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# Striving for Professionalism in Cost Effective Boreholes in Zambia

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Procurement, Costing & Pricing and  
Contract Management of Borehole Construction

Zambia Short Course Report



**March 2016**

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Dotun Adekile and Dr Kerstin Danert  
Skat Foundation, Vadianstr 42, CH 9000 St Gallen, Switzerland  
on behalf of the Ministry of Local Government and Housing and UNICEF New York and  
UNICEF Zambia



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## Abbreviations

MLGH	Ministry of Local Government and Housing
NCC	National Chamber of Commerce
PCA	Project Cooperation Agreement
RWSN	Rural Water Supply Network
SPICE	Striving for Professionalising in Cost Effective Boreholes
ToR	Terms of Reference
WARMA	Water Resources Management Authority
ZPPA	Zambia Public Procurement Agency

**Frontispiece:** Group photograph of the workshop participant on the lawn of the Chaminuka Lodge

## Summary

The Ministry of Local Government and Housing (MLGH) Zambia and the Water and Resources Management Authority (WARMA), in several communications expressed the need to be supported by the cooperation of UNICEF and Skat Foundation to strengthen capacity in the country with respect to siting, drilling, supervision, procurement and contract management. This led to the development of Terms of Reference (ToRs) between UNICEF Zambia and Skat Foundation to support MLGH and WARMA with the expressed needs. The specific outputs of the support were:

- Delivery of a five-day short course to 35 participants in Zambia on drilling procurement, costing & pricing and contract management
- Draft action plan and budget of UNICEF support to WARMA and MLGH to develop technical guidelines and draft regulation for groundwater

This report presents the proceedings and outcomes of the first output. The second output is presented in separate report.

The learning objectives of the short course were that by the end of the course, the participants would:

- Understand the Principles of Cost Effective Boreholes
- Have some knowledge of groundwater occurrence in Zambia
- Understand the procurement process in borehole construction
- Appreciate why transparency in procurement is essential for sustainable water supplies
- Understand how to cost and price boreholes in drilling projects
- Be able to prepare engineer's estimates for borehole drilling projects
- Evaluate tender documents for siting and drilling of boreholes

The short course was conducted from the 7<sup>th</sup> to 11<sup>th</sup> March 2016 at the Chaminuka Lodge and Lodge by Kerstin Danert and Dotun Adekile on behalf of Skat Foundation. A total of 38 participants took part including 3 UNICEF staff members. The delivery of the course was by lectures with PowerPoint presentations, interactive discussion, group work, drama sketches and film shows. All of the lecture materials can be downloaded from the RWSN website. Annex 2 sets out the training programme. Participants were presented with the following six RWSN publications:

- [Code of Practice for Cost Effective Boreholes](http://www.rural-water-supply.net/en/resources/details/128)<sup>1</sup>
- [Costing and Pricing; A guide for Water Well Drilling Enterprises](http://www.rural-water-supply.net/en/resources/details/146)<sup>2</sup>
- [Procurement and Contract Management of Drilled Well Construction](http://www.rural-water-supply.net/en/resources/details/431)<sup>3</sup>
- [Supervising Water Well Drilling: A Guide for Supervisors](http://www.rural-water-supply.net/en/resources/details/392)<sup>4</sup>
- [Siting of Drilled Water Wells](http://www.rural-water-supply.net/en/resources/details/187)<sup>5</sup>
- [Sustainable Groundwater Development: use, protect and enhance](http://www.rural-water-supply.net/en/resources/details/371)<sup>6</sup>

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<sup>1</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/128>

<sup>2</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/146>

<sup>3</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/431>

<sup>4</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/392>

<sup>5</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/187>

<sup>6</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/371>

They were also each presented with a flash drive containing all the prepared course materials, RWSN publications and other relevant documents.

The discussion throughout was very lively and informative. All the participants contributed to the group exercises and were attentive throughout. From the evaluation by the participants, it can be deduced that the participants were highly satisfied with the conduct and organisation of the course.

From the discussion and participation in the activities strongly indicate the need to continue to develop the capacity of water supply practitioners to effectively procure and supervise high quality, and sustainable boreholes in the country. Key issues identified by participants are as follows:

- Lack of standards and guidelines for borehole construction (this is being addressed by WARMA)
- Poor borehole construction by drillers; they need to be regulated, supervised and monitored
- Lack of capacity for effective supervision
- Lack of understanding of siting procedures
- Government to use an informed approach to estimating the cost of a borehole
- Lack of systematic collection of drilling data and poor borehole data management
- The need to reach out to others and work together (e.g. engineers with procurement staff, or procurement committee with security).
- The need for decision makers to understand groundwater development procedures
- Lack of transparency in borehole procurement

## 1 Introduction

This report presents the proceedings and outcomes of the short course on Procurement, Costing & Pricing and Contract Management of Borehole Construction, organised by a collaboration of UNICEF New York and SKAT Foundation together with UNICEF Zambia. It was undertaken as support to the Ministry of Local Government and Housing (MLGH) and the Water Resources Management Authority (WARMA) and in improving safe water delivery in rural areas of Zambia and regulating groundwater. The course was held at the Chaminuka Lodge between the 7<sup>th</sup> and 11<sup>th</sup> March 2016.

A total of thirty eight participants took part. The participants included nine WASH officers, ten procurement officers, two drillers, five engineers, four hydrogeologists. They were drawn from WARMA, MLGH, the Zambia Public Procurement Agency (ZPPA), 14 district councils, the NGO and private sectors. Three participants were from UNICEF (one from UNICEF New York and two from UNICEF Zambia<sup>7</sup>). Six of the participants (16%) were female. The list of participants is provided in Annex 1.

The course was declared open by Mr. Abel Manangi, Principal Engineer, Rural Water and Sanitation representing the Director of the Department of MLGH. He welcomed all the participants and stated the government's commitment to increasing water supply coverage in the country and urged the participants to avail themselves fully of the opportunities provided by the workshop.

## 2 Background to the Short Course

The cooperation between UNICEF Programme Division (New York) and Skat Foundation, **Striving for Professionalising in Cost Effective Boreholes (SPICE)** identifies problems that undermine borehole cost-effectiveness such as poor construction quality, high failure rates and high cost of construction and installation. To tackle this, the cooperation aims at improving country capacity to professionalise practice of both manual and machine drilling, including construction quality. The cooperation tries to embed the Principles of Cost Effective Boreholes in country practice in a number of African countries. Zambia was the first country to express an interest in benefitting from the in-country support from the current cooperation (2015 - 2017).

MLGH and WARMA fulfil complementary roles in ensuring that boreholes are drilled and rehabilitated in a professional manner. WARMA was inaugurated in 2011 and has the mandate to regulate the utilisation of both surface and groundwater resources in the country. WARMA is in the process of setting up the required regulatory framework and statutory instruments which will lead to licensing of qualified groundwater resources contractors and consultants and issuance of permits for borehole drilling and a system of borehole numbering

In discussion and communication WARMA expressed a desire to be supported by UNICEF in developing its capacity to carry out its mandate. MLGH expressed desire for support to strengthen skills in the country with respect to siting, drilling, supervision, procurement and contract management. This led to Terms of Reference between UNICEF Zambia and Skat Foundation to support WARMA and MLGH in the expressed needs. The specific out puts of the consultancy were:

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<sup>7</sup> Note that one of the participants from UNICEF Zambia and the participant from UNICEF New York joined the course for the last two days. The participant from BGR participated in the course for one day (day 3). The World Vision participant joined on the second day.

- Delivery of a five day short course to 35 participants in Zambia on drilling procurement, costing & pricing and contract management
- Draft action plan and budget of UNICEF support to WARMA and MLGH to develop technical guidelines and draft regulation for groundwater

This report presents the outcome of the first output. The second output is presented in a separate report.

The short course was co-financed as follows:

- UNICEF Programme Division/Skat Project Cooperation Agreement (PCA) covered the costs of the travel and fees of the international trainers (including preparation of materials and reporting)
- UNICEF Zambia covered the costs of the training venue, as well as accommodation, catering and transport for the participants and trainers for the duration of the five-day course.

### Learning objectives

The learning objectives of the course were that by the end, the participants would:

- Understand the Principles of Cost Effective Boreholes
- Have some knowledge of groundwater occurrence in Zambia
- Understand the procurement process in borehole construction
- Appreciate why transparency in procurement is essential for sustainable water supplies
- Understand how to cost and price boreholes in drilling projects
- Be able to prepare engineer's estimates for borehole drilling projects
- Evaluate tender documents for siting and drilling of boreholes
- Effectively manage borehole drilling projects from site selection through to completion

## 3 Course Structure and Activities

The programme of activities of each day are summarised in Annex 2. The overall approach to the delivery of the course delivery recognised that most participants had knowledge of procurement and contract management (being mostly procurement officers, engineers and WASH coordinators). However, the knowledge needed to be refreshed and strengthened so that they can identify and focus on the essential aspects of borehole projects. The approach used was a mixture of training and teaching methods, to enhance the knowledge of the individual participants and provide the opportunity for knowledge and experiences sharing, as well as exchange of ideas and opinions.

The course was delivered by lectures using PowerPoint presentations, interactive discussion, group work, drama sketches and film shows. The course materials are available for download on the RWSN website together with this report. Participants were encouraged to ask questions for clarification regularly during each presentation or activity. Seating places were changed part way through the course and five different groupings were formed through the week (for different activities). This, combined with the residential nature of the course enabled each participant to interact with everyone else and get to know each other.

Each morning began with an icebreaker and there was an energiser after each lunch break or afternoon tea-break. Issues of concern in the sector that came out of the discussions amongst the



participants during the course were noted by the facilitators and participants and discussed on day 4. The highlights of each day's activities are summarised below.

## Day 1: Opening, Introduction & Groundwater without the Jargons

### Background to the course

Kerstin Danert began the course with a presentation of:

- the background to the course
- the aims of SPICE (Striving for Professionalism in Cost Effective Borehole Construction) and the Cooperation between UNICEF and Skat Foundation
- an overview of the Rural Water Supply Network (RWSN)
- the course outline
- the learning objectives



Picture 1 Peter Malupenga making a contribution on Day 1

### Understanding groundwater without jargons

Dotun Adekile delivered a lecture on *Understanding groundwater without jargons*. It aimed to provide participants without a technical background in hydrogeology with a basic understanding of groundwater occurrence and development. The lecture explained the importance of water and groundwater usage, its occurrence in different rock types, prospecting for groundwater, borehole design and borehole construction and the groundwater resources of Zambia. It used simple language, and was intended to enable the participants to subsequently carry out their duties in procurement and management of borehole projects in a more informed manner. Questions were encouraged at regular intervals.

### Films

Two animated films on [Borehole Siting](https://vimeo.com/126795160)<sup>8</sup> and [Borehole Supervision](https://vimeo.com/128478995)<sup>9</sup> were shown to the participants and they then discussed the messages of the films in small groups, which were subsequently shared in plenary.

<sup>8</sup> Available on: <https://vimeo.com/126795160>

<sup>9</sup> Available on: <https://vimeo.com/128478995>

### Drama sketches

The participants were divided into four groups and each was provided a thematic drama sketch. They were asked to rehearse, augment and perform the sketches on subsequent days of the course. They were informed that there would be an award for the best female actor (who may be a man playing a female role), best male actor (who may be a woman playing a male role) and best play. Later in the week a voluntary committee was established to develop a system of selecting the award winners.

### Publications

Participants were presented with the RWSN publication the [\*Code of Practice for Cost Effective Boreholes\*](#)<sup>10</sup>. They were also each presented with a flash drive containing all the prepared course materials and other relevant publications and documents.



Picture 2 Happy Chilonka leading a group discussion

## Day 2: Procurement

### Procurement of Borehole Projects

There was a lecture on *Procurement of Borehole Projects* which gave the definitions of procurement and the highlights of the Zambia Public Procurement Act and Regulations. Subsequently, the participants were asked to break into four to develop the requirements and criteria for the evaluation of prequalification applications for a planned borehole project. The outcome of the group work was presented by each group and compared to the requirement and criteria previously prepared by the facilitator. There was a close correlation between the two.

<sup>10</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/128>

### Drama sketch

A drama sketch, *The importance of transparency in procurement* or *OK you can have the contract* was presented by Group 1. The moral of the play was discussed by the participants.

### Contract Award

The lecture on Contract Award process covered the need for multiple borehole contract packaging, and technical specification that fit the purpose and realistic bills of quantities. It advised on arbitration rather than litigation in settlement of disputes.



Picture 3 Participants in group discussion on Day 2

## Day 3: Contract Management (including an introduction to drilling supervision)

### Contract Management

The lecture on Contract Management was delivered in two parts. The first part defined contract management and discussed the need for effective arrangements for logistics, meetings, quality assurance and data management. The second part discussed the need for effective supervision to achieve cost effective boreholes, the roles and responsibilities of the supervisor and different types of supervision. It also discussed the need for timely payment, analysing the risk of dry boreholes and the client sharing the risks with the contractor, monitoring of borehole functionality and reporting.

### Drama sketches

Two drama sketches were presented:

- *Where is the data on the borehole drilled last year? or Information is not monkey business*
- *Payment for dry borehole or but this is the third borehole we have drilled that is dry*

The messages of the plays were discussed by the participants, also drawing out personal experience and ideas.





Picture 4 Drama sketch: Namakau Kamayoyo and Philip Musonda in "The importance of Transparency in Procurement"

### WARMA Presentation

Levy Museteka gave a presentation on the history and activities of WARMA. He also presented the draft form of the Borehole Completion Report for discussion

### Publications

The participants were presented with the RWSN publication: [\*Procurement and Contract Management of Drilled Well Construction\*](#)<sup>11</sup>.



Picture 5 Drama sketch: Kanyindi Dada "Where is the data on the boreholes drilled last year" or "Information is not monkey business"

<sup>11</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/431>



Picture 6 Drama sketch: The 4 happy monkeys – From left Isabel Kalaluka, Abel Manangi, Levy Museteka and Tenara Banda in "Where is the data on the boreholes drilled last year" or "Information is not monkey business"

### Issues of concern in the sector identified by the participants

As the course progressed and discussion continued, issues of concern in the sector were identified. The issues were recorded on coloured cards and grouped by the participants under four headings (which were identified by the participants themselves):

- planning & administration
- procurement & contract management
- regulation
- technical

It was noted that several issues could, and perhaps should be considered under more than one heading. Four groups (one per topic) were asked to discuss and find solutions, which were subsequently presented in plenary. They were requested to email them to Kerstin Danert after the course. At the time of reporting only group had sent in both the problems and solutions (Box 1).

**Table 1 Issues of Concern**

Planning and administration	Procurement and Contract Management	Regulation	Technical
Guidance to councillors on correct procedures	Involvement of security in procurement	Lack of NCC registration by drilling companies	Gravel packing
Incentives to collect data	Different tender documents by different agencies	Licensing of all water practitioners	Solutions to dry boreholes
Lack of hydrogeologist in district council	Different contract documents by different agencies	How to mitigate groundwater pollution	Seasonal boreholes
Transport and allowance and equipment to supervisors	Different costing and payment methods	Dewatering of mines by mining companies	Improper casing and screening
Who manages the project	What comes first - geology or contract documents?		Lack of technical specification for institutions
Director of works does not understand drilling	Lack of staff in the district to supervise		Inappropriate gravel pack
Sensitise political leaders	Early involvement of the procurement team		
Project manager needs knowledge	We don't ask for geophysical reports		
Improvement to the planning process	Who reports to whom?		
	15% advance payment too low		
	Lack of supervision staff		
	Involve end users in drilling boreholes		
	Incentives to collect data		
	Intensify supervision by the client		
	Insurance bonds		

**Box 1: Regulation -Key Issues and Proposed Solutions**

Problem	Solution
<b>Lack of NCC registration</b>	Make NCC registration a mandatory bid requirement
<b>Licensing of drilling contractors and practitioners</b>	Await the enactment of the Statutory Instrument regarding licensing
<b>Dewatering of mines and local access [to safe drinking water]</b>	The mines should treat the water extracted and supply to the communities affected by the dewatering process and WARMA, ZEMA, etc. should enforce the effluent discharge management plans

## Day 4: Costing and Pricing

### Definition of terms

Day 4 started with an exercise on definition of common terms in costing and pricing of boreholes and the difference between the *cost* and the *price* of a borehole. The terms were written on coloured cards and participants were asked to discuss them in their groups to come to a common understanding of each of them. It generated a rather heated discussion with some participants accusing the others of getting their definition from the internet.

### Steps in Borehole Costing and Pricing

The participants were taken through the steps in borehole costing and pricing and then carried out 3 exercises in:

- calculating interest and loan repayment
- calculation of depreciation

Participants were led in identifying the six common components of boreholes and identifying the items of cost in each component. This led to calculating the cost of a 50m deep borehole lined with 110 PVC casing and screening and discussion on how to arrive at the price.

### Development of an Engineer's Estimate

The participants were asked to carry out a group exercise to develop an engineer's estimate for a borehole project. All the groups made a spirited effort at the exercise. Although the time proved to be inadequate to complete the exercise fully, all of the participants all realised the importance of carefully identifying all the cost components in arriving at the estimate.

### Publication

Participants were presented with the RWSN publication: [\*Costing and Pricing, A guide for Water Well Drilling Enterprises\*](#)<sup>12</sup>.

### Fish bowl exercise: To pay or not to pay for dry boreholes - that is the question?

There was a debate on whether the client should pay for dry holes or not. This was done in the form a fish bowl exercise: two main speakers who volunteered to take the roles of protagonist and antagonist respectively sat in the middle of the room encircled by the other participants. Two other chairs were placed in the circle and participants who had questions or comments sat in the two chairs to make their contributions. The participants took the debate seriously, it was lively and it was fun.

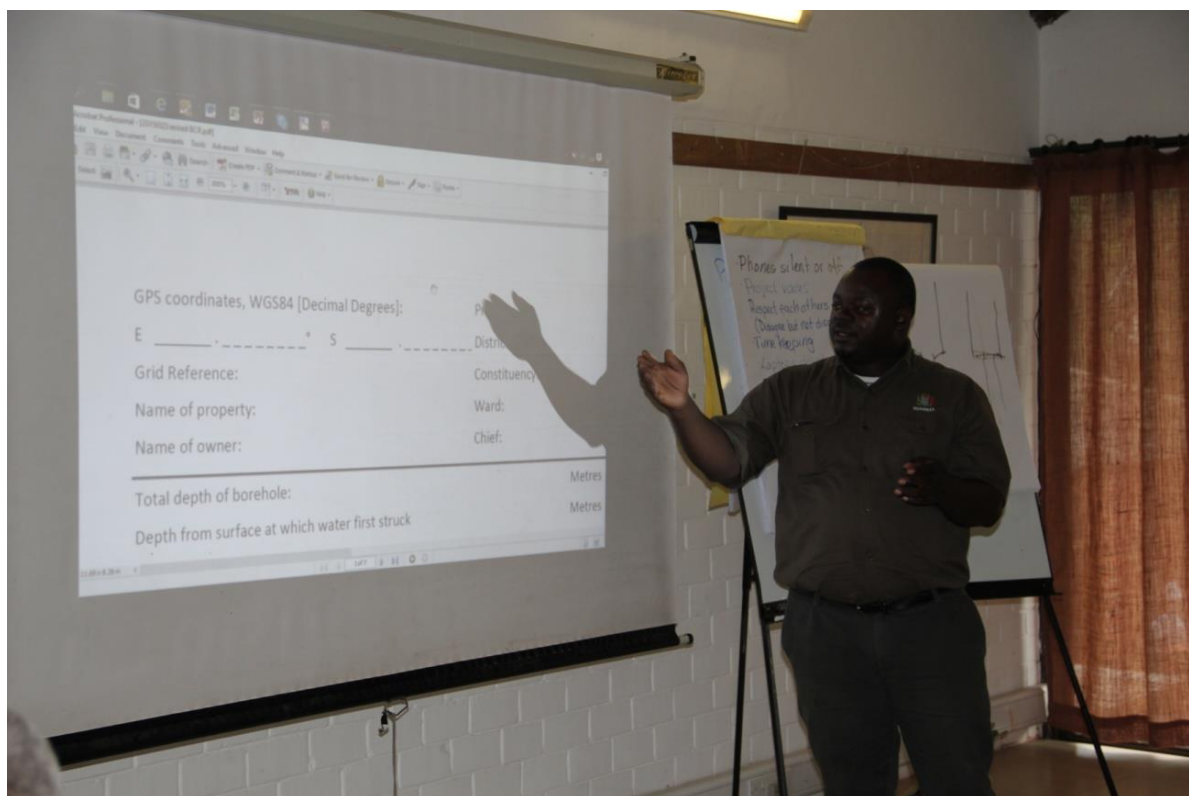
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<sup>12</sup> Available for download from: <http://www.rural-water-supply.net/en/resources/details/146>





Picture 7 Abel Manangi, Dailes Mbewe and Tenara Banda networking at the workshop



Picture 8 Levy Museteka gives an overview of WARMA and the Planned Standard Borehole Completion Form



## Day 5: Course Review, Awards, Certificates and Closing

### Drama Sketch

The last drama sketch was presented: The importance of realistic engineer's estimate or what does a borehole really cost. The lessons learnt were discussed afterwards.

### Course Review

The entire course was reviewed on the final day. Participants were each asked to state what they were taking away from the course as it concerns them personally, their institutions and linkage to others. Most participants said personally they had learnt a lot. They mentioned in particular:

- an informed approach to estimating the cost of a borehole
- the need for effective supervision in borehole construction
- the need for systematic data collection
- the need to change the attitude of the decision makers by enlightening them on groundwater issues
- reaching out to others and working together (e.g. engineers with procurement staff, or procurement committee with security)

For more details see Annex 3.

### Borehole Design

During the exercise on developing the engineer's estimate, it was realised that some of the participants struggled with aspects of borehole design. Douglas Abuuru WASH Specialist UNICEF took the participants through the standard MLGH borehole design, explain the reasons for components of the design such as the gravel pack and the sanitary seal.

### Quiz

A quiz was conducted as a revision exercise for the course and to evaluate how much the participants had learnt and retained. The quiz consisted of ten questions spanning the entire course content. The average score was 80%. Only two people scored below 70%. However 26 of the 38 participants who took the quiz were wrong on the question on the need for geophysics only in cases where it enhances knowledge of the aquifer. Time was taken to further explain this aspect of borehole siting and the participants indicated an understanding of when to use geophysics.

### Course evaluation

Participants were asked to evaluate, using a form, the presentation, delivery and organisation of the course to improve on the design of future courses. The form and a summary of the response to the questions are shown in Table 2. From the summary and discussions, it can be inferred that the participants were highly satisfied with the conduct and organisation of the course. Specific comments and recommendation for improvement to the course are summarised in Table 3. Annex 3 consolidated the takeaway messages.

### Presentation of drama awards – “the Cambrians”

A three-person committee defined the modalities of for the selection of the best actors and the best drama. Three nominations had been made for the different awards and the participants had to vote for whom they considered the best (in a secret ballot). The award for the best female actress went to Namakau Kamayoyo. The best actor was Kanyindi Dada. The best drama was the group that performed “*The importance of realistic engineer's estimate or what does a borehole really cost*” on day 5.

### Certificates and Closing

Certificates of attendance were awarded to the all participants and the workshop was brought to a close with remarks by Abel Manangi, Principal Engineer, MLGH, who enjoined the participants not to be just hearers of the word but also doers of the word.



Picture 9 Maggi Mvula collecting votes for the drama awards on day 5

Table 2: Summary of course evaluation

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	The training met my expectation	25	2			
2	I think that I will be able to apply the knowledge acquired	23	4			
3	The training objectives for each unit were identified and followed	20	7			
4	The content was organised and easy to follow	21	6			
5	The material distributed were pertinent and useful	25	2			
6	The instructors were knowledgeable	24	3			
7	The quality of instruction was good	20	7			
8	The instructors responded well to questions	22	4			
9	Trainees participation and interaction were encouraged	22	5			
10	Adequate time was provided for questions and discussion	18	9			

**Table 3: Comments and recommendations by course participants**

<b>General comments</b>
<ul style="list-style-type: none"> <li>• The meeting/training was well conducted. Wish for more of such kinds to help us refresh and increase on our capacities as we supply safe water to our rural communities</li> <li>• The facilitation was very good, I did not dose off</li> <li>• Excellent</li> </ul>
<b>How could the format be improved?</b>
<ul style="list-style-type: none"> <li>• The format was good but programmes were too squeezed for a workshop like this. More time was needed (like 15 days) so that all aspects are discussed and all participants understand these things so that they can go back and apply them with confidence when they go back to the office</li> <li>• More time should be given to mathematical parts of the course to enhance understanding</li> <li>• Other participants, top managers (council secretaries) should be enlightened in order to impact knowledge on them also</li> <li>• Providing course for other districts and participants. All districts should take part so that we speak the same language</li> <li>• More people should be trained from other councils</li> <li>• The workshop to be held every year, maybe twice</li> <li>• Appreciated the training and request that it will be spread country-wide.</li> <li>• The ministry to organise for other districts to promote uniformity</li> <li>• Practical experience needed, it would be good in future to be at a drilling site so that we have practical experience</li> <li>• Local governments should be educated on the importance of data collection as they are drilling and the use of this important data. With this database, knowledge of areas will be known and dry boreholes will be reduced.</li> <li>•</li> </ul>
<b>Venue</b>
<ul style="list-style-type: none"> <li>• All participants should be accommodated at the same place. In this case some of us were 2km away from the main lodge and at times the driver delayed in picking us.</li> </ul>
<b>Specific improvements to the course to be considered for incorporation in this or other courses in the future</b>
<ul style="list-style-type: none"> <li>• Make the learning objectives of each unit/day more explicit at the start and end of the day</li> <li>• Include a clear statement on the calculation of profit</li> <li>• Include the word “margin” in the like-mindedness exercise</li> <li>• Include pump selection and sizes in the course</li> <li>• Provide a folder with the materials, and include sources for further reading</li> <li>• Consider how to follow-up on the application of the knowledge</li> <li>• Spend more time explaining when geophysics should be used and when it should not be</li> <li>• Over sight roles, who oversees in contract management</li> <li>• Include a the video of a borehole camera log in presentation</li> </ul>

## 4 Observations and Conclusion

The discussion throughout was very lively. All the participants contributed to the group exercise and were attentive to the presentations. The drama sketches and debates were taken seriously and the participants readily identified the messages of the sketches and the logic in the debates.

From the discussion and participation in the activities strongly indicate the need to continue to develop the capacity of water supply practitioners to effectively procure and supervise high quality, and sustainable boreholes in the country. Key issues identified by participants are as follows:

- Lack of standards and guidelines for borehole construction (this is being addressed by WARMA)
- Poor borehole construction by drillers; they need to be regulated, supervised and monitored
- Lack of capacity for effective supervision
- Lack of understanding of siting procedures
- Government to use an informed approach to estimating the cost of a borehole
- Lack of systematic collection of drilling data and poor borehole data management
- The need to reach out to others and work together (e.g. engineers with procurement staff, or procurement committee with security).
- The need for decision makers to understand groundwater development procedures
- Lack of transparency in borehole procurement

Two other practical short courses proposed for the future are:

- Borehole siting
- Drilling supervision

## ANNEXES

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## Annex 1 List of Participants

	Name	Position	Organization	District	Mobile	Email addresses
1	Happy Chilonga	WASH Officer	Siavonga District Council	Siavonga	0979904974	<a href="mailto:hchilongo@yahoo.com">hchilongo@yahoo.com</a>
2	Namakau Kamayoyo	Procurement Officer	Siavonga District Council	Siavonga	0977619476	<a href="mailto:Kkautz29@yahoo.com">Kkautz29@yahoo.com</a>
3	Edward Mutale	WASH Officer	Nchelenge District Council	Nchelenge	0971597425	<a href="mailto:ecmutale99@gmail.com">ecmutale99@gmail.com</a>
4	Yobe Seko Bumbila	Procurement Officer	Nchelenge District Council	Nchelenge	0978990827	<a href="mailto:yobesekobumbila@gmail.com">yobesekobumbila@gmail.com</a>
5	Oswell Katooka	Assistant Director	MoLGH-HQ; Dept. of Housing & Infrastructure Development (DHID)	Lusaka	0977334422	<a href="mailto:katooka71@yahoo.com">katooka71@yahoo.com</a>
6	Joseph Matambo	Marketing Director	Irrigation World Ltd (Drilling Contractor)	Lusaka	0977651543	<a href="mailto:irrigateworld@gmail.com">irrigateworld@gmail.com</a>
7	Rabbecca Tembo	WASH Officer	Kazungula District Council	Kazungula	0979574175	<a href="mailto:r.tembo@yahoo.com">r.tembo@yahoo.com</a>
8	Carol Kalaluka	Procure. Officer	Kazungula District Council	Kazungula	0977421345	<a href="mailto:kalalukacarol@gmail.com">kalalukacarol@gmail.com</a>
9	Bobby Chimuka	Principal Officer ZPPA	Zambia Public Procurement Authority (ZPPA), HQ, Lusaka	Lusaka	0977452186	<a href="mailto:bobby.chimuka@zppa.org.zm">bobby.chimuka@zppa.org.zm</a>
10	Chanda Musonda	WASH Officer	Chikankata District Council	Chikankata	0974240434	<a href="mailto:chandamusonda64@yahoo.com">chandamusonda64@yahoo.com</a>
11	Ndinawe Chileshe	Procurement officer	Chikankata District Council	Chikankata	9778375678	<a href="mailto:cndinawe@yahoo.com">cndinawe@yahoo.com</a>
12	Clement Chilupula	Senior Engineer	MoLGH/DHID, Eastern Province	Eastern	0977365613	<a href="mailto:clechilupula@gmail.com">clechilupula@gmail.com</a>
13	Kondwani Simukoko	Town Planner	Petauke District Council	Petauke	0967510965	<a href="mailto:kondwanisimukoko@gmail.com">kondwanisimukoko@gmail.com</a>
14	Kapala Moses	Principal Engineer;	MoLGH/DHID, Northern Province	Kasama	0979505404	<a href="mailto:moses.kapala@gmail.com">moses.kapala@gmail.com</a>
15	Peter Malupenga	Principal Engineer;	MoLGH/DHID, Copperbelt Province	Copper Belt	0966305240	<a href="mailto:pchilamo@gmail.com">pchilamo@gmail.com</a>
16	Dailes HS Mbewe	Procurement Officer	Mansa Municipal Council	Mansa	0977509565	<a href="mailto:dailesmbewe@yahoo.com">dailesmbewe@yahoo.com</a>
17	Innocent Lungu	WASH Officer	Mansa Municipal Council	Mansa	0962244410	<a href="mailto:innocentfosterlungu@rocketmail.com">innocentfosterlungu@rocketmail.com</a>
18	Maggie Mvula	WASH Officer	Katete District Council	Katete	0976073181	<a href="mailto:mvulamaggie88@yahoo.com">mvulamaggie88@yahoo.com</a>
19	Chelo Sikasote	Procurement Officer	Katete District Council	Katete	0977239029	<a href="mailto:sikasotechalo@gmail.com">sikasotechalo@gmail.com</a>
20	Brian Mweebo	WASH Officer	Sinda District Council	Sinda	0974347390	<a href="mailto:brianmweebo@gmail.com">brianmweebo@gmail.com</a>

	<b>Name</b>	<b>Position</b>	<b>Organization</b>	<b>District</b>	<b>Mobile</b>	<b>Email addresses</b>
21	Mwambazi Gillad	Procurement Officer	Sinda District Council	Sinda	0977882913	<a href="mailto:gmwambazi@yahoo.com">gmwambazi@yahoo.com</a>
22	Able Manangi	Principal Engineer-RWSS	MoLGH-HQ/DHID	Lusaka	0977493475	<a href="mailto:manangi@yahoo.co.uk">manangi@yahoo.co.uk</a>
23	Charles Mwale	Senior Engineer-RWSS	MoLGH-HQ/DHID	Lusaka	0977651372	<a href="mailto:mwalec09@gmail.com">mwalec09@gmail.com</a>
24	Charles kalapa	SE -RWSS	MoLGH-HQ/DHID	Lusaka	0966890645	<a href="mailto:bokalapa@gmail.com">bokalapa@gmail.com</a>
25	Tenara Banda	Procurement Officer	MoLGH-Procurement & Supply Unit	Lusaka	0977788818	<a href="mailto:tenara_banda@yahoo.com">tenara_banda@yahoo.com</a>
26	Levy Museteka	Senior Hydrogeologist-WARMA	Water Resources Management Authority (WARMA), Lusaka	Lusaka	0978847218	<a href="mailto:levymuseteka@hotmail.com">levymuseteka@hotmail.com</a>
27	Isabel K B Kalaluka	WASH Officer	Lufwanyama District Council	Lufwanyama	0968823545	<a href="mailto:kangwab@yahoo.com">kangwab@yahoo.com</a>
28	Phillp Musonda	Procurement Officer	Lufwanyama District Council	Lufwanyama	0977660386	<a href="mailto:philsmusonda@gmail.com">philsmusonda@gmail.com</a>
29	Estatius Miyomba	DOW- Lufwanyama	Lufwanyama District Council	Lufwanyama	0966724479	<a href="mailto:emiyambo@gmail.com">emiyambo@gmail.com</a>
30	Kanyinji Dada W	WASH Officer	Nsama District Council	Nsama	0977128460	<a href="mailto:dadakanyinji@gmail.com">dadakanyinji@gmail.com</a>
31	Connie c Kapatamoyo	Procurement Officer	Nsama District Council	Nsama	0977587754	<a href="mailto:chipangoconnie@gmail.com">chipangoconnie@gmail.com</a>
32	Chikwanda Ernest	MECB Consulting Ltd	Managing Director	Lusaka	0977747224	<a href="mailto:e.chikwanda@mecbconsulting.co.zm">e.chikwanda@mecbconsulting.co.zm</a>
33	Clement Mulenga	Principal Engineer	MoLGH/DHID, Central Province	Kabwe	0977922892	<a href="mailto:clementchali@yahoo.com">clementchali@yahoo.com</a>
34	Andrew Kaluba	Senior Hydrologist	Dept. of Water Resources Management	Lusaka	0977743361	<a href="mailto:andrekaluba@gmail.com">andrekaluba@gmail.com</a>
35	Peter Simuyemba	Senior Driller	World Vision Zambia	World Vision	0977769737	<a href="mailto:petersimuyemba05@gmail.com">petersimuyemba05@gmail.com</a>
36	Jose Gesti Canuto	Water and Sanitation Specialist	UNICEF	New York		<a href="mailto:jgesticanuto@unicef.org">jgesticanuto@unicef.org</a>
37	Douglas Abuuru	Water Sanitation Specialist	UNICEF	Lusaka		<a href="mailto:dabuuru@unicef.org">dabuuru@unicef.org</a>
38	Max Kern	Hydrogeologist	BGR	Lusaka		

## Annex 2 Training Programme

DAY 1	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD
8:30 – 9:00	Welcome & register			Kerstin Danert
<b>Sitting Arrangements: Horseshoe behind tables</b>				
9:00 – 09:30	Introduction	<b>Prayer</b> <b>Rules of the week (defined by class)</b> <b>Welcome (Representative for the Director, MLGH)</b> <b>Introductions – standing</b> <b>PPT Presentation – RWSN, Cost Effective Boreholes, Zambia &amp; Course with learning objectives (20 min)</b> <b>Overview of the five days – on flip chart</b> <b>Logistics</b>	Overhead projector	Kerstin Danert     Humble
09:30-10:15	Understanding groundwater without the jargon	Lecture – PPT presentation, interspersed with questions & answers		
10:15 – 10:45	Tea break			
10:45 – 12:45	Understanding groundwater without the jargon		Overhead projector	Dotun Adekile
12:45 - 14:00	Lunch			
14:00 – 15:30	Cost-effective Boreholes – what does this mean for Zambia?	Presentation of animated films (10 min) <ol style="list-style-type: none"> <li>1. Show Siting Film – discussion</li> <li>2. Show Supervision Film – discussion</li> </ol> Any clarifications? (10 min) Discussion in small groups (10 min).	Overhead projector, films and speakers. Flash drives RWSN Code of Practice	Kerstin Danert



DAY 1	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD
		<ul style="list-style-type: none"> <li>- What is the main message?</li> <li>- Do you agree?</li> <li>- What are your experiences of siting and supervision?</li> <li>- What (if anything) could be improved in Zambia?</li> </ul> <p>Note any issues raised on cards</p> <p>Hand out RWSN Code of Practice</p>		
15:30 – 16:00	<i>Health break</i>			
16:00-16:50	<b>Understanding groundwater without the jargon (part II)</b>	<b>Lecture – PPT presentation</b> , interspersed with questions & answers	Overhead projector	Dotun Adekile
16:50 – 17:00	<b>Drama Sketches explanation</b>	<p><b>Hand out number and drama sketches to the participants,</b></p> <p>Day 2 - The importance of transparency in procurement or <i>“OK, you can have the contract”</i></p> <p>Day 3a - Payment for dry boreholes, or <i>“...but this is the third borehole we have drilled that is dry</i></p> <p>Day 3b - Where is the data on the boreholes drilled last year?! or <i>“information is more than monkey business”</i></p> <p>Day 4 - The importance of a realistic engineer’s estimate or <i>“What does a borehole actually cost?”</i></p> <p>Hand out cards for nomination of :</p> <ul style="list-style-type: none"> <li>- the best performing actress (who could be a man playing a female role)</li> <li>- the best performing actor (who could be a woman playing a male role)</li> </ul> <p>the best performing group</p>	<p>Drama script handouts (4 sets x 10 copies)</p> <p>Nomination cards</p>	
17:00	End of the day			

DAY 2	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD FACILITATOR
8:30 – 9:00	Ice-breaker & register			Kerstin Danert
9:00 – 10:15	<b>Procurement of Borehole Projects</b> <b>Highlights of the Zambia Public Procurement Act</b> <b>Stage 1 Procurement Planning</b>	<b>Lecture – PPT presentation</b> , followed by questions & answers <b>Short discussion based on the Zambia Public Procurement Act 2008</b> <b>Exercise 2.1: Pre-qualification requirements</b> Development of prequalification requirements and criteria for a planned borehole project. Presentation of group exercise, discussion and summary	Overhead projector	Dotun Adekile
10:15 – 10:45	<i>Tea Break</i>			
10:45 – 12:15	<b>Stage 2 Contract Award (part I)</b>	Participants are presented with RWSN <i>Procurement and Contract Management of Drilled Well Construction</i>  <b>Lecture - PPT presentation</b> on Contract packaging, Technical specification, Pre-bid meeting, Bid opening and Award	Handouts RWSN Proc & CM Publication	Dotun Adekile
12:45-14:00	<i>Lunch</i>			
13:30 – 15:15	<b>Stage 2 Contract Award (part II)</b>	<b>Drama Sketch Day 2 - The importance of transparency in procurement or “OK, you can have the contract”</b>	“Stage” Overhead projector	Kerstin Danert Dotun Adekile
15:15 - 15:30	<i>Health Break</i>			
15:30 – 17:00		<b>Lecture - PPT presentation</b> on Contract packaging, Technical specification, Pre-bid meeting, Bid opening and Award	SWOT Table on wall 80 cards, pins, 40 markers & and bid board to pin them onto.	Kerstin Danert
17:00	End of the day			

DAY 3	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD FACILITATOR
8:30 – 9:00	<b>Ice-breaker &amp; register</b>	<b>Communications game (Chinese whispers/telephone)</b>		Kerstin Danert
9:00 – 10:15	<b>Stage 3 Contract management (part I)</b> (definition, logistics, meetings and QC, data management)	<b>Lecture- PPT presentation</b> , followed by discussion of data management based on slides of RWSN formats for data collection Drama 3b Payment for dry boreholes, or “...but this is the third borehole we have drilled that is dry	PPT & overheads “Stage”	Dotun Adekile Kerstin Danert
10:15 – 10:45	<i>Tea Break</i>			
10:45 – 12:15	<b>Stage 3 Contract management (part II)</b> (supervision, payments & completion)	<b>Lecture- PPT presentation</b> , followed by questions and answers	PPT & overheads “Stage”	Dotun Adekile Kerstin Danert
12:45 - 14:00	<i>Lunch</i>			
14:00 – 14:45	<b>Data</b>	Drama 3a. Where is the data on the boreholes drilled last year?! or “ <i>information is more than monkey business</i> ”		Dotun Adekile
14:45 – 15:30	<b>Groundwater Regulation</b>	<b>WARMA Presentation</b> including institutional overview, Process for developing Statutory Instruments & borehole completion report	.	Levy Museteka
15:30 – 15:50	<i>Health Break</i>			
15:30 – 17:00	<b>Stage 3 Contract management (part III) &amp; Stage 4 Monitoring &amp; reporting</b>	<b>Short lecture PPT presentation</b> , followed by questions and answers <b>Facilitated discussion</b> on what is just theory, what		Kerstin Danert

DAY 3	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD FACILITATOR
	Theory and practice!	could be put into practice with respect to procurement & contract management		
17:00	End of the day			Kerstin Danert

DAY 4	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD FACILITATOR
8:30 – 8:40	Icebreaker & register			Kerstin Danert
9:00-9:45	<b>Unit objectives &amp; outline</b> <b>Introduction – define cost and price</b>	<b>Opening – PPT presentation</b> <ul style="list-style-type: none"> <li>Exercise 4.1: Towards like mindedness. Define cost and price - Make four groups - participants discuss and define the key terminologies of the topic, written on coloured cards. Randomly ask group members to stand up and explain at the end.</li> </ul>	Coloured cards with the terminology written onto them (see Annex 4.1)	Kerstin Danert
9:15 – 10:15	<b>Steps in Borehole Costing:</b> <b>Step 1: Basic cost of running the business</b>	<b>Lecture – PPT presentation</b> - understanding basic cost of running a drilling business and overheads, followed by exercises. <ul style="list-style-type: none"> <li>Exercise 4.2: Calculation of interest and loan repayment</li> <li>Exercise 4.3: Pay off the loan at once!</li> <li>Exercise 4.4: Calculation of depreciation cost per day and per hour for various categories of equipment</li> </ul> Participants are presented with RWSN <i>Costing and Pricing A Guide for Water Well drilling enterprises</i>	Handouts in annex 4.2, 4.3 & 4.4	Dotun Adekile

DAY 4	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD FACILITATOR
	<b>Step 2: Analyse the tender documents</b>	<b>Lecture – PPT presentation</b> basic issues to be considered in tender analysis followed by discussion	Overhead projector	Dotun Adekile
	<b>Step 3: The six cost components of drilling</b>	<ul style="list-style-type: none"> <li>Exercise 4.5 - Cost components of drilling. Participants set out the main stages of borehole drilling on a flip chart and identify the cost components within each stage.</li> </ul>	Plenary	Dotun Adekile
10:45 – 11:15	<i>Tea break</i>			
10:45 – 12:15	<b>Step 4: Calculating Costs</b>  <b>Step 5: Determining the Price</b>  <b>Other issues for consideration</b> <ul style="list-style-type: none"> <li>Evaluating bill of quantities</li> <li>Risks and uncertainties</li> <li>Professionalism</li> </ul>	<ul style="list-style-type: none"> <li>Exercise 4.6: Calculation of mobilisation and demobilisation cost. The facilitator leads participants in the calculation of mobilisation/demobilisation cost using the table below. The participants will fill in the answers into the empty cells in the Amount column</li> <li>Exercise 4.7: Calculation of Drilling Cost. The facilitator will lead the participants in the calculation of drilling cost using the table below. The participants will fill in the answers into the empty cells in the Amount column.</li> </ul> <p>PPT presentation. Other cost components and arriving at the price, followed by discussion</p>	Handouts in Annex 4.6	Dotun Adekile
12:45 - 14:00	<i>Lunch break</i>			
13:30 – 15:15	<b>Engineers Estimate</b>	<ul style="list-style-type: none"> <li>Exercise 4.8: Each group will prepare an engineer's estimate and a bill of quantities for the drilling of a 10 borehole project in Kabwe in Southern Region complete with pump platform but no pump using the following steps: <ul style="list-style-type: none"> <li>a) Determine the geology of Kabwe</li> <li>b) Determine possible drilling depth</li> </ul> </li> </ul>	Handouts	Dotun Adekile

DAY 4	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD FACILITATOR
		c) Determine the cost components		
15:15 - 15:30	Health break			
15:30 – 17:00	Clarifications	Questions and answers with respect to costing and pricing		Dotun Adekile
17:00	Explain homework	Each participant to present the takeaways for: <ul style="list-style-type: none"> <li>• You</li> <li>• Your institution</li> <li>• Your linkage or relationship with others</li> </ul>		Kerstin Danert
17:00-17:45	Payment for dry boreholes	<b>Fishbowl</b> – Should the local government, the national government or UNICEF pay for dry boreholes?	Five chairs in the centre of the U	Kerstin Danert
17:00	End for the day			
19:00-20:00		<b>Homework (in four groups 1-4)</b> how should borehole procurement and contract management in Zambia be improved?	<b>Cards with No (1 to 4) on one side and letter (A to D) on the other.</b>	

DAY 5	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD
8:30 – 8:45	<b>Icebreaker</b>			
8:45 – 9:30	<b>Drama 4</b>	Drama 4: The importance of a realistic engineer's estimate or <i>"What does a borehole actually cost?"</i>		
		Quiz		

DAY 5	TOPIC	TECHNIQUE	EQUIPMENT & MATERIALS	LEAD
		Homework – what have you learned Evaluation Awards Certificates Closing		
		Collect nomination of : - the best performing actress (who could be a man playing a female role) - the best performing actor (who could be a woman playing a male role) - the best performing group Summary of drilling procurement & contract management issues that need to be addressed in Zambia!		Kerstin Danert Participant Nominated participant(s)
10:15 – 10:45	<i>Tea break</i>			
10:45 – 11:30	<b>Quiz</b>	Quiz sheet handed to all participants, who fill it in, followed by a self-assessment and discussion of the results.		Dotun Adekile
11:30 – 12:00	<b>Course evaluation by participants</b>	Participants fill in evaluation forms		Dotun Adekile
12:30 – 13:30	<b>Award of certificates and closing speeches</b>			UNICEF Zambia
13:30	<i>Late lunch and departure</i>			

## **Annex 3 Takeaways from the Course**

### **The importance of:**

- borehole siting
- following procurement procedures to avoid compromised quality
- working together; involving all stakeholders; integration of procurement, engineers and managers; engaging others in procurement; procurement is a combination of all departments for better works; provision of water is everyone's business; quality is not a one man show - involve others; roles of all involved; involving others in monitoring; involving all stakeholders' community to policy makers
- pre-qualification
- pre bid and inception meeting;
- the procurement process and supervision; supervision aspects; the [previous] focus was only on procurement but now realise that information from supervision is vital, both for dry and wet boreholes; supervision
- acquire resources in advance before starting project; support and logistics to supervise; the right equipment; provide resources to supervise
- costing and pricing; reviewing the current estimates of the boreholes costs and coming up with realistic prices to keep contractors in the market; knowledge of costing and pricing to local enterprises; think twice before borrowing from bank; look at how best to work for the contractor not to incur losses of borrowed money
- data collection for both dry and wet boreholes; improving the keeping of records; information will be well stored; information and data management; Hydrogeological map of Zambia is very general so need to capture information; need to collaborate to gather recent info
- education in hydrogeology; enrich hydrogeological understanding; bringing qualified and experienced people to deliver cost effective boreholes; need to have qualified and skilled persons to do supervision to generate this info..
- cost-effective boreholes; nine steps of cost effective boreholes; principles of cost effective boreholes
- potential for manual drilling

### **Specific to borehole costing and pricing**

- I can now answer the parliamentarians when they ask questions about the price of boreholes.
- Knowledge of a Bill of Quantities (BOQ); appreciated preparing BOQ.
- Need to cost every aspect of drilling
- Will tell when overpriced; will do better estimates
- Will use knowledge in pricing and costing in doing BoQs and contracts.
- Overheads and Profits
- I now know the difference between supervision and monitoring.

### **In relation to dry boreholes**

- it feels it is harsh to not pay for dry BHs. Proper siting can reduce dry BH
- contractor have been drilling dry BHs and just left without data



- dry boreholes – somehow the Government pays for it (indirectly); “Better not know we are paying for it than pay for it directly”
- We have been avoiding the issue of dry BHs

#### **Statements of intent**

- There are gaps in procurement in my district. I will take it up with the procurement officer and supervise better. Need better borehole designs, quality screens and casings and better gravel pack.
- The information from this course will be captured in future reviews by ZPPA.
- We have been fixing the drilling depth at 50m but now will drill deeper. Deeper wells have been lasting more. They will be drilling 300 BHs.
- will supervise better
- will involve all the stakeholders
- will bring drilling supervision up with Mgt. For cost effective borehole – look at all process.

#### **Quotes**

- *I am now recharged like a borehole!*
- *Contracts go to cadres (those politically connected)*