

Northern Bahr el Ghazal State Framework and Implementation Programme for Operation and Maintenance of Water Supplies

A Politically Enabled Public Private Partnership



'There is nothing as powerful as an idea whose time has come'

Quoted by the Minister of Water, Cooperatives and Rural Development Northern Bahr el Ghazal

25 October 2013

Acknowledgements

This framework and implementation programme was developed by the Ministry of Water, Cooperatives and Rural Development with financial and advisory support provided by the Swiss Agency for Development and Cooperation. A two-week consultancy was carried out by Dr Kerstin Danert of Skat Foundation in September 2013 to support its development.

The development of this framework was only made possible thanks to the contributions and frank discussions with many water supply stakeholders in Northern Bahr Ghazal and Juba. Thanks in particular for the inspiration and encouragement from Major General Salva Chol Ayat (Deputy Governor Northern Bahr el Ghazal), Bona Makwach (State Minister of Water, Cooperatives and Rural Development) and the efforts and enthusiasm of Abraham Aleu Ngong (Director Water Resources), Deng Nkinkuenyi (Deputy Director Urban Water and Sanitation) and Ian Curtis (SDC and Advisor to the Directorate of Water Resources).

Thanks for the numerous insights and ideas from Sam Anguyo Ondoma (AWUDA), Banniance Barak Bennet (Unicef), Walter Baumgartener (SDC), Mohamed Abdalla, Gorang Achweil and Deng Mareng Deng (International Organisation for Migration), Simon Nyeko (ACF), Paul Anei Khom (WASH Assistant Commissioner Aweil East), James Malou Kon (WASH Deputy Assistant Commissioner Aweil West), Salva Guot (Executive Director Aweil West), David Piol Deng Uyay (WASH Assistant Commissioner Aweil South), Bol Pioth Agoth and Philip Gok Achuul (MWCRD), Achenaki Badege (IRC) and Angelo Ugwaag (ECOM). A particular thanks to Simon Bol (Unicef) for enabling a half-day



Figure 1 State Minister, Government & Unicef Representative and Consultant after half day workshop on operation and maintenance

workshop on operation and maintenance to take place during the Unicef Bottleneck analysis.

Peter Mahal (Director General for Rural Water Supply and Sanitation, Ministry of Electricity, Dams, Irrigation and Water Resources, Ministry of Water and Energy) and Patrick Okuni (Unicef) have all contributed to this framework. Representatives of the Aweil West Handpump Mechanic association also provided frank and insightful inputs:

James Chol Garang, Paul Ariel Atak, William Deng Kuach, Dut Yel Akol, Thiek, Kur Chor, Sando Ngong and Rebecca Aluel Antiak. Thanks to Rebeca Abuk, the volunteer female handpump mechanic in Aweil town for her story so far and ideas for the future and the numerous water users in the state that shared their experiences and challenges.

Contents

Acknowledgements	iii
Summary	vi
1. Introduction	1
2. Context	2
Population.....	2
Water Supply Technologies	3
Provision of Water Supply Infrastructure.....	5
Leadership and Coordination.....	5
Monitoring, Information and Reporting.....	6
Management, Operation and Maintenance.....	6
Handpump Mechanics and Handpump Mechanic Associations	8
Village Caretaker	9
Spare Parts Supply.....	9
3. Issues to be addressed to improve Operation and Maintenance.....	10
4. Important Issues beyond Operation and Maintenance	11
5. O&M Framework - A Politically Enabled Public Private Partnership	13
Action 1 Vision	14
Action 2 Roles and Responsibilities Defined	14
Action 3 Fulfilment of Roles and Responsibilities.....	16
Action 4 Standard Approaches and Common Procedures	16
Action 5 Alignment of Approaches and Procedures	19
Action 6 Spare Parts Supply Chain.....	19
Action 7 Handpump Mechanics and Association.....	21
Action 8 Community Management and User Fees	21
Action 9 Routine Maintenance	22
Action 10 Communications	22
6. Resource Requirements	22
7. Proposed Activities	24
Bibliography and References	27
Annex 1 Stages of Water Supply Services.....	28
Annex 2 Details of Stages within the Procedures for Water Services.....	29

Annex 3 India Mark II Specifications and Bill of Quantities..... 33

Annex 4 Costs and Prices..... 36

Annex 5 Schedule of Requirements for Handpump Supply 38

Annex 6 Other Issues Raised 40

Summary

Northern Bahr el Ghazal faces a major challenge to ensure sustainable water services to rural and urban communities. In the past Unicef's regular supply of spare parts helped to keep the number of broken down hand pumps to a relatively low level (officially around 10%). With no more free spare parts from Unicef the number of non functioning hand pumps could increase dramatically. This framework provides a basis for turning a potential crisis into an opportunity. Its success will need a major shift in both policy and practice for operating and maintaining hand pumps and require state politicians and public services, private sector and community actors to each play their role.

The Vision is for Northern Bahr el Ghazal, through its own leadership and involvement of communities, to ensure sustainable access to safe water for all in the State.

Implementing a successful operations and maintenance framework will require the public and private sectors, NGOs, CBOs and communities to play their part. There are three particular requirements for success, which are that:

- The State Ministry for Water, Co-operatives and Rural Development of Northern Bahr el Ghazal lead the framework and implementation process.
- All rural and urban communities of the State make payments for the operation and maintenance of their drinking water systems.
- The skills, experience and commitment of the entire water sector within the state (NGOs, UN agencies as well as the multilateral and bilateral agencies and private sector) is built upon, with all working together to implement the framework.

Successful operation and maintenance depends on much more than ensuring the supply of spare parts. It requires a wide range of actions at state level as well as at county, payam and boma level. All stakeholders need to ensure that they are effective and respond to the demands and needs of communities for safe and reliable water services. The following key issues need to be addressed in a co-ordinated manner:

- a) Political leadership and senior officials agree on a joint vision.
- b) This leadership clearly communicates the vision using a range of media.
- c) Water users being willing and able to pay for operations and maintenance (including spare parts), and village water committees collecting, managing and saving these fees to pay for future O&M.
- d) Commercial suppliers making spare parts available at affordable prices.
- e) Sufficient skilled and motivated handpump mechanics and plumbers (with tools, transportation and other equipment) to maintain and repair the facilities.
- f) Moving from a fragmented and incoherent coherent approach to having common procedures between agencies, so that nobody undermines the state policies on operation and maintenance and the development of a responsive service culture to meet the needs of rural communities, including clear standards of service, response times, and clear information on the costs of repairs.
- g) It may be more cost-effective to encourage water point servicing before the borehole breaks down. However, changing such practices is a long term process.

- h) The government leadership and ability to ensure that all stakeholders follow the same approach and comply with agreed procedures in supporting service delivery.
- i) A thorough planning and budgeting process that matches the actions required with available human and financial resources.
- j) And finally, a flexible approach, with all partners continuing in a spirit of learning, documenting experiences and making course corrections as needed over the coming years.

The box below sets out ten key actions for operation and maintenance for Northern Bahr el Ghazal.

Operation and Maintenance Framework for Water Supplies - Actions

1. State Ministers, Governor and State Government discuss and endorse a vision and key policy issues for the operation and maintenance framework including:
 - No more free spare parts are distributed (apart from emergency responses in camps);
 - Communities pay for spare parts and maintenance;
2. Clear roles and responsibilities for WASH are defined at state, county, payam, boma and community levels. This includes planning, management, monitoring and reporting as well as ensuring equitable access to water services and addressing community concerns at county level, with the regulation, oversight and support from the State Ministry.
3. All agencies work towards enabling stakeholders at state, county, payam, boma and community levels to fulfil their roles and responsibilities
4. A standard approach and common procedures for all aspects of developing and maintaining new and existing handpumps and water yards are developed by state government, together with partners.
5. All agencies support the operation and maintenance framework and align their approaches accordingly. This is supported by memoranda of understanding, agreements or compacts that are signed by all stakeholders working on WASH in the state.
6. Private supplier(s) make pumps available for purchase in Aweil and spare parts available in each county.
7. Each handpump mechanics association registers as a legal entity, opens a bank account and members are equipped (with tools, communications and transport) and enabled (with training and support) to fulfil their responsibilities.
8. Communities are able to undertake routine maintenance, with handpump mechanics undertaking inspection and preventive maintenance as part of their work schedule.
9. Communities make regular payments and save these funds for future maintenance and repairs.
10. An extensive and continuous process of communication is undertaken to ensure that all are aware of the framework, roles and responsibilities, procedures and that spare parts are no longer free.

The table below summarises the current situation, and response required to implement the Operation and Maintenance Framework.

Situation in September 2013	Response
Core aspects for Implementation of the Operation and Maintenance Framework	
Political leadership at State, Ministry, County, Payam and Boma level silent (or quiet) about user payment for operation and maintenance.	Ministry to draft a short policy paper on rural water fees levied on communities to cover operations, maintenance and repair costs
Roles and responsibilities for all Government Staff at State, County, Payam and Boma level with respect to WASH are not clear.	Ministry to lead a process to define WASH roles and responsibilities at State, County, Payam and Boma levels, and issue staff with job descriptions.
Irregular work for handpump mechanics, mainly to repair pumps.	NGOs and other agencies channel work through the handpump mechanics associations, including contracts for platform casting, pump installation, and major and minor repairs.
Strong sense of pride in their role in developing the nation by volunteer handpump mechanics.	Ministry in its monitoring and regulatory role ensures that the framework (and more commercial approach) does not undermine the volunteer handpump mechanics' sense of pride in their role.
Not all handpump mechanic associations are formally registered, have a bank account and have established membership rights and responsibilities.	The Ministry, with support of nominated agencies/NGOs in each county, assists handpump mechanic associations to formally register, have a bank account and have established membership rights and responsibilities, including ID cards and membership fees.
Spare parts only available for purchase in Aweil East	The Ministry (with support from agencies and NGOs) facilitates supply chain spare parts available for purchase in all counties – ideally with suppliers opening outlets in Aweil, and arranging distribution to the counties.
Spare parts stock in Aweil East runs out prior to purchase of new stock.	The Ministry and Counties (with support from agencies) develop advance ordering procedures to ensure that spare parts shops remain properly stocked throughout the year.
Not all communities with a handpump are aware of their roles and responsibilities, including the purchase of spare parts and payment of handpump mechanics.	The Ministry and Counties work together to raise communities' (with a handpump) awareness of the new arrangements, and their roles and responsibilities, including the purchase of spare parts and payment of handpump mechanics (target 95% of communities aware by Dec 2014).

Situation in September 2013	Response
Spare parts are being given free by some agencies	WASH agencies, active in the State of Northern Bahr el Ghazal, compact with the Ministry to adopt a common approach in providing no free, spare parts, to communities ¹ . It will strongly encourage WASH agencies to buy spares locally to help develop the market.
Not all communities are collecting fees from water users for handpump or water yard use.	Communities with handpumps or water yards supported and encouraged to collect regular user fees in line with state legislation (to be enacted).
No systematic and regular communication of WASH messages and examples of good practice through the media, local leaders and churches.	Ministry (including Governor and Minister of Water) and counties (including Commissioners) develop systematic and regular communication of WASH messages and examples of good practice through the media (including radio), local leaders and churches.
<p>Agencies follow their own procedures, some of which are not written down for:</p> <ul style="list-style-type: none"> (i) community mobilisation and training (ii) post-construction follow-up and support of community WASH committees (iii) drilling/construction/installation supervision (iv) borehole, platform & fencing design (v) diagnosis of reason for handpump or water yard breakdown 	<p>Standard, state-approved procedures exist for:</p> <ul style="list-style-type: none"> (i) community mobilisation and training (ii) post-construction follow-up and support of community WASH committees (iii) drilling/construction/installation supervision (iv) borehole, platform & fencing design (v) diagnosing the cause of handpump or water yard breakdown
No preventive maintenance culture or system in place.	Ministry (working with WASH agencies) develop and disseminate procedures for preventive maintenance, equip teams and communicate to communities that preventive maintenance will save them money.

¹ The compact clearly sets out circumstances in which some subsidy is permissible. For example all communities pay the first 2000 SSP for spare parts and agencies (or government) subsidises major repairs which are over and above this level starting at 50% and tapering to 0% over 5 years. For rehabilitation communities contribute 25% of the costs in cash or labour, and make an upfront contribution to the community operation and maintenance fund.

Situation in September 2013	Response
Important issues for the Water Sector as a whole	
WASH Cluster provides co-ordination for the humanitarian response but there is no government-led WASH, or Water Resources coordination body.	Ministry of Water convene a government-led coordination body to regularly discuss important issues of policy and practice, agree actions and review progress.
No comprehensive database of handpumps or water yards.	Ministry of Water (with support from agencies) builds WIMS database at State level to include data of all existing water sources and able to generate relevant reports for monitoring progress and decision-making.
No unambiguous identification of water points possible because of lack of serial numbers	Ministry of Water agrees on a system to give out serial numbers (independent from Payam boundaries) and hand pump mechanics mark all water points.
Transport to rural communities is a major challenge for the Handpump Mechanics Association and county government staff	The Ministry and WASH actors should work together on innovative approaches to increasing mobility of handpump mechanics and transport of spare parts
Communities are often not clear on ownership of hand pumps – as, with a few exceptions, they are provided free with no requirement for cash or in-kind contributions to the work	The Ministry (with WASH actors) develops and agrees an approach that requires some contribution (in kind or cash) to test demand and encourage clearer understanding of ownership
Technology choice is currently very limited. The presumption is for machine drilled boreholes and the installation of India Mk II handpumps (driven by the desire to limit the required range of spare parts). This is an expensive technology, with high maintenance costs.	Ministry (with support from agencies) develops groundwater mapping (initially based on topographic maps, borehole logs and local knowledge) to identify areas of alluvium, shallow groundwater, and shallow and hard rock aquifers. This provides a basis for identifying areas for protected wells and hand drilling as alternatives to machine drilled boreholes. Options broadened to include less expensive technologies – particularly for smaller communities unable to pay for maintenance costs of India Mk II Handpumps.
Unclear criteria for identifying priority communities needing water infrastructure.	Ministry and county administrations work together to agree a basis for selection to ensure greater transparency and equity in allocation of water points. The Government of Northern Bhar el Ghazal to communicate process to WASH agencies.

1. Introduction

The Central Ministry of Electricity, Dams, Irrigation and Water Resources is responsible for national water policy. It holds to a 'one policy approach'. This means that state policy is directed by national policy. In this respect, the Northern Bahr el Ghazal State Framework for Operation and Maintenance (O&M) of Water Supplies is the State Government's response to section 4 of the National Water Policy (GoSS 2007). In particular section 4.1.5 *"rural communities shall be supported to take an active role in planning, managing and financing RWSS schemes on a sustainable basis"* and section 4.2.6 *"to encourage users to contribute towards O&M costs while ensuring that the poor are not disadvantaged"*. The framework also responds to the States transition from an emergency situation through recovery to development as well as the end of free spare parts distribution in South Sudan by Unicef in 2013².

The Ministry's decision to embark on developing an O&M Framework is supported by the agencies represented in the WASH cluster meetings. The Framework is testimony to South Sudan and Northern Bahr el Ghazal determination to move from a dependency on others to take on full responsibility for water development. The framework has been developed by the State Ministry in collaboration with agencies active in supporting WASH activities in Northern Bahr el Ghazal State. The framework is guided by the *Draft Policy Paper for Operations and Maintenance of May 2013* (MoWCRD 2013) and the *Planning and Strategy Workshop in Wau* in August 2013 (MWCRD 2013)..



Figure 2 A spectrum of settlement patterns in Northern Bahr el Ghazal

The aim of the O&M Framework is that rural and urban³ dwellers of Northern Bahr el Ghazal benefit from affordable basic water services, which are effectively managed, protected and maintained. This document includes the following:

- A description of the context of Northern Bahr el Ghazal today, with an emphasis on water supplies and their operation and maintenance
- Issues to be addressed to improve the operation and maintenance of water supplies.
- Important issues beyond operation and maintenance
- A proposed Operation and Maintenance Framework comprising
- A proposed set of actions to implement an Operation and Maintenance Programme.

² Although not officially communicated by Unicef, the agency has effectively stopped supplying spare parts to the Government of Northern Bahr el Ghazal and other states in South Sudan.

³ 'urban' areas in Northern Bahr el Ghazal are currently characterised as large villages, or conglomerates of villages with point sources of water – akin to rural supplies.

2. Context

Population

The National Bureau of Statistics estimates that the state's population to be just over 720,000 (NBS 2011). The return of populations from Sudan to Northern Bahr el Ghazal is an on-going process, with an estimated 400,000 having returned since the Comprehensive Peace Agreement was signed in 2005 (Northern Bahr al Ghazal Strategic Plan 2012-2015, quoted in Concordis 2013). There are currently about ten officially recognised camps for returnees in the state. These locations may or may not become permanent homes for their populations, many of whom move on to their ancestral homes or are resettled elsewhere by the Government. Many communities in the state are characterised by a mix of host and returnee populations. The movement of people is coordinated by the State Government who guarantees security for the roads and provide temporary land and support to returnee as well as refugee populations (Concordis 2013).

The people of Northern Bahr el Ghazal people reside in a spectrum of settlement patterns ranging from scattered homesteads to denser settlements to growth centers and towns including Aweil. Areas which are referred to as urban would be considered rural in many other countries.

The on-going border dispute with Sudan has resulted in significant levels of movement within the State including between different land types (high, medium and low lying land). People are also keen to obtain and hold on to fertile agricultural land by residing there. Such land may lack basic services including safe drinking water supplies. In addition, there is migration of family members with their cattle towards the wetland areas in the dry season that provide dry season pasture. Nomadic cattle keepers from South Darfur also migrate into Northern Bahr el Ghazal in these months. The state is thus characterised by considerable seasonality as well as longer term change in where people live. The dynamic nature of the situation is a challenge for the planning process.



Figure 3 View from the road to South Aweil at the end of the rains (Source: Danert, Sept 2013)

Water Supply Technologies

According to the National Baseline Household survey of 2009 (GoSS 2010) 63% of the population of Northern Bahr el Ghazal State use handpumps as their main drinking water source. However, a wide range of other sources are also used (Figure 4). Discussions with county WASH teams suggest that people use a mix of sources, depending on the season

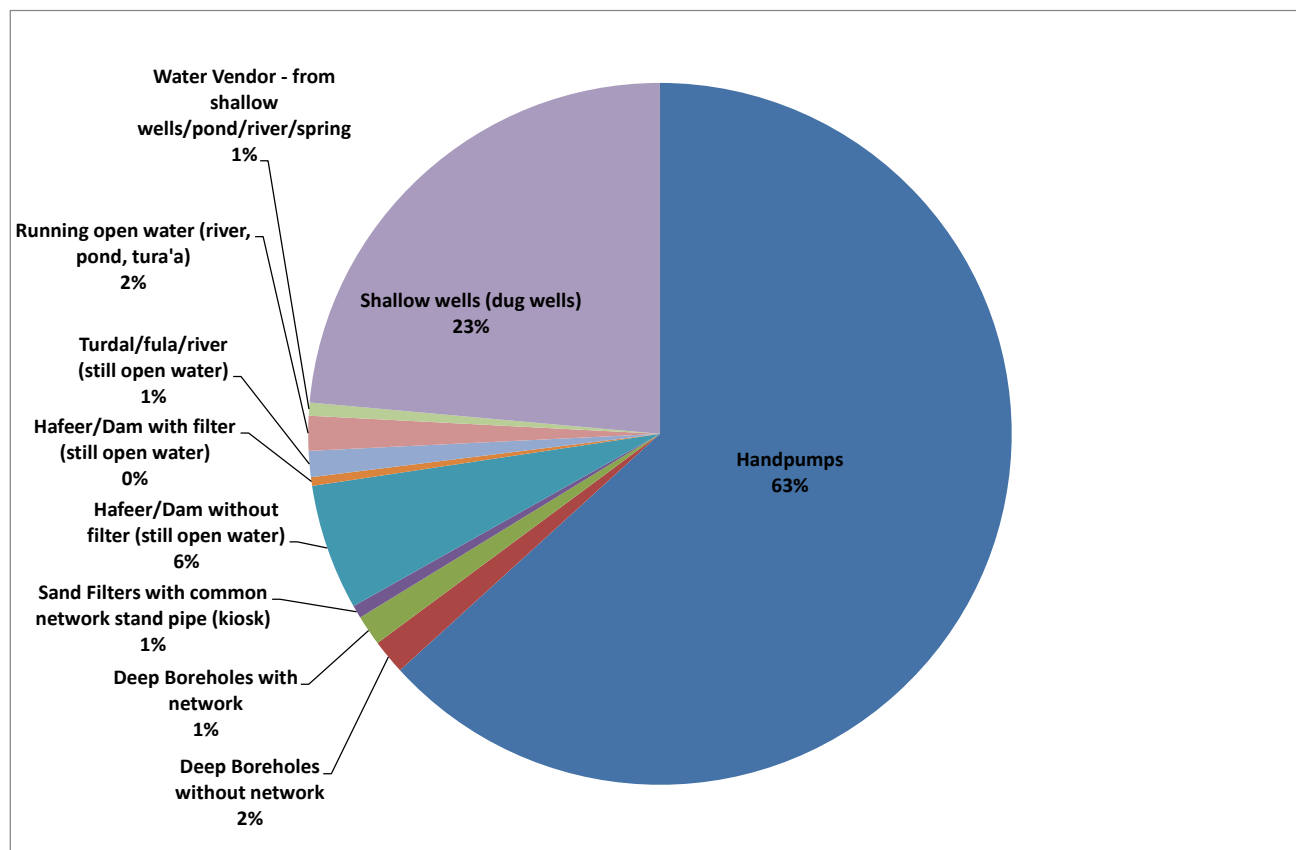


Figure 4 Main Drinking Water source in Northern Bahr el Ghazal, Percentage of Population (Source National Baseline Household Survey, 2009 in GoSS 2010 pp36)

The India II handpump⁴ (fitted onto a borehole) and the water yard (comprising a borehole fitted with a submersible pump run by solar panels) are the two main technologies currently being provided in the state by external agents and through Government-funded programmes. While handpumps are generally for rural dwellers, water yards tend to be for urban populations or areas considered to be in a process of urbanising.

It is estimated that over 2,000 India II handpumps are in the State and almost 100 water yards (Table 1). The exact figure is not known because:

- A full inventory has never been carried out,
- Not all new sources are reported to government and
- The Water Information Management System (WIMS) at state level is incomplete.

Although the reporting system in the State is not perfect there appears to be a semi-formal mechanism of communication in place (see section on Monitoring and Reporting below).

⁴ There are also a small number of India III and Afridev pumps in use, but these are not currently being installed in the state.

Table 1 Estimated Water Supply Data (Source: Minutes of WASH Cluster Meeting)

County	No of Boreholes		No. of Water Yards	
	May 2013	July 2013	May 2013	July 2013
Aweil East	676	657	43	45
Aweil South	250	250	4	no data
Aweil North	545	560	13	12
Aweil West	480	486	11	9
Aweil Centre	139	141	3	no data
Total	2,090	2,094	81	n.a.

The Market Study by IRC (2012) for Aweil East indicated that there is significant demand for handpump spares in the county. The survey noted that 150 pumps out of 497 (30%) were in need of repair. Assuming an average cost of 660 SSP of spare parts for each pump (details in Annex 6) this amount to a total spare parts investment of 99,000 SSP (US\$24,750).

The replacement of riser pipes and pump rods within a relatively short period of time has been raised by a number of stakeholders. This concern is based on anecdotal evidence rather than specific studies or data. As per design, riser pipes for the India II are slow-moving parts - only needing replacement every two to five years. However, there are stories of them being replaced much earlier. Some handpump mechanics cited areas of acidic groundwater that results in aggressive corrosion of pipes. It is also worth noting that riser pipes are recycled into bed frames and apparently have a market value of about 80 SSP. Pump rods are also used for construction.

Given that until relatively recently, spares were given freely the pipes and rods may have been replaced more than necessary to make money. Nevertheless, the Ministry should consider carrying out water quality testing to determine pH values in areas where there are particular concerns about corrosion. India Mk II pumps are not recommended to be used in aggressive water, meaning pH < 6.5. In such circumstances pvc rising mains should be used, such as the Afridev pump, or the Uganda Modified Pump (U3M) – depending on depth requirements.

Although not set out in writing, there seems to be a common understanding at county level that drilled wells fitted with boreholes should be provided for communities where there are a good number of people in need. The boreholes may be machine, or hand drilled, depending on the geology as well as the resources and partners available to construct. The official coverage target is one handpump for 250 people. However decisions are taken on a case by case basis and thus communities with smaller populations may also benefit from borehole.

It is noted also that settlement patterns vary considerably within the state. In cases of small hamlets government officials may advise communities to construct their own hand dug wells (if feasible). However, this is not an official part of the planning and advisory process. It would be beneficial for the state to establish a clear application, assessment and decision-making process for community selection, technology choice and advice. The State, through the Ministry of Water, Co-operatives and Rural Development should seek support from partners to develop hydrogeological maps (including key water quality parameters such as pH or iron) to further inform technology choice.

Provision of Water Supply Infrastructure

Currently all water supplies are provided by UN agencies, bilateral agencies and NGOs⁵ through discrete projects. Usually the capital cost of the facilities is fully subsidised.

The mechanisms used to prioritise communities and identify their needs vary between projects and are not always explicit. A number of agencies base their programmes on county priorities. In such cases, the planning officer in the county administration would lead the process for identifying priority communities for new water supply infrastructure. Others agencies work more independently of local government and take their own decisions of whom to serve.

Decisions appear to be driven by the demands of emergency or humanitarian response; at least based on the minutes of the recent WASH Cluster meetings. Emergency refers mainly to the camps, particularly on the border with Sudan whereas humanitarian assistance tends to be given to returnees to the state requiring direct support in order to survive, resettle and ultimately integrate. Discussions suggest that in reality the definitions of humanitarian and development are a bit blurred and subject to some interpretation.



Figure 5 Collecting Water from India Mk II handpump in Aweil East County.

Leadership and Coordination

The WASH Cluster monthly meetings provide a key mechanism for coordinating and prioritising actions. Although they were established as a way to coordinate humanitarian response the meetings are now covering wider issues. The recognition of the need to systematically address operation and maintenance for the state is an example of this. With the state having transited into a predominantly development context there is need to revisit the role of the WASH cluster and consider how to coordinate the development of WASH and water resources in the state for the long term. In particular, it is essential that the Directorate of Water Resources takes on a leadership role as well as coordinating and overseeing the other actors in the sector. Coordination mechanisms at county level are also advisable. The capacity development support on policy, managerial and technical issues provided by SDC provides crucial support to the Government as it steps into this leadership role in the state.

⁵ ARARD, Action Contra le Faim (ACF) USA, ASCDA, AWODA, BADS, BRIGDE PROGRAM, CESVI, IAS, International Red Cross and Red Crescent (ICRC), International Rescue Committee (IRC), International Organisation for Migration (IOM), MCC, SMOWCRD, Samaritans Purse, SNV, SODA, Swiss Agency for Development and Cooperation (SDC), TEARFUND, SMWC & RD, UNICEF, UMCOR, UNMISS/RRP, UNOCHA.

Monitoring, Information and Reporting

As yet, there is no comprehensive water supply information system for the state. Implementing agencies do not always provide data, or timely reports to the county and/or state government. However, there are semi-formal reporting mechanisms which could be built upon. Interviews revealed one process:

Essentially, the handpump mechanics borrow their tools (and at times transport) from the Payam. Once completing their repair, they report back to the Payam. This information is passed on to the county by the county supervisor. The county delivers monthly reports to the state ministry, where the data is compiled. Data is compiled monthly at State level for the WASH cluster meetings. However, the data often comes late leaving insufficient time to investigate inconsistencies and correct errors by the WIMS team.

Unfortunately the above reporting system does not allow the identification of which actual pumps have been repaired and thus building up a detailed picture of the frequency of breakdown, age of the facility under repair. There is also a lack of data on the type of breakdown. Thus stakeholder base their discussions and decisions on anecdotal evidence. There are no standard serial numbers for water points.

SNV supported a single event of data collection for one Payam in each county and provided one GPS and one laptop per county. Enumerators were trained and provided with 3litres of fuel and paid SSP 170 per day. The data is now held in an access database (separate from the WIMS data described below). If fully analysed and presented, this data could, for example provide the state with information to help understand more about why facilities are not functioning.

The Water Information Management System (WIMS) data is not comprehensive and it seems that the links between Juba and Northern Bahr Ghazal could be strengthened considerably. The WIMS team could benefit from support to prepare more detailed reports and analysis of the data they already have. This would build confidence and generate ideas for improving the system in the future. The capacity building support of SDC to the Ministry to enable the WIMS team to have virus protection software should help to avoid the loss of data and reports in the past.

Management, Operation and Maintenance

Objective 4.2.3 of the Water Policy (GoSS 2007) is for effective structures to manage delivery of rural water supply services are to be at the lowest appropriate level. Both handpump and water yard facilities in South Sudan are managed at community level. The Water Policy states that *"Following years of protracted conflict, rural communities have only limited capacity to contribute towards the capital costs. However it is generally agreed that communities can reasonably be expected to contribute towards the costs of operation and maintenance"*.

Usually a committee is established which is expected to collect user fees on a regular basis and pay handpump mechanics to repair the pumps in case of breakdown. However, there is no consolidated information regarding the extent, content or duration of training. Training materials have both developed by Samaritans Purse (2013) and the International Organisation for Migration (2013).

In the case of water yards repair are undertaken by plumbers. The Water Policy notes the need to formalise arrangements for financial sustainability of operation and maintenance, including the development of guidelines *"for progressive involvement of user communities in financing the cost of operating and maintaining rural water supply schemes while ensuring that the poor and vulnerable groups are not disadvantaged"*. Discussions with a select number of handpump mechanics and some agencies suggest that communities are generally willing and able to raise funds for both spares and labour. Apparently the lack of spare parts and distribution of free spare parts are the main reasons for problems. It should be noted that there is no systematic data to verify or contradict these sentiments. Indeed some suggest a counter view that communities expect handpumps that are provided free by agencies will also be repaired by the agencies. Based on experiences in other countries, it can be assumed that the community mobilisation and training (or lack of it) has a significant impact on community understanding of ownership as well as attitudes and behaviour towards payment.

SNV, IRC and ACF-USA have all undertaken efforts to improve O&M (and in some cases reporting) in the areas of their operation. None of these approaches have been state-wide, all have been limited in duration and scope and all are different:

- SNV supported the stocking of spare parts to handpump mechanics in Aweil West.
- ACF-USA implemented a voucher scheme subsidising 80% of the cost of spares.
- IRC supported the establishment of the handpump mechanic association in Aweil East and initial stock of spares; SNV provided training and support with respect to team-building, managing a business, entrepreneurship and financial management.

Worthwhile lessons can be drawn from all of these attempts (Table 1) to develop a common approach that covers all counties.

Table 1 Lessons from Supporting Handpump Mechanic Associations in Aweil East and West

Lesson	Experience/Information/Template
All members require an ID card. This also facilitates the opening of a bank account.	IRC have developed ID format for Aweil East
Associations require training and support	SNV have training schedule and materials.
Minimum stock required to enable spares shop to be viable	Aweil East with start-up capital of 28,000 SSP - apparently still operating successfully ⁶ while Aweil West's start-up of 2,000 SSP which collapsed.
Dialogue on appropriate geographic areas to be covered by handpump mechanics and whether these need to be political boundaries.	Note the long thin strip-like shapes of each Payam in Aweil East which is not a cost-effective area to be served.
Support mechanics to collect bids and make a bid analysis with the first procurement.	IRC – this enables them to carry it out for themselves next time.
Once supplier has been selected support agency transfers money to association account to pay supplies.	IRC – this enables them to carry it out for themselves next time.

⁶ According to interview with Aschenaki Badege of IRC; although the association currently need to replenish spares.



Figure 6 Drainage channel and cattle trough from handpump close to Aweil Town after several rehabilitations

Handpump Mechanics and Handpump Mechanic Associations

An estimated 20 to 40 pump mechanics have been trained and are active in each of the five counties (Aweil East – 32; Aweil West – 28). Not all of the pump mechanics are literate. The mechanics have received different amounts and types of training; some are employed by government while others are volunteers. The tools that they have as well as means of transport vary. In early 2013 Unicef provided one quad bike per county to Aweil South and Aweil East pump mechanics. Some also have skills in hand dug well construction, latrine slab casting and hand drilling (auguring).

Because of the weight of the installation the India Mk II handpump mechanics have to work in teams in order to repair it. Apparently current prices for team carrying out a repair range from about 420 SSP (working for NGOs) to 300 SSP (for water users). In some cases a team is paid 150 SSP to check the problem.

In 2009, NGOs (SNV in particular) supported the formation of Handpump Mechanics Associations in each county. Each association was encouraged to formally register as a Community Based Organisation (CBO) and develop a system of membership fees. However follow-up has been limited and the status of each association is not clear. In mid-2013 the State Ministry made it clear that the handpump mechanic associations could comprise only volunteer handpump mechanics. Government employed mechanics would not be eligible to join the association – to avoid double payments. The cohesiveness of each association is not clear but they appear to be motivated and energetic.⁷ The associations would benefit from support to their leadership, management, record keeping, handling finance and business development over a couple of years. This should include an explicit component to learn from each other. In the medium term it would be useful to see and for agencies to support the handpump mechanics secure contracts for pump installation.

⁷ This statement is based on the group discussion with the association in Aweil West in September 2013.

Village Caretaker

In some villages there is also one or more trained caretaker, equipped with spanners and grease gun. They are supposed to maintain the above the borehole components. Daw (2012) in his study of maintenance of handpump and supply chains found that there was a severe lack of preventative maintenance culture in South Sudan including NBEG State. This appears to be correct through discussions with various stakeholders.

Spare Parts Supply

Until recently all spare parts were supplied freely to water users via State and County Government by Unicef. Officially they were intended for use in humanitarian or emergency response but ended up being used extensively. However, Unicef supply to Northern Bahr el Ghazal has been stopped⁸. Some other NGOs still provide free spares. The two shops set up by the handpump mechanics association (described above) are the only places in the State where spare parts for the India Mk II could be purchased. Spare parts are also not available in Wau.



Figure 7 Evidence of Handpump Recycling

In interviews, the handpump mechanics in Aweil West considered the lack of availability of handpump spares as their biggest challenge. As they have dwindled to nothing over the past months, hand pump mechanics are recycling spares, which risks more frequent pump breakdown.

As noted above, the handpump mechanics association in Aweil East runs a spare parts shop (having been supported by IRC and SNV. IRC provided a grant of 28,000 SSP for the initial stock. They ordered from suppliers in Juba, and have subsequently made two new orders without any additional financial support – although IRC has provided support with arranging transportation of spare parts from Juba. The shop is located at the county headquarters and there are thus no charges for rent. A similar initiative in Aweil West collapsed, but the initial investment capital was only SSP 2,000. Interviews with the association revealed that they have learned a number of lessons from this experience (Table 1).

There are apparently about six India II dealers operating in Juba including WaterAfrica and Relief line, which has considerable stock. Follow up discussions with Relief line suggest that their pumps and spares do meet International Standards. It will be important for the Ministry and partners to explore ways of directly linking reputable suppliers in Juba with potential outlets in NBG – in particular the Handpump Mechanics Associations.

⁸ It is noted that a small final containment of Spare Parts was on its way from Juba in October 2013.

3. Issues to be addressed to improve Operation and Maintenance

Spare parts availability is clearly the most pressing issue with respect to operation and maintenance of handpump supplies in the State. The Ministry (in collaboration with partners) needs to urgently address this issue. However, this problem should not overshadow a set of interlinked issues that are likely to undermine operation and maintenance if not addressed systematically. Ensuring that water services continue to function as designed starts long before facilities are built and handed over to the community. In fact, it starts with the messages from the political leadership. Key issues for Northern Bahr el Ghazal are:

- a) There is need for a joint vision between the political leadership and technical leadership with respect to the key political messages (such as no free spares, approval of shops, user fees and payment)
- b) The vision needs to be communicated clearly and widely using a range of media.
- c) Ensuring that water users know and are able to collect and manage user fees and pay for the labour, transport and spares required for O&M. Given that not all users have been sensitised in the same way, it means that some communities with sources will need to be re-sensitised or trained for the first time. An important assumption is that the O&M costs are within the means of the community, and that the community finds ways of supporting those who cannot afford to pay. The Government (with WASH partners) should assess whether this is realistic for major repairs, or if there should be a short (say one to three year) transition for more expensive repairs.
- d) Establishing a reliable and affordable flow of high quality spare parts, within the private sector, that is within reach of the communities and that communities know where they can purchase spares from.
- e) Ensuring that there continue to be sufficient numbers of skilled and motivated handpump mechanics and plumbers who can maintain and repair the facilities.
- f) Currently, the procedures and practices for community selection, mobilisation and training, supervision of construction, rehabilitation and user follow-up vary between agencies. As a result it is unlikely that communities receive the same messages regarding their roles and responsibilities for management, operation, collection of funds, protection (preventative maintenance) and repair of their water supply services. This undermines operation and maintenance and self-reliance. There is need for a coherent approach between agencies, so that nobody undermines the state framework.
- g) Given the limited financial resources at Payam level, regular follow-up of water users is extremely limited. Essentially Payam supervisors that are notified of handpump breakdowns have respond by issuing the handpump mechanics with tools and spares. This is an approach that is responding to breakdown. It may be more cost-effective to encourage water point servicing before the borehole breaks down. However, changing such practices is a long term process.
- h) Government must be in the lead and able to ensure that all stakeholders follow the same approach and comply with agreed procedures that support service delivery.

- i) In order to address the numerous inter-related issues, a thorough planning and budgeting process that matches the needed actions, with the human and financial resources available, is essential.
- j) All partners continue in the spirit of learning, thus documenting experiences and making corrections over the coming years as the framework is established and develops.



Figure 8. Maintaining the Roads is also a challenge (Travel to Aweil Centre cut off due to flooding)

4. Important Issues beyond Operation and Maintenance

The Water Policy (2007) objective 4.2.5 explicitly refers to water users making informed **technology choices** taking local needs and priorities and capacity for the management and finance of O&M. Currently there is practically no technology choice given rural dwellers. Given that there are areas where hand dug and hand drilled wells are feasible, it would be worth trying to broaden the technology choice⁹.

Given the potential to **upgrade** handpump sources to systems with a small submersible pump, the Ministry could consider revisiting borehole design specifications. This will require research to determine the areas that require higher drilling specifications (particularly in terms of diameter and gravel packing) to ensure that pumped water supplies can operate without siltation.

As the state shifts away from recovery towards development, the question of how to reach safe **water for all** will become increasingly important. This needs data on water supply coverage and differences between coverage at county, payam, boma and villages level. Reliable data will be needed to inform decision-making and the planning process. Efforts to implement an operation and maintenance framework should thus also build reporting systems and data management. Rather than try to undertake a one-off and expensive inventory for example, literate payam supervisors or handpump mechanics could be issued with GPS equipment to help identify and map water points. This information could be fed into a state-wide database with a serial number for each water point.

⁹ There are examples of water users investing in their own water supplies (self supply). It is worth exploring whether this approach could be promoted further.

The Directory of Water Resources confirmed that all **new boreholes** to be drilled require permission from the State and County level Government. However, not all agencies or drilling companies adhere to this requirement. What should happen is that once drilling is completed a filled-in Watert Information Management System (WIIMS) Borehole Completion Form (also known as dynamic data) is delivered to the State and County. The reality in Northern Bahr el Ghazal, few agencies actually submit drilling records to the Government. This means that valuable information is lost which would otherwise help the government to plan regular and systematically follow-up of all water facilities in the area. The drilling records also provide the basis for learning about, and ultimately mapping the groundwater resources of the state. In turn, this would provide the foundation for systematically exploring technology options within the state.. It also reinforces the importance of government leadership to ensure that the reporting are clear, and adhered to by all agencies.

There is need for Ministry developing a database of water points linked to a groundwater database. There is a distinct lack of hydrogeological **maps**, comprehensive water quality data, or maps indicating which type of technologies can be utilised in a particular area. Mapping of water resources alongside (dynamic) settlement patterns is a key priority for the state. Some measurement work has been started recently. The ministry should expand on this work, but will require additional resources and expertise. In the meantime, it would be very useful to systematically tap, document and map the tremendous knowledge in the heads of people who have been involved in hand and machine drilling projects as well as hand dug well projects over many years. It would be a useful exercise to hold participative meetings (in the style of participative rural appraisal – PRA) to draw out and document this



Figure 9 Children proudly show the fish caught from one of a seasonal water source

information. Such an exercise does not replace hydrogeological mapping with reliable data. However, it provides a useful first step to understand the value of mapping and what is missing. This could provide a good learning incentive for the MIS department to build up a database with the existing drilling logs. The exercise can also help to share knowledge about areas that are particularly suitable for say hand dug wells, auger drilling or other hand drilling techniques, which have suspected aggressive water, or which are particularly risk for machine drilling.

Government **oversight** of what the WASH agencies are doing is weak. Essentially it relies on the hope and trust that they will operate in a professional manner. In order to implement the actions set out in the proposed Operation and Maintenance Framework, as well as build up knowledge of water supply and water resources in the state, all agencies need to follow and adhere to common procedures. To try and ensure this, there may be need to move towards formal agreements, memorandum of understanding or compacts between the Government and agencies. These would refer to requirements for planning, implementation and reporting and stipulates what action is taken when they are not adhered to.

5. O&M Framework - A Politically Enabled Public Private Partnership

Northern Bahr el Ghazal State strives to achieve development through self-reliance, also regarding safe drinking water. The Northern Bahr el Ghazal State Framework and Implementation Programme for Operation and Maintenance of Water Supplies is a politically enabled public private partnership.

Operation and maintenance is community based, with the communities taking responsibility to manage the facility, collect fees and pay for regular maintenance and repair. Maintenance and repair work is undertaken by handpump mechanics, who are members of a registered county-based association. Spare parts are provided by the private sector. Backup support and follow-up of communities is provided by WASH agencies in the State under the oversight and coordination of Government. Communication of roles and responsibilities is an on-going process and involves the political leaders, media and religious organisations as well as all implementing agencies. All agencies in the state follow a common set of procedures for planning, implementation and reporting.

In order to develop a common vocabulary for the state, the main terms of the Framework are defined in Table 2.

Table 2 Definitions for the Operation and Maintenance Framework

Term	Explanation
Operation	The day to day use of a facility to deliver clean water according to design. This includes pumping the water or opening the tap. In the case of a water yard it may include switching on the generator, or the connection between the pump and the solar panels. It includes locking and unlocking the facility, or guarding it.
Preventative Maintenance or Protection	<p>The activities that are carried out to keep the water facility in good working order. In the case of a handpump, these activities include keeping the platform, drainage and surroundings clean and maintaining the fence good condition. On a monthly basis there is need to undertake routine servicing of the above ground parts:</p> <ul style="list-style-type: none">• open the pump head and grease the chain,• check that the handle axle nuts and chain bolt and "Nyloc" nut are tight,• make sure that the flange bolts and nuts are tight,• repair holes and cracks on the pump platform• clean the drainage and repair cracks. <p>Ideally, there should also be routine checks and servicing of the below ground parts every three months so that wearing parts are replaced before there is a complete breakdown.</p>
Minor Repair:	Activities done to fix a pump that is not operating as it should or is broken down. It includes the replacement of fast wearing parts such as the chain, some pipes and rods or the cylinder.
Major Repair or Rehabilitation	<p>A complete overhaul of a handpump that is beyond repair. It includes:</p> <ul style="list-style-type: none">• fishing out broken pipes• cleaning or re-development of the borehole due to incrustation of the screen, siltation or poor development at the initial construction stage• replacement of the platform or drain• replacement of the rising mains.

Term	Explanation
Follow-up support	The process where an extension worker visits a community to encourage, motivate and reinforce practices until they become habitual. It also includes helping communities and committees to deal with situations they are encountering for the "first" time. Note that the turnover of committee members means that something experienced every few years may be a "first" time for the individuals involved.

The Framework comprises ten actions as set out below.

Action 1 Vision

The vision is for Northern Bahr el Ghazal, through its own leadership and involvement of communities, to ensure sustainable access to safe water for all in the State.

The Governor, State Ministers need to discuss and endorse a vision for operation and maintenance, and agree on and key policy issues for the framework including:

- a) Government, with the support of its development partners will continue to subsidise the capital costs of some new water supply services for communities with a population of over 250 people. However resources are limited and not everyone can be served immediately.
- b) Communities are expected to contribute in cash and in kind towards the construction of all facilities that are supported by government or external support agencies.
- c) Communities and households who cannot benefit from subsidised water sources in the near future are encouraged to improve their own drinking water supplies as much as possible (such as by digging or upgrading hand dug wells)¹⁰.
- d) Communities will be expected to levy about 2 to 5 SSP/month/household (to be confirmed) to cover costs of operation and maintenance of handpumps; higher tariffs will be required for water yards (to be determined).
- e) Communities must pay for spare parts and maintenance of their handpumps and water yards.
- f) No more free spare parts are distributed. From [date] quality spare parts will be available from private [dealers];F
- g) UN Agencies, NGOs, and bilateral agencies are only to provide free spares in the case of emergencies, which are defined as designated camps.

Given the 'one policy approach', these policy issues should be shared and endorsed by the Ministry of Energy and Water in Juba.

Action 2 Roles and Responsibilities Defined

Clear roles and responsibilities for WASH need to be defined at: state, county, payam, boma and community levels. This is linked to Action 4, which sets out the standard procedures to be followed in the sector. Roles and responsibilities for the planning, management, implementation, supervision,

¹⁰ It is noted that this advice is one step beyond the scope of the Operation and Maintenance Framework but is an issue that will need to be addressed as Government considers how to support services in an equitable manner given the limited human and financial resources in the state.

monitoring and reporting at each level needs to be defined. In the long term, these need to ensure equitable access to water services and addressing community concerns at county level, with the regulation, oversight and support from the State Ministry.

Strike a balance with what needs to be done with the available human and financial resources within the Government at this time will be a challenge. Also, there are likely to be changes in the future as the institutions develop. As in the case of Action 1, it is important to consult with the National Ministry of Water and Energy as well as Public Service to determine if there are any other reforms planned that affect the state.

The State Ministry leads on this process of defining roles and responsibilities. Table 3 provides a starting point for the roles and responsibilities for communities and committees. Samaritans Purse (2013) and IRC (no date) have a both developed materials which cover many of the issues listed below and could thus be considered as for the state as a whole.

Table 3 Key roles and responsibilities at community level

Community	Water User Committee
1. Select or elect a water user committee of 7 to 12 members including chair, deputy chair, secretary, treasurer, caretaker(s) and members. Decide how the local political leadership is to be involved with the committee.	1. If the village is receiving a new water facility, the committee is responsible for: <ul style="list-style-type: none"> a. Collecting the initial capital contribution and paying this to the handpump mechanic for installation, b. Organising the handover celebration of the pump.
2. Determine: <ul style="list-style-type: none"> a. The tenure of office for the committee, b. How to replace the committee members in case they do not fulfil their roles or leave the job/community. c. Record keeping requirements. d. Accountability and reporting mechanisms. 	2. Organise a meeting with the entire community every three months to discuss operation and protection of the facility and fees. Provide the community with an account of how much has been collected and from whom, how much has been spent, what it has been spent on and what the balance is. Short minutes of the meeting should be taken.
3. Decide whether it wants to try and protect the facility from breakdown by having it serviced regularly or whether it wants to only fix it when it breaks down. This decision should be reviewed every three months.	3. Make sure that the area at the pump is kept clean and that the pump is not damaged by children playing on it. In the initial months the committee must ensure that every member of the community knows how to properly operate the facility.
4. Set and review user fees to pay for the protection and repair of the handpump.	4. Collect and store all user fees and keep records of collection as well as expenses. Look after the handpump tools.
5. Pay a regular fee for the operation and maintenance of the handpump to the committee. If the fees are insufficient e.g. for a large repair, an additional amount may need to be raised.	5. If the committee decides to ensure pump protection , the committee must agree with the handpump mechanics that they will come and service the pump every three months. The committee should supervise the mechanic and pay him/her from the O&M fund and receive a receipt.
6. In case the committee is not fulfilling its roles and responsibilities as agreed the	6. In the case of a breakdown the committee should contact the designated handpump

Community	Water User Committee
community should first contact the chief, and then the Boma, Payam or County WASH Office for assistance in conflict resolution	mechanic or Boma to undertake an assessment and repair of the facility. The committee should supervise the mechanic and pay him/her from the O&M fund and receive a receipt. If the breakdown is considered beyond the capacity of the community
	7. The committee may either decide to purchase the spare parts themselves or may buy them directly from the mechanic.

Roles and responsibilities needs to be set out for:

- Volunteer Handpump Mechanics
- Government Handpump Mechanics
- Handpump Mechanics Association
- Boma Staff
- Payam Staff
- County Staff
- State Ministry Staff
- Political leadership at all levels
- WASH Support Agencies

Action 3 Fulfilment of Roles and Responsibilities

Once the roles and responsibilities have been defined, it is not an overnight process to enable them to be fulfilled. Rather it is a process whereby all sector agencies work together. It will require capacity development at all levels. This should include on-job training and mentoring. It will also need the WASH support agencies to better involve Government in the planning, implementation and reporting process, e.g. by enabling the Government staff to supervise borehole drilling or community mobilisation.

Action 3 is linked to Action 4 below in particular.

Action 4 Standard Approaches and Common Procedures

A standard approach and common procedures for all aspects of developing and maintaining new and existing handpumps and water yards need to be developed by state government, together with partners. Figure 11 sets out a ten-stage procedure for new water supply services in Northern Bahr el Ghazal, as a procedure for existing functional and non-functional services. Ultimately the procedures need to be linked and embedded in the government and WASH agencies planning, implementation and reporting processes. Ensuring that each stakeholder plays their part will need considerable coordination.

Within the standard approach, the development and rehabilitation of new and old water points and systems is based on needs as prioritized by the competent authority. All activities are guided by people's needs as reflected in the State Ministry's strategic plans. The planning process should be inclusive and participatory, as well as realistic, given the available human and financial resources.

It is likely that it will take at least two to three years for the planning and implementation processes to be fully linked to community assessment and selection. However, some agencies will be in a position to follow these procedures from the start. At the assessment stage the implementing agency, in consultation with the County Assistant Commissioner and the community, take a decision on the most suitable technology option for that location. This takes account of existing sources, distance to improved sources, population density and settlement patterns, feasible technology options (with respect to water quality, water resources and groundwater resources), affordability and management capacity.

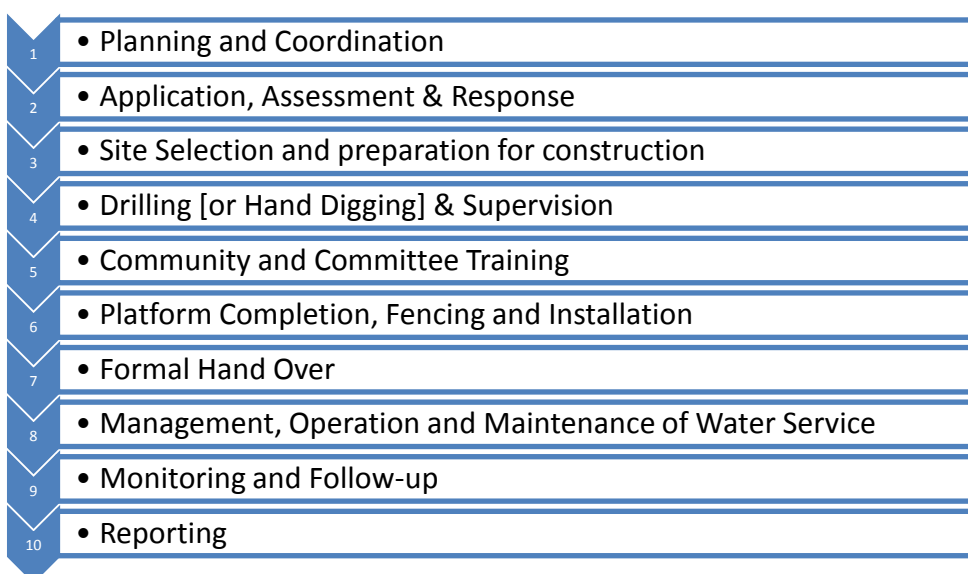
Since many of the Ministry and County WASH staff have experience of these processes over several years from and that agencies including the International Organisation for Migration, Samaritans Purse, ACF, IAS and IRC have already set out certain procedures, it is essential to build on these where possible (Annex 1). The Skat (2008) *Installation and Maintenance Manual for the India II handpump* is also a useful resource and is already being used by some agencies. Annex 2 provides an example of the detail required for a process with respect to new sources.



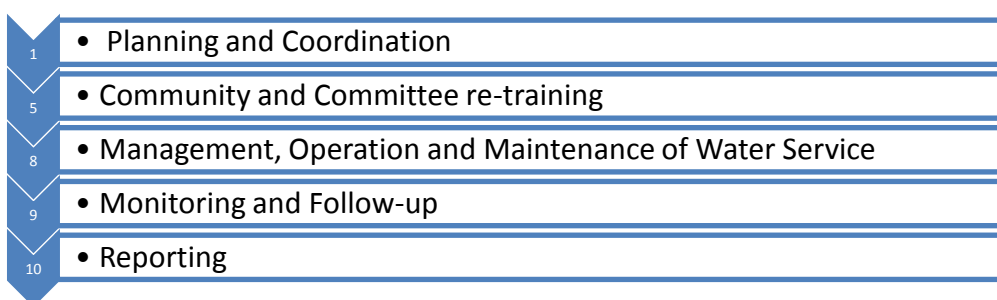
Figure 10 Standard procedures as well as clear roles and responsibilities should help different stakeholders work together more effectively and resolve problems together

Figure 11 Stages of Water Supply Services (Boreholes with handpumps and water yards)

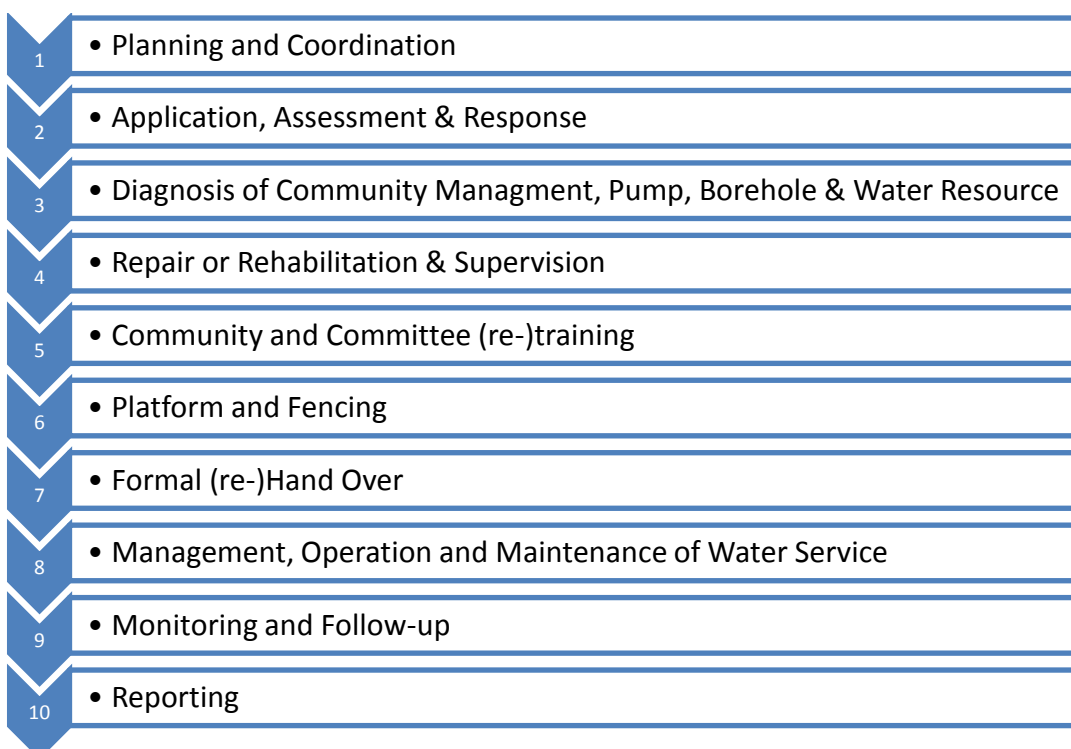
New Sources



Existing Functional Sources



Existing Sources that are non-functional



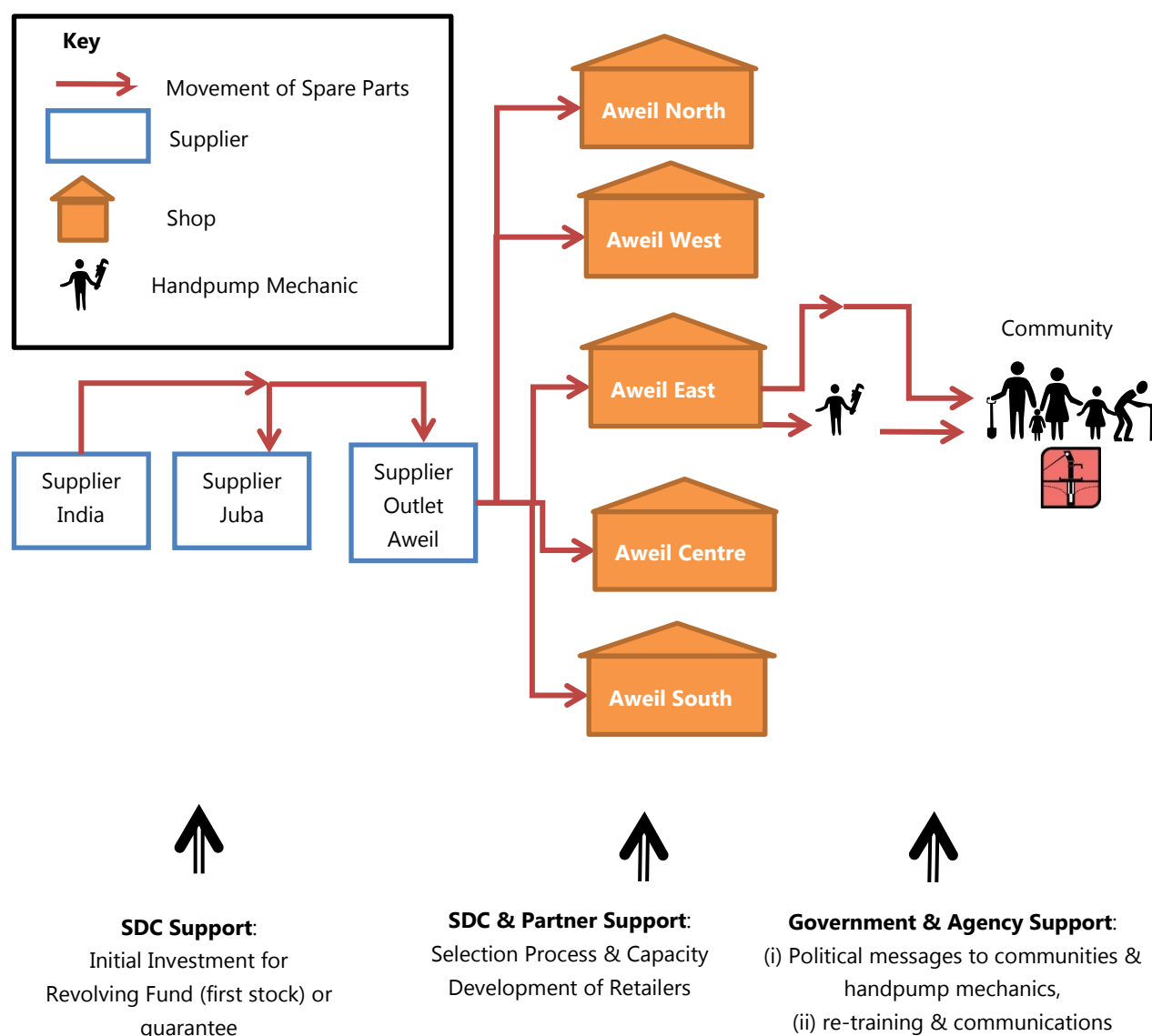
Action 5 Alignment of Approaches and Procedures

In order to support the implementation of the operation and maintenance framework, all agencies should align their approaches with the State approved process (described in Action 4). This may require that memorandums of understanding, agreements or compacts are signed by all stakeholders working on WASH in the state.

Action 6 Spare Parts Supply Chain

The O&M process depends on the local availability of spare parts that can be sold to water users at an affordable price. The handpump spare parts supply chain proposed to commence in January 2014 is set out in Figure 2. In Northern Bahr el Ghazal, private supplier(s) will ensure that quality pumps and spare parts available are available for purchase in each county. It is extremely important that no more free spare parts are given out in the state as this would undermine the private enterprise. In order to bring the supplies closer to the communities, shops/stockists are needed at least at county level.

Figure 12 Handpump Spare Parts Supply Chain Option for Northern Bahr el Ghazal



It is proposed that The Ministry, with support from the WASH agencies trigger the supply of spare parts in the state. This could be by either guaranteeing a realistic minimum sales volume for an investor, a soft loan, or by purchasing an initial stock as a revolving loan for local stockists.

It is essential that the suppliers have sufficient incentive and that there is a healthy balance between the supply and demand of spare parts. Considerably more margin can be made from selling pumps for new installation than from stocking spare parts which can have a relatively long shelf life. Thus, ideally the local suppliers should ultimately supply all projects with handpumps. Communities need to be made aware of the shops, e.g. through radio, local leaders and churches.

Key issues for the spare parts supply chain are:

- economies of scale in procurement to reduce costs, and thus prices in the state,
- ability of supplier to maintain availability of sufficient stock in Aweil outlet
- ensuring the quality of spare parts
- ability of the shops to properly manage their stock, manage their capital and liquidity, and restock on time.
- ability of shops to resist pressure to supply stock on credit/promise of later payment

The following list provides an indication of the criteria for seeking a Juba-based company to establish an outlet in Aweil for distribution to shops at county level:

- Good track record of reliable supply in South Sudan
- Demonstrable ISO 2001 certified quality assurance procedures
- Willing to import from India to Aweil, to maintain prices in Aweil as close as reasonably possible to Juba prices – based on like for like quality
- Supportive of the development objectives of the framework, albeit from a commercial perspective
- A commitment to ensuring access to spares at County level either through the Hand Pump Mechanics Association or through separate stores – providing support and training as needed.

The following list provides a starting point for developing detailed criteria for the selection of the entities that can become shops:

- Must be a registered/licenced entity
- Must know the names of the spare parts
- Must know the quantity of various spare parts needed in the county
- Need to understand the cost of spare parts
- Need to be able to calculate a realistic selling price for each part that covers the cost of purchase as well as transport and a margin for overheads and profit
- Must be business minded
- Must have some managerial skills and experience
- Must have some financial management skills and experience
- Can be outsiders from the local area.

The handpump mechanic association or a self-selected group within the association may be an ideal choice for shop as they understand the spares and are reliant on their supply for employment.

However, it will take significant capacity building to enable handpump mechanics to acquire business and financial management skills¹¹. It is essential that the process is well understood and supported by the local political leadership (at county level) to prevent subsequent challenges.

Action 7 Handpump Mechanics and Association

The handpump mechanics form the backbone of the Operation and Maintenance System. Ensuring that they build their skills, remain motivated, can move around and are pair by the communities is fundamental. The handpump mechanics associations provide an ideal entity for the mechanics to learn from each other, overcome challenges together and, in the longer term try to win commercial contracts.

Each handpump mechanics association should be registered as a legal entity, opens a bank account. All members should be equipped with tools, communications and transport. Note that one of the biggest challenges for the handpump mechanics association is transport to communities, which are dispersed and in many case relatively remote. External support for transport, e.g. towards purchase of a bicycle may be needed. However, this should not undermine long-term self-reliance.

and enabled (with training and support) to fulfil their responsibilities. It is recommended that the Ministry, together with the agencies operating in Northern Bahr El Ghazal explicitly try to support the further development of the capacity of the handpump mechanic associations including:

- Encourage and support all associations to register as legal entities.
- Encourage each association to hold regular meetings and take minutes.
- Ensure that all members can access the necessary tools (e.g. through a soft loan).
- Hold competitions within and between the associations so that they develop explicit mechanisms for “what is a good handpump mechanic” and “what is a good handpump mechanic association”.
- Provision of training business skills such as costing and pricing, entrepreneurship, business and the family, financial planning and record keeping;

Action 8 Community Management and User Fees

As noted in Action 4, ultimately, communities are expected to apply for their water source improvements and may even be requested to raise funds towards the construction, or as a start-up for the maintenance fund. Communities manage the water facilities through a water management committee, which is established and trained before as well as after construction (see procedures set out in Action 4).

Communities and committees will require training as well as follow-on support to enable them to undertake their roles and responsibilities (Table 3). The committee members require skills in organising and running meetings, taking minutes, record keeping, collecting user fees, handling finance as well as accountability and reporting. Some members will also require basic technical skills to be able to undertake preventative maintenance (Table 2).

¹¹ The level of support and intervention needed will depend on whether a Juba based supplier is willing to run his own distribution system across the state, and establish supply depots in each of the counties, possibly with the Handpump Mechanics Associations

Communities make regular payments and save these funds for future maintenance and repairs. . It is often very difficult for communities to hold onto large sums of cash over several years. The WASH community should jointly explore alternative ways of keeping funds. Ideas could include options such as links to savings and credit, livestock or other ventures.

Action 8 is linked to Action 10, on communications, which are essential so that the exemplary communities can share their experience with others and thus motivate them.

Action 9 Routine Maintenance

Communities are able to undertake routine maintenance (defined in Table 2), with handpump mechanics undertaking inspection and preventive maintenance as part of their work schedule. Given the distinct lack of a preventative maintenance culture, it is likely to take considerable time for such an approach to be taken up. Some communities will never invest unless the source has completely broken down. However, the concept of preventative maintenance, as well the benefits should be explained to communities so that they can take a choice.

Action 10 Communications

In order to prevent inconsistent approaches between different Bomas, Payams, Counties, NGOs and drillers there is need for an extensive and continuous process of communication. This will ensure all are aware of the framework, roles and responsibilities, procedures and that spare parts are no longer free. This communication requires political engagement, as well as that of local media, particularly radio. Ideally a dedicated and regular slot should be allocated (say 15 to 30 minutes every week, or an hour a month) for WASH and Water resource issues and experiences to be discussed.

It may be useful to launch an operation and maintenance campaign, both through the media and by direct visits to enable re-training of communities.

6. Resource Requirements

Table 4 is an estimate of the annual cost to be paid by the community to operate and maintain a borehole fitted with an India II handpump. The values should be reviewed once more detailed prices for spare part are available. Assuming that a community comprises 50 households, 2 SSP per month would need to be collected. If there are only 25 households in the community, 4 SSP is required. This assumes that the fees collected in the first years can be kept for subsequent years which is often problematic (see Action 8).

Table 4 Cost Components for Operation and Maintenance

Component	Who Pays	Unit Cost (SSP)	No of Units/year	Annual Cost
Labour and transport for repair	Community	300	2	600
Fast moving parts, including	Community	100	2	200
Transport to collect fast-moving parts	Community	50	2	100
Slow moving parts (every 2 years)	Community	400	0.5	200
Major repair or rehabilitation (every 5 years)	Community pays contribution	500	0.2	100
Annual Total for Community				1,200

The Government and support agencies also incur costs to follow-up and retrain communities as well as support major repairs and rehabilitations beyond the affordability of the users. Table 5 provides a rough estimate for of the cost of supporting an asset base of 500 handpumps. It assumes that every year 250 communities are visited, 100 committees re-trained and 50 sources are rehabilitated at a cost of SSP 4,000. The total (which is equivalent to about US\$64,000, or \$128 per year) is considerably higher than the resources currently available for WASH at county government level. This illustrates the importance of planning and coordinating with other agencies in the state.

Table 5 Estimated Annual Cost to Government/Agents of Supporting 500 pumps

Component	Unit	No	Cost (SSP)	Amount (SSP)
Major repair or rehabilitation (every 5 years)	Lump Sum	50	4,000	200,000
Monitoring and follow-up of water users (fuel & DSA assuming four communities per day – 10 SSP/l)	Day	62.5	50	1,250
Re-training (includes fuel, DSA & IEC materials assuming an average of two days per community)	Community	100	400	40,000
Support to conflicts and problem solving	Community	50	200	10,000
Retraining of pump mechanics (two days)	Participants	30	80	2,400
Sensitisation of local leaders (lunch & refreshments for 20 people)	Meetings	6	400	2,400
Monitoring of pump supply shops (fuel for monthly visit)	Visit	12	40	480
Total cost				256,530
Cost per pump				513

In addition to considering the financial resources, it is essential that the Framework is matched with available human resources, and that joint efforts are taken to overcome major bottlenecks in this regard.

7. Proposed Activities

The table below proposes a number of activities to take the Framework forwards and start an operation and maintenance programme. It needs to be developed further by the Ministry of Water, Cooperatives and Rural Development, or may be better used as a checklist for other work plans under development.

Activity	Responsible	Timeline			
		Sept - Dec	Jan - Mar	Apr - June	July - Sept
Overall Management					
Review Framework and compare with Ministry Strategic Plan					
Review Framework and compare with available human & financial resource					
Political Engagement and Communication					
Discuss and agree key policy statements of Framework with Minister, council of Ministers and Governor at State level, as well as with the director general, undersecretary and minister at national level.					
Formally present policy statements, particularly with respect to no free spare parts to Unicef at national level.					
Work with Governor, Minister and Director General on how best to communicate the above political messages to County, Payam, Boma and village political leaders.					
Prepare policy paper that sets out where subsidies are provided for new water supply services. Present this to council of ministers.					
Find out price of 15 min per week radio slot for WASH for 12 months. Determine who will take responsibility for the programmes.					

Explore the engagement of churches and traditional leaders to take key policy statements to the communities.					
Prepare schedule for first two months of radio broadcasts and start to broadcast.					
Government Leadership and a Common Approach					
All WASH agencies operating in Northern Bahr el Ghazal discuss and agree date to stop providing free spare parts to communities in the state.					
Further develop and finalise procedures for new as well as existing facilities.					
Government a WASH Agencies to sign a Memorandum of Understanding to work towards using common procedures throughout the state, including no free spare parts.					
Spare Parts disarmament by County Governments and WASH agencies.					
Formal WASH (or Water Resources) Working Group Established – quarterly meetings chaired by Ministry. Define relationship/links/or incorporation of the WASH cluster.					
Handpump Mechanics and Supply Chain					
Meeting between the Government and all agencies who would like to support the handpump mechanic capacity development or supply chains with finance, training or technical support to agree on process and division of labour. Could be part of a Working Group Meeting.					
In depth analysis of the experiences of sales (to whom), purchase, stock management, cash flow costs, prices, transport and hidden subsidies for Aweil East Handpump Mechanics Association.					
Meetings with all members of each handpump mechanics association to discuss and share ideas for spare parts supply initiative and as a basis for					

capacity development support. Agreement on which actions the associations should take forwards (eg registering, registration fees, identity cards,, defining terms of office and roles).					
Assessment of existing tools as well as means of transport and ways that they are accessed/shared/hired for handpump mechanics at the county, payam and individual mechanics.					
Meeting to map which areas (villages, bomas and Payam) are covered/could be by various handpump mechanic teams. Analysis of numbers and whether any areas are not covered sufficiently.					
Handpump mechanic association training and support.					
Analysis of prices of spare parts in Juba and costs to bring them to county. Analysis of the prices that could be charged for spare parts by the association on a fully commercial basis. Comparison of this with current prices in Aweil East.					
Take decision on how to best procure spare parts and possibly full pumps for all counties.					
Work with handpump mechanics to determine on the quantities of spare parts required (for given level of support).					
Further Studies					
Find out more about the financial resources available at County; Payam and Boma level, for WASH eg through the Basic Services Fund, that can be used for community mobilisation and follow-up.					

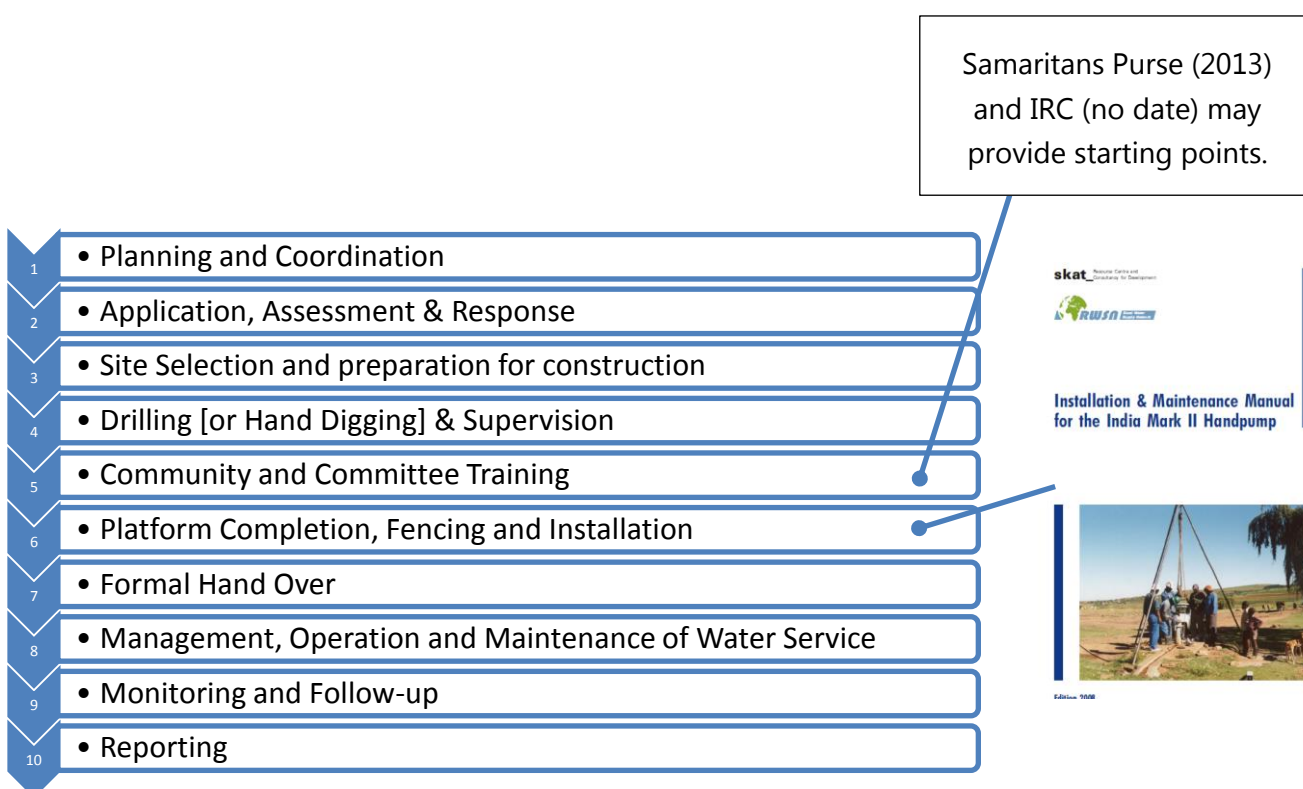
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- State Ministry of Water, Cooperatives, and Rural Development's drafted policy on community water supply operation and maintenance

Annex 1 Stages of Water Supply Services

Guidelines and standards will need to be adopted, modified or developed that clearly set out each of the stages. The table below provides a starting point for the collation of suitable materials.

New Sources	Guidelines
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Annex 2 Details of Stages within the Procedures for Water Services

The table below proposes details for each stage of the procedures for the development of new water services. It needs to be developed further by the Ministry of Water, Cooperatives and Rural Development, and can serve as a checklist. The column with the heading "Further Details" provides ideas for additional documents that could be developed, providing more details.

No.	Responsible	O&M Procedure	Further Details
		Stage 1 – Planning and Coordination	
	State	All WASH agencies to provide information on available resources for water supply provision in the state with key restrictions/conditions.	WASH or State Planning Guidelines
	State	Agreement of which counties to prioritise, including estimated number/type of supplies.	
	State	Communication of resource availability including estimated number/type of supplies.to the counties.	
	County	Agreement of which payams to prioritise, including estimated number/type of supplies.	
	State	Communication about water application and selection process as well as roles and responsibilities (include resources available as well as number/type of supplies) through political system & radio.	WASH Radio Programme Guide
		Stage 2 - Assessment and Response	
	Community	Community application for a Water Supply to _____	WASH Community Manual & Guidelines for site selection ¹² with form
	County	Response by _____ that the community will be considered this year or put onto a waiting list.	
	County or NGO/Agency	If community is to be considered this year, community visit by _____ to explain roles and responsibilities and critical requirements from community and other stakeholders wrt preparation, construction, O&M responsibilities and costs. Technology choices (if applicable) are explained to community. Community is mobilised so that it knows to form a _____ committee.	
	County or NGO/Agency	Committee is formed and must raise SSP _____ as a contribution towards the capital investment. Funds are kept by _____ and used later to pay the mechanics to install the handpump. <i>[At a later stage there may also be Sanitation requirements]</i>	
	County or NGO/Agency	Committee is trained in the skills needed to fulfil its roles and responsibilities for construction and O&M.	
		Stage 3 Site Selection and preparation for construction	WASH Community

¹² Including land ownership, minimum distances from pollution sources, community preference, hydrogeology etc)

7.	Payam/Client/ Community	Social and Technical Assessment to select preferred sites for locating the water facilities. If necessary the assessment the team will include a trained hydrogeologist. <i>[Site selection form filled in and signed]</i> .	Manual
	County or NGO/Agency	Community is informed of the date that the contractor/NGO will commence construction with.	
	County or NGO/Agency	Community is given a short refresher training on roles and responsibilities during construction.	
	County or NGO/Agency	Community and committee introduced to the drilling supervisor.	
	County or NGO/Agency	Community and committee introduced to the driller.	
		Stage 3 [Non-Functional Sources] - Borehole Diagnosis	WASH Community Manual
	County or NGO/Agency	Borehole Diagnosis to determine and record issues regarding the borehole and/or the water user committee/water users. <i>[Diagnosis form filled in and signed]</i> .	
	County or NGO/Agency	If a repair will be sufficient, the community is informed of what needs to be done and the spares that are required.	
	County or NGO/Agency	Community is given refresher training on roles and responsibilities.	
		Stage 4 Drilling [or Hand Digging]	
	Community	Community takes part in preparing the construction site (have already been informed of their roles and responsibilities).	WASH Community Manual
	Supervisor /Driller	Construction process under supervision of _____(e.g. rig set-up, drilling)	Drilling specifications & Borehole completion record & Supervision record
	Supervisor /Driller	Well development, test pumping and completion under supervision of _____	
		Drilled borehole covered to prevent damage. Demobilising of drilling equipment.	
	Supervisor /Driller	Duplicate borehole completion form signed by contractor and supervisor. Supervisor keeps one copy for submission to the Ministry.	
		Stage 5 Community and Committee Training	
	County or NGO/Agency	Both the community and committee need to be trained in their roles and responsibilities (Table 3). It is essentially that the community members understand and appreciate the community.	

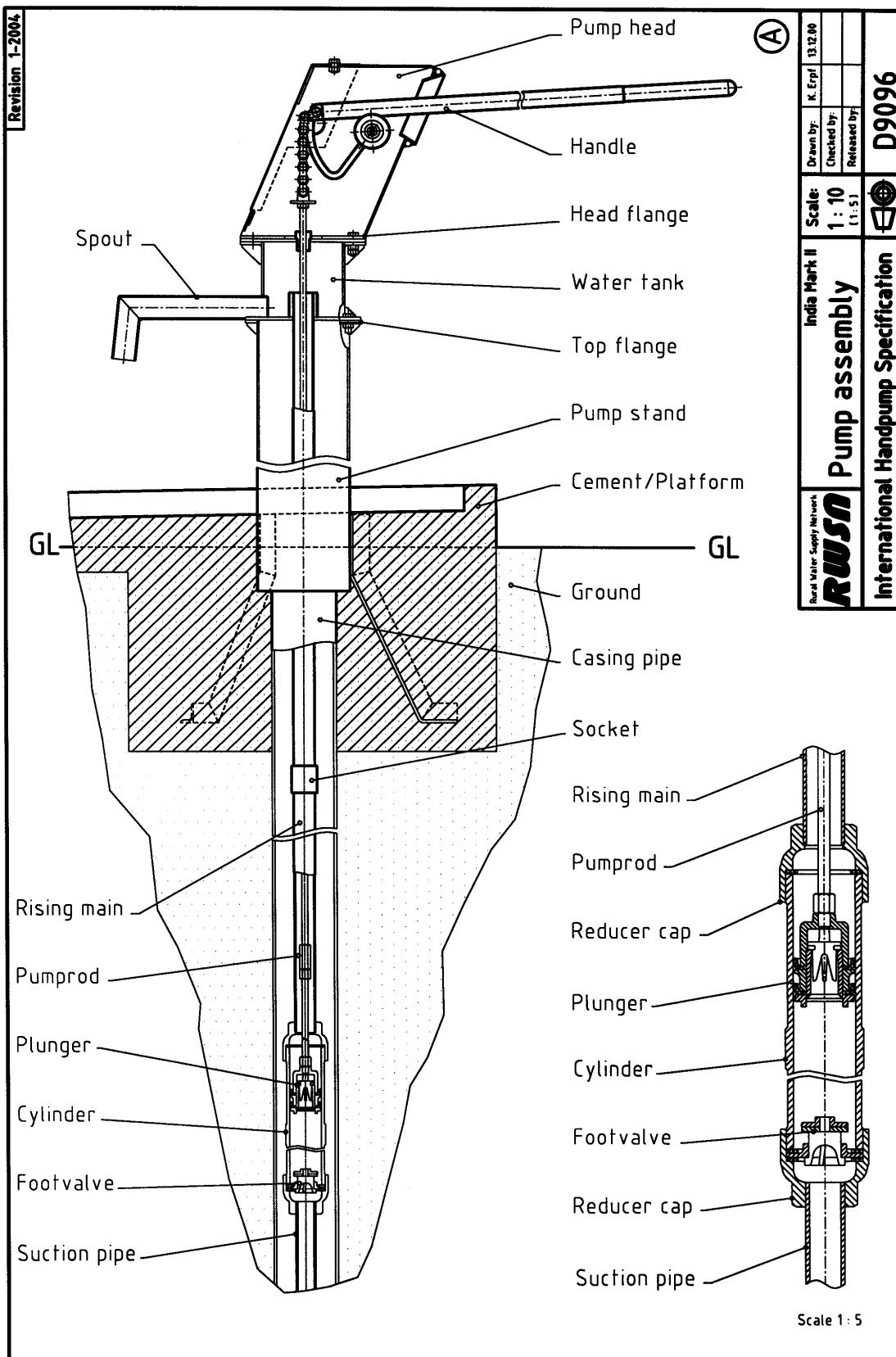
	County or NGO/Agency	Committee is trained in their roles and responsibilities (Table 2). The committee members require skills in organising and running meetings, taking minutes, record keeping, collecting user fees, handling finance as well as accountability and reporting. Some members will also require basic technical skills to be able to undertake preventative maintenance (Table 1).	
		Stage 6 Platform Completion, Fencing and Installation	
		The ground at the borehole is left to settle for two weeks.	Platform specifications &/or contract
	NGO/Agency. Contractor or Handpump mechanics	The pump platform is constructed and pedestal installed by _____.	
	Community	Once completed, the community keeps the structure moist while curing and constructs a fence to protect the water facility from animals.	WASH Community Manual
	Supervisor (County or NGO/Agency)	The supervisor checks that the platform is complete according to the specifications and that the facility is fenced. If there are any problems they must be rectified.	Platform specifications
	Handpump mechanics	The approved local handpump mechanics are called by the supervisor to install the handpump.	Platform specifications &/or contract
	Supervisor (County or NGO/Agency)	Handpump mechanics install the handpump under the supervision of the _____. and are paid for their labour by the community (from the initial funds collected).	WASH Community Manual
		Stage 7 – Formal Hand Over	
	County & Community	Celebration of the handover of the water facility with speeches from Boyam and Payam leaders, village chief, members of the committee and community members. Roles and responsibilities of all stakeholders to manage, operate, maintain, finance and repair the facilities are reiterated.	WASH Community Manual
		Stage 8- Management, Operation and Maintenance of Water Service	
	Community	Community and committee adhere to their roles and responsibilities as described in Table 3.	WASH Community Manual & Handpump mechanic record book
	Community	Committee (caretaker in particular) undertakes preventative maintenance as described in Table 2.	
	Handpump Mechanic	Committee (caretaker in particular) with handpump mechanic undertakes preventative maintenance every three months as described in Table 2 and detailed in Skat (2008).	
		Stage 9 – Monitoring and Follow-up	

	County/Payam	Depending on the availability of human and financial resources, communities with handpumps should receive an annual follow-up visit by the County/Payam. This visit should enable key issues and conflicts to be discussed on the spot. Requirements for refresher training or re-election of the committee should be noted and incorporated into work plans as well as discussed at coordination meetings.	
	Payam/Boma	Annual competition to determine the best committee or community management in say a Boma, Payam and County; ideally with the development of criteria and scoring by selected community representatives from the area.	
		Monitoring and follow-up can be incorporated into the work of the handpump mechanics who are undertaking preventative maintenance.	
		Stage 10 - Reporting	
	Various	Simple reporting formats are followed for: <ul style="list-style-type: none"> • Community Assessment • Siting • Community Mobilisation and Training • Borehole construction/drilling record • Community records • Borehole repair • Borehole diagnosis • Borehole rehabilitation • Monitoring visits 	
	Various	Reports are submitted to the appropriate authority.	
	County	Reports are consolidated into an agreed format at county level (simple data on a monthly/more details on a quarterly basis).	
	State	Reports are consolidated into an agreed format at state level level (simple data on a monthly/more details on a quarterly basis).	
	State	Annual report on Water Resources and WASH of Northern Bahr el Ghazal prepared.	
	All (political, govt, NGO, private, community reps, HPM Assoc reps)	Annual review of report on Water Resources and WASH of Northern Bahr el Ghazal.	

Annex 3 India Mark II Specifications and Bill of Quantities



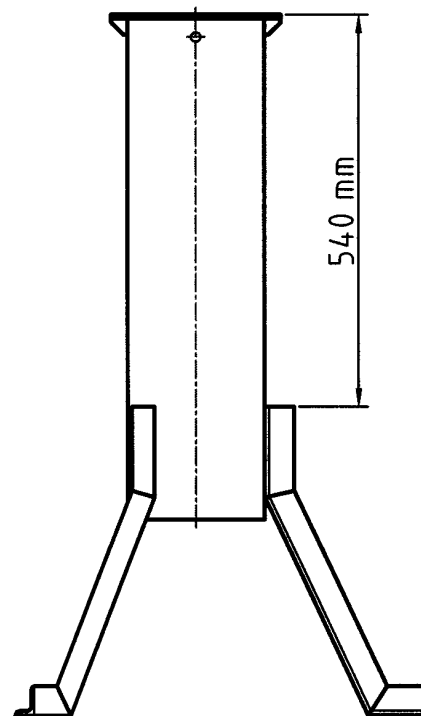
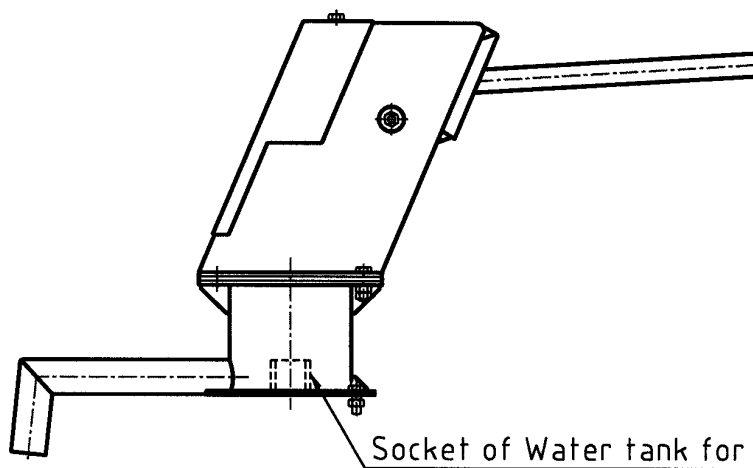
should not be used in aggressive waters (pH < 6.5)



Specification

No deviation from these specifications should be allowed.

Pump head with standard handle and water tank



Pump stand with 3 legs drawing No. B2048

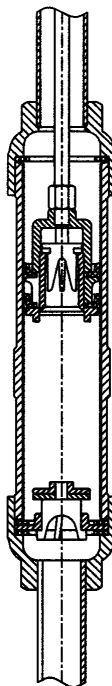
Rising Main:

Galvanized GI
pipe
with sockets
(1 ¼" medium)



Cylinder arrangement:

Cast-iron
cylinder,
brass
plunger and
foot valve
drawing No.
A2350



Pump rod arrangement:

MS- Pump rods
with
threaded
connectors
drawing No.
A2370



Bill of Quantities

Description	Unit	Qty. Per Pump	Spare Part Category
India Mark II Pump			
Above Ground Components	---		
Pump head assembly	piece	1	3
Front cover assembly	piece	1	3
Handle assembly	piece		
Chain assembly	---		
Ball Bearings	piece	2	1
Spacer	piece	1	2
Handle axle	piece	1	2
Axle washer	piece	1	2
Third plate assembly	piece		
Water tank assembly	piece	1	3
Pump stand with 3 legs (NB 150)	piece	1	3
Cylinder parts	---		
Cylinder (cast iron) with liner (Copper-zinc alloy)	piece	1	3
Reducer cap (cast iron)	piece	2	2
Sealing ring (Rubber)	piece	2	2
Riser pipe (GI-pipe), 1 1/4"			
Socket (GI-pipe), 1 1/4"	piece	xx	2
Plunger/Footvalve parts	---		
Plunger body (Copper-zinc alloy)	piece	1	3
Follower (Copper-zinc alloy)	piece	1	3
Spacer (Copper-zinc alloy)	piece	1	3
Upper valve (Copper-zinc alloy)	piece	1	2
Cup seal (Rubber)	piece	1	1
Rubber seating (Rubber)	piece	1	2
Check valve (Copper-zinc alloy)	piece	1	3
Check valve seat (Copper-zinc alloy)	piece	1	3
Seat retainer (Copper-zinc alloy)	piece	1	3
Rubber seating (Rubber)	piece	1	3
Pump rods	---		
Pumprod (Mild steel), threaded	piece	xx	2
Plunger rod (Stainless steel), threaded	piece	1	3
Installation & Maintenance tools	---		
Connecting tool assembly	piece	1	
Pipe clamp assembly (1 1/4")	piece	1	
Bearing mounting assembly	piece	1	
Chain support	piece	1	
Axle punch	piece	1	
Pipe vice assembly	piece	1	
Pumprod vice assembly	piece	1	
Lifting spanner (1 1/4")	piece	3	
Spanner 10 mm	piece	1	
Spanner 16 mm (new standard)	piece	2	
Spanner 18 mm (new standard)	piece	2	
Spanner 24 mm	piece	1	
Pipe wrench	piece	2	

Annex 4 Costs and Prices

The table below provides an example for calculating the cost of handpump and spare parts supplies to the State and County. The prices given are based in estimates in RWSN (2012) *Costing and Pricing* Publication.

Cost component	Remarks	Example
Sales Price Freight on Board (FOB)	Often the smallest amount	\$385
Seafreight & Insurance		\$60
Clearing & Forwarding	Depending on procedures can be a lengthy process	\$60
Customs Duty -VAT	If duty exempt, the process of reimbursement can be lengthy	\$40
Storage	Normally done in the centre warehouse of the dealer	\$35
Re-packing	From container to the lorry	\$45
Transportation to warehouse	Lorry transport (often many kilometres)	\$40
Storage	Normally done in the warehouse	\$15
Transportation to State Capital	Often many km on the pick-up truck	\$100
Re-packaging	From lorry to pickup	\$10
Transport to county store		
Storage		
Capital Cost/Prefinancing/ Risk	Capital to purchase pumps can be tied up often for long periods, the private sector needs to calculate these costs	\$115

Indicative prices for South Sudan (based on discussions) are set out below:

	Drilling Company)	Ajay Pumps)
Container of 90 India II pumps (of which 15 are extra deep well pumps) to Mombasa	\$40,000	
Transport of container from Mombasa to Wau (clearing at Mombasa costs about \$1,500)	\$25,000	
20 foot Container from Mumbai to Mombasa		\$ 2,000
20 foot Container from Mombasa to Juba		US\$ 10,000
20 foot container from Juba to Aweil		Us\$12,000

Not that the taxes between borders in South Sudan are not predictable. Private companies have to pay taxes but NGOs and development agencies can bring in pumps and spares with a tax exemption.

The table below presents the prices collated by IRC (2012) in their Market Study.

S.No	Item Description	Unit	Unit Price at Juba (SSP)
1	Indian Mark II GI riser pipes	PC	114
2	Indian Mark II Connecting rods	PC	78
3	Indian Mark II Foot Valves	PC	150
4	Indian Mark II pump Cylinder complete	PC	423
5	Indian Mark II pump bucket	PC	30
6	Indian Mark II pump O-ring	PC	25
7	Indian Mark II pump Chain	PC	80
8	Indian Mark II pump Bearings	PC	30
9	Indian Mark II pump Head assembly	Set	300
10	Indian Mark II pump Pedestail	PC	100
11	Indian Mark II pump T-bar	PC	100
12	Indian Mark II full set pump (60m depth)	Set	4425

Annex 5 Schedule of Requirements for Handpump Supply

The requirements for supply of handpumps and spare parts of NBEG are foreseen to be as shown in the table below. The average depth of installation indicated determines the components forming a complete set for each handpump type. It should be noted that:

1. The fast or medium moving Spare Parts are indicated with the following colour code:

Slow Moving	> 6 years
Medium Moving	2 - 5 years
Fast Moving	1 – 2 years

However, it is noted that in NBEG rising mains and pump rods are also fast moving parts. As noted in chapter XXX it is not clear whether this is due to corrosive water or economic incentives to replace these parts and sell the original parts for other use.

2. The components Indicated with **x*** are multiple parts per pump depending on the installation depth.
3. Under normal circumstances, the recommended numbers of spare parts to be included into a first order are indicated in the last column. The numbers indicated are approximate values when 1000 pumps are purchased.

Drawing No	Description of spare part	Qty /pump	Qty / 1000 Pumps
Pump head			
B2304	Head assembly (welded and hot dip galvanised)	1	20
B2320	Front cover assembly (welded and hot dip galvanised)	1	20
C1017	Hexagonal bolt M12 x 40 , (for Pump head/Water tank)	4	400
C1016	Hexagonal nut M12 (for Pump head/Water tank)	8	800
Pump handle			
B2326	Handle assembly (welded and hot dip galvanised)	1	40
B2346	Chain assembly	1	200
C2332	Spacer (electroplated)	1	40
C2333	Handle axle (Stainless Steel)	1	40
C2334	Axle washer (electroplated)	1	40
C1035	Ball bearing (double shielded)	2	1000
C1016	Hexagonal nut M12 (for Handle axle)	2	40
Third plate			
B2335	Third plate assembly (welded and hot dip galvanised)	1	20
Water tank			
B2340	Water tank assembly (welded and hot dip galvanised)	1	20
C1017	Hexagonal bolt M12 x 40 , (for Water tank/Pump stand)	4	400
C1016	Hexagonal nut M12 (for Water tank/Pump stand)	8	400

Pump stand			
B2348	Stand assembly (welded and hot dip galvanised)	1	20
Pumprods			
B2373	Pumprod assembly (Mild Steel, threaded, hot dip galvanised)	x*	200 x*
B2555	Plunger rod assembly (Stainless Steel, threaded)	1	200
Rising main			
C2365	Riser pipe (GI pipe, 1 1/4", medium, threaded, hot dip galvanised)	x*	200 x*
C2366	Socket (GI pipe, 1 1/4", medium, threaded, hot dip galvanised)	x*	200 x*
Pump Cylinder			
C2351/52	Cylinder (Cast iron, painted with Brass liner C2352 fitted)	1	40
C2353	Reducer cap (Cast iron, outside painted)	2	40
C2354	Sealing ring (Nitrile Rubber)	2	80
Plunger and Check valve			
C2355	Plunger body (Brass component)	1	40
C2356	Follower (Brass component)	1	40
C2357	Spacer (Brass component)	1	40
C2358	Upper valve (Brass component)	1	40
C2359	Cup seal (Nitrile Rubber)	2	1000
C2360	Rubber seating (Nitrile Rubber)	1	200
C2361	Check valve (Brass component)	1	40
C2362	Check valve seat (Brass component)	1	40
C2363	Seat retainer (Brass component)	1	40
C2364	Rubber seating (Nitrile Rubber)	1	200
Other components			
	Grease multipurpose – for greasing chain assembly	1 can	200
Installation and Maintenance Tools			
A2443	Pumprod vice assembly (for installation of Pumprods)	1	20
B2420	Connecting tool assembly (for installation of Pumprods)	1	20
A2470	Pipe clamp assembly (for installation of Riser pipes)	1	20
A2478	Bearing mounting assembly (for installation of Ball bearings)	1	20
C2476	Chain support (for installation of Chain assembly)	1	20
C2477	Axle punch (for installation of Handle axle)	1	20
A2515	Pipe vice assembly with Clamping & Fixed jaws for 1 1/4" (for installation of Riser pipes)	1	20
B2545	Lifting spanner 1 1/4" (for installation of Riser pipes)	3	60
C1005	Spanner 19 (for M12 hexagonal bolts and nuts)	2	80
C1137	Spanner 17 (for M10 hexagonal bolts and nuts)	1	80
C1081	Spanner 24 (for M16 hexagonal nuts)	1	40

Table (below) Replacement Frequency Estimates by IRC (2012)

S.No	Component	Estimated frequency of replacement in years	Unit cost (SSP)	Estimated Annual cost (SSP)
1	Cup leather	3	25	8.3
2	Handle axle	4	100	25
3	Axle bearing	3	50	16.7
4	M12(10 nut	1	8	8
5	M12(50 nut	1	8	8
6	Indian Mark II GI riser pipes	1	114	114
7	Indian Mark II Connecting rods	1	78	78
8	Indian Mark II Foot Valves	4	150	37.5
9	Indian Mark II pump Cylinder complete	4	423	105.7
10	Indian Mark II pump bucket	1	30	30
11	Indian Mark II pump O-ring	3	25	8.3
12	Indian Mark II pump Chain	2	80	40
13	Indian Mark II pump Bearings	2	30	15
14	Indian Mark II pump Head assembly	3	300	100
15	Indian Mark II pump Pedestail	5	100	20
16	Indian Mark II pump T-bar	5	100	20
17	Grease	1	25	25
Estimated Total annual cost of components				659.58

Annex 6 Other Issues Raised

The following issues were raised during a half day workshop with the State Ministry, counties and Unicef on 26th September 2013:

- Roles and responsibilities need clarification at Payam, County and State level. This is a priority***
- There is no official approved design for a hand dug well (with lining).
- Standard specifications for drilling not well known (despite GoSS, 2009, Technical Guidelines for the Construction and Management of Borehole Handpumps)
- There are only two trained drilling supervisors in the state.
- What should be done with the drilling log data?
- What should be done when organisations to coordinate with government or report what they have done?
- It is difficult to provide numbers of people served due to movement.
- People move to areas due to land and agriculture but they may lack water.
- Some populations will also relocate in the future.
- Accessibility of drilling equipment is an issue in the highlands and midlands.
- There is no clear policy on when to train people to help themselves and when to drill
- The spear master plays an important role in some communities
- Clear policy needed for community contributions