigot. Tighten gently with the spanner. DO NOT OVERTIGHTEN
- Open the gate valve at the reservoir to turn on the water flow
- Check the tap for leaks. If the tap still leaks, then the whole tap may need to be replaced.

REMEMBER: *If you solve a problem early, you will avoid a bigger problem later. This will save you and your community lots of time, effort and money in difficult and expensive repairs.*

3.8.2.5 Solve Minor Problems

If there are problems with your spring development, you should try to solve them quickly so that they don't become bigger problems. A delay may cause more damage; cost you more to repair and mean the community cannot use the scheme for a while.

Some problems you can solve yourself. Others you may need to get help from the Woreda to fix.

Some common problems you may have included:

Table 3-12: Solving Minor Problems for Spring Box

Problem	Cause/Solution:
Leaking Taps	Repair taps
Boggy Ground	Look for leaks in spring box, reservoir etc
Low flow at taps	Blocked pipes – clear pipes Clogged spring box – clean out Empty Reservoir – check flow from spring box
Poor drainage	Drains clogged with vegetation – clean out
Dirty/smelly water	Fence broken – repair Drainage inadequate – clean drains NOTE: If the water has become contaminated – the system must be flushed with chlorine. Contact the Woreda for assistance with this.

3.8.2.6 Get Help with Major Problems

Every few years you may begin to have some major problems which you will need help to solve and repair. These problems will be too difficult for you to deal with on your own so you should contact the Woreda Water Resource Office (WRO) to get assistance with them. If it is beyond the capacity of the WRO, the Zonal Water Resource Development Office (ZWRDO) shall be consulted.

If you can't solve or fix a problem yourself, report the problem to the WUC/WASHCO. The WUC/WASHCO will get external support to do the repair. Payment for external support could be done based on the mutual agreement made between the two parties.

You should participate on the repair work being done by the external support. If you help then you can make sure he/she does a proper job and also you can learn how the problem is solved so that you can do it yourself next time.

Examples of major problems include:

- Contaminated Water: Flushing the system with chlorine once the source of contamination has been identified and solved
- Major cracks/leaks in spring box or reservoir
- Major leaks in pipelines.



3.8.2.7 Keep Tools and Parts

One of your other jobs is to keep and look after the tools. You should keep them in a safe place so that they are available when they are needed for maintenance or repair. If you lose or damage them, then the community will have to replace them.

You will also be asked to buy and store spare parts. Let the WUC/WASHCO know when you will need more spare parts, so that they can raise the money in time.



3.8.2.8 Keep Records

You will need to keep records so that you know what you have done with your spring development including parts that you have replaced and repairs that you have done.

Keeping records will make it easier for you to report to the WUC/WASHCO about the condition of the spring development. It will also make it easier to let an outside contractor or technician know what has already been done.

A MAINTENANCE RECORD SHEET is included with this manual. Whenever you carry out a repair or replace a part you should record it on this sheet. More sheets are available from the Woreda if you fill up the first sheet.

If you cannot write, ask the WUC/WASHCO secretary to help you.

An example of this form and how to fill it in is shown below.



Table 3-13: Spring Chamber Maintenance Sheet

DATE	PROBLEM	REPAIR DATE	PARTS USED/REPAIR CARRIED OUT	REPAIR BY
8/08/13	Tap leaking	9/08/13	Tap washer	Biliso
17/10/13	Spring box clogged	17/10/13	Spring box cleared	Biliso
1/8/13	Leak in reservoir wall	14/12/13	Cement	External Support & Biliso

3.8.3 Proper Use of the Developed Spring

Synthesize every user, including children, how to use the spring development properly. This will prevent the system from becoming damaged and will save your community lots of money on parts and repairs.

Call benefiting community meeting and agree on the rules for how the developed spring should be used. The following is an example of some of the rules you should agree to:

- Always turn taps off
- Do not over tighten taps
- Do not let children play on or around the tap stand, spring box or reservoir
- Do not let animals near the tap stand, spring box or reservoir. Fence the entire area to prevent animals coming near.
- Do not allow clothes washing at the tap stand. This should be done away from the tap stand in a clothes washing area.
- Do not allow people to wash themselves at the tap stand. This should be done somewhere else.
- If the taps start to leak or other problems are identified, stop using it until the problem is identified and solved.

These are just some of the rules you should discuss with everyone. Make sure everyone understands and agrees to the rules.

3.8.4 Get the Community Involved

Maintaining the spring site is the responsibility of the WHOLE BENEFITING COMMUNITY, not just the caretakers. Your job is to organise the work, not do it all yourself!

Here are some ideas for how to organise the community:

- Call a community meeting and get everyone’s view about how best to organise spring site maintenance and rules about spring development use.
- Divide the work of sweeping and scrubbing the apron amongst the women from different sections of the community on a rotating basis.
- Divide the work of weeding the site amongst the men from different sections of the

- community on a rotating basis.
- Get children involved in sweeping, scrubbing and weeding.

Organise a maintenance day at the end of the rainy season.

3.9 Capacity Building and Training

Among the most useful general areas of training are problem solving, preparation of resolutions, how to conduct meetings and tariff setting.

On more specialized topics, the bookkeeper is trained on records keeping and the preparation of financial reports, and the System Operator on repairs and maintenance of the water system.

One of the important functions of the recommended Adviser is to provide hands-on training/on-the-job coaching for the different tasks required in O&M.

Observation visits to other nearby utilities are extremely helpful. These will give insights on the what, why and how to do the various tasks.

Annex F provides an outline of Staff Development/Training subjects to guide the SSWP in prioritizing and selecting the types of trainings that could be given to the different levels of personnel.

3.10 Preventive Maintenance

Preventive or routine maintenance involves tasks and activities carried out according to pre-established schedules to ensure the quality and reliability of operating facilities. It is based on rational considerations such as the manufacturer's recommendations for servicing equipment, industry standards and practices (which are based on collective experience), and the SSWP's own experience on the performance, durability, and reliability of the different equipment and their parts and components. Once established, these schedules need to be kept and the results recorded.

3.11 Unscheduled Maintenance

Unscheduled maintenance (also called Emergency or Repair maintenance) is a reactive intervention forced on the Utility when equipment, components, or parts either break down or malfunction. The activities and tasks are unplanned and generally unexpected, thus taking the nature of emergencies. They tend to be disruptive, inefficient, and often costly – not only to undertake but also in terms of lost revenues and goodwill. These occur most frequently when preventive maintenance has been poor or inadequate, after accidents and natural force majeure events, and when aging facilities are kept in service without replacement beyond their useful life.

All unscheduled maintenance situations need to be analyzed and the causes of the malfunction or breakage recorded. These records are important as they help in deciding whether part or all of a network or plant should be upgraded or replaced, and serve as a guide in future procurement decisions (for instance, sourcing of new equipment and of parts and supplies), as well as in related management decisions (e.g., inventory lists and levels).

3.12 Support System of Operation and Maintenance

3.12.1 Government Support

Governments provide the framework within which O&M policy is developed. The role of government is vital to create an 'enabling environment', one of the key elements of sustainability. An enabling environment can be fostered by appropriate legal provisions, regulations, education, training and information, and monitoring. If a supportive O&M policy is not forthcoming from federal government then support for O&M at the Woreda level will be considerably hindered.

Woreda's promotes an awareness of national policies and supports WASHCOs. However, many Woreda Water Offices are under-resourced and are unable to give effective support.

3.12.2 NGOs Support

Traditionally, local and international NGOs have worked closely with communities and have often provided an interface with Regional Water Bureaus, and Woreda Water Office and other bodies to facilitate the joint development of schemes.

NGOs rely on external funding and if the form of O&M developed between an NGO and the community is also reliant on external funding then its sustainability may be jeopardized. Thus, NGOs should capacitate the Woredas as well as WASHCOs to operate and maintain their schemes before phase out of the project. Their support shall be offering capacity building and training, provision of seed spare parts, establishment of community management system etc.

3.12.3 Financers Agencies Support

Financer agencies include multi-lateral and bi-lateral donor agencies and development banks like DFID, COWASH, UNICEF, the World Bank, Africa Development Bank, European Bank. They are an important source of capital funds for the construction of new supplies and for rehabilitation work. For the investment of donor funds to be worthwhile, however, it is essential for donors to consider future O&M needs at the earliest stage of project formulation.

The traditional handover of donor projects in the past has often left both community and Woreda Water Office with schemes which neither party was properly prepared to operate and maintain. By following a supportive approach both parties should be fully equipped and prepared to continue O&M. It has been noted, however, that the continued presence of an agency in an area can lead to false expectations on the part of some communities:

3.12.4 The Private sector Support

Private sectors are involved in the construction, service delivery and supply of goods. However, private sector involvement in O&M may be limited by the poor profit margin in scattered rural communities. Where little or no competition exists, charges are likely to be higher, rather than lower. Therefore, the impact of the private sector will very much depend on circumstances.

In the absence of rigorous inspection and regulation there is a problem of private sector accountability. Communities who contract services from the private sector need to be sure that they get a job well done and at a fair price. To some extent, communities themselves can monitor the quality of work if they know what to look for and this may, initially, require external assistance. But if the private sector is to be promoted then safeguards must be instituted to ensure cost-effective minimum standards of work. Any such monitoring and regulation will have a cost which governments will need to meet.

3.13 Health and Environmental Requirements

3.13.1 Hygienic Operation and Use

The advantages of a well-maintained, safe supply of water can be drastically reduced if the collected water is not subsequently handled and used hygienically. The hygienic handling and use of water is an important part of O&M in its broadest sense.

Hygiene may be more important in the operation and maintenance of some systems than others. Users can follow simple agreed operational rules as shown by the following examples.

a) Use of an open well

To maintain the quality of open well water, the correct use of a bucket and rope lifting system is important. There are various combinations of lifting systems using communal or household buckets. Each system has its merits and drawbacks regarding hygiene. What is important in many cases is not so much the type of system but agreement by all users on how to operate it so that water quality can be preserved.

b) User operation of point water supply

Unsafe and insanitary conditions due to the careless handling of water at the standpost must be avoided. Typical rules that consumers and users agree on through consultation include :

Box 19: Typical hygienic rules for users

- ☞ wash hands and containers before collection
- ☞ avoid spillage, but if it does occur, direct all wastewater to the drainage channel
- ☞ do not leave taps open when there is no flow as water will be wasted and create insanitary pools when flow recommences
- ☞ do not leave taps running unattended
- ☞ do not drink water directly from the tap
- ☞ Do not allow cattle and other animals within the fenced area of the point water supply

The hygienic transport and use of water from the source to the point of final use is important for all supplies. For example, the coverage of containers during carrying and storage and the prevention of contamination through touching the collected water. Raising awareness of the need to take measures to safeguard water is an important part of community action. Hygienic operation and water use can be promoted by all O&M personnel. For example, a standpost caretaker's role often includes promoting the careful and hygienic use of taps.

3.13.2 Household Hygiene

Clean water is a key factor in keeping people health. A water source that is not protected, a dirty container, or unwashed hands can easily turn water, even water that looks and tastes clean, into something that makes people ill.

Even clean water collected from a source can be contaminated prior to use at critical points due to unsafe hygiene practices at household level.

- Transporting water from the source to the house in dirty water containers.
- Storing water at home in open and/or dirty water containers.
- Handling water at home with dirty utensils or hands

1) Water Fetching/Transport with Clean Containers

Containers, especially if they are narrowed neck-type, you are encouraged to clean them regularly with a soap solution, chemical disinfectant (if available), or pebbles.

2) Household Hygiene (water storage)

Safe water storage is the use of clean containers with covers AND good hygiene behaviors that prevent contamination during water collection, transport, and storage in the home.

Good hygiene in handling food is very important. However, it is also important to make sure that the dishes and utensils used for serving food are clean. If dishes and utensils are washed in dirty, greasy water they will be covered with many microbes. If they are dried with dirty cloth, they will collect more microbes.

Utensils that are clean and dry should be stored where pests and flies will not spread microbes on them. They can be stored on a drying rack and covered with a cloth. Utensils should not be left lying on the ground.

Use soap for washing dishes and utensils. If water supplies are limited, washing water does not have to be drinking water quality. However, always rinse dishes and utensils with safe water after washing. Avoid drying them with cloths. It is much better to make a simple drying rack so that dishes dry in the sun. Not only is this more hygienic but it saves time!

3.13.3 Environmental Hygiene

A water source can be contaminated through a number of routes including:

- Contaminated surface water run-off entering wells and springs.
- Collecting water with unwashed hands and/or dirty containers.
- Animals using the same source.

The following are some recommendations to keep water source always clean.

- Clean platform (apron, drainage and soakaway) and surrounding of the water scheme regularly
- If you find cracks in the platform, repair them.
- Keep animals away from the water scheme
- Sanitation facilities to be built at least away from 30 meters

Annexes

Annex A: Afridev Hand Pump Maintenance and Repair Sheet

A) Maintenance and Repair Sheet-1



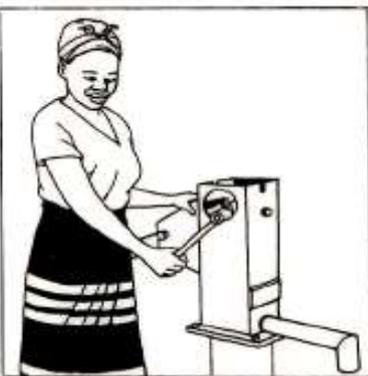
1. Before starting, wash your hands and fill some buckets with clean water for cleaning parts.



2. Loosen the pump head cover bolt



3. Take off the cover



4. Loosen both hanger nuts



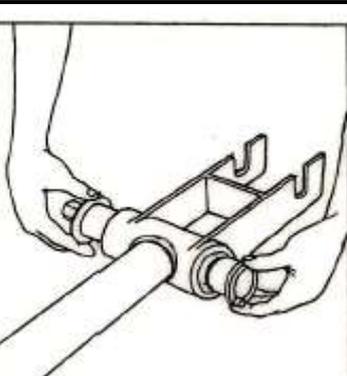
5. Loosen both fulcrum nuts



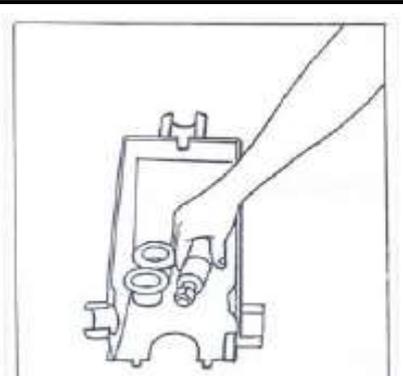
6. Put spanner through hanger eye



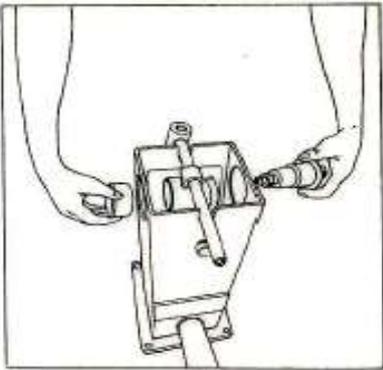
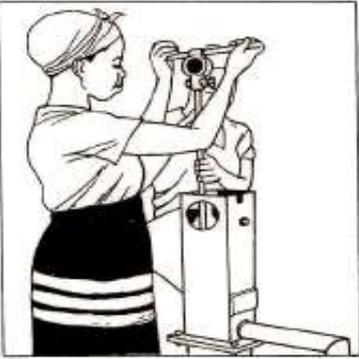
7. Raise and withdraw handle. Take care! As you remove the handle make sure the bush bearings and pin do not fall out as they may break on the floor.



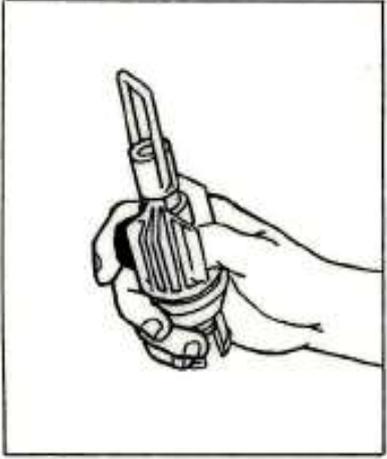
8. Remove fulcrum pin and bush bearings.

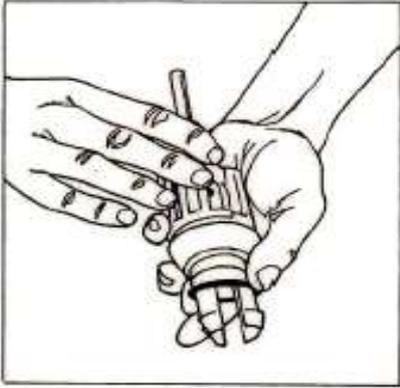
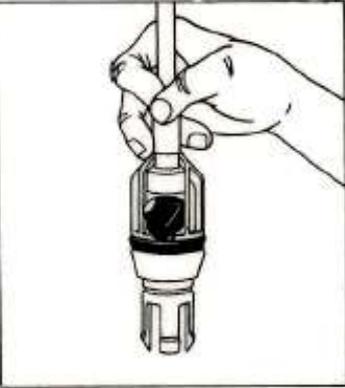
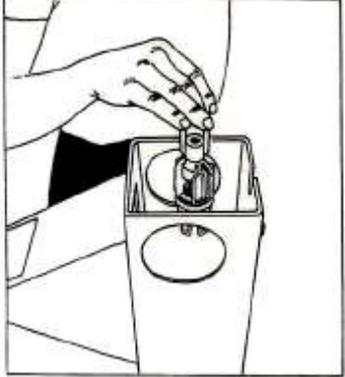


9. Place all parts in cover for safe keeping

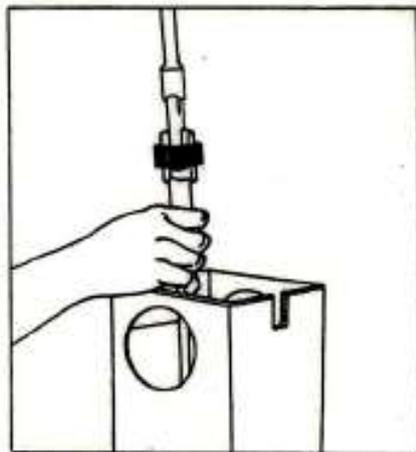
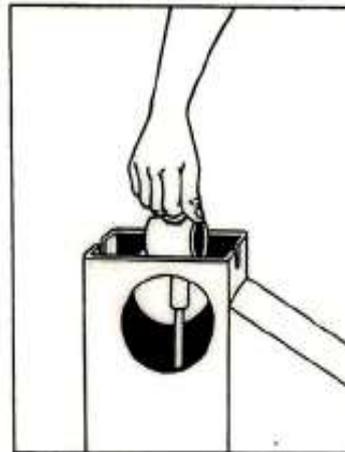
 <p>10. Remove hanger pin and bush bearings</p>	 <p>11. Pull up the hanger and first rod.</p>	 <p>12. Slide the rubber centralizer where the rods join.</p>
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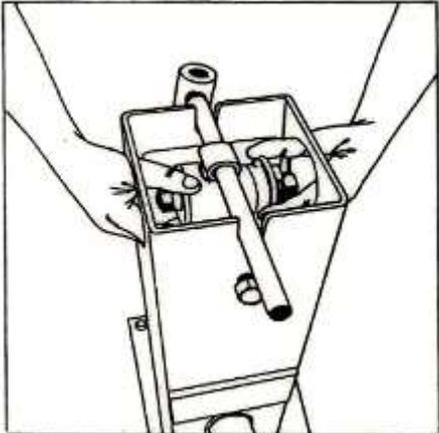
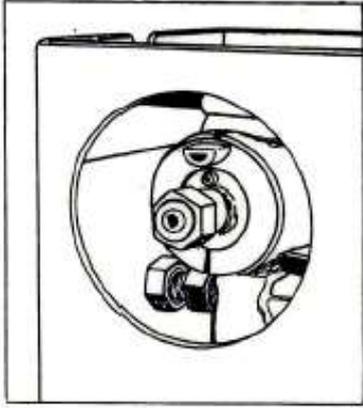
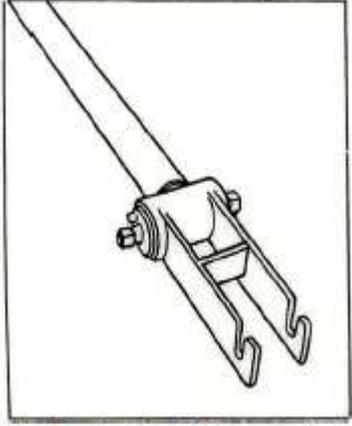
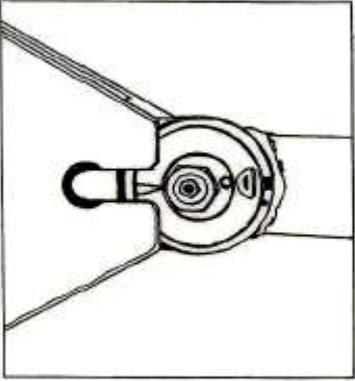
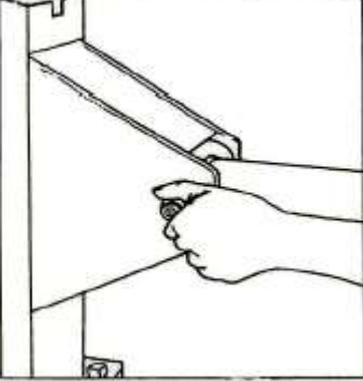
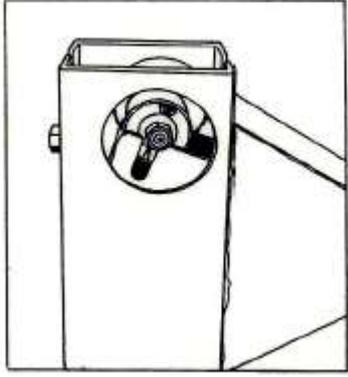
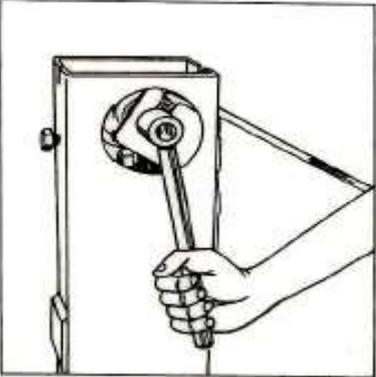
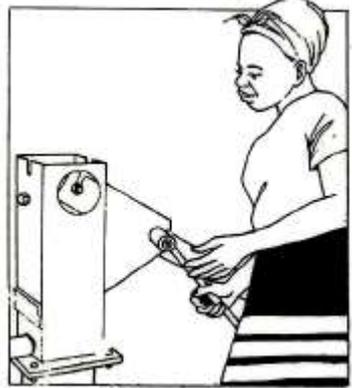
B) Maintenance and Repair Sheet-2

 <p>13. Disconnect and remove all rods. Remember to keep the rods in the same order. The last rod taken out should be the first rod put back..</p>	 <p>14. Remove the plunger</p>	 <p>15. Lower the fishing tool and connect to the rods</p>
 <p>16. Gently lower the last rod and hanger until you feel that you have caught the foot valve</p>	 <p>17. Remove all the rods, the fishing tool and the foot valve</p>	 <p>18. Push out the bobbin from the foot valve with your thumb. If the bobbin is damaged, replace it with a new one.</p>

 <p>19. Remove the O-ring from the foot valve. If the O-ring is damaged, replace it with a new one</p>	 <p>20. Push out the bobbin from the plunger with your thumb. If the bobbin is damaged, replace it with a new one</p>	 <p>21. Carefully remove the U-seal. If it is damaged, replace it with a new one. Make sure the groove faces upwards</p>
 <p>22. Wash the foot valve, plunger and rods. Use only clean water</p>	 <p>23. To reassemble the pump, first drop the foot valve down the borehole. Make sure the hook is upwards</p>	 <p>24. Put the plunger and pump rods back together and lower them down the borehole</p>

C) Maintenance and Repair Sheet-3

 <p>25. Make sure the rubber centralizer is slid down over each joint on the pump rods.</p>	 <p>26. Join all the rods together until the hanger rod is connected</p>	 <p>27. Make sure the foot valve is in place by pushing the rods at arms length down the borehole.</p>
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<p>28. Put the spanner through the hanger eye to support the rods and then replace the hanger pin and bush bearings. If the bush bearings are worn out or damaged, replace them with new</p>	<p>29. Turn the hanger pin and bush bearings so that the small projecting lugs are at the top</p>	<p>30. Put back the fulcrum pin and bush bearings in the handle. If the bush bearings are worn out or damaged, replace them with new ones.</p>
		
<p>31. Put the handle back</p>	<p>32. Make sure the projection lugs on the pin and bush bearings will fit into the slots on the pump body. Ensure that the pin is pushed right to the back of the slot.</p>	<p>33. Tighten the fulcrum nuts by hand.</p>
		
<p>34. Push the handle down so that the slots engage in the hanger. Ensure that the hanger pin has slid to the bottom of the slots. Remove the spanner.</p>	<p>35. Tighten the hanger nuts with the spanner. Tighten alternatively on both sides</p>	<p>36. Tighten the fulcrum nuts with the spanner. Tighten alternatively on both sides.</p>

D) Maintenance and Repair Sheet-4 (Re-assembling “Above Ground Components”)



37. Put the cover back on



38. Tighten the cover nut



39. Pump water until clear water comes out before using for drinking

Annex B: Weekly and monthly Inspections Sheet

Site Name		Caretaker Leader:		Pump Type:	Afridev		
Weekly							
Check Date	1. Working Condition			2. Is the surrounding of pump clean? (Yes/No)	3. Does pump handle work properly? (Yes/No)	4. Are bolts and nuts tightened? (Yes/No)	Remarks
	Check	In case of "non-functioning"					
		When stop	When repair				
	Functioning/ Non-functioning						
	Functioning/ Non-functioning						
	Functioning/ Non-functioning						
	Functioning/ Non-functioning						
	Functioning/ Non-functioning						

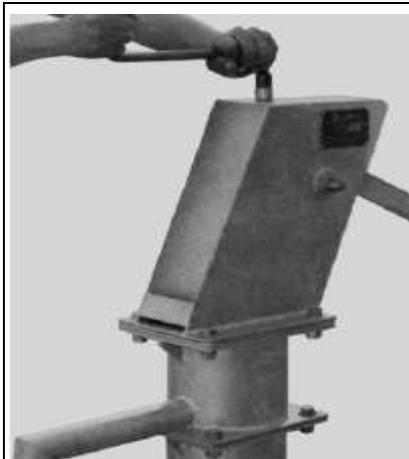
Monthly				
Check Date	1.Stroke Test	2.Buket Test	3.Chek Bering	Remarks
		How many times stroke to come up water	How many times stroke to fill up 20 liters	Worn out? (Yes/No)

Spare Parts Stock (In regard to the “rod centralizer, enter the number of rod in the bracket)

	U-seal	O-ring	Bobbin	Rod Centralizer	Bearing	Hanger	Fulcrum Pin
					bush	Pin	
For 1 year stock	2	1	1	4	8	0	0
Present stock							
Last replacement							
Next replacement							

Annex E: Indian Mark-II Hand Pump Maintenance and Repair Sheet

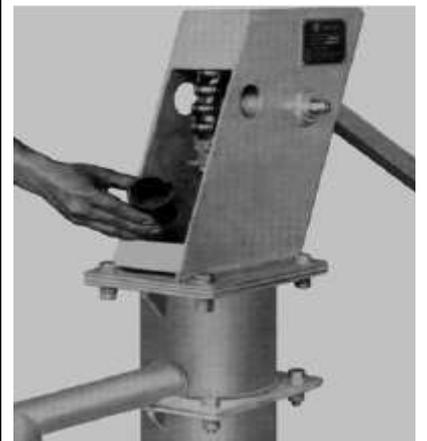
a) Maintenance and Repair Sheet-1(Dismantling the “Above Ground Components”)



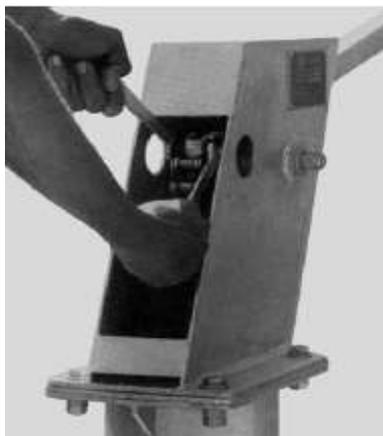
1 Loosen Front cover bolt



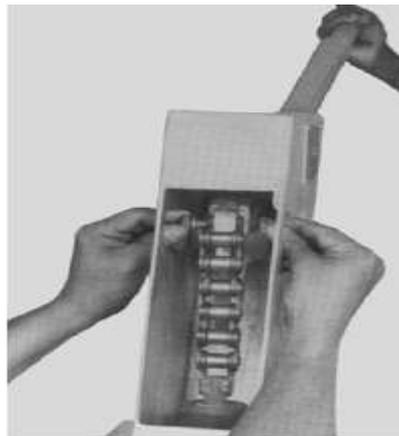
2 Remove Front cover from Pump head



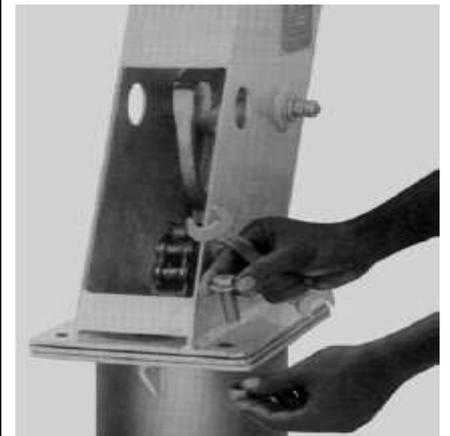
3 Lower Pump handle, put Chain below the Chain assembly



4 Lift Pump handle to top position and loosen “Nyloc” nut with spanners



5 Remove the “Nyloc” nut from bolt and remove Chain from the Handle



6 Loosen and remove bolts and nuts connecting Head and Water tank



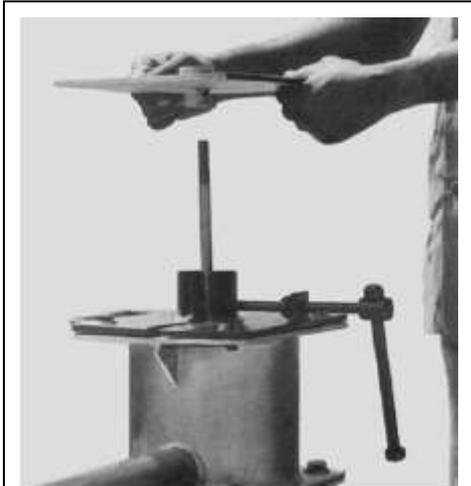
7 Lift and remove Head assembly (chain passes hole in Head flange)



8 Lift Third plate with Pumprod assembly and insert Rod vice

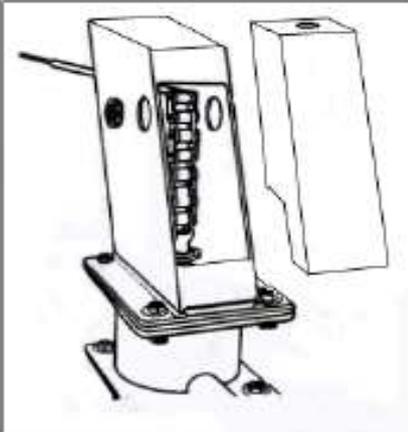
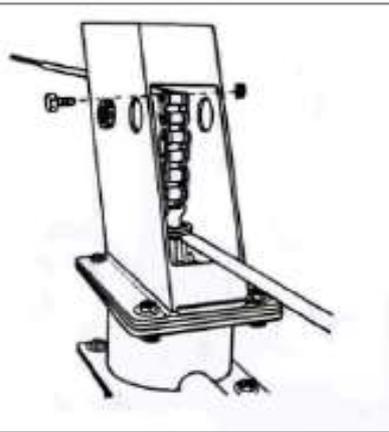
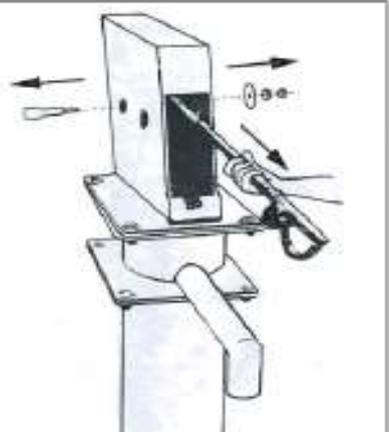
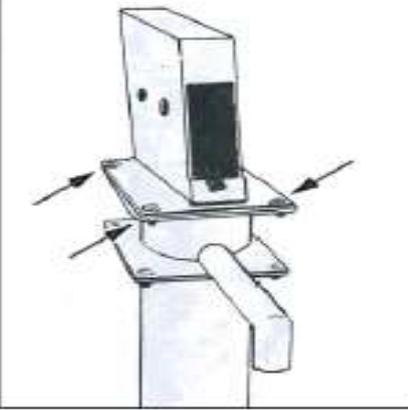
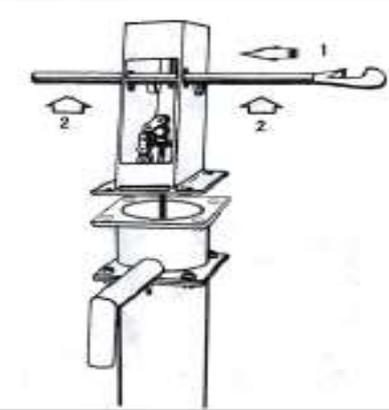
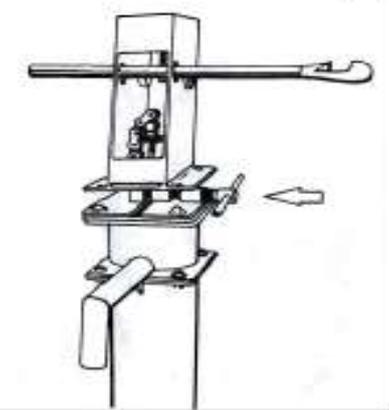
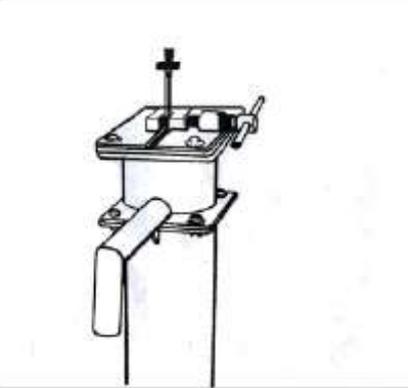
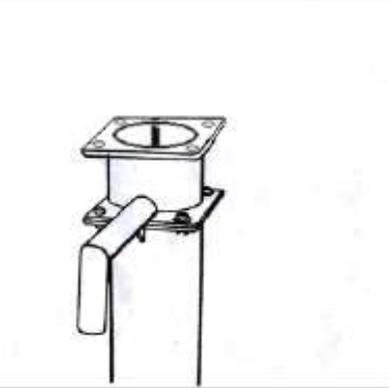
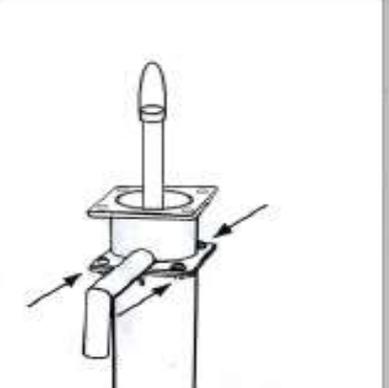


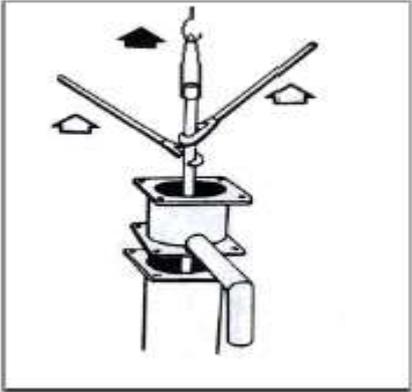
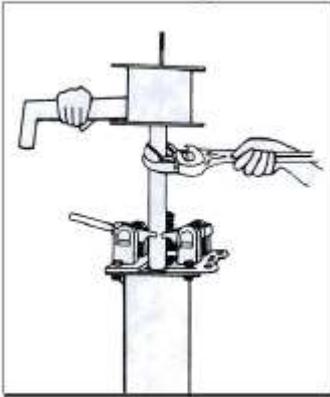
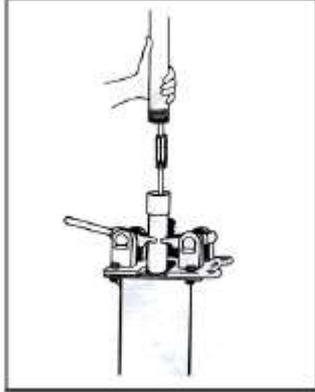
9. Place Third plate on Rod vice, take off the Chain support and remove the Chain assembly



**10 Unscrew check nut and remove
Third plate assembly**

b)

		
<p>1. Remove inspection cover from head assembly</p>	<p>2. Disconnect handle from chain by removing the lock nut and bolt</p>	<p>3. Take out handle-axle. While removing, use axle punch to protect axle thread and remove handle from head assembly.</p>
		
<p>4. Remove flange bolt from head assembly</p>	<p>5. Insert one pipe lifter into the holes provided in the head assembly and lift up</p>	<p>6. Fit the connecting rod vice onto the water chamber top flange</p>
		
<p>7. Remove chain & chain lock nut and remove head assembly</p>	<p>8. Support connecting rod with connecting rod lifter, loosen connecting rod vice and remove. Gently lower connecting rod. Remove connecting rod lifter</p>	<p>9. Remove water tank bottom flange bolts and set pipe lifter</p>

 <p>10. Lift water tank by using water tank lifter and pipe lifters or chain block</p>	 <p>11. Fit self locking clamp or clamp and remove water tank</p>	 <p>12. Disassemble rising main and connecting rods. Remove connecting rod lengths, one at time</p>
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Maintenance and Repair Sheet-1(Dismantling the “below Ground Components”)

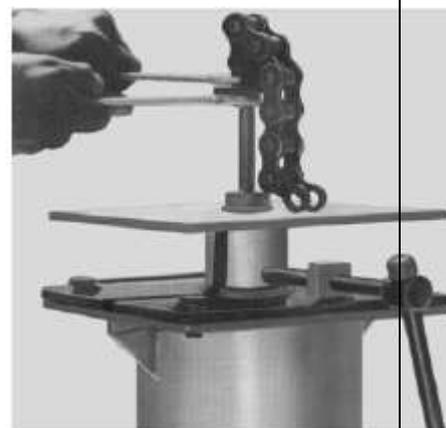
 <p>1 Attach Rod lifter to Top rod, hold Rod lifter and remove Rod vice</p>	 <p>2 Lift Pumprod assembly by hand until next connection is about 30 cm above the Water tank. Introduce Rod vice and clamp Pumprod securely in this position</p>	 <p>3 Open the connection with two spanners and remove the rod</p>



7 Lift and remove Head assembly (chain passes hole in Head flange)



8 Lift Third plate with Pumprod assembly and insert Rod vice



9. Place Third plate on Rod vice, take off the Chain support and remove the Chain assembly

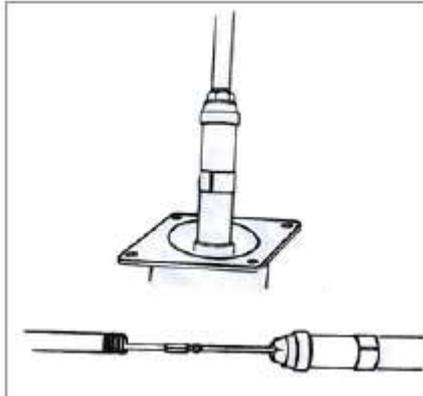


10 Unscrew check nut and remove Third plate assembly

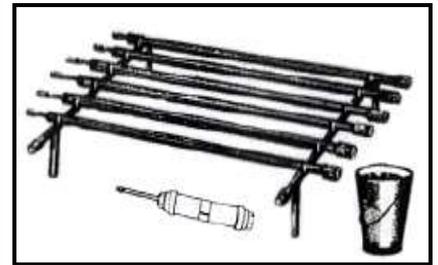
c) Maintenance and Repair Sheet-2



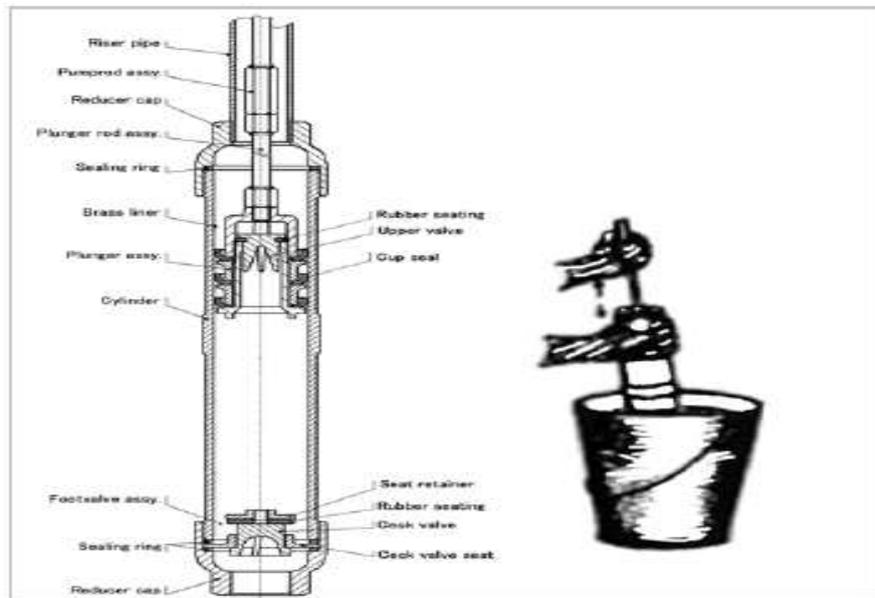
13. While removing the pipes and rods, ensure that you place these on the pipe stands. Continue doing so until the entire below-ground assembly has been removed from the tube-well



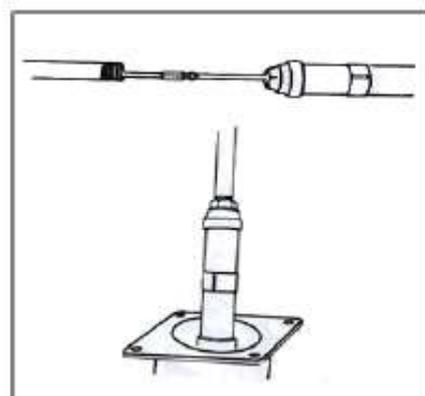
14. Disconnect cylinder from the last pipe



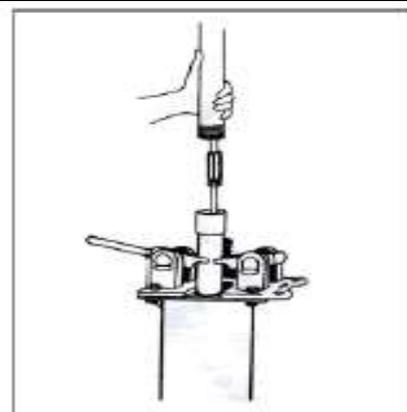
15. Check all the pipe thread; clean out the threads by using wire brush. Remove any dirt and rust from the pipes by using wire brush or sandpaper. If any pipe is damaged, replace. Ensure that all pipe couplings are intact and fit properly



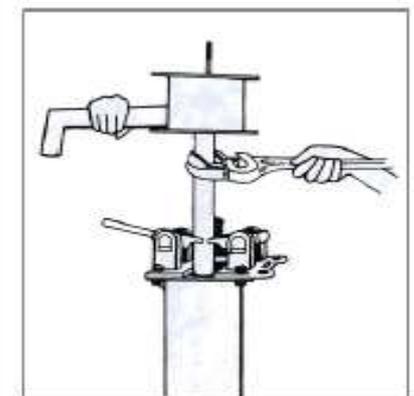
16. Open cylinder with the help of pipe wrenches and check that plunger and footvalve are tight and properly assembled. Test cylinder in a bucket of water. If check-valve leaks replace it.



17. Joint first connecting rod to plunger rod. Screw first pipe into cylinder. Lower cylinder



18. Lower pipe and connecting rod into tube-well using pipe lifters/chain block and clamp with self-locking clamp. Continue to last pipe

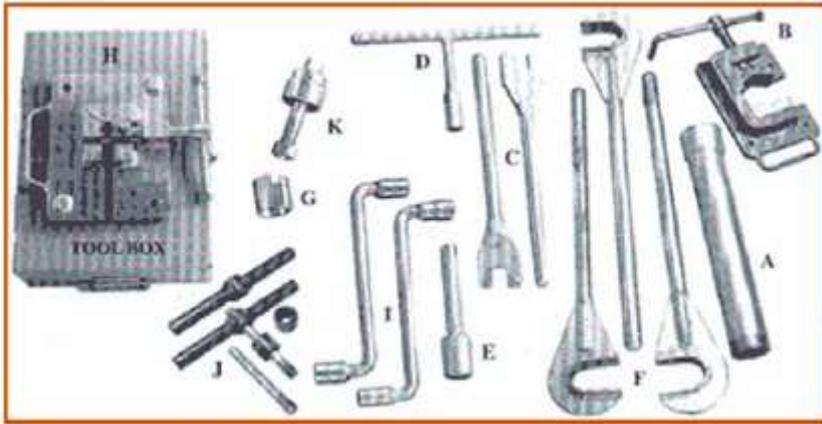


19. Screw water tank to last pipe. Tighten fully

d) Maintenance and Repair Sheet-3

<p>20. Remove clamp. Carefully lower water tank on to pedestal with the pipe lifters or chain block. Spout must face drain</p>	<p>21. Bolt and fit check nuts</p>	<p>22. Fit the connecting rod vice onto the water chamber top flange</p>
<p>23. Screw chain onto rod. Use two spanners-tighten check nut fully against chain coupling</p>	<p>24. Remove rod clamp. Lower head onto water tank. Bolt and fit check nuts</p>	<p>25. Insert handle through head. Adjust handle, then insert axle. Tap lightly, but do not use</p>
<p>26. Fit chain to handle</p>	<p>27. Fix inspection cover on the head</p>	<p>30. Put back the fulcrum pin and bush bearings in the handle. If the bush bearings are worn out or damaged, replace them with new ones</p>

e) Maintenance and Repair Sheet-4 (**Special Installation & Maintenance Kit**)



Annex F: Monthly check sheet for spring Type-1

Site Name:	Caretaker leader:
------------	-------------------

Date	Facility	Work condition		Crack (Yes/No)	Leak/ Broken (Yes/No)	Wet ground (Yes/No)	Clean in/outside (Yes/No)	Drainage OK? (Yes/No)	Over flow OK? (Yes/No)	Pipe OK? (Yes/No)	Valve? (Yes/No)	Remarks	
		Check	In case of "non-functioning"										
			When stop										When repair
	Spring Box	Functioning/No n-functioning											
	Tap	Functioning/No n-functioning		/	/	/	/	/	/				
	Spring Box	Functioning/No n-functioning											
	Tap	Functioning/No n-functioning		/	/	/	/	/	/				
	Spring Box	Functioning/No n-functioning											
	Tap	Functioning/No n-functioning		/	/	/	/	/	/				
	Spring Box	Functioning/No n-functioning											
	Tapstand	Functioning/No n-functioning		/	/	/	/	/	/				
	Spring Box	Functioning/No n-functioning											
	Tap	Functioning/No n-functioning		/	/	/	/	/	/				
	Spring Box	Functioning/No n-functioning											
	Tap	Functioning/No n-functioning		/	/	/	/	/	/				

Annex G: Monthly check sheet for spring Type-2

Site Name:			Caretaker leader:										
Date	Facility	Work condition			Crack (Yes/No)	Leak/ Broken (Yes/No)	Wet ground (Yes/No)	Clean in/outside (Yes/No)	Drainage OK? (Yes/No)	Over flow OK? (Yes/No)	Pipe OK? (Yes/No)	Valve? (Yes/No)	Remarks
		Check	In case of 'non-functioning'										
			When stop	When repair									
	Spring Box	Functioning /Non-											
	Tapstand No.1	Functioning /Non-											
	Tapstand No.2	Functioning /Non-											
	Spring Box	Functioning /Non-											
	Tapstand No.1	Functioning /Non-											
	Tapstand No.2	Functioning /Non-											
	Spring Box	Functioning /Non-											
	Tapstand No.1	Functioning /Non-											
	Tapstand No.2	Functioning /Non-											
	Spring Box	Functioning /Non-											
	Tapstand No.1	Functioning /Non-											
	Tapstand No.2	Functioning /Non-											

Annex H: Monthly check sheet for spring Type-3

Site Name:			Caretaker leader:										
Date	Facility	Work condition		Crack (Yes/No)	Leak/ Broken (Yes/No)	Wet ground (Yes/No)	Clean in/outside (Yes/No)	Drainage OK? (Yes/No)	Over flow OK? (Yes/No)	Pipe OK? (Yes/No)	Valve? (Yes/No)	Remarks	
		Check	In case of "non-functioning"										
			When stop										When repair
	Spring Box	Functioning /Non-functioning											
	Reservoir	Functioning /Non-functioning											
	Tapstand No.1	Functioning /Non-functioning											
	Tapstand No.2	Functioning /Non-functioning											
	Spring Box	Functioning /Non-functioning											
	Reservoir	Functioning /Non-functioning											
	Tapstand No.1	Functioning /Non-functioning											
	Tapstand No.2	Functioning /Non-functioning											
	Spring Box	Functioning /Non-functioning											
	Reservoir	Functioning /Non-functioning											
	Tapstand No.1	Functioning /Non-functioning											
	Tapstand No.2	Functioning /Non-functioning											
	Spring Box	Functioning /Non-functioning											
	Reservoir	Functioning /Non-functioning											
	Tapstand No.1	Functioning /Non-functioning											
	Tapstand No.2	Functioning /Non-functioning											

RURAL WATER SUPPLY POINT SOURCES

(Parts A, B, C, D)

Technology and Management

Part - D: Rural Water Supply Scheme Management

Document 2

Part - D: Rural Water Supply Scheme Management

Table of Contents

List of Tables	iii
List of Figures	iii
List of Annexes	iii
4. RURAL WATER SUPPLY SCHEME MANAGEMENT	1
4.1 Introduction	1
4.2 Objectives	1
4.3 Community Managed WASH Systems	2
4.3.1 Community Managed O&M	2
4.3.2 What is the “Community”?	3
4.3.3 Partners in Community Management	4
4.3.4 Organizational Structure for O&M Management-1	5
4.3.5 Organizational Structure for O&M Management-2	6
4.3.6 Roles and Responsibilities of Stakeholders in O&M Management	7
4.3.6.1 Federal MoWIE	7
4.3.6.2 Regional Water Bureaus	8
4.3.6.3 Zone Water Offices	9
4.3.6.4 Woreda Cabinet	9
4.3.6.5 Woreda Water Offices	10
4.3.6.6 WASHCOs	11
4.3.6.7 Pump Attendant/Care Taker (PA/CT)	11
4.3.6.8 Beneficiary Community	13
4.3.7 Formation of WASHCO/WUB	13
4.3.7.1 WHAT IS WASHCO?	13
4.3.7.2 Structure of WASHCO	13
4.3.7.3 Committee Composition and Member	14
4.3.7.4 Gender aspects of the WASHCO’s	14
4.3.7.5 Task of WASHCO Members	15
4.3.7.6 How to elect WASHCO members?	16
4.3.7.7 What is tenure of WASHCO members?	17
4.3.7.8 Position of WASHCO to other stakeholders in the community	17
4.3.7.9 Evaluation and Re-Election of the Committee	18
4.3.7.10 Legal Status of WASHCO	18
4.3.7.11 Handing Over	18
4.3.8 Formulation of By-Law	18
4.3.8.1 Sample of By-Law for WASHCO’s	19
4.4 Sources of Income and Financial Management of Water Scheme	24
4.4.1 General	24
4.4.2 Source of Income	24
4.4.2.1 Users Fee Payment Condition	24
4.4.3 Identifying operation and maintenance costs	25
4.4.4 What is O & M Cost?	25
4.4.5 Community- based Cost Recovery	27
4.4.5.1 Recovery of O&M costs only, with initial use of subsidies	27
4.4.6 Water Supply Tariff	28
4.4.7 Daily Financial Management	30
4.4.7.1 Decision on Payment Method	30
4.4.7.2 Options for Collection of O&M Fund	32

4.4.7.3	Formulation of User Households List	33
4.4.7.4	Bank Account Opening	34
4.4.7.5	Management of Daily Cash Movement	35
4.4.7.6	Basic Elements of Financial Records	35
4.4.8	Access to other sources of funding	40
4.4.8.1	Tapping into existing community contribution	40
4.4.8.2	Cooperative funds	41
4.4.8.3	Subsidies	41
4.4.8.4	Grants	41
4.4.8.5	Micro-credit	42
4.5	Human Resource Management	42
4.5.1	Restructuring and training	42
4.6	O&M Information Management	43
Annexes: FORMATS		44

List of Tables

Table 4-1:	Roles and responsibilities of beneficiary community	13
Table 4-2:	General tasks assigned for WASHCO members	15
Table 4-3:	Procedures in the Formation of By-Law	19
Table 4-4:	Suggested Schedule of Spare Part Replacement	26
Table 4-5:	Income and Expenses Book Model	35
Table 4-6:	A Typical Cash receipt Registration Form/ Invoice	37
Table 4-7:	A Typical Cash Payment Invoice Form	38
Table 4-8:	Model of Payroll List	39
Table 4-9:	Per-Diem Payment Form	39

List of Figures

Figure 4-1:	WaSHCO's Stakeholders	4
Figure 4-2:	Organizational structure for O&M Management-1	5
Figure 4-3:	Organizational structure for O&M Management-2	6
Figure 4-3:	Structure of WASHCO for Point Water Sources	14
Figure 4-5:	Demonstration of WASHCO in relation to other stakeholders	18

Lists of Boxes

Box 1:	Specific Objective of the Guideline	2
Box 2:	principles of Community managed O&M	3
Box 3:	Roles and Responsibilities of Ministry of Water, Irrigation and Energy	8
Box 4:	Roles and Responsibilities of Regional Water Bureau	8
Box 5:	Roles and Responsibilities of Zone Water Department	9
Box 6:	Roles and Responsibilities of Woreda Cabinet	9
Box 7:	Roles and Responsibilities of Woreda Water Office	10
Box 8:	Roles and Responsibilities of WASHCOs	11
Box 9:	Roles and Responsibilities of Pump Attendant/Caretaker	12
Box 10:	Operation and maintenance costs include	25
Box 11:	Options for collection of O&M Fund	32

List of Annexes

Annex A:	Basic Ledger of Water Fee Collection	44
Annex B:	Income & Expense Ledger	45

4. RURAL WATER SUPPLY SCHEME MANAGEMENT

4.1 Introduction

The sustainability of the development effect is one of chief concerns among stakeholders including the sustainable functioning of the water scheme constructed. The sustainable Operation and Maintenance (O & M) and management of water scheme primarily depend upon the capacity of the beneficiary (or users') communities accompanied with discharging their responsibilities and confidence. The realization of these conditions requires considerable time and efforts to be made through continued interactions among all stakeholders concerned, particularly the target users' communities and Woreda officials. In this respect, the Woreda Water Office (WWO).

(WWO) are expected to perform their tasks through which those users' communities are expected to be encouraged and empowered into self-organization for sustained operation and management of water scheme.

In the past, in many cases, constructed water schemes had considerable problems; there was poor usage and maintenance of water schemes, eventually broken down, because the user communities did not feel that they owned the water scheme, they did not take responsibility of management and O & M, the water schemes were installed without their involvement. Recent experiences have shown that water schemes are effective management system much depends on regular management and monitoring and close communication between the administration (WWO) and the beneficiaries.

Community Based Management (CBM) is the process of empowering the community members to assume the lead role in decision making about the levels of services they require, whilst organizing themselves to plan, implement, operate and maintain their water supply and sanitation facilities.

It was indicated in the assessment report that about 25% of the existing water supply schemes were non-functional, as reported in the WaSH Inventory of the 2011. Some of the core issue for non-functionality is that the lack of functional community managing the schemes, no ample contribution for O&M and poor spare part management.

This manual is prepared to establish solid community-based management system through capacity building of water user communities represented by Water, Sanitation and Hygiene Committee (WASHCO).

The O&M manual has been prepared to be used as a basis for bridging the gaps which have been indicated in the assessment report.

4.2 Objectives

Community Management and Ownership Manual have been prepared for the purpose of providing guidance principles for water supply O&M. The manual contains task management and personnel management. By task management it is meant the management of the activities set in the water supply and sanitation system so as to ensure that the system is reliable and sustainable. Regarding personnel administration it is meant that the management of the personnel who are assigned to do O&M tasks.

Box 20: Specific Objective of the Guideline

[Specific Objectives of the Guideline]

- ☞ To determine the right and obligation of the community over the scheme,
- ☞ To define the responsibility of the **WASHCO**,
- ☞ To enhance and develop common responsibility among stakeholders for the water scheme reliability and sustainability,
- ☞ To bring active community participation that lasts long under sustainable condition.
- To provide basic and practical knowledge & skills on how to manage and maintain the completed water schemes which are necessary as daily water scheme management.

4.3 Community Managed WASH Systems

Community management refers to the capacities and willingness of users to change and determine the nature of development affecting them. However, community management can only work if WASHCO receives support when they require it. But usually external support agencies, such as Bi-lateral donors, multi-lateral organizations and development banks, assist governments in the provision of water supply systems to communities. Community members are asked to participate in construction and trained to operate and maintain the system.

Once construction is done the support agency and government staff "hand over" the system to the community and go off, saying that the community should from now on manage the system. We assume that they can and will. Often too little thought is given to putting in place the conditions for sustained community management. Thus, in WASH system community management refers to the level at which the community exercise responsibility for decision making and control over subsequent education of these decision during project development and a capability of a community control and strongly influence the development of its water supply and sanitation schemes, which has three basic components:

4.3.1 Community Managed O&M

Community managed O&M is the process of empowering the community members to assume the lead role in decision making about the levels of services they require, whilst organizing themselves to operate and maintain their water supply and sanitation facilities.

Box 21: Principles of Community Managed O&M

Community managed O&M based on the following principles:

- ☞ Communities must be empowered to control and make their own decisions concerning their water supply and sanitation situation.
- ☞ Communities must be committed, responsible and be ready to pay for maintenance of water supply facilities
- ☞ Communities must take the initiatives to solve their own problems rather than solely depending on outsiders.
- ☞ Communities must make informed decisions
- ☞ Communities must organize and mobilize local resources such as labor, money and other materials to O&M of the schemes
- ☞ Communities must maintain their water supply facility and repair it if it breaks down.
- ☞ Communities should monitor progress and evaluate impact.

In the Community Managed O&M, the representative of the user-group (WASHCO) – i.e. the **Community is the O&M Manager**. Allocated funds are transferred to a special CM-O&M account through a financial intermediary (e.g. micro-finance institution) with Woreda WaSH Team (WWT) authorization, are withdrawn by community signatories for approved expenditures on operation and maintenance activities. The WASHCO is directly responsible for contracting, procurement, quality control and financial accountability – to the community and to the Kebele and Woreda Administrations. There is no hand-over. The user-community “owns” the project from the beginning. CM-O&M contribution mechanism can also include community financing mechanism through the government financial system.

The fund/contribution flow (disbursement, settlement and replenishment) mechanism to the community through the government financial system is also the other option for community financing in CM-O&M which requires developing and testing.

4.3.2 What is the “Community”?

We have been talking a lot about “COMMUNITY”, but what or who do we mean by “COMMUNITY”?

We are talking about a “WATER USER COMMUNITY/WASHCO” - people who live around a borehole scheme, a shallow well or piped system and share the use of this facility. They form a “community” – they are neighbors’, draw water from the same water point, and can work together to improve their water, sanitation, and hygiene.

For a single water point (e.g. borehole scheme) the “WASHCO” will be small - **people living in one section of a village**. For a piped scheme, the “water user community” will be large - **members of a whole village or several villages**.

User communities will take the lead to develop water supply and sanitation facilities for their own areas. They will come together, work out what they want, and apply for help to develop these facilities.

So the “COMMUNITY” is YOU – you and your neighbors’.

Let’s start talking about:

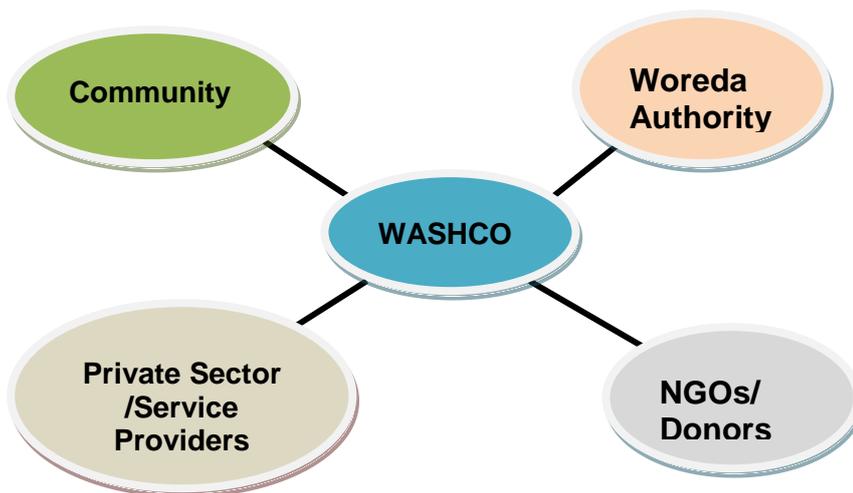
- Problems with the existing water supply facilities
- How can you improve these facilities
- How you can work together to plan and make these improvements.



4.3.3 Partners in Community Management

Community management puts water users in charge of their own water system. The most effective community management is an evolving partnership, in which a community – centred organization typically a WASHCO draws on resources from within the community, from other communities, and from a variety of other outside agencies. Potential partners of WASHCO’s include:

Figure 4-1: WASHCO’s Stakeholders



Active and continuous stakeholder’s participation and engagement for water supply and sanitation systems O&M is indispensable and without this it is quite difficult to realize sustainable condition. In fact it is very natural for a given community to participate in different activities that could generate benefit for them. The existing arrangement of Rural WASH in Ethiopia is community based on community management and ownership. The

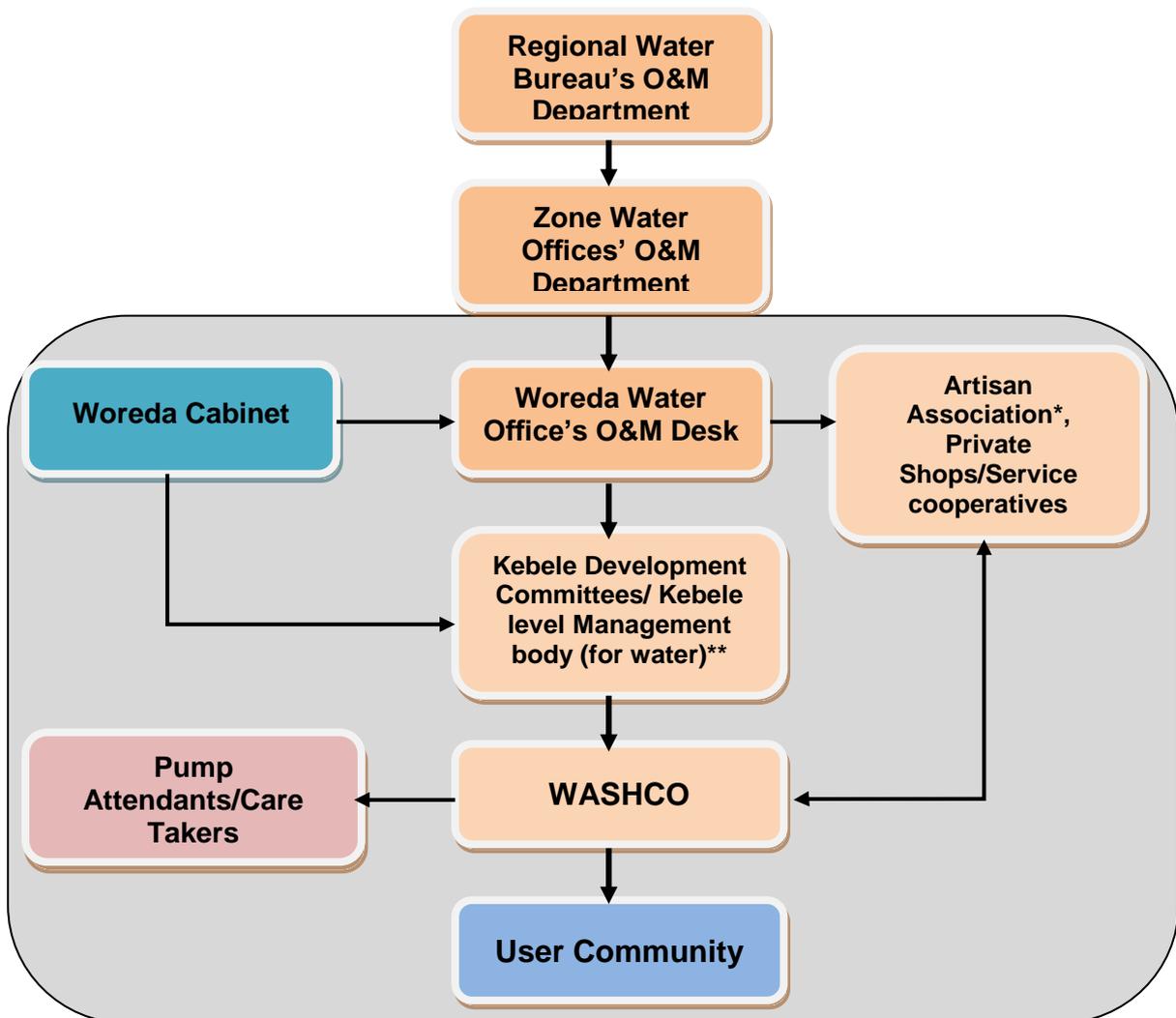
Rural WASH O&M shall be carried by the WASHCO with technical support and backup from the Woreda, Zonal and Regional Water Office/ Bureau establishments.

The immediate government body who shall give technical support and backup to WASHCO is the Woreda Water Office (WVO). In general, with a due consideration to the participatory O&M issue right and obligation of the beneficiary community, duties and responsibilities of the committee and decision area and the point of punishment up on the role and responsibility that will be violated by every stakeholders has to be call the attention of every development partners.

4.3.4 Organizational Structure for O&M Management-1

Figure 4-2 below shows the organizational structure of the operation and maintenance management of rural water supply embrace the regional water bureau to the user community.

Figure 4-2: Organizational structure for O&M Management-1



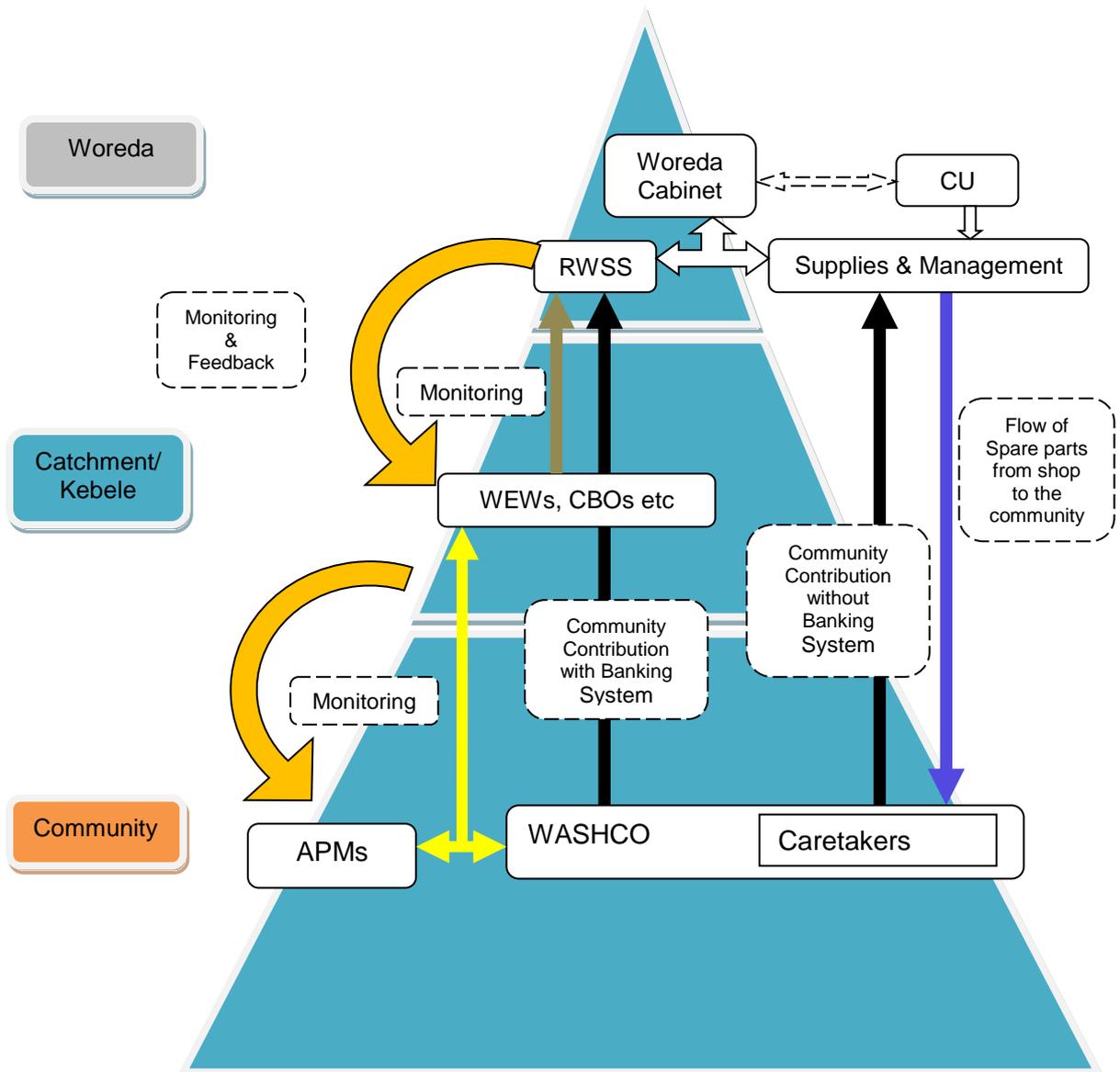
Note: The roles and responsibilities of the Government institutions shown in this structure remain within their regular duty. However, their roles and responsibilities related to O&MM is also described in this guideline.

- * The Artisan associations are formed by the local contractors, which would provide services in the construction and maintenance of RWS schemes, and private shops and service cooperatives are proposed to distribute spare parts to the user communities.
- * * The kebele level management body may be an individual who will be paid by the user communities in the kebele or a group of people drawn from that particular kebele, which will work voluntarily (without payment). The selection of either of the options and election of the management body should be left to the users in the Kebele.

4.3.5 Organizational Structure for O&M Management-2

Figure 4-3 shows the organizational structure at Woreda level to manage the operation and maintenance of water supply schemes. The above organization structure has broken down to show the involvement of various bodies at Woreda level.

Figure 4-3: Organizational structure for O&M Management-2



4.3.6 Roles and Responsibilities of Stakeholders in O&M Management

Implementation and operation and maintenance (O&M) of rural water supply (RWS) activities shall be carried out through a partnership of various key actors. The WASH strategy formally brings together active stakeholders at Woreda level to support the community in planning and coordination of the implementation of RWS throughout the Woreda. This section identifies and recognizes the stakeholders involved at different levels, their roles and responsibilities, and how they relate to one another for implementation and O&M of RWS activities.

The various key players in RWS are located at various levels from the national level down to the community. The table below summarizes the key players and their strategic functions.

Table 4- 1: Key Stakeholders in O&M Management of RWS

Level	Players	Focusing on	Roles
Federal Government	MoWIE/	Regional Gov Council	Providing policy direction and sourcing funds for capacity building, strategy formulation, Supporting Regions in Programming (new / rehabilitation of water supply and sanitation facilities)
Regional Government	Regional WB	Council	Backstopping in the supply of spares (spare parts), especially for hand dug wells. Technical Support and Monitor ZWO/WWO
Zone	Zone Water Office	Woreda Council	Backstopping in the supply of spares (spare parts), especially for hand dug wells. Technical Support and Monitor to Woreda
Woreda	Council	WWO	Backstopping in the supply of spare parts; Accounting, Planning, Storing of spares
	Woreda Water Office	WASHCO	Implementing Training, Monitoring, Supervision, Reporting & Recommending
	WASHCO	Caretaker	Community Sensitization, Repairing & Monitoring
Community	WASHCO	Water point And individual households	Owners of the water points. Managing & Budgeting of various activities at the water point including organizing meeting, training of community members, arranging for repairs, and scheduling for preventive maintenance

4.3.6.1 Federal MoWIE

Box-3 described the roles and responsibilities of the Ministry of Water, Irrigation and Energy in the operation and maintenance management of rural water supply schemes.

Box 22: Roles and Responsibilities of Ministry of Water, Irrigation and Energy

- ☞ Is responsible for formulating national water policy, strategy and action plans, and for establishing national standards pertaining to spare parts, water quality, water infrastructure and other relevant standards.
- ☞ is responsible for supervising and following up on the implementation of O&M policy and strategy instruments as well as overall sector standards. In addition to its regulatory function,
- ☞ Provide technical support to Regional Water Bureaus
- ☞ Arrange and facilitate the involvement of private sectors in O&M management, and raise the awareness of the private sector on the business opportunities of spare part.
- ☞ Facilitates and develops the local production of spare parts.
- ☞ In collaboration with the programme prepares training programmes to Regional Water Bureau experts.

4.3.6.2 Regional Water Bureaus

The Regional Water Bureaus monitors the implementation of the operation and maintenance management procedure. The Bureaus also updates the procedure when required. In addition to this, the Regional Water Bureaus R&R are:

Box 23: Roles and Responsibilities of Regional Water Bureau

- ☞ Provide technical support to WASHCO/WUB in the preparation of O&M action plan, budget and identification of spare part supply requirement for maintenance within the Woreda.
- ☞ Provide technical support to WASHCO/WUB and make all efforts to assure water supply for the community is reliable, adequate and safe for drinking.
- ☞ Arrange and facilitate the availability of spare parts for O & M activities
- ☞ Based on the selected and approved spare parts management option, the Bureaus facilitates the establishment and strengthens spare part shops at Woreda level
- ☞ Again, based on the approved option (if it is through the WWO), sets guideline on the prices of spare parts and bill collection tickets for sell at Woreda level.
- ☞ Procures and distributes spare parts and bill collection tickets when requests and delegation comes from Woredas.
- ☞ Raise the awareness of the private sector on the business opportunities of spare part.
- ☞ Facilitates and develops the local production of spare parts.
- ☞ Prepares payment guideline for maintenance services to be provided by artisans or their association

- ☞ Provide tools to the WWO and facilitates the availability of necessary documents at Woreda level.
- ☞ Facilitate the legal environment for community management (e.g. WaSHCOs' legal entity and others)
- ☞ -Develop regional performance indicators for O&M and monitor their implementation.
- ☞ In collaboration with the programme prepares training programmes to Zonal & Woreda experts.

4.3.6.3 Zone Water Offices

Box 24: Roles and Responsibilities of Zone Water Department

- ☞ Provide technical support to Woreda Water Office in the preparation of O&M action plan, budget and identification of spare part supply requirement for maintenance,
- ☞ are the supporting arms of the Water Bureaus and are mandated to provide technical support to Woreda Water Offices
- ☞ are responsible for coordinating activities, consolidating plans and reports of woredas and relaying requests from regional water bureaus and/or Woreda water offices,
- ☞ Zonal Water Offices are the links between Regional Bureaus and Woreda Water Offices

4.3.6.4 Woreda Cabinet

The Woreda Cabinet effectively functions as the Woreda WaSH steering committee. Its main function is oversight and guidance of the Woreda WaSH program. In this specific O&M framework, its responsibilities include but not limited to:

Box 25: Roles and Responsibilities of Woreda Cabinet

- ☞ defining O&M priorities and objectives for the Woreda
- ☞ establishing the Woreda O&M Team
- ☞ approving O&M annual plans and budgets
- ☞ confirming community contribution transfer arrangements with Woreda Finance Office or local Micro Finance Institution
- ☞ receiving, approving and forwarding O&M monitoring reports
- ☞ conducts regular performance review of the WWT and its member offices and the O&M implementation in the Woreda
- ☞ advocates the O&M finance requirements to sustain utilization of the schemes
- ☞ ensures that the O&M annual plan and budget is approved by the Woreda Council

4.3.6.5 Woreda Water Offices

Box 26: Roles and Responsibilities of Woreda Water Office

- ☞ The Office shall prepare the O&M annual action plan, budget and identification of spare part supply requirement for maintenance within the Woreda and submit to the Zone Water Office.
- ☞ The office shall facilitate the implementation the O&MM procedure
- ☞ The office shall support the establishment of tariff collection pattern and follow up the tariff collection and the saving.
- ☞ The office shall ensure that WASHCOs have all the necessary tools and documents for O&M.
- ☞ The office shall provide new and refresher trainings to pump attendants and care takers in collaboration with the Region and Zone.
- ☞ The office shall ensure that trained artisans exist in the Woredas for the maintenance of rural water supply schemes.
- ☞ The office shall ensure the availability of the most needed spare parts in the Woreda for sell to the user communities.
- ☞ The office shall facilitate the maintenance of water points through pump attendants/caretakers/artisans.
- ☞ The office shall be responsible for the development of technical capacity in the maintenance of schemes at Woreda level. It will also periodically provide training to concerned people at Woreda, kebele and WASHCO level as their regular task.
- ☞ The office shall maintain defects, which are beyond the capacity of pump attendants, care takers and artisans.
- ☞ The office shall take data on the number of users of each scheme.
- ☞ The office categorizes water user communities as category 1 and 2 to facilitate the proposed demonstration in the implementation strategy of the procedure.
- ☞ The office will keep records of O&M status of all water supply schemes in the Woreda and updated annually.
- ☞ The office monitors and ensures the regional performance indicators for O&M are implemented.
- ☞ Monitors the water quality status of rural water supply schemes at least twice a year and undertakes disinfection.
- ☞ The office shall report to the Zone Water Office and to the Regional water Bureau's on monthly basis.
- ☞ The office shall prepare the annual spare parts and associated items needs, calculate the budget required and presents it to the Zone Water Office for budget allocation.

4.3.6.6 WASHCOs

The job of this committee is to take the lead in managing the water facilities. They have a number of responsibility and tasks:

Box 27: Roles and Responsibilities of WASHCOs

Roles and Responsibilities of WASHCO's:

- ☞ In general, responsible for the management of the water supply schemes and establishing of the tariff collection pattern
- ☞ Collects O&M Management funds from the user community and saves the money in Credit and Saving Institute or in another nearby Bank
- ☞ Reports the collection of the O&MM fund and other O&MM activities to the Woreda Water Office regularly
- ☞ To employ water scheme personnel, if necessity is arisen, and set salary and obtain the approval of the users' assembly
- ☞ Shall supervise the activities of PAs/CTs and keep the maintenance logbook and other important documents of the scheme in the Who is providing metal boxes to WASHCOs?.
- ☞ Shall quarterly inform the community about the financial status of their scheme
- ☞ Shall initiate and follow up preventive and corrective maintenance
- ☞ Is responsible for resolving the complaints of the community about the quality of the service they receive from the schemes
- ☞ Is responsible for the procurement of spare parts, bill collection tickets and other documents necessary for O&MM.
- ☞ To make regular and close communication with Woreda Water Office on any issues related to O &M and management of water scheme
- ☞ To prepare work plan for the rehabilitation the water facility in consultation with Woreda Water Office.

4.3.6.7 Pump Attendant/Care Taker (PA/CT)

A caretaker is the key person for preventive maintenance and daily operation of the water supply facility. This section includes roles and responsibilities of caretakers, Preventative maintenance activity and Community sensitisation on O&M by caretakers.

Caretakers, attendants and operators are men and women chosen by the WaSHCO to operate and maintain water supply facilities.

The following criteria should be taken into consideration when selecting the caretaker/attendant.

Box 28: Roles and Responsibilities of Pump Attendant/Caretaker

Criteria for selection of caretaker/attendant:

- ☞ Good motivation
- ☞ Authority and respect to control use of facilities
- ☞ Able to carry out maintenance and small repairs after training
- ☞ Good communication with women and men about water use and hygiene
- ☞ Living near the water facility
- ☞ Seldom absent for long periods
- ☞ Likely to remain in the community
- ☞ Completes training successfully
- ☞ Able to keep records - not always a requirement but level of literacy to be stipulated if necessary.

Roles and Responsibilities of Pump Attendant/Caretaker

- ☞ Is responsible for conducting preventive maintenance and recording both corrective and preventive maintenance activities carried out
- ☞ Is responsible for identifying the corrective maintenance needed and reporting to the WASHCO/WUB for action
- ☞ is responsible for following up the corrective maintenances carried out by artisans and reporting to the WASHCO/WUB
- ☞ Conduct routine services of the hand pump (e.g. greasing of chain, tying of loose nuts, check of pumping rate, etc.) and appurtenant facilities.
- ☞ Conduct minor hand pump repairs.
- ☞ Locking and opening of water facility as scheduled
- ☞ To keep the equipment operation follow-up card at the proper place and avail on request to the body that needs the information
- ☞ To show the beneficiary how to use the scheme properly
- ☞ Sensitize the community on the usage of the water supply facility.
- ☞ Enforce agreed guidance on the water uses.
- ☞ Keep records of households drawing water from the water facility
- ☞ To report any break down or damage on time to the concerned.
- ☞ To keep and utilize the maintenance toolkits
- ☞ To prepare O&M report and submit to the WASHCO

4.3.6.8 Beneficiary Community

Table 4-1: Roles and responsibilities of beneficiary community

Roles	Responsibilities
<ul style="list-style-type: none"> ☞ To get the service without any discrimination. ☞ To be elected for or elect the water supply and sanitation committee. ☞ To elect caretaker for the scheme and fix the salary. ☞ To decide on the type of tariff rate and the amount to cover running and maintenance cost and the like. ☞ To select the site of the water source and the water point. ☞ To decide upon the expansion and choice of technology. ☞ To decide upon the type and amount of contribution whenever the need arises. ☞ To fix the amount of allowance for the water committee member. ☞ To attend the general meeting. ☞ To decide on free services provision of water for individuals who are not capable to pay for the service. ☞ To decide the type and the amount of incentive that shall be given for the committee members. 	<ul style="list-style-type: none"> ☞ To use the water scheme properly. ☞ To safe guard the scheme from damage or abuse. ☞ To be involved actively in every activity that shall be significant and required for the scheme, e.g. construction of access road, clearing the surrounding areas of water source and water point. ☞ To attend the general meeting that shall be arranged by the committee. ☞ To pay on time users fee that shall be decided on the general meeting. ☞ To report on time any break down or unusual conditions of the scheme to the concerned body. ☞ To safe guard the water source from pollution and keep the scheme under good sanitation condition. ☞ To co-operate with the water supply, sanitation and hygiene committee and caretakers. ☞ To perform every activity but only significant for the scheme that shall be assigned by the committee chairperson, for instance conveying message to the concerned bodies. ☞ To adhere to the regulation set to manage the scheme.

4.3.7 Formation of WASHCO/WUB

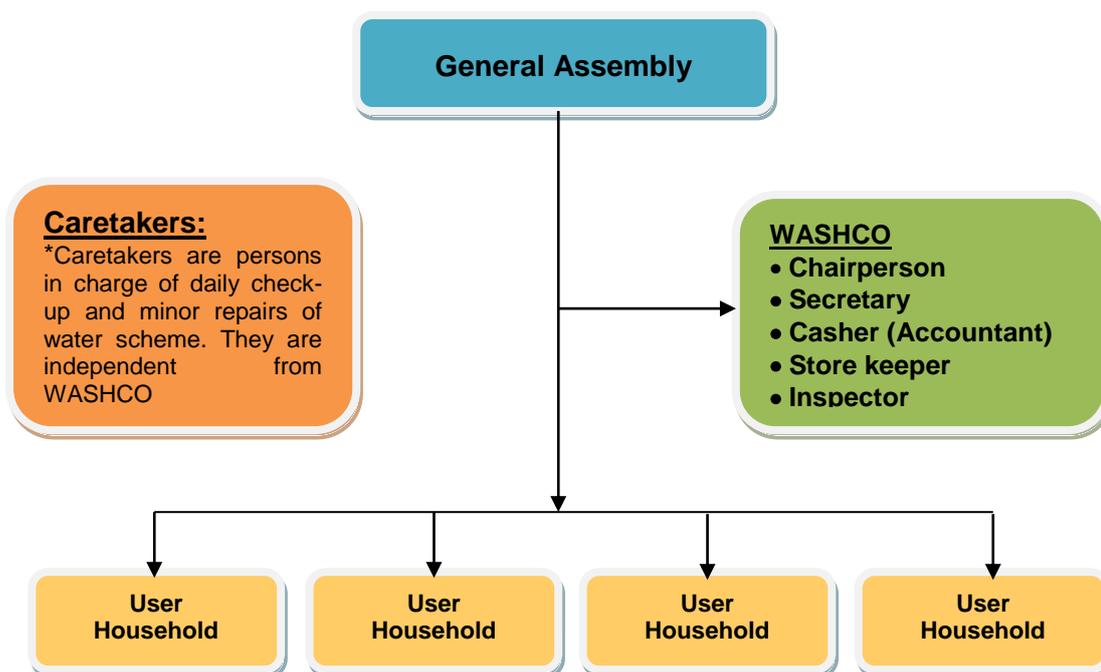
4.3.7.1 WHAT IS WASHCO?

Water, Sanitation and Hygiene Committee, usually shortened as “WASHCO”, is a management committee made up of about 5 to 7 people (the number can vary) who live in the user community.

4.3.7.2 Structure of WASHCO

In general, five (5) to seven (7) members shall be elected in the community mass consultative meeting for WASHCO who manage the point-source type water scheme such as shallow well/deep well with hand pump, on-spot spring. In case of piped line water scheme, a committee is also formed at each water point (like tap committee).

Figure 4-4: Structure of WASHCO for Point Water Sources



4.3.7.3 Committee Composition and Member

i) Composition

Among the committee members at least three of them (more than 50%) should be women and should play key managerial role. This is due to the fact that the woman bear the maximum burden of water related activities.

ii) Members

The committee shall have at least the following members (minimum requirement):

1. Chairperson
2. Secretary
3. Cashier/treasurer
4. Store keeper,
5. Inspector

4.3.7.4 Gender aspects of the WASHCO's

A balance of men and women on WASHCO's may help to achieve, but not necessarily ensure, an equitable division of work and responsibilities between men and women. The aim is to avoid either men or women doing all the work or making all the decisions. Gender often plays a role in the division of tasks. A man usually chairs a committee but a woman may be secretary or treasurer. Widespread experience indicates that women treasurers often perform better than men but appropriate training is required.

The *Dalocha* water supply scheme fully managed by women, which is an exemplary O&M management, indicated that women are responsible to manage the schemes.

4.3.7.5 Task of WASHCO Members

General tasks assigned to each member of WASHCO are described below

Table 4-2: General tasks assigned for WASHCO members

No.	Members	Duties and Responsibilities
1	Chairperson	<ul style="list-style-type: none"> ☞ Provide leadership to the overall WASHCO/WUB activities ☞ Approve payments ☞ Supervise the activities of the cashier ☞ Order purchase of Spare parts ☞ Ensure the collection water tariff and other incomes ☞ Arrange services for maintenance in consultation with Woreda Water Office. ☞ Facilitate the proceeding of general assembly of the community ☞ Hold regular WASHCO/WUB meeting as well as ad-hoc meeting when necessity arises ☞ Attend meetings at Woreda or Regional levels representing the WASHCO/WUB. ☞ Make official communication and sign on behalf of WASHCOs with public institutions, NGOs and private firms representing the WASHCO.
2	Secretary	<ul style="list-style-type: none"> ☞ Prepare the minutes of meetings of the general assembly as well as of regular and ad-hoc WASHCO/WUB meetings ☞ Perform all activities of the chairperson in his/her absence. ☞ Prepare receipts for collection of incomes ☞ Prepare payments and submit for approval of the chairperson ☞ Record all incomes and expenses in account book ☞ Make sure that collection of incomes and effect of payments shall be made only by the cashier. ☞ Prepare monthly and quarterly performance and finance reports of WASHCO/WUB for approval of the chairperson ☞ Keep all financial and administrative records of WASHCO properly ☞ If the deposit of the WASHCO/WUB is at bank or approved institution by general assembly, he/she will be co-signatory with the chairperson and the cashier. ☞ In case of cash payment, he/she will be co-signatory with the chairperson. ☞ Prepare, contract agreements with service providers
3	Cashier (Treasurer)	<ul style="list-style-type: none"> ☞ Collect water fees or other incomes based on the receipts prepared by secretary ☞ Effect payments in accordance with approved documents, by chairperson and secretary. ☞ Keep the bank deposit slips or approved institution for record ☞ Request petty cash for immediate expenses for O & M of the water scheme, the amount shall be fixed by the general assembly. ☞ Keep all the documents at hand properly for inspection and auditing.

No.	Members	Duties and Responsibilities
4	Store Keeper	<ul style="list-style-type: none"> ☞ Keep the properties of the water facility by registering in the format prepared by Woreda Water Office. ☞ Issue items upon the approval of chairperson and secretary. ☞ Prepare report on the status of fast moving items for replacement and purchase. ☞ Keep all records in proper for inspection and inventory
5	Inspector	<ul style="list-style-type: none"> ☞ Inspect the financial management of WASHCO. ☞ Supervise the proper utilization of purchased items ☞ Check the monthly water consumption and respective income. ☞ Ensure the expenses of WASHCO are as per the set acceptable procedure and regulations. ☞ Act as internal auditor. ☞ Inspect the records of secretary and cashier. ☞ Prepare a report on the overall water supply management of the water scheme. ☞ Present the report to the general assembly

4.3.7.6 How to elect WASHCO members?

❖ Whom to elect?

- **Is the participation of main water users (often they are women) promoted?**

The election meetings must be announced indicating that the participation of water users i.e. mainly the women should be promoted. Traditionally, mainly the men are participating in decision-making meetings. If more men attend, mainly the men will be elected.

Special care need to be taken to explicitly announce that it is desirable that those actively collecting water and thus using the source are participating in both the election and the committee. If a committee comprises only of men who never go to the source, they are not likely to discover anything wrong with it and take early action.

- **Are more users given chance to be candidate of members?**

Another risk is that unless people are specifically sensitized to the need for having actual users in the committee, very often the existing local leaders are often appointed, although they may not have the time to participate fully. A local spread of responsibilities will increase democracy and strengthen capacity and responsibility.

- **Is committee representative of all users?**

This is the best way to avoid dormant or dying committees. Members who drop out also need to be promptly replaced. The committee should if possible be representative of all users. The community selects representatives of:

- Different socio-economic groups
- Different education
- Different ages

- Both men and women (50%-50% is desirable!)
- From existing groups

- **What are criteria to select effective WASHCO members?**

To select effective members of WASHCO, the following criteria are to be fulfilled.

- Good ethics, example to the other community members
- Responsible and honest
- Have good motivation to work for sustainable community water supply
- More than 18 years old
- At least 5 years living in the community
- Able to read and write
- Willing and able to spare enough time to serve the community including promoting appropriate sanitation and hygiene practices in collaboration with health extension workers
- Permanent user of the water scheme
- Free from corruption and prioritize the benefit of the community rather than personal interest
- Positive to make the by-law of the water scheme acceptable for the community.

4.3.7.7 What is tenure of WASHCO members?

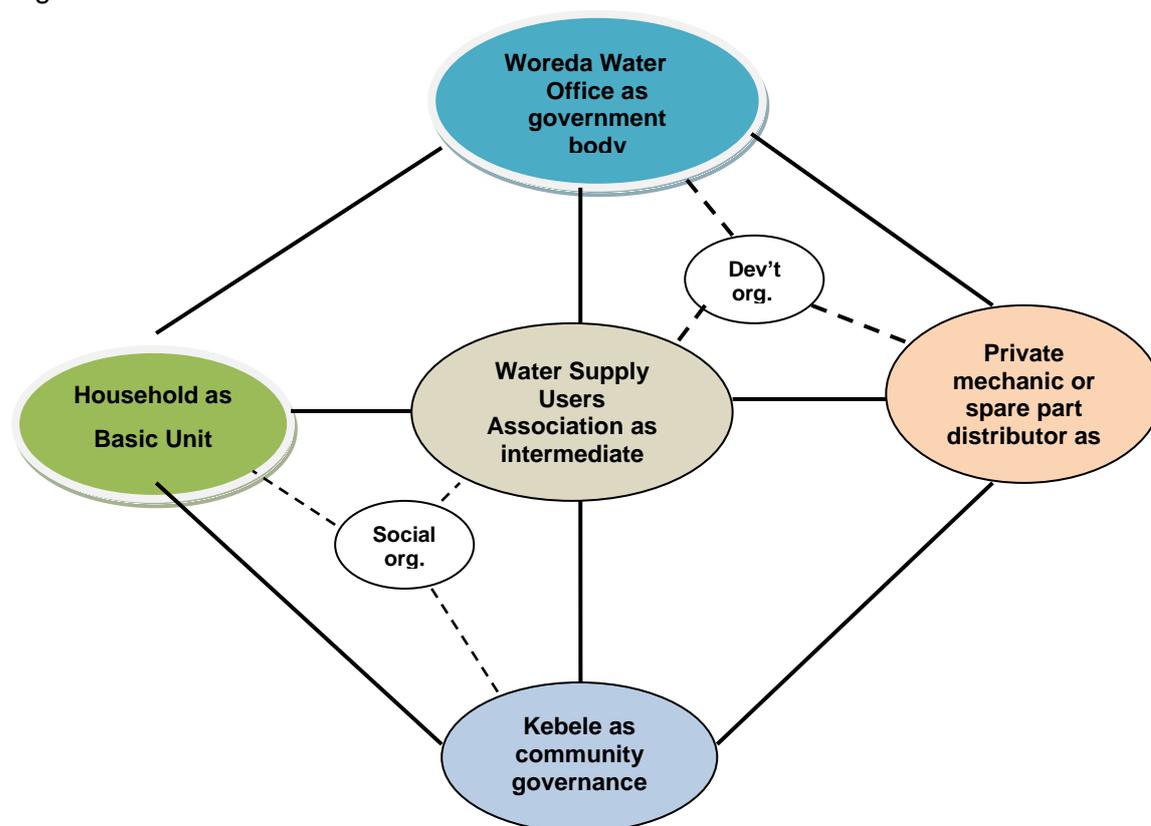
It is better to elect members every three year at maximum in order to introduce “democratic management”, in other words, to avoid “monopolized management”.

Many experiences have shown that if same members keep same positions, they may consider the water scheme as their own property. Then, the democratic management system tends to be more corrupted.

4.3.7.8 Position of WASHCO to other stakeholders in the community

Main actors in acquisition, utilization and management of water and human resources can be categorized into seven organizations (or groups of people); (i) Woreda Water Office as government body; (ii) private area mechanics or spare-part distributors available in local market; (iii) Kebele as community governance body; (iv) individual household as users; (v) social organization that maintain human relations in peace and order including *Idir* or religious organization; and (vi) Water Supply Users Association (including WASHCO) as intermediate organization through which relevant interactions take place for consensus building, technical interventions and resources supplement that are needed to ensure sustainability of operation and management of individual water supply facility. In other words, the prime role of Water Supply Users Association is to combine social consensus among main actors, technical ideas and resources into one function of sustained operation and management.

Figure 4-5: Demonstration of WASHCO in relation to other stakeholders



4.3.7.9 Evaluation and Re-Election of the Committee

The beneficiary community and the Woreda Water Office shall evaluate the performance of the committee. If the member of the committee fails to discharge its duties and responsibilities the general meeting shall be called and re-election shall be undertaken.

4.3.7.10 Legal Status of WASHCO

The legal status of WASHCO is based on specific authorities given to them by the regional state which shall be based on the general guideline of the MoWIE or otherwise the Country's Water Resource Management Policy.

4.3.7.11 Handing Over

Every WASHCO member shall handover to the concerned body all documents and materials that may belong to the WASH scheme on termination of the committee membership for different reasons. The handover activity shall be done using the handover format and at the presence of Woreda Water Office representatives.

4.3.8 Formulation of By-Law

The by-law is a summary of ground rules for the use and the management of the water scheme and management. The formulation of the by-law is an important step to have water users consider the water scheme as their own property by discussing different topics related to the use and management of water scheme in a mass meeting.

Table 4-3: Procedures in the Formation of By-Law

Activity	Formulation of By-Law
Objective	<ul style="list-style-type: none"> To establish common rules and basis of management of water scheme through participatory and democratic way
Main Organizers	<ul style="list-style-type: none"> WASHCO with assistance from Woreda Water Office staff
Timing	<ul style="list-style-type: none"> During the planning (before starting operation)
Expected Participants	<ul style="list-style-type: none"> At least of two thirds (2/3) out of a total user household heads have to attend that mass meeting All community members should be invited to the community meeting such as village leaders, prime users (women), kebele executive and kebele chairperson as mentioned earlier
Procedure	<ul style="list-style-type: none"> Explain the objective of a meeting Woreda Water Office staff explains topics to include in the by-law. Woreda Water Office staff facilitates participants to discuss and decide operation and management rules. One of WASHCO members (e.g. secretary) keeps notes. After completion of the draft by-law, one of WASHCO members (e.g. secretary) read all the points decided for approval of the participants.
Tips!	<ul style="list-style-type: none"> This session requires sufficient time (does not need to be completed in a hurry) so as to allow users to consider the water scheme as their own property by discussing different rules. In this regard, if one session is not enough in consideration of the understanding level of the participants and their time available, it is recommended to divide into two sessions.

4.3.8.1 Sample of By-Law for WASHCO's

By-Law for Water Users Association
<p>Considering the need of appropriate organization organ to take care of the overall water supply management of our community on water scheme in sustainable manner and promote improved hygiene and sanitation practices, Water Supply Users Association has been formed by the beneficiaries of the water scheme of _____ in accordance with the regulations and rules stated below.</p> <p>Article -1: Name</p> <p>The name of association shall be _____ Water Supply Users Association; hereafter called "the Association".</p> <p>Article – 2: Address</p> <p>The office of the Association shall be in _____</p>

Article – 3: Objectives

1. Ensure sustainable operation and maintenance of Community's water scheme.
2. Promote improved hygiene and sanitation practices in the community
3. Ensure direct participation of the water users in the water supply management of the community's water scheme
4. Set water tariff
5. Assign appropriate water scheme operator (care taker)
6. Carry out other activities that promote sustainable operation and maintenance of community's water scheme and improved hygiene and sanitation practices.

Article – 4: Source of Income

The following shall constitute the source of income of the WASHCO:

1. Water tariff being collected from the beneficiaries
2. Subsidy and donations that might be extended to the WASHCO

Article – 5: Membership

1. Any person residing in the user community can join the WASHCO on voluntarily basis.
2. The membership shall be valid after being signatory of this by-law

Article 6 Right and Obligations of the members

6.1 Rights

1. Use the water facility of the community
2. Elect and be elected in WASHCO
3. Participate in General Assembly and cast their ballot

6.2. Obligations

1. Abide by the By-law of the WASHCO
2. Pay for the water supply service according to the tariff set by the WASHCO
3. Participate directly in the operation and maintenance of the community's water scheme

Article – 7: Failure to meet membership obligations

A member who fails in fulfilling his/her obligations shall be deprived the right of the Association's membership.

Article – 8: Organizational Management of the Association

The Association shall have the following organizational management arrangements:

- 1 General Assembly
- 2 Water, Sanitation and Hygiene Committee (WASHCO)

Article – 9: The General Assembly

The General Assembly is comprised of all members of the Water Supply Users Association and shall discharge the following responsibilities:

1. Elect the members of the WASHCO
2. Define and determine their duties and term of service
3. Make decisions on critical issues of the Association.

Article -10: Water, Sanitation and Hygiene Committee (WASHCO)

The WASHCO shall comprise of 5-10 members, at least half of the members must be women. The core members of WASHCO are Chairperson, Secretary, Cashier (Treasurer), Store Keeper and Inspector.

The committee shall have the following powers and responsibilities

1. Implement the decisions passed by the General assembly
2. Execute the operation and maintenance of the community's water scheme
3. Ensure the proper utilizations of Association financial and material resources
4. Suspend the membership of users who fail to meet their obligations.
5. Maintain partnership with stakeholders on sustainable operation and maintenance of community's water scheme and on promotion of improved hygiene and sanitation practices.

Article -11: Duties and Responsibilities of WASHCO members

11.1: Chairperson

- Provide leadership to the overall WASHCO activities
- Approve payments
- Supervise the activities of the cashier
- Order purchase of spare parts
- Ensure the collection water tariff and other incomes
- Arrange services for maintenance in consultation with WWO.
- Facilitate the proceeding of general assembly of the community
- Hold regular WASHCO meeting as well as ad-hoc meeting when necessity arises
- Attend meetings at Woreda or Regional levels representing the WASHCO.
- Make official communication with public institutions, NGOs and private firms representing the WASHCO.

11.2: Secretary

- Prepare the minutes of meetings of the general assembly as well as of regular and ad-hoc WASHCO meetings
- Perform all activities of the chairperson in his/her absence.
- Prepare receipts for collection of incomes
- Prepare payments and submit for approval of the chairperson

- Record all incomes and expenses in account book
- Make sure that collection of incomes and effect of payments shall be made only by cashier.
- Prepare quarterly report on financial and other activities of WASHCO for approval of the chairperson
- Keep all financial and administrative records of WASHCO properly
- If the deposit of the WASHCO is at bank or approved institution by General Assembly, he/she will be co-signatory with chairperson and cashier.
- In case of cash payment, he/she will be co-signatory with chairperson.
- Prepare, contract agreements with service providers

11.3: Cashier (Treasurer)

- Collect incomes based on the receipts prepared by the secretary
- Effect payments in accordance with approved documents, by chairperson and secretary.
- Keep the deposit slips bank or approved institution of for record.
- Request petty cash for immediate expenses for operation and management of the water scheme, the amount shall be fixed by the general assembly.
- Should keep all the documents at hand properly for inspection and auditing.

11.4: Store Keeper

- Keep the properties of the water facility by registering by the format prepared by Woreda Water Office.
- Issue items upon the approval of the chairperson and the secretary.
- Prepare report on the status of fast moving items for replacement and purchase.
- Keep all records in proper for inspection and inventory.

11.5 Inspector

- Inspect the financial management of WASHCO.
- Supervise the proper utilization of purchased items
- Check the monthly water consumption and respective income.
- Ensure the expenses of WASHCO are following acceptable procedure and regulations.
- Act as internal auditor
- Inspect the records of the Secretary and the cashier.
- Prepare report on the overall water supply management of the water facility.
- Present the report to the general assembly of the beneficiaries.

Article -12: Cautions and Penalty

12.1. Cautions and Penalty for Individual WSUA member

The performance of water scheme shall be monitored by WASHCO under the supervision and guidance of Woreda Water Office.

If, in the opinion of WASHCO, any user household shows that individual household is unable to discharge duties set in the By-Law due to the following reasons, WASHCO reserves the right to withdraw the usufruct right from individual user of the household:

- (i) failure in regular payment of water fees consecutively three times against advises and warning to be made by WASHCO; and,
- (ii) Unclearness or dishonesty is observed to abide by the By-Law.

In the case of failure in regular payment of water fees consecutively three times, the representative of the individual household is advised to pay penalty to WASHCO at the rate of Birr _____ or by any other equivalent form of penalty as _____.

In the case of unclearness and dishonesty practices, the representative of the individual household is requested to make compensation by an action set as _____.

12.2 Cautions and Penalty for WASHCO and WSUA

The performance of WSUA as well as WASHCO is monitored by Woreda Water Office.

If, in the opinion of Woreda Water Office, WSUA and/or WASHCO shows that WSUA and/or WASHCO is unable to discharge duties set in the By-Law due to the following reasons, Woreda Water Office reserves the right to withdraw the usufruct right from WSUA:

- (i) Improper use of water scheme out of the scope of the set work; and,
- (ii) Unclearness or dishonesty is observed in keeping rules and regulations set in the By-Law.

The WSUA/WASHCO shall not transfer water scheme and related equipment and materials to any other individuals or organizations in all cases. In such case, the water scheme and related materials should be compensated by WSUA and the WASHCO.

4.4 Sources of Income and Financial Management of Water Scheme

4.4.1 General

This section looks at financial aspects of water scheme management, which is an essential part of sustainable O&M and management of water scheme with regardless of type of water scheme.

In the community-based water scheme management, **Cost Sharing for O&M of a water scheme** is an important government policy. The community needs to pay for maintenance & repair of the water schemes and save the replacement of the equipment.

Maintenance is your job! When a part wears out, you have to buy a new part. When the facility breaks down, you have to fix it themselves or pay service provider to fix it.

To take measures promptly when the water scheme gets broken down, you need to **collect money in advance**. With enough financial resource, you can buy spare parts and pay for a repair works and other necessary expenses. Some of this money should be used to buy spare parts in advance.

Before starting concrete financial management tasks, you need to understand about the O&M cost and how to cover O&M cost.

4.4.2 Source of Income

- User fee which shall be paid to cover the project cost or running and maintenance cost every week / two weeks / month / year in the form of cash and/or kind.
- Volunteer contribution from beneficiary community or outsiders in the form of cash and/or kind.
- The committee shall arrange fund raising activity to collect money. In this case different systems for special contribution shall be arranged including labour and locally available material that could be converted to money.
- Support of money from government and non-government organization in cases of a considerable problem encountered to run the activity.
- Revolving fund for spare parts which shall be availed from donor or government agencies.

4.4.2.1 Users Fee Payment Condition

- Every beneficiary household except those who shall be exempted from payment pay Birr____ every week/ two weeks/ month/year. The amount to be paid shall be prepared by the Committee and endorsed by the benefiting community in the General assembly.
- Payment in accordance with the agreed tariff,
- The payment shall be effected to the cashier, water point attendant or bill collectors.

4.4.3 Identifying operation and maintenance costs

Box 29: Operation and maintenance costs include

- **Material costs** – consumables, chemicals, energy, tools, spare parts and equipment
- **Works personnel** - staff involved in operation, maintenance, routine preventive maintenance, repairs, and construction for minor rehabilitation
- **Management personnel** - staff involved in planning, supervision, financial management, administration, and monitoring
- **Financial costs** - interest, amortization, depreciation, exchange rate variations, inflation
- **Environmental costs** - water source protection and conservation,
- **Support costs** – training support, technical assistance, institutional strengthening, monitoring and evaluation
- **Future investment costs** - Major overhauls (rehabilitation), replacement, and extension
- **Other costs** – transport, services paid to a private contractor, unaccounted for water due to leakage, bad administration and vandalism

All the above types of O&M cost should be considered in calculating and setting of tariff.

4.4.4 What is O&M Cost?

The scope of the cost recovery for a water scheme includes three groupings of cost;

- i. Running (operation) cost
- ii. Maintenance cost
- iii. Replacement cost

For the purpose of simple explanation, the case of a hand pump, which is one of major water schemes, is shown as an example.

(1) Running Cost

Running cost, which is also called as **operation cost**, can be defined as cost required for day-to-day operation of a water scheme. Such operation cost includes in general the following items.

- Personnel expenses (salary for a pump attendant or guard)
- Overhead cost (travelling cost, communication, per-diem etc.)

Office expenses (stationeries, etc.)

Example:
A WASHCO in XXXX Kebele employs one pump guard. Monthly running costs of XXXX WASHCO are as follows:

Item No.:	Description of Expense	Amount (Birr)
1	Salary of pump operator (Ato XXXXXX):	150.00
2	Stationary expenses:	30.00
3	Per-diem for travelling to Woreda	50.00
	Total	230.00

(2) Maintenance Cost

Maintenance cost is concerned about any cost required for continuity of operation of a water scheme without any breaks including spare parts cost, repair cost, technical service fee, and so on.

With regard to the regular replacement of spare parts for Afridev hand pump, it is recommended to follow a schedule below. Some parts (U-seal and bearings) need to be replaced every 6 months, others once a year, and others once a two years.

Normally a community would put aside enough money to cover the FAST WEARING PARTS - parts that need to be replaced frequently. In addition, WASHCO should buy a few long wearing parts – e.g. rod) - as a way of investing the money and guarding against inflation.

Table 4-4: Suggested Schedule of Spare Part Replacement

Part	Months					
	6	12	18	24	30	36
U-seal	√	√	√	√	√	√
O-ring (big)		√		√		√
O-ring (small)		√		√		√
Bobbin		√		√		√
Rod Centralizer		√		√		√
Bearing (inner)	√	√	√	√	√	√
Bearing (outer)	√	√	√	√	√	√
Hanger Pin						
Fulcrum Pin				√		
Pipe Centralizer				√		

On average most pumps will require the following maintenance:

YEAR 1: No major problems - the warranty will cover any costs during first year.

YEARS 2-4: Replacement of fast-wearing parts - but no major repairs.

YEARS 5+: Major faults will occur, which require help from the Woreda Water Office.

(3) Replacement Cost

The replacement cost includes an amount necessary to replace of equipment at the end of its service period. A service period of a hand pump lasts for 10 years under normal handling.

Conceptually somebody should accumulate financial resources to procure a new hand pump in assumption that the present pump shall cease to function forever after 10 years. In other words, depreciation cost should be covered including water fees.

These above three types of cost are needed to be covered through regular payment of water fees for only one single purpose. The purpose is to produce potable water for drinking continually.

How and who bear those costs? Let's look at the following sub-section.

4.4.5 Community- based Cost Recovery

4.4.5.1 Recovery of O&M costs only, with initial use of subsidies

This consists of introducing progressively an “O&M costs recovery only”, mainly by subsidizing costs (for example the price of spare parts, M&E cost, the cost of fuel) at the beginning, and providing free technical support for some maintenance. Although this approach can be necessary for poor communities, the use of subsidies can send wrong signals to a market, especially for spare parts. Some arrangement will need to be made about who will recover the other costs that the community will not cover, and how.

(1) Basic Concept of Cost Recovery

You (community) need to build up a maintenance fund so that you can spend money to buy parts and make repairs whenever necessary.

As you have seen the basic formula below, which you have to save is as below

$$\text{Total Cost} = (1) \text{ Running Cost} + (2) \text{ Maintenance Cost} + (3) \text{ Replacement cost}$$

The Total Cost is **Supported by Users** of the water scheme !

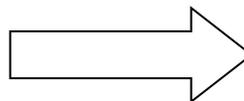


Question: **How do Users support the Total Cost?** That is revenue, mainly water tariff paid by users.

$$\text{Revenue} = \text{Tariff} \times \text{Quantity}$$



Users Payment



Revenue
(Essential Fund for O & M)

(2) Some idea on the cost to be borne: How much do we need to save?

Based on an extensive study conducted in Ethiopia, a required amount of maintenance cost is estimated to account for 5 % of total replacement cost annually. In this manual, cost of a hand-pump is considered. We shall use an example of average cost of a hand pump at Birr 8,000.00 for this paper.

Example:

Total replacement cost: Birr 8,000.00

Annual Maintenance cost: Birr 8,000 x 5 % = Birr 400.00

Monthly Maintenance cost: Birr 400 / 12 months = Birr 33.30

Taking an estimated price of a hand pump at Birr 8,000, a WASHCO accumulate at least Birr 800.00 annually, while this can be interpreted as monthly reserve with an amount of Birr 66.00.

Example:

Cost of a hand pump: Birr 8,000.00

Service period: 10 years

Annual Replacement Reserve: Birr 8,000/10 = Birr 800.00

Monthly Replacement Reserve: Birr 800 / 12 months = Birr 66.00

Note: The above calculation is prepared without any considerations on interest rate, inflation rate, and foreign currency exchange rate.

4.4.6 Water Supply Tariff

A water tariff is the rate at which users are charged for water. If cost recovery aims to satisfy an increasing demand for water then the tariff should reflect the cost of the operation and maintenance for rural schemes as stipulated in Water Resources Policy. However, many water supply tariffs do not achieve coverage of the current costs of O&M.

The discussion is moved into water tariff. O&M cost recovery shall be taken into considerations under the subsequent exercises.

Let us refer to the following basic formula in the cost recovery.

Total Cost = (1) Running Cost + (2) Maintenance Cost + (3) Replacement cost

a) Revenue:

Taking the above case of XXX WASHCO, let us calculate an amount of required revenue.

Revenue = Tariff x Quantity

Minimum required revenue accounts for the sum of running cost plus maintenance cost plus and replacement cost in reference with the above basic formula No. 2

Example:

Monthly running cost: Birr 230.00

Monthly maintenance cost: Birr 33.00

Monthly replacement cost: Birr 66.00

Total Birr 329.00

The answer to an amount of required revenue shall be Birr 329.00.

Then, let us move into a discussion on quantity required.

b) Quantity:

In accordance with technical standard, a hand pump lifts up waters with an amount of 0.2 liter per second. XXX WASHCO sets service hours separately in the morning and in the afternoon.

Example:

Service hours:

- Morning service (2 a.m. to 6 p.m.) local time: 4 hours
- Afternoon service (8 p.m. to 1 p.m.) 5 hours
- Hand pump operation hours (hours to lift up waters 8 hours)

(During 9 hours of service hours, it is estimated that a hand pump serves to lift up waters approximately for 8 hours)

- Pumping capacity (l/s): 0.2 litre per second
- Pumping capacity (l/h): 0.2 (l/s) x 3,600 (seconds) = 720 litre per hour
- Daily production of water (=Quantity): 720 l/h x 8 = 5,760 litre
- Daily Quantity in m³: 5,760 / 1,000 = 5.76 m³
- Monthly quantity in m³: 5.76 x 30 (days) = 172.8 m³

■ Cross-check exercise:

Is the above estimated quantity sufficient enough to serve for people's demand? Let us see as follows;

A hand pump is ideally set to serve 350 people (70 households).

15 liter per capita per day of water is required as set in the Universal Access Plan (UAP)

Therefore, a case of XXX WASHCO can be interpreted as follows.

Population served by a hand pump: 350 people from 70 households

Daily minimum demand: 15 liter per capita per day

Daily demand: 15 l/c/d x 350 = 5,250 liter

Therefore, the above estimation shall be considered as enough amounts to serve for 350 people in this case.

Tariff Rate:

Let us go back to the following basic formula.

By quoting the above case of XXXX Water Supply Users WASHCO, the required tariff can be calculated as follows;

Example:

Required amount of monthly revenue: Birr 329.00

Monthly amount of water production(quantity): 172.8 m³

Required tariff: $329.00 / 172.80 = 1.90$ Birr / m³

Monthly consumption per household:

Daily consumption: 15 liter per person per day

Average size of a household: 5 people

Daily Household consumption: $15 \text{ l/c/d} \times 5 = 75$ liter

Monthly household consumption: 75×30 (days) = 2,250 liter

Monthly household consumption-2: $2,250 / 1,000 = 2.25$ m³

Monthly Water Tariff per household: $1.90 \times 2.25 =$ Birr 4.30

Through the above simple exercise, it is suggested in the case of XXX WASHCO that each household shall be requested to make a monthly payment with an amount of Birr 4.30 in order to reach the O&M cost recovery.

4.4.7 Daily Financial Management

4.4.7.1 Decision on Payment Method

Once the amount of water supply fee is determined, WASHCO will decide how to collect the fee. Let community users decide what method will work best for them. When the community helps to choose the method of collection and the amount to be collected, they are more likely to contribute.

The WASHCO should organize a general assembly to meet with the whole community to decide on how money is to be collected and managed.

Financial Activity1:	Decision on Payment Method (through Community Consultative Meeting)
Objective	☞ To set the basic rules for collection and any sanctions for those who fail to contribute.
Main Organizers	☞ Woreda Water Office (WVO), WASHCO
Procedure	<ul style="list-style-type: none"> ☞ WASHCO organize a community consultative meeting ☞ WVO explains to users the importance of users contribution to O & M fund and possible payment options ☞ WASHCO facilitate users to discuss the following; <ul style="list-style-type: none"> ■ Who Pays? Some communities levy money from each individual adult; other communities levy money from each family or compound. ■ Frequency: Some communities with a regular income pay on a regular (e.g. monthly) basis; other communities (e.g. farming communities) pay on a seasonal basis (e.g. at harvest).

	<ul style="list-style-type: none"> ■ Amount: Some communities collect the same amount of money from men and women; others collect different amounts from men and women. <p>Households that cannot affordable to pay from economic reasons may be exempted from payment or accepted to pay reduced amount through communal decision.</p> <ul style="list-style-type: none"> ■ When to Collect Money? <p>When money is collected will depend on when people have money to pay. People who earn a regular income (e.g. traders) can pay on a monthly basis.</p> <ul style="list-style-type: none"> ▪ Date of collection shall be fixed. For example: every 25 date of each month. <p>Farmers, however, are more likely to contribute once a year at harvest. There may be a need to design different payment systems for the different sections of the community. Traders may want to pay a small amount after every market day, whereas farmers will prefer to pay a large amount at harvest.</p> <ul style="list-style-type: none"> ▪ Seasonal Variation of Water Fee <p>Some of WASHCO can handle water fee collection by setting different rates of water charge by season. Some cases indicate that each household pays Birr 1.0 per month during non-harvest season, while they agree to make payment of Birr 2.0 per household for six months after harvest.</p> <ul style="list-style-type: none"> ■ Who to collect? <p>The number of collectors will depend on the size of the kebele and the payment system. If money is collected from each household, several collectors will be needed to go from house to house. If payment is done at a central location, then only a few collectors will be needed.</p> <p>The cashier may visit each household to collect water tariff if the community size is small to cover.</p> <ul style="list-style-type: none"> ✓ Money collected should not stay with collectors for more than 24 hours. Money should be paid to a cashier of the WASHCO who deposit to the bank promptly. ✓ Don't let the money be used by the collectors. They may be tempted to take out some money for their own use with the intention to refund it immediately. If this practice is not stopped, however, the small amounts may build up to a huge sum that collectors cannot easily refund. <ul style="list-style-type: none"> ■ Any penalty to the non-payment? <p>Penalty shall be determined by the General Assembly.</p>
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	<p>For example;</p> <p>Penalty against the first failure in payment: Oral warning by WASHCO</p> <ul style="list-style-type: none"> ▪ Penalty against two consecutive failures in payment: Last warning by WASHCO ▪ Penalty against three consecutive failures in payment: Measure to be taken by WASHCO (e.g., double payment) ▪ If the users fails to pay in three consecutive, the users will be omitted to utilize the scheme however, it is needed to study why the users do not pay
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4.4.7.2 Options for Collection of O&M Fund

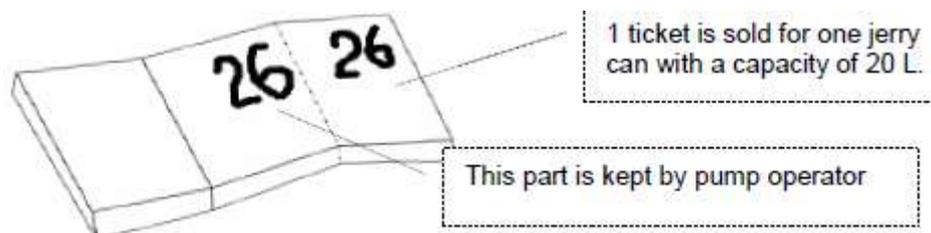
Box 30: Options for collection of O&M Fund

☞ Options for collection of O&M fund

There are many ways to raise funds for O&M :

1. CASH CONTRIBUTIONS:

- i) **FLAT RATE:** this is the common method for point sources. Each household or individual makes a regular payment at fixed amount.
- ii) **BUCKET LEVY:** In some villages money is levied at the water point on each bucket of water collected. For example, 10 cents per one Jerry-can with 20 liter capacity. Any cash transaction should be transparent with proper accountability. In some case a ticket shall be used for this payment.
 - Pump Operator shall prepare a pile of tickets.
 - Each ticket shall be piled in order with sequential number.
 - A pump operator shall give collected cash with numbers of tickets that were sold to a cashier.



- ☞ After cross-checking between an amount of cash and tickets, a cashier shall enter cash transaction into an account book.

Date	Description	In	Out	Balance
10 - 10 - 2005	XXXXXXXXXX	XXX	XXX	120.00
11 - 10 - 2005	Sales of waters (70 tickets)	14.00	0.00	134.00

2. IN-KIND CONTRIBUTIONS:

Some farming communities ask households to contribute in the form of produce on an annual basis (i.e. after harvest)

3. COMMUNAL FARMS OR LABOUR:

Some communities establish communal farms or organize communal labour to raise funds for maintenance.

4.4.7.3 Formulation of User Households List

WASHCO needs to have an updated list of all household users in the community. Based on that households list, WASHCO prepare “Household Payment List (see attached list) which can be used every month for record keeping.

Financial Activity 2	Formulation of User Households List
Objective	<input type="checkbox"/> To set the basic management document for proper record keeping and transparency of fee collection
Main Organizers	<input type="checkbox"/> WASHCO
Procedure	<ul style="list-style-type: none"> ▪ WASHCO make a user household list (in a notebook) in collaboration with kebele chairman, kebele executives ▪ WASHCO uses the above list to check when collecting O & M fee from user households ▪ WASHCO needs to update regularly the household lists so as not to miss households who have newly joined in the community.

How to Use

Money should be collected in a way that promotes trust!

Payments should be carefully recorded in a register of payees and receipts should be issued for all payments. The minimum record of cash transaction should be kept by the cashier that is accountable to users as well as WASHCO members. Based on experiences prevailing in the region, a sample form of minimum record is presented in Table below.

Table: WASHCO Basic Ledger of Water Fee Collection

No.	Name of Household	Rate of Water Fee in Birr	Month												
			1	2	3	4	5	6	7	8	9	10	11	12	
1	Kefel Genzeb	1.5 Birr/Month													
2	Tamen Mulate	18 Birr/Year													
3	Chala Tulu	9 Birr/6 Months													

Some advanced WASHCO can also prepare a membership booklet as individual record of monthly payment of water fee.



Sample of household check book

4.4.7.4 Bank Account Opening

For proper and safe keeping financial resources, collected cash is deposited in an account of financial institution of either the nearest bank or micro-finance institute (MFI).

Woreda Water Office shall follow ordinary procedures in reference with their own experiences, so that each WASHCO can have its own the bank account or the Micro-Finance account soon as possible.

Financial Activity 3	Bank Account Opening
Objective	<ul style="list-style-type: none"> <input type="checkbox"/> To save collected money in safe and to avoid misuse of O & M fund by WASHCO <input type="checkbox"/> To keep accountability to the water scheme users
Main Organizers	<ul style="list-style-type: none"> <input type="checkbox"/> WASHCO
Procedure	<ul style="list-style-type: none"> ▪ WASHCO submits a letter of application to WWO ▪ Upon an official acknowledgement of the letter of application by WASHCO, the WWO issues a supporting letter to a financial institute. ▪ WASHCO goes with cash to the designated financial institute with the official supporting letter for opening an account. ▪ WASHCO is given a bank account book or statement by the financial institute.
Tips!	<ul style="list-style-type: none"> ■ Minimum requirement of cash to open a bank account. It is said that Birr 500 is required to open an account in a certain bank. Some cases can be shared herewith to respond to such conditions. ■ Formulation and collection of seed money. Some of WASHCO succeeded in meeting this minimum requirement of Birr 500 through collection of seed money. In this case, each registered household shall contribute equal amount of money to form group fund. For instance, there is a case that more than 50 registered households accumulated Birr 500 through even contribution of Birr 10 per each household.

4.4.7.5 Management of Daily Cash Movement

The WASHCO will keep its own **FINANCIAL RECORDS**. The record-keeping system should be simple – mainly a record of payees and an account book to record monies collected and used.

4.4.7.6 Basic Elements of Financial Records

In any production and service giving organization, there exists a system of financial management whether complex or simple in their procedures. Financial accounting display and stress what an organization possess in terms of finance, property and assets and how it expended these resources at any point of time usually in a year.

In order to establish financial management system in an organization, the first step is to formulate and introduce different formats and books for financial data and interactive gathering so that all transactions and disbursements are clearly kept in registration and documentation books; which finally serve as input for financial reporting.

The basic account registration and documentation instruments required in financial management system are presented below.

Tool - 1: Income and Expenses

This book is maintained and kept in the hand of the cashier or secretary of the WASHCO. The cashier or secretary keep copies of receipts and payments and reconcile records in the income and expense books. Accordingly receipts and expenses are recorded by date, reasons and amounts and serial numbers in the income and expense books. In the income and expenses books, invoices of receipts and payment vouchers are recorded according to their sequential serial numbers and coded to their budget line numbers.

Records are kept daily in the income and expenses book and closing are processed on monthly basis.

The differences between income and expenses recorded in the account book are reconciled against cash in the hand and bank account.

Payment vouchers and receipt invoices should be maintained in separate files; payment vouchers in payment box files and receipts in a receipt box files. Filing should be according to sequenced numbers and box files should be labeled according to their orders say 1, 2, 3, - - - this will facilitate and expedite processes for internal audit and control activity. An explanatory of the income and expenses book model are show below.

Table 4-5: Income and Expenses Book Model

June, 2005

Date	Details	Income	Expenditure	Balance		
				Cash	Bank	Total
01/10/05	Balance Forwarded from the previous month			-	150.00	150.00
05/10/05	User fees	200.00		200.00	150.00	350.00
07/10/05	Stationery		10.00	190.00	150.00	340.00

Date	Details	Income	Expenditure	Balance		
				Cash	Bank	Total
28/10/05	Guard fee		50.00	140.00	150.00	290.00
30/10/05	Transportation to WWO		10.00	130.00	150.00	280.00
30/10/05	Deposit to the Bank (100Birr)			30.00	250.00	280.00
Total		200.00	70.00			

This can be carried out with Excel spreadsheet.

Tool - 2: Cash Receipt Registration

- Cash receipt registrations are invoices issued for the cash amount paid for the water service by employees, other individuals or organization.
- Other revenues collected from sales of water at public fountains or on water consumption bills are also invoiced in the cash receipt registration.
- Receipt invoice pads should be printed in sequenced numbers in three duplicates. The original receipts are forwarded for payer; the copy is passed to the cashier or tiller while the third copy shall remain in the pad.
- In the receipt first the date shall be filled, full name of the payer, signature of payee, and delegated authority are required.

The cashier should keep the copy of the receipt in file and record in the book of the account all the details such as receipt number, date, reasons of receiving, amount in figures and words in sequence.

If receipts are invalid or when there is an error in the preparation of the receipt, the receipt is cancelled by writing "**CANCELLED**" diagonally across the face of the receipt.

A typical cash receipt registration form/ invoice is shown below.

Table 4-6: A Typical Cash receipt Registration Form/ Invoice

XXX Regional Administration	
YYY Woreda Water Office	
Water Supply Scheme	
<u>CASH RECEIPT INVOICE</u>	
No. _____	
Name of payer: _____ Kefel Alemu _____	Date:- <u>Sene 30, 2005</u>
Amount in figure: Birr 100.00	
Amount in words: Birr Hundred	
Payment Reason: Remuneration to the pump guardian	
Prepared by: Name and signature	
Name and signature of cashier _____	
<u>Distribution</u>	
<ul style="list-style-type: none">• Original for payer• Copy for cashier/tiller• Second copy in the pad for account section	

Tool - 3: Cash Payment Invoices/Vouchers

- Cash payment vouchers are legal documents for payment of cash approved and authorized by committee or Head of WWO.
- Before processing cash payment voucher, all supporting documents and invoices are carefully examined for completeness and then cash payment vouchers are signed by the secretary and chairperson of the WASHCO or Woreda Finance Head and office superintendent on the amount for payment.
- Supporting documents for village water schemes or WWO could be:
 - Purchase requisition or application for purchase of fuel oil and lubricant, the recommendation given by the committee or the office on the application and stores good receiving notes.
 - For spare parts, the operator purchase application, the copy of water committee verbal for purchase of spares addressed for WWO and stores goods receiving models.
- Similar to cash receipt registration, cash payment pads are printed in sequence numbers in three duplicates and the original payment leaflet are attached with source document and kept in box files with cashers. The second copy of the payment leaf should be maintained in other box file for reconciliation for account head the third copy shall remain in the pad.

- In the cash payment voucher the following details should be presented, date, paid name, amount paid in numbers and words, reason for payment, prepared by, approving authority signature, recipient signature; moreover the recipient address and ID number if kept in the receipt are recommended.
- The account clerk maintaining payment registration should reconcile the source document against the voucher there by coding the expenses and record them in the book of expenses sequentially by date, voucher number, reason, amount and filing them in box files.

A typical cash payment invoice form is shown below

Table 4-7: A Typical Cash Payment Invoice Form

XXX REGIONAL ADMINISTRATION	
YYY Woreda Water Office	
_____ WASHCO	
<u>CASH PAYMENT INVOICE</u>	
S.No.<u>000001</u>	
Date: <u>Sene 30. 2005</u>	
<ul style="list-style-type: none">▪ Name of Payee: Kebede Tolla▪ Amount in Figure: Birr 500.00▪ Amount in Words: Five Hundreds Birr only▪ Payment Reason: For the purchase of office table and chair▪ Prepared by: <u>Tolera Degefa</u>▪ Received by: _____▪ Name & Signature: _____▪ Name & Signature of payee: _____▪ Approved / Authorized by: _____▪ Name & Signature: _____	

Tool - 4: Payroll

Employees recruited and employed by the water committee or Woreda Water, Mining and Energy Offices are paid their salaries in pay rolls. Salary pay rolls are prepared for the number of days that employees are on duty in the month.

In processing pay roll all legal deductions such as income taxes and pension contributions are netted out from gross salary and passed to tiller. The casher effects payment for each employee with signing of pay roll by respective recipients.

Model of a payroll list is shown below.

Table 4-8: Model of Payroll List

No.	Name of Employee	No of days on duty	Gross Salary		Income Tax		Other Contribution		Total Deduction		Net Pay		Signature
			Birr	C	Birr	C	Birr	C	Birr	C	Birr	C	
1	Tolera Degefa	30	200	00	5	00	1	50	6	50	193	50	
2	Alemu Kebede	30	350	00	20	00	2	50	22	50	327	50	
3													
4													
5													

Prepared by Name and signature	Checked by Name and signature	Authorized by Name and Signature	Name and signature of Casher
--------------------------------------	-------------------------------------	--	------------------------------------

Note: This payroll shall be prepared in excel spreadsheet!

Tool - 5: Per Diem Payment Form

Table 4-9: Per-Diem Payment Form

XXX REGIONAL ADMINISTRATION	
YYY Woreda Water Office	
_____ WASHCO	
<u>PER-DIEM PAYMENT FORM</u>	
Date: <u>Sene.30, 2005</u>	
Per diem Recipient Name: <u>Geremew Bekele</u>	
Reasons for redeem payment: <u>Training participation in WWO</u>	
Per diem amount per day in figure: <u>100.00</u> birr, in words: <u>Hundred Birr</u>	

No of days allotted: 4 days

Total amount of per diem in fig. 400.00 Birr, in words Four Hundred Birr

Transport cost amount paid: 50.00 Birr, in words Fifty Birr

Total: 450.00 Birr (Four Hundred Fifty Birr) in words

Payer Name and Signature: Alemu Bekele

Received by: Kebede Zeleke

Approved and Authorized by: Kassa Ali

Document Prepared by: Tadesse Berega

4.4.8 Access to other sources of funding

“New strategies should aim towards increased efficiency in the use of available funds and in increased mobilization of additional funds.” It will indeed be important to plan and determine financial mechanisms which cover all costs, if these are not fully covered by user’s fees. As seen earlier, tariffs are often based on the recovery of basic operation and maintenance costs, and rarely include the cost for major repairs, rehabilitation and replacement. Communities will need to tap into alternative sources, and it is proposed that planners take this into account, and facilitate /organize access to these sources. Possible alternative financial sources are:

- ☞ existing community contributions,
- ☞ Cooperative Fund,
- ☞ subsidies and taxes,
- ☞ Credit–loan mechanisms,
- ☞ Grants,
- ☞ Specific funds.

This section gives an overview of these possible alternatives to tariffs. Government need to assess the availability, reliability and sustainability of these sources and, where they are non-existent, the possibility of developing them.

4.4.8.1 Tapping into existing community contribution

In communities with significant seasonal variations in income, it is difficult to recover costs through regular payments. An alternative is to cover the costs through community fund raising where “families do not pay regular contributions towards the cost of the community water system. Instead, money is periodically accumulated in other ways. Community fundraising options include voluntary funds, general community revenue and payment in kind.

a) Voluntary funds

Voluntary funds are built up by voluntary contributions from generous people or community groups through public meetings, bazaars, festivals and similar social activities.

b) General community revenue

This mentioned above that the community pays based on the set of tariff.

c) Payment in kind

Instead of contribution of money, the community contributes in terms of kind such as labor, local material provision.

4.4.8.2 Cooperative funds

Cooperative funds result from an initiative by a group of users or individuals who get together to finance productive activities, not in the first place always related to WS&S. The initial capital comes from contributions in cash or in kind from the members of the cooperative. Once the group has sufficient revenue, members may decide to use part of their funds to finance WS&S services. However, the amount of capital available in this option depends on the results of the first stage investments. With good financial and organizational practices, this is a good way to administer WS&S services.

4.4.8.3 Subsidies

a) Direct government subsidies

In fact the Water resources management policy stated that the O&M cost should be recovered by the users, however, the government still provide spare parts to the community, assisted the community in provision of technical, monitoring and evaluation activities.

Regional Water Bureaus allocate part of their budget towards operating and maintaining of rural water supply schemes, but the allocated budget is too low compared to the construction of new schemes.

Subsidies can be used as promotion tools for a particular professional group, for instance the informal and formal private sector. They can also be used to promote access to water services by marginalized groups, with subsidies adapted to various levels of marginalization.

b) Cross-subsidy

One way to make the service equitable and affordable for all is to subsidize the poor and surcharge high-income consumers. However, in rural and low-income urban areas the majority of users have low-income levels, so funds raised from surcharging richer users in that area will not cover their subsidies.

4.4.8.4 Grants

NGOs and donors have used grants as a type of financing mechanism for the construction of new water supply facilities. Grants rarely pay for recurrent costs. Nowadays, this approach should be changed and the NGOs and Donors provide grant for O&M in order to use the facilities sustainably. Grant should not be for basic O&M management.

4.4.8.5 Micro-credit

Micro-credit is financing through lending mechanisms, similar to credits given by banks, except for their nature and size. Micro-credits are generally small in volume and respond directly to the specific needs of rural or low-income urban communities.

☞ Credit and Saving Institute

A micro-credit system can be used to:

- ☞ contribute to investments,
- ☞ purchase material and equipment for replacement, extension and rehabilitation,
- ☞ finance major unforeseen repairs,
- ☞ cover short-term cash-flow problems;
- ☞ Develop a stock of spares, parts and tools.

The Amhara region has already commenced to implement the CSI and became effective.

There is rules and regulation for the fund, lending conditions, interest rate, guarantee against risk, loan reimbursement, and limits of loan.

4.5 Human Resource Management

Human Resources Development (HRD) entails the development of skills, the raising of awareness, confidence-building and the motivation of people. Training is an important and major component of HRD but it is not the only one. Improving access to information, recognizing people's endeavors' and worth, and providing monetary and non-monetary incentives, such as promotion prospects, can all contribute.

Woreda Water office, Zone Water office and regional water bureaus often have a surplus of staff in their departments but the majorities are untrained or only semi-skilled. Staff who are suitably qualified tend to be few and often overburdened. This situation is partly due to the problem of attracting and retaining skilled staff. Little professional interest in O&M, poor salaries and low esteem has been responsible for the failure to retain managers, engineers, technicians and other skilled personnel. It is not uncommon to find a skilled worker's monthly salary in the public sector to be equivalent to a day's income for an artisan in the private sector.

Incentives for skilled staff are often restricted by rigid salary structures. Incentives are more easily paid on donor-supported construction programmes but the effect then is to divert much needed O&M staff away from their important tasks of running existing water supplies. Such incentives can harm O&M and be counter-productive in the long term. On the other hand, new projects with appropriate donor support can provide valuable experience to personnel and give the opportunity and funds for the further development of skills. Women are often less mobile than men and, therefore, the training of women may have a longer-lasting benefit.

4.5.1 Restructuring and training

Human resources development complements the restructuring of organizations. Job descriptions will need to be adapted and new performance criteria established. Agency staff- professionals, managers, technicians, extension workers - will need orientation to a partnership approach and extra skills will need to be acquired. Technical field staffs, for example, are potential trainers themselves and may need to be sensitized to their expanding role as advisers rather than 'doers'. At the community level, committee officials,

treasurers, operators, leaders and users will all need support to be able to participate and perform their new operation and maintenance tasks.

Training and education will vary for the different personnel in the O&M system:

- The incorporation of aspects of O&M in existing formal courses for technicians, engineers, trainers and managers.
- In-service or on-the-job training for existing and new personnel: technicians, mechanics, health and social workers, extension staff, accountants.
- Specific short courses held informally in rural communities and follow-up support for unskilled community personnel, committee members and artisans.

4.6 O&M Information Management

O&M information management is the recording, documentation and dissemination of information relevant to O&M to support the sector.

There is a need to exchange information at a localized level - within Woreda, Zone, region and Federal levels. The kind of information is broad and includes performance and technical data, skills needs and training, financing and costs, all related to O&M. The people who will use the information are professionals in the water sector involved in planning, design and management; policy makers, practitioners at the field level, community members involved in O&M management and the users of water supply facilities.

Information management system has already established at Ministry of Water, Irrigation and Energy, and this system should be linked down with region, zone, woreda and kebele levels.

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Ministry of Water, Irrigation and Electricity
Directorate of Water Supply and Sanitation
P. O. Box 5744 and 5673
Tel. 011 663 7222
Fax. 011 661 0710
Email: info@mowr.gov.et
Addis Ababa
Ethiopia

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Demewoz Consultancy

P.O.BOX 20023 CODE 1000

ADDIS ABABA ETHIOPIA

TEL: +251-(0)118-60 80 12/0911-158613

E-mail: d.consultancy02@gmail.com

