



# **Partners for Water and Sanitation**

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# **Partners for Water and Sanitation Project No: 89-ETH**

**Partners for Water and Sanitation Training visit report  
to Oromiya WRB, Ethiopia:**

**Water Resources Management & Planning Training**

**Submitted by:**

**Sandy Elsworth (Independent)  
and  
Ulrike Feistel (Mott MacDonald)**

**8<sup>th</sup> – 25<sup>th</sup> July 2009**

## Background

This visit was a follow up to a workshop which had been held in April 2008 by the Partners for Water and Sanitation that identified key areas, in which the Oromiya Region requested further support and training. The key support areas were to include:  
Water Resource Management & Planning  
Groundwater modelling and assessment  
Surface Water modelling and assessment

A preparatory meeting was held a week prior to the visit in Cambridge under the auspices of Partners for Water and Sanitation attended by Rebecca Scott from Partners for Water and Sanitation, Dr Ulrike Feistel from Mott MacDonald and Sandy Elsworth. The format of the visit was agreed during a tele-conference with Melkamu J, the Ethiopian representative and a programme was discussed.

## Visit Programme

### Preparatory Meetings

Sandy Elsworth (SE) and Ulrike Feistel (UF) arrived in Addis Ababa on the Tuesday 8<sup>th</sup> July. This allowed three days preparatory visits and assessment prior to the commencement of the primary training sessions on the following Monday. During these three days, the following meetings were arranged:

Ato Alemagehu Geleta, and Environmental Protection Bureau of Oromiya.  
Ato Tesfu Tessema, Water Resource Management core process, Oromiya WRB.  
Ato Girum Tadesse, Senior Promotion Expert, of Ethiopian Investment Agency.  
Ato Kebede Geerba, Deputy Head Bureau Head & Water Supply core Process of Oromiya WRB, together with three other senior staffs of the Bureau.  
Ato Yohannes Gebreruidine, WR Administrator in the Ministry of Water Resources.  
Eng Wondimu Tekle, Deputy GM, Addis Ababa Water and Sewage Authority (AAWSA).  
Ato Dessalegne Mesfin, Deputy Director General of Environmental Protection Authority  
Ato Yohannes Gebre-Medine, Head of Water Resources Administration, Urban Water Supply & Sewerage Department of Ministry of Water Resources.  
The discussions provided valuable background information on the structure of the water resources management departments, roles and responsibilities of the various sections, and the relationships between the various bodies.

In addition, a visit was made to Bishoftu, a town some 45km south –east of Addis Ababa. Discussions were held with the water supply service manager on the supply arrangements, particular difficulties in the town, the operational aspects of the 6 boreholes and records held. A short visit to the borehole field allowed the viewing and inspection of the pumping arrangements and the limited metering opportunities. In addition, a visit to a domestic compound provided useful information on the general metering arrangements and the usage of water in this type of environment.

## **A. The Water Resources Management & Planning Primary Training Week**

The training for the 5 days of the primary sessions was moved to the small town of Dukem, some 35km south-east of Addis Ababa, where it was considered that, being located outside Addis, participants would be encouraged to stay during the full training period instead of leaving to go to the office.

During this training period SE and UF were based at the hotel in Dukem to minimise on unnecessary travelling and allowed time to review the programme and modify the course in-situ.

The final delivered programme was modified from the original proposed programme as it transpired during the sessions that particular aspects were of greater importance than originally estimated, and that sessions planned, for example, on risk and uncertainty (outage and headroom) were not immediately relevant at this stage. It is clearly necessary for the trainers to continue to be sensitive to needs on the ground and the requirements of the participants rather than be too rigidly bound to an irrelevant timetable.

The original programme was to be covered in 6 modules which included (copies of the module presentations are included in the Appendix A-1):

- Module 1: Overview and Introduction
- Module 2: Water Supply Balance
  - Components
  - Distribution Input, Leakage, per capita consumption, etc.
- Module 3: Water Resource Assessment – Water Available for Use
  - Baseline Data
  - Surface Water
  - Groundwater
  - Additional Sources
  - Environmental Assessment
- Module 4: Demand Forecasting
- Module 5: Baseline Supply Demand Balance
  - Dealing with Uncertainty (outage and headroom)
- Module 6: Options Appraisal and Final Supply Demand Plan

Each day was sub-divided into 4 sessions; 2 morning and 2 in the afternoon separated by a coffee/tea break. The hotel hosting the conference room provided excellent refreshments & conference facilities and, proved entirely adequate electric power backups during general power failure.

In the end the following sessions were delivered:

Day 1:  
Introduction and Overview of Water Resources Planning (SE)

Day 2:

Morning sessions: Water Supply Balance (SE)

Afternoon sessions: Resource Assessment – baseline data (UF)  
Surface Water Assessment (UF)

Day 3:

Morning Sessions: Surface Water Analysis and Assessment (UF)  
Environmental Assessment (UF)  
Alternative Water Resources (UF)

Afternoon sessions: Groundwater Assessment (SE)

Day 4:

Morning Sessions: Groundwater Assessment (SE)

Afternoon Sessions: Borehole Analysis (SE)

Day 5:

Morning Sessions: Baseline SDB, Demand Forecasting and Option Appraisal (SE)

Afternoon Sessions: Final Water Resource Plan (SE)  
Review of Key Issues and Way Forward

A list of the primary training participants is included in Appendix A-2. It can be seen that they included a wide range of disciplines, from hydrogeologists and engineers to economists, irrigation specialists and mining advisors. Consequently it is accepted that some of the modules would not be of interest to all the attendees. However, it is hoped that the benefits of the range allowed the full spectrum of discussion on the wider aspects of water resource management to be explored.

Certainly there was considerable discussion, both within the periods of Group Discussion and the open Plenary sessions. Each day the programme allowed for periods of Group Discussion around a set of questions which had been prepared beforehand and which were handed out to the group. Each group comprised of around 8 to 12 members and remained the same during the duration of the training.

Each Group selected a name and at the end of each day a light-hearted quiz was held with a few questions which gained points if correctly answered. At the end of the week each member of the winning team (Kananissa) was given a football as a prize – although it seemed that suddenly the team gained a few additional members! But this allowed for a certain amount of team spirit to develop.

At the end of each Group Discussion session a member of each of the groups made a presentation on either the individual question allocated to them, or a general comment on the responses from the other groups. The resulting discussion was recorded by one of the presenters and this would be picked up during the next sessions if possible.

The final session on the Friday set three questions to the Groups:

1. What were the important /key issues raised during the week?
2. How can these be applied going forward?
3. What focussed trainings for the next week were required?

A summary of the responses of the final discussions is included in Appendix A-3. However the responses to the question 3 were unhelpful and consequently the issues to be included focussed training was determined separately by SE and UF.

At the end of the WRM&P primary training, a course evaluation format was circulated to the participants, in which most of them have forwarded their valuable feedbacks. In general, most of the participants have rated that the training has went excellent and they want to see such capacity building assistance in the future, with well structured short and long term supports. The summary of the feedback is attached as Appendix A-4.

## **B. Focussed Training Programme**

The three days in the following week were used to provide more concentrated and focussed training to a dedicated group which allowed for detailed and technical issues to be tackled. 26 participants were selected from those who have participated in the primary training. The list of the attendees is attached as Appendix B-1. Following a short discussion on the Monday morning the three days were structured as follows:

Monday 20 July:

Borehole Analysis (SE)

The trainees constructed their own excel programme for the analysis of a pumping test, and the various hydrogeological characteristics of aquifers and drawdown curves were discussed. Software was also provided.

Tuesday 21 July

Surface water and river flow analysis (UF)

Flow data for five river gauges had been obtained prior to the focused training. Based on the presentation and discussions during Module 3 the trainees firstly developed a procedure of the necessary checks and the analysis of the data for use in water resource management. The trainees were introduced to the use of the HECDSSVue database to allow efficient data processing and checking and to the use of pivot tables in Excel for various analyses of the data.

Wednesday 22 July

Groundwater modelling (SE)

The trainees were introduced to groundwater modelling based upon an alluvial aquifer near Mojo (about 70 Km south East of Addis). Software was provided in the CD and they constructed and run a groundwater model of the area. This included the developing of a finite element grid, allocating parameters, steady state modelling and transient modelling showing the impact of well abstraction and water balance calculation.

## **C. A Practical Site Visit**

Finally, on the Thursday a visit was made to the town of Mojo with the following purpose:

- To investigate the issues and difficulties in developing a water supply balance for a typical supply zone;
- To measure and obtain information on the boreholes in the zone;
- To view and inspect the river monitoring station on the Mojo River to appreciate particular issues on river flow data.

The visit was made in the company of the Deputy Head of the WRB ( Ato Kebede Gerba) together with the other Senior Hydrogeologist and the District Hydrogeologist, and other staff; namely, Ato Lemessa Mekonta, Ato Fekadu Lebecha, Ato Tibebe Terefe, Ato Tesfaye Gashe, Ato Tesmamaw W/Giorgis, Ato Debebe Muleta and Ato Yehualashet Demie (the Mojo Water Utility Manager)..

During the visit the following issues were discussed and explored:

1. The production output from the boreholes.  
The town is currently supplied from 8 boreholes with a No 9 borehole being commissioned but not in supply as yet. Output totals from the No 6, 7 and 8 boreholes are available, and the total from the No's 1 to 4 and No 5 output meter is not available as it is not functioning. No water level dip information from the boreholes is available.
2. The supplied output to the town was discussed.  
Each month the total billed output is provided on two separate computer printouts. However, in many cases a "Zero" billed volume is recorded where no access to the property is possible, or where the meter has failed. Where access has finally been possible, a total billed for the period is included. Consequently the total volume consumed that month is not necessarily equal to the total billed during the month.
3. Metering issues:  
The meters are typically changed out around every 4 years as they seem to fail in this time period. They are generally Chinese make meters (plastic) with few of the Polish and other makes.
4. The distribution network was discussed:  
It appears that the primary constraint on the output of the boreholes and the provision of water to the town is the limitations of the trunk transmission mains. These 100mm and 80mm mains are highly susceptible to pumping, tending to burst if the boreholes are turned on all together. In addition, the 300m<sup>3</sup> reservoir above the town at 1830m a.s.l. is never used as the water never reaches this elevation.
5. The borehole No 8 and No 5 were visited.  
The records at the No 8 borehole included the daily pumping hours, the Kent Meter was fully operational and a record on the daily output was kept, together with the hours run and electrical usage.  
  
The No 5 borehole meter was not functioning properly, and it is the lowest output borehole with a 2" pipe delivering about 2 l/s.
6. We were told that the World Bank and consultants were currently investigating the water supply network and that improvements were being planned.

Overall, the team was very impressed with the level of record keeping by the staff and the management. They were able to provide historical water pumped information back to about 1997, and daily outputs were available, although there was not time to input the data and carry out any analysis.

## Recommendations for Modjo:

Based on a very limited visit and discussions, the following recommendations would be made, although it must be recognised that these are only very limited given the minimal time for the visit and therefore should be treated cautiously.

1. Groundwater Monitoring.  
It is recommended that the No 5 borehole is used as a primary Monitoring Borehole for the local catchment. It is sited in the centre of the town, and well away from the pumping wells No's 6 and 7 and the group of the boreholes No's 1 to 4, and is therefore likely to be only minimally impacted by the pumping of the other boreholes. In addition, as the output is very small and the pump and rising main is small, the pump can be kept in the borehole and the borehole can be maintained for emergency purposes if a dipping tube is installed at the side of the pump. Dips should only be taken when the borehole has been off for at least 6 hours to ensure that the water level is reasonably representative of the static water level.
2. Production Records:  
It is recommended that the production output records from the borehole meters are put onto a spreadsheet and a monthly m<sup>3</sup>/day is reported to the appropriate WRB person. In addition, the historical records should be entered into a spreadsheet so that the daily, weekly and monthly outputs from the boreholes can be reviewed and recorded.
3. Transmission Main:  
It is recommended that a review of the pressures in the transmission mains from the No's 1 -4 borehole and the No 8 borehole is carried out. This is because it would appear that the water availability is constrained, not by the boreholes or the water, but by the limit of the transmission mains which bursts when all the boreholes are turned on.
4. Network design:  
It is recommended that the network design and layout is reviewed to allow for proper usage of a service reservoir and therefore the optimum pressure management of the network.
5. Billing/Water Billed records:  
It is recommended that the monthly billed m<sup>3</sup>/day is recorded in a spreadsheet for analysis, and that twice per year, and annually, the average volume m<sup>3</sup>/day is reported to allow for an estimate of the Unbilled volume/Unaccounted for Water.
6. Customer records:  
It is recommended that the report on customer billed volumes is reported according to the size of the meter so that some attempt can be made to separate the domestic, commercial, industrial usage. In the future, if the database allows, an attempt should be made to classify each meter as Domestic, Mixed use, Commercial, Government, School, Hotel, etc in accordance with the descriptions



which are appropriate for the town. This would allow for a much improved analysis of the growing water needs of the town and the review of the actual amount consumed by domestic customers.

## **Conclusions and Way Forward**

### **General conclusions**

We would like to thank the many people involved with arranging this visit, in particular those who opened their doors and offices and files etc to us and responded to our questions.

The full and comprehensive response from the participants to the training sessions as detailed in the Appendices, in our view, sufficiently covers the issues which need to be addressed with the WRB and presents a useful conclusion to the training process.

These conclusions cover a range of issues including:

- The need for instituting a programme of widespread groundwater catchment monitoring;
- The need for a programme of collecting surface water and meteorological data;
- Project management for new boreholes;
- Developing a programme for deployable output assessment for boreholes, and drought triggers;
- Demand assessment as part of resource management;
- Estimating the surplus versus the deficit in planning for new resources;
- Environmental impact assessment needs to be included;
- A longer term programme of training and support needs; etc.

Given that this Visit was for the primary purpose of providing training and support, rather than technical assessment, it is not considered appropriate to provide a set of Recommendations for the Oromiya WRB and for the Ethiopian water resources programme. I consider that it is essentially for their staff to take the lessons and discussions from the training sessions and develop their own programme, which we should then support.

Consequently, rather than provide any further detailed conclusions and recommendations, it is more pertinent to suggest a range of next steps for the Partnership between the Partners for Water and Sanitation, Oromiya WRB and the Water Resources Ministry in Ethiopia.

### **Next Steps for the Partnership Programme**

There are potentially 3 areas which should be considered for further support in the future in thinking about progressing further from this training programme:

## **1. Oromiya Region Follow up;**

Based upon the notes made by the participants at the main training sessions and the focussed sessions, there are a number of areas which the WR Bureau will be progressing. Subject to their comments, it is worthwhile providing a follow up programme to specifically track those areas which have been identified in the sessions and see how the programme is progressing. In particular, the areas of interest include:

- a) Catchment Monitoring: the identification and dipping of a selection of monitoring boreholes in the catchment units;
- b) Borehole analysis: the beginning of the collation and analysis of output and drawdown data from boreholes in areas considered at risk of failure – the application of the Deployable Output estimation;
- c) Surface Water monitoring: the development of the analysis of river monitoring through data collection, review and flow analysis in specific catchments;
- d) Water Supply Analysis; the collection of data on water usage in specific Woredas and Zones under threat of water deficit.
- e) Option Analysis; The widening of the review of alternative options for meeting water supply deficits

It is recommended that this programme should not be less than one year from this training programme to give sufficient time for the implementation of the various schemes of work and projects to be implemented. In particular, this will allow for the monitoring and analysis of a full dry season to be incorporated in the followup workshop.

## **2. Extension to Federal level and other Regions**

Subject to the thoughts and guidance from the Oromiya WRB, consideration can be given to the provision of a similar training course to managers at the Federal level and to appropriate managers and staff in other Regions. **This scaling up process would better work if the MoWR could play a coordination role. In order to launch this federal level leading effort, the Oromiya WRB needs to initiate through the formal correspondence with the MoWR**

## **3. Extension to water supply managers**

Finally, it was noticeable that the water supply managers in the towns and large villages and cities were absent from this training course. However, it is recognised that the full implementation of Water Resource Planning requires the participation of such managers who are, in the end, responsible for the day to day running and operation of supply networks, of operating the boreholes, of managing pressures and supply failures. Consequently, it is recommended that a course is designed for these important functionaries, either specifically for them or integrated with the broader Supply Demand Planning course together with hydrogeologists and engineers.

Such a course should be discussed with the necessary senior staff and can cover issues which were not fully included in this current course, including;

- pressure management techniques
- zonation of supply systems
- leakage measurement and leakage management
- metering and billing issues

- managing illegal connections and illegal use;
- pump and booster maintenance and operation
- operation cost management
- etc.

## **Appendix A-1:**

**a) The original programme that covered in 6 modules including the copies of the module presentations**

**PARTNERS IN WATER AND SANITATION**

**ETHIOPIA: TRAINING JULY 2009, WATER RESOURCES PLANNING**

**PROVISIONAL PROGRAMME**

08-Jul Wednes day	09-Jul Thursday	10-Jul Friday	11-Jul Saturday	12-Jul Sunday	13-Jul Monday	14-Jul Tuesday	15-Jul Wednesday	16-Jul Thursday	17-Jul Friday	18-Jul Saturday	19-Jul Sunday	20-Jul Monday	21-Jul Tuesday	22-Jul Wednesday	23-Jul Thursday	24-Jul Friday	
Visits as arranged, and meetings with relevant groups			Preparations for training		Training Course: 6 Modules						Coursework, preparations for focus studies		Focus groups on specific topics			Free /recovery time?	

**TRAINING WEEK SCHEDULE**

Monday 13-July				Tuesday 14- July				Wednesday 15-July				Thursday 16-July					
Mornin g 1	Morning 2	Afterno on 1	Afternoon 2	Morning 1	Morning 2	Afternoon 1	Afternoon 2	Morning 1	Morning 2	Afternoon 1	Afternoon 2	Morning 1	Morning 2	Afternoon 1	Afternoon 2	Morning 1	
Module 1 - Overview and Introduction				Module 2 - Water Supply Balance		Module 3 - Water Available for Use, and Resource Assessment						Module 4 - Demand Forecasting		Module 5 - Base Supply Demand Balance		Module 6 - F	
Welcome, Introduction, Schedule, presentations  Module 1.1: Overview and Introduction to WRP. Key Process issues  Module 1.2: Demand and Supply side elements  Module 1.3: Supply Demand Balance Assessment, options, Final Plan				Module 2.1: Water Supply Balance. Background  Module 2.2: Components, Distribution input, leakage, etc		Module 3.1: Data/Baseline Data  Module 3.2: Surface water Resource Assessment  Module 3.3: Groundwater Resource Assessment		Module 3.4: Additional Sources  Module 3.5: Environmental Issues  Module 3.6: Options Appraisal		Module 4.1: Building a Demand Forecast  Module 4.2: Forecasting demands and leakage		Module 5.1: SDB Dealing with Uncertainty  Module 5.2: Developing Baseline Supply Demand Balance		Module 6.1: Options Appraisal			

***b) Schedule for the training jointly organized by Partners for Water and Sanitation and Oromiya Water Resource Bureau on Water Resources Management & Planning at Dukem, Ethiopia (13<sup>th</sup> to 17<sup>th</sup> July, 2009)***

**Day 1 (Monday 13<sup>th</sup> July, 2009)**

<b>Date</b>	<b>Time</b>	<b>Activities</b>	<b>Presenter /responsible person</b>	<b>Facilitator(s)</b>	
<b>13<sup>th</sup> July, 2009</b>	8:30 – 9:00	Registration	Organisers	PR	
	9:00 – 9:15	Welcoming & Introducing the objectives of the training & plan of the day	Melkamu Jaleta	PR	
	9:15 – 9:30	Key Note Address	Guest of Honour	PR	
	9:30 – 10:15	Module 1.1: Overview and Introduction to WRP, Key Process issues	Mr Sandy, Dr Feistel, Ulrike	Ato Kebede G./ Melkamu	
	10:15 – 10:30	Panel Discussion on the presentations	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu	
	10:30 – 11:00	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>	
	11:00 - 11:30	Module 1.2: Demand and Supply side elements	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu	
	11:30-12:00	Groups Discussion – On the Demand and Supply side elements	Participants in groups	Melkamu, Mr Sandy & Dr Feistel, Ulrike	
	12:00-12:30	Group discussion reporting and Panel Discussions	Group Reporters and the Participants	Mr Sandy & Dr Feistel, Ulrike	
	<b>12:30 – 14:00</b>	<b>LUNCH BREAK</b>			Individually
	14:00 -15:00	Module 1.3: Supply Demand Balance Assessment, options, Final Plan	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu	
	<b>15:00 -15:30</b>	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>	
	15:30-16:30	Group Discussion on the presentation of Supply Demand Balance Assessment, options, Final Plan	Participants in groups	Sandy, Dr Feistel, Ulrike & Melkamu	
	16:30 – 17:00	Group discussion reporting and Panel Discussions	Ato Kebede G. / Melkamu	Mr Sandy & Dr Feistel, Ulrike	
17:00-17:30	Wrap up of the Day	Group 1	Mr Sandy & Dr Feistel, Ulrike		

## Water Resources Planning & Management Training

### Day 2 (Tuesday 14<sup>th</sup> July, 2009)

Date	Time	Activities	Presenter /responsible person	Facilitator(s)
14 <sup>th</sup> July, 2009	8:30 – 8:45	Registration	Organisers	PR
	8:45-9:00	Recap of the 1st Day & Overview of the day	Group 2 & Sandy	PR
	9:00-9:30	Module 2.1: Water Supply Balance. Background	Mr, Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu
	9:30-10:00	Group Discussions on the Water Supply Balance, Background	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	10:00-10:30	Group presentations	Group Reporters	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	10:30- 11:00	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	11:00 - 11:30	Module 2.2: Components, Distribution input, leakage, etc	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu
	11:30 – 12:00	Group Discussion – on the presentation of Components, Distribution input, leakage,	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	12:00 – 12:30	Feedbacks and Panel discussion	Group Reporters and the Participants	Mr Sandy & Dr Feistel, Ulrike
	<b>12:30 – 14:00</b>	<b>LUNCH BREAK</b>		
	14:00 -14:45	Module 3.1: Data/Baseline Data	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	14:45 – 15:00	Panel discussion on the presentation	Participants	Sandy & Dr Feistel, Ulrike
	<b>15:00 -15:30</b>	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	15:30 – 16:15	Module 3.2: Surface water Resource Assessment	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	16:15 – 16:45	Group Discussions on Surface Water Assessment	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	16:45 -17:05	Group presentations	Group Reporters	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	17:15 – 17:30	Wrap up of the Day	Group 3	Sandy & Dr Feistel, Ulrike

## Water Resources Planning & Management Training

### Day 3 (Wednesday 15<sup>th</sup> July, 2009)

Date	Time	Activities	Presenter /responsible person	Facilitator(s)
15 <sup>th</sup> July, 2009	8:30 – 8:45	Registration	Organisers	PR
	8:45-9:00	Recap of the 2nd Day & Overview of the day	Group 4 & Mr Sandy	PR
	9:00-9:30	Module 3.2: Surface Water Resource Assessment	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	9:30-10:00	Group Discussions on the Surface Water Resource Assessment	Participants in groups	Sandy, Dr Feistel, Ulrike & Melkamu
	10:00-10:30	Group presentations	Group Reporters	Sandy, Dr Feistel, Ulrike & Melkamu
	10:30- 11:00	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	11:00 - 11:30	Module 3.3: Groundwater Resource Assessment	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	11:30 – 12:00	Group Discussion – on the presentation of Additional Sources	Participants in groups	Sandy, Dr Feistel, Ulrike & Melkamu
	12:00 – 12:30	Panel discussion on the findings	Sandy	Dr Feistel, Ulrike
	<b>12:30 – 14:00</b>	<b>LUNCH BREAK</b>		
	14:00 -14:45	Module 3.3: Groundwater Resource Assessment	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	14:45- 15:00	Panel discussion on the presentation	Sandy	Dr Feistel, Ulrike
	<b>15:00 -15:30</b>	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	15:30 – 16:00	Module 3.4: Additional Sources	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	16:00 -16:30	Module 3.5: Environmental Assessment	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	16:30 – 17:15	Panel discussion on presentations	Participants	Sandy & Dr Feistel, Ulrike
17:15 – 17:30	Wrap up of the Day	Group 5	Sandy & Dr Feistel, Ulrike	

## Water Resources Planning & Management Training

### Day 4 (Thursday 16<sup>th</sup> July, 2009)

Date	Time	Activities	Presenter /responsible person	Facilitator(s)
16 <sup>th</sup> July, 2009	8:30 – 8:45	Registration	Organisers	PR
	8:45-9:00	Recap of the 3st Day & Overview of the day	Group 6 & Sandy	PR
	9:00-9:30	Module 4.1: Building a demand forecast.	Mr, Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu
	9:30-10:00	Group Discussions on the Demand Forecast	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	10:00-10:30	Group presentations	Group Reporters	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	10:30- 11:00	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	11:00 - 11:30	Module 4.2: Forecasting Demands and leakage	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu
	11:30 – 12:00	Group Discussion – on the Forecasting of Demands	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	12:00 – 12:30	Feedback and Panel discussion	Group Reporters and the Participants	Mr Sandy & Dr Feistel, Ulrike
	<b>12:30 – 14:00</b>	<b>LUNCH BREAK</b>		
	14:00 -14:45	Module 5.1: Supply Demand Balance, Uncertainty	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	14:45- 15:00	Panel discussion on the presentation	Participants	Sandy & Dr Feistel, Ulrike
	<b>15:00 -15:30</b>	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	15:30 – 16:00	Module 5.2: Baseline Supply demand balance	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	16:00 – 16:45	Group Discussion on the Baseline Supply Demand Balance	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	16:45 -17:15	Group presentation	Participants	Mr Sandy Dr Feistel, Ulrike
17:15 – 17:30	Wrap up of the Day	Group 7	Sandy & Dr Feistel, Ulrike	



## Water Resources Planning & Management Training

### Day 5 (Friday 17<sup>th</sup> July, 2009)

Date	Time	Activities	Presenter /responsible person	Facilitator(s)
17 <sup>th</sup> July, 2009	8:30 – 8:45	Registration	Organisers	PR
	8:45-9:00	Recap of the 4st Day & Overview of the day	Group 8 & Sandy	PR
	9:00-9:30	Module 6.1: Options Appraisal.	Mr, Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu
	9:30-10:00	Group Discussions on the Options Appraisal	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	10:00-10:30	Group presentations	Group Reporters	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	10:30- 11:00	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	11:00 - 11:30	Module 6.2: Final Water Resource Solution	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G./ Melkamu
	11:30 – 12:00	Group Discussion – on the Final Water Resource Solution	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	12:00 – 12:30	Feedback and Panel discussion	Group Reporters and the Participants	Mr Sandy & Dr Feistel, Ulrike
	<b>12:30 – 14:00</b>	<b>LUNCH BREAK</b>		
	14:00 -14:45	Module 6.3: Review of Key Issues	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	14:45- 15:00	Panel discussion on the presentation	Participants	Sandy & Dr Feistel, Ulrike
	<b>15:00 -15:30</b>	<b>Coffee / Tea Break</b>	<b>Grand Hotel</b>	<b>Organisers</b>
	15:30 – 16:15	Group Discussion on Key Issues and Focussed Training	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
	16:15 – 16:45	Group Presentations	Participants in groups	Mr Sandy, Dr Feistel, Ulrike & Melkamu
	16:45 -17:15	Wrap up of Training Programme	Mr Sandy & Dr Feistel, Ulrike	Ato Kebede G. / Melkamu
17:15 – 17:30	Final Comments	Ato Kebede G.	PR	

## **Appendix A-2:**

### **List of Water Resource Management and Planning Primary Training Participants**

Visit Report to Oromiya, Ethiopia, 8<sup>th</sup> to 24<sup>th</sup> July 2009

No	Name	Organization	Responsibility	Tel No	Email
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## Appendix A-3:

### Responses to the final discussions of the primary Training

#### Group - 1:

The feedback of this group was presented by Ato Kebede, but later turned to be views of all groups' participants of the training on Water Resource Management and Planning at the end of the first week's training.

#### Important Issues discussed:

- Available resources (groundwater, surface water, others such as rainfall harvesting etc)
- Way how to plan to utilise resources was discussed
- Demand – supply was discussed

- Forecast demand was discussed, its components and the variation in demand were explained, techniques of how to assess demand were presented and discussed
- Estimation of deployable output was explained in detail followed by practical exercises , applicable in groundwater utilisation, should be implemented
- Identification of constraints when using resources was another topic, has to be known for WRM
- Importance of data and data management for WRM was discussed, WRB have to establish database and carry out checking and analysis of data before using it for WRM
- Importance of regional monitoring wells was discussed in great detail
- Surface water components were discussed,
- To establish reliable hydrometric data records to assess the available surface water resources it might be possible/useful to decentralise monitoring,
- The contribution of gauges needs to be reviewed and how regional gauges can be linked to the national network, also: how can the federal data be accessed und be efficiently used?
- Components of demand and supply were discussed, it is necessary to keep records (on database)
- Need to establish details of the demand and its components was discussed; unless the components are known planning is impossible
- Climate change was discussed a number of times, it is important for WRM&P to know what impact climate change is likely to have in the Region (excess rainfall, less rainfall etc.)

#### **Way forward:**

- Implement groundwater monitoring (soon , means available),
- WRB has already agreed to start groundwater monitoring, start establishing monitoring stations using the four dip metre received, this will be followed by one monitoring well per zone, 18 dip metres (14 from UNICEF, 4 from Sandy Elsworth)
- Have do design monitoring concept, assign staff, suggestion: monitor where people live, make it uncomplicated (e.g. locate the dip metre at the WRB, people can take the dip from the WRB and carry out measurement), have to use it as much as possible
- Check how existing data can be accessed (Federal bodies etc, any other data) including soil classification, have to identify what data exists and how it can be accessed, have to assign staff to carry out inventory (1 person)
  
- Review way of designing projects, use simple techniques such as the EXCEL spreadsheet,
- Review way the projects are carried out (e.g. don't buy pump before testing and designing etc), improve schedule to optimise resources
  
- Environmental issues have to be considered, felt that some stakeholders were missing, better to include people from Agriculture, Municipalities, Irrigation, City administration

#### **Focused training<sup>1)</sup>:**

- GW modelling
- Hydrological cycle, surface water modelling
- To enable estimate of components
- Application of software (pumping test, design, construction, any type which can be supportive in WRM)

<sup>1)</sup> The needs for the focused training were further specified at the start of the training

### **General comments**

- Training is very applicable,
- Agreed that participation of multi-disciplinary professions should be envisaged as it is important to understand each other to move forward,
- Conduct training twice a year (to others including National bodies).

## Group - 2

### **A. Important issues**

#### I. Integrated WRM is a must because of several driving forces

- Pressure on water resource
- Multiple use of water are competing (water supply, irrigation, hydro power...)
- In population and quality of water resources (pollution and contamination)
- Overuse depletion of sources
- Climate change and social pressure and population

#### II. Water supply balance that is demand and supply side element

- Demand forecast
- Supply element forecast
- Dealing with uncertainty
- That is surplus versus deficit should be checked

#### III. Deplorable out put assessment

- Source output (Q), WL, Pump information, Borehole information, distribution network, water quality, licensing etc has to be monitored regularly

#### IV. Environmental Impact Assessment

- To be considered in every WRM and planning

### **B. Way Forward**

- Such training has to be given taking into current gap and also as a refresher

- Backstopping through the provision and training on software

### **C. Focused training**

## **GROUP - 3**

### **A. Important issues**

- Water resource planning and management is mandatory and basic for water resource development
- Identification of water resources (quantity, quality and spatially, and variation with time)
- Integrated water resources development for sustainable development
- Recording data consistently
- Continuous monitoring

### **B. Way Forward**

- Consistent data recording
- Integrated approach
- Water resource management development should be strengthened
- Awareness creation
- Conducive working situation

### **C. Focused Training. What?**

- Applicability of modeling should be focused on existing situation

### **D. Any general comments?**

- Continuity of the training
- Follow up the outcome of the training by both partner and the recipients
- How did we get the new technology (geophysical log software, integrated ...)
- Let us do it what we learn more as an engineer and as an hydro geologist

## **GROUP - 4 ???**

### **A. Important issues**

What we have good experience and experience sharing and knowledge of the UK

- How to manage our water resources
- How to plan water resources
- How to effectively utilize water resources
- Technique and methodology of modeling

- How to design at peak draught year
- How to calculate useful deplorable output

Interesting points we have appreciated

- Drought curve
- Monitoring well
- License of ground water exploration that is abstraction of limited amount of water
- Modeling of supply and demand
- Drought triggers
- Water is life so we should use it wisely
- Studies should be quantified???
- We should have to use water saving even if it was a renewable resources
- Global warming issues alarming now

## **B. Way Forward**

Action by the WRB

- Budget should be allocated not only for GW exploration but also for monitoring and evaluation
- Oromiya water resource bureau commitment to water resources planning and management according to the training should start now
- Strengthening the capacity of staff and experts on water resource planning and managing should start right now

Action by PAWS

- Further training on application and practice of UK
- Software training
- Capacity building

## **C. Focused Training. What?**

- Software
- Leakage detection analysis
- GIS modeling of GW
- Economic appraisal (NPV)

# **GROUP - 5**

## **A. Important issues**

Best approaches to

- Identify available resources
- Plan for wise use that is demand and supply
- Forecasting demand



- Determine deplorable output
- Identify constraints
- Importance of D-base
  - Ground water level
  - Surface water components (data)
  - Components of demand and supply
  - Climate change
  - Hydrology and metrological data

## **B. Way Forward**

- Ground water monitoring
  - Identify monitoring well and stations in each zone
  - Distribute resources
  - Assign personnel
  - Orientation, generation of data for a start from September 2009
- Hydro metrology data
  - Work for easy access
  - Assign focal person for data compilation
- Revisit water supply design outline and shape accordingly the experience
  - Design parameters
  - Construction scheduling
- Environmental issues
- Periodical training by PAWS that is more than two times in a year

## **C. Focused Training. What?**

- Ground water modeling
  - Analysis of hydrologic cycle components (estimation for practical use)
  - Application of software (WRM related)

## **D. Any general comments?**

- Training is best applicable
- Participation of multi disciplinary professionals are well encouraged
- Certain stakeholders missed
  - EPA
  - Agriculture
  - City administration
  - Investment

## GROUP - 6

### A. Important issues

- Water resource planning and management
- Demand and supply management
- Implementation of observation well and well and water resource monitoring
- Importance of hydrometric monitoring
- Leakage management
- WRP unit

### B. Way Forward

Water resource bureau

- Identify data gaps
- Integration and harmonization of key stakeholders
- Strengthening monitoring
- Emplacing integrated water resource management approach
- Focusing on the objective reality of the region

Partners for water and sanitation

- Organizing short term and long term training
- Provision of different software

Up scaling

- Arrange similar workshop at the national level
- Organizing TOT
- Financial and logistic support
- Advisory support

### D. Any general comments?

## GROUP - 7 ???

### A. Important issues

- Resource assessment
- Surface water resource assessment using
  - hydrological data
- ground water resource assessment using
  - observation well/ monitoring well
  - regional ground water assessment
  - deplorable output ground water assessment

- additional water resource assessment
  - rainwater harvesting
  - water recycling
  - flood storage
  - retention pond / barrage
  - black water
- water demand forecast
  - domestic demand forecast
  - animal demand
  - agricultural demand
  - commercial demand
  - losses
- supply forecast
  - ground water resource
  - deep well
  - shallow well
  - spring
- demand supply balance
  - calculate deficit
  - identifying point where additional water source required
  - design for different scenarios
- option appraisal
  - additional source
  - managing water utilization
- Catchments water balance
- Triggering conditions
  - Conjunctive use of different water sources
  - Licensing
  - Database formation
- Things did not go well
- as there was power interruption

## **B. Way Forward**

### Action plan for bureau

- Observation well
- Resource inventory
- Decentralization for data generating stations

### Action for partners for water and sanitation

- Follow up whether or not the training has been implemented
- Arrange similar training

### Up scaling

- Same training for all level of the bureau members and other regions

### C. Focused Training. What?

- Optimum water resource allocation for using different software
- Resource inventory format
- Flood and draught forecasting method
- Impact of climate change on water resource using different software

### D. Any general comments?

- The topic “water resource management and planning is very wide and touch many disciplines like irrigation, fishing, recreation etc while the training is only given on water supply. The topic may be narrowed to the water supply
- In the case of our country, rain water flood harvesting, shallow ground water harvesting is much utilized. But less attention is given to it.
- Like us other concerned bodies in our region like the environmental professionals should participate a session like this

## Appendix A-4

### Feedback from the WRM&P Primary Training Course Evaluation

	Responses	Score (1-6)
<b>Regarding relevance of course content</b>		<b>5.286111</b>
<i>What I learnt in this course will help me improve my performance?</i>	32	5.25
<i>Material and issues were current and worthwhile</i>	30	5.23
<i>The course was relevant to my needs</i>	32	5.37
<b>Regarding the quality of course design</b>		<b>5.192708</b>
<i>The structure and institutional modes of the course encouraged learning</i>	32	5.34
<i>The course objectives were fully addressed</i>	32	5.21
<i>The course actively and effectively engaged me throughout</i>	32	5.43
<i>The duration of the course was just right</i>	32	4.81
<i>Overall this was a high quality course</i>	32	5.12
<i>Relative to other training that I have attended I would rank this course as one of the best</i>	32	5.34
<b>Regarding the quality of the instructors</b>		<b>5.549501</b>
<i>The instructors encouraged and responded will to questions</i>	26	5.34
<i>The instructors have knowledge in the course content</i>	27	5.59

<i>The instructors treated participants with respect</i>	27	5.62
<i>The instructors were well prepared and organised</i>	27	5.62
<i>The pace of instruction was just right</i>	27	5.62
<b>Comments</b>		
Please comment on any of the statements in the previous sections, particularly those you disagree with.		
<ul style="list-style-type: none"> <li>• The duration of the course was proper and useful</li> <li>• The course duration was short</li> <li>• It was OK but the duration of the course was very short</li> <li>• The duration of the course is right and proper</li> <li>• To involve the decision makers or politicians of the region in the training because the implementation of water resources is influenced by the politicians</li> <li>• It was an excellent training</li> </ul>		
Where there any aspects of the course that you think should be improved?		
<ul style="list-style-type: none"> <li>• Please elaborate the area of software applications</li> <li>• Everything was OK</li> <li>• The water demand analysis as there is no supply forecasting in Ethiopia</li> <li>• Software application</li> <li>• How to bring change in implementing the water resource management and planning works. First by assessing how the region is implementing water resource management and planning in the real situation</li> <li>• Experience from developing countries will be more important if considering for the future</li> <li>• Water resource management and planning can be integrated to other uses like irrigation, recreation and fishing etc</li> </ul>		
Which parts of the course did you find useful?		
<ul style="list-style-type: none"> <li>• All parts are useful</li> <li>• Deployable output assessment</li> <li>• Water resource assessment</li> <li>• Unbilled water quantities</li> <li>• Demand forecasting</li> <li>• Balancing supply and demand</li> <li>• Surface water resource management</li>   <li>• Surface water modelling</li> <li>• Surface water and ground water</li> <li>• Groundwater assessment monitoring</li> <li>• Monitoring wells for costing draught</li> </ul>		
General comments.		
<ul style="list-style-type: none"> <li>• Please continue the capacity building aspect in water resource management</li> <li>• In the future the UK partners should think about capacity building in short term and in long term within the country and outside the country</li> <li>• In my region /country there are much talks but few walks. We talk much and practice less. So how to bring change should be underlined</li> <li>•</li> </ul>		

## Appendix B-1:

### List of Water Resource Management and Planning Focussed Training Participants (July 20<sup>th</sup> – 22<sup>nd</sup>, 09

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7.	Chaluma Regassa	OWRB	Office head	0911781933	ambowater@ethionet.et
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12.	Frezer Fekadu	S/W/Shoa	Geologist	0911035031	
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