MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT
FOR
THE STUDY ON
GROUNDWATER RESOURCES ASSESSMENT
IN THE RIFT VALLEY LAKES BASIN
IN
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

Addis Ababa,
January 17, 2012

Mr. Toshiyuki Matsumoto
Team Leader
Study Team
Japan International Cooperation Agency (JICA)

Ato. Tesfaye Tadesse
Groundwater Study Development & Management
Directorate Director
Ministry of Water & Energy
Federal Democratic Republic of Ethiopia

Witnessed by
Dr. Yuji Maruo
Senior Advisor
Japan International Cooperation Agency (JICA)

Based on the Scope of Works agreed between the Japan International Cooperation Agency (hereinafter referred to as "JICA") and MoWE (then MoWR) on July 23rd, 2009, the JICA sent to Ethiopia the JICA Study Team (hereinafter referred to as "the Team") for THE STUDY ON GROUNDWATER RESOURCES ASSESSMENT IN THE RIFT VALLEY LAKES BASIN (hereinafter referred to as "the Study"). The Team started study in January 2010. And finally the Team prepared the Draft Final Report (hereinafter referred to as "DF/R") in January 2012.

The Team will submit the Final Report on March 2012 by airmail.

1. Explanation of DF/R

The Team submitted twenty (20) copies of the DF/R to the MoWE on 6th January, 2012.

The DF/R was presented by the Team to the MoWE and to concerned authorities, and was discussed at the time of the seminar for DF/R on 12th January 2012 in Addis Ababa and at the time of the steering committee (hereinafter referred to as "SC") on 16th January 2012 in Addis Ababa. The attendant list of the seminar and the SC are attached in Appendix-1.

Technical matters, such as geology, hydrogeology, groundwater modeling and water supply planning of the DF/R were discussed among the participants from the MoWE, Geological Survey of Ethiopia (hereinafter referred to as "GSE"), Addis Ababa University (hereinafter referred to as "AAU") and concerned authorities and the Team. The contents of discussion on DF/R in the seminar and the SC were shown in Appendix-2

The Ethiopian side accepted the contents of the DF/R in principle, understood the study results of DF/R, and confirmed the maximum utilization of the Final Report (hereinafter referred to as "F/R").

Major issue and the content regarding the DF/R are as follows:

1) The Team explained that the Ethiopian side should submit if any comments, questions and corrections on the DF/R to the Team by the 16th January 2012. The Team also explained that as the results of discussion made during the seminar and the SC, the correction and modification wherever necessary would be reflected in the F/R.

2. Recommendations from the Team

The Team made the following four recommendations on the groundwater resources study and management in Ethiopia at the time of seminar and 4th SC.

1. Establishment of groundwater database system (ENGWIS)
2. Maximum utilization of geological and hydrogeological maps produced in this study
3. Improvement of drilling capability of the drilling private sector

4. Utilization of water supply planning of the study

Ethiopian side replied to the recommendations as follows;

Recommendation1: Due to the high cost for the server installation and maintenance, it is very difficult to upload the result of ENGWIS to share the information with the public. However the MoWE is trying harder to realize this action. The data and information is still not enough to demonstrate the result. The MoWE will try its best to provide the database to the public and update the accurate information.

Recommendation2: The MoWE will deliver all the reports and maps to the related organization as the form of hard and soft copies. The utilization of the map by their hydrogeologist and water supply engineer will definitely contribute to the development of both groundwater management and water scheme. The MoWE with the JICA mission indicated the idea of selling the geological and hydrogeological maps at the GSE and/or EMA (Ethiopian Map Agency) for the purpose of the maximum utilization of the results of the Study. The GSE replied that it is possible if the soft and hard copies of the maps and reports are made available.

Recommendation3: The poor drilling works in private sector is very serious problem and challenging matter. The MoWE plans to initiate two years diploma courses of the drilling technology in EWTEC. The Oromia TVETC has provided drilling technology training to about 20 persons graduated as information.

Recommendation4: The water supply plan of the Study is very important, so we will distribute the report to the local WASH project.

KOKUSAI KOGYO
Addis Ababa, Ethiopia
CO., LTD.

END

The Federal Democratic Republic of Ethiopia
Ministry of Water & Energy

Appendix-1

ATTENDANCE LIST

1. The seminar for DF/R

ETHIOPIAN SIDE

Ministry of Water & Energy (MoWE)

Mr. Tesfaye Tadese	EGRAP+ coordinator, Groundwater Study Development & Management Directorate Director
Mr. Zebene Lakew	Staff of GSD&MD
Mr. Girum Admasu	Staff of GSD&MD
Mr. Dawit Tafesse	Staff of GSD&MD
Mr. Tesfaye Emiru Eshetie	National Fluorosis Mitigation Project
Mr. Tegenu Tsegaye	Permanent Groundwater Monitoring Section

EWTEC

Mr. Tamiru Fekadu	Hydrogeologist

GSE

Mr. Yohannes Belete	Head of groundwater resources assessment Department
Mr. Muhuddin Abadela	Hydrogeologist
Mr. Sileshi Mamo	Hydrogeologist
Mr. Degefe Shiferaw	Hydrogeologist

AAU

Prof. Dr. Tenalem Ayenew	Department of Earth Sciences
Dr. Seifu Kebede	Department of Earth Sciences
Mr. Adane Abebe	Department of Earth Sciences

Oromia Region

Mr. Fekadu Lebecha	Oromia Water Resource Bureau

SNNPRS

Mr. Tadele Kibru	SNNPRS Water Resource Bureau
Mr. Meskel Tumiso	SNNPRS Water Resource Bureau

Others

Mr. Abera Mekonnen	Senior consultant
Mr. Shiferaw Lilu	AG CONSULT
Mr. Asamenew Gebeyehu	World Vision
Mr. Shimels Fehadu	UNDP MDGs &Poverty reduction Deparment
Mr. Esayas Tilahun	Hydrogeologist
Mr. Moges Tigabe Asres	Hydrogeologist
Mr. Getachew Geletu	Hydrogeologist

JAPANESE SIDE

JICA Ethiopia Office

Mr. Koji Ota	Chief Representative
Mr. Hideshi Yamashita	Representative
Mr. Ephrem Fufa Leta	In-house consultant for water sector

JICA Study Team

Mr. Toshiyuki Matsumoto	Team Leader of the Study Team
Mr. Kensuke Ichikawa	Hydrogeologist 2
Dr. Peifeng Lei	Groundwater Modeling
Mr. Hiroshi Takashima	Water Supply Planning

JICA Official Mission

Dr. Yuji Maruo	Leader of Official Mission
Mr. Shutaro Shiraki	Project Planning

2. The SC for DF/R

ETHIOPIAN SIDE

Ministry of Water & Energy (MoWE)

Mr. Tesfaye Tadese	EGRAP+ coordinator, Groundwater Study Development & Management Directorate Director
Mr. Zebene Lakew	Staff of GSD&MD

EWTEC

Mr. Tamiru Fekadu	Hydrogeologist

GSE

Mr. Muhuddin Abadela	Hydrogeologist
Mr. Sileshi Mamo	Hydrogeologist

SNNPRS

Mr. Tadele Kibru	SNNPRS Water Resource Bureau
Mr. Meskel Tumiso	SNNPRS Water Resource Bureau

Others

Mr. Getachew Geletu	Hydrogeologist

JAPANESE SIDE

JICA Ethiopia Office

Mr. Hideshi Yamashita	Representative
Mr. Ephrem Fufa Leta	In-house consultant for water sector

JICA Study Team

Mr. Toshiyuki Matsumoto	Team Leader of the Study Team
Mr. Kensuke Ichikawa	Hydrogeologist 2
Dr. Peifeng Lei	Groundwater Modeling
Mr. Hiroshi Takashima	Water Supply Planning

JICA Official Mission

Dr. Yuji Maruo	Leader of Official Mission
Mr. Shutaro Shiraki	Project Planning

The discussion on the DF/R

1. The Seminar for DF/R

The questions, suggestions and comments from the participants and answer from JICA Study Team were as follows;

QUESTIONS AND ANSWERS ON GEOLOGY AND HYDROGEOLOGY

Q. In regard to the table 2.11 in page 2-23 of DFR, the classification in this table seems to be not correct to refer as aquifer.
A. As indicated in page 2-22, description in 2.3.3 Hydrogeology b. Aquifer of existing well, the table was aimed to point our the current problem on compilation of drilling log. We do think it is important description to note this fact to realize the current problem. However the Team decided to remove the description and Table 2.11 as requested by the chairman of the Seminar.

Q. The regulation line indicated in the figure of "Distribution of Hydrogen & Oxygen Isotope Ratio (by sub-basin)" (Figure 3.5 on page 3-19) shall be deleted if the anomaly values are included to formulate the line. And also the character of δ should be used instead of σ.
A. The team has agreed to this comment and will delete the regulation line as well as amendment of improper character used in the Figure 3.5.

Q. In regard to the relation between fluoride content and the depth (the trend of decrease of fluoride concentration by depth), it may lead to misunderstanding of proper understanding of distribution of fluoride in the rift valley lakes basin, as the drilling data in this area is almost shallow well of some 15-30m depth, and which occupies more or less 60% of the total number of the well.
A. The relation between fluoride content and the depth shall be studied more carefully for the future. However, utilizing the data available at this stage, there is tendency of decline of fluoride concentration in deeper groundwater. This shall be examined not in this report but to be further clarified by the new project highlight on fluoride concentration in the area.

In regard to the hydrogeological section, there were some other questions on the water quality (definition of stagnant condition on groundwater). These questions are individually explained by the Team and Questioner finally agreed with it.

Q. The ignimbrite is generally considered as aquiclude or impermeable basement in RVLB of

Ethiopia. However according to the geological cross sections of the Study Team, it seem like the hydrogeological impermeable basement is the Plio-Pleistocene Ryolite.

A. Basically, the startigraphy in RVLB is established based on the correlation with the strata of seven areas. Stratigraphy of seven areas in the study was correlated with respective existing articles, papers and chronology. The strata in the RVLB are divided by the lithological aspects in our study, and we correlate lithofacies of strata in outcrops with the results of drilling. During our survey, we have not recognized the ignimbrite, but welded tuff, acidic volcano-sedimentary rocks, welded pumicious pyroclastics, rhyolotic compacted tuff with pumice, rhyolite lava and tuff, white pumice and hard tuff including obsidian. Therefore we created the cross-section based on the above lithofacies.

QUESTIONS AND ANSWERS ON GROUNDWATER MODELING

Q. The precipitation has been summarized and shown in the Figure. How did you get this result?

A. Summarizing of precipitation is based on all available data (70 from local precipitation stations and 10 from WMO database), the detailed procedure of data check, modification station selection and station coverage area division were given in Interim Report, Chapter2 , Section2.

Q. What is the procedure for groundwater model recharge amount specification?

A. The model recharge amount calculation is conducted by using all available data for water resources balance analyzing in each model basin. The base data and detailed analyzing procedure are given in Progress Report (2), Chaper7, Section4 (Billate model) and Interim Report, Chapter5, Section3 (Ziway model), Section4 (Eastern Abaya Lake Model) and Section5 (Western Abaya Lake model).

Q. What is the aquifer type specification for different layer?

A. For all the 4 Models the top layer is specified as unconfined aquifer and all below layers are specified as confined aquifer. The description of models layer specification is given in Progress Report (2), Chaper7, Section5 (Billate model) and Inter Report, Chapter5, Section3 (Ziway model), Section4 (Eastern Abaya Lake Model) and Section5 (Western Abaya Lake model).

Q. How mach is the groundwater development potential for each basin?

A. Groundwater development potential is affected by many factors such as recharge amount, aquifer type, hydrological conductivities, topography, location of groundwater use, and so on. It's not easy to collect high precision data for all those parameters. On the other hand, when considering the water balance in a lake basin, the groundwater recharge amount can be calculated by water resources balance analysis. And the groundwater recharge amount is

generally considered as the limitation of groundwater development potential. The groundwater recharge amount for each sub-basin in the Study area have been calculated and given in Interim Report, Chapter2, Section2 and Draft Final Report, Chapter3, Section3.

Q. What is the amount of storage in the Study Area?

A. The meaning of word "storage" can be taken by different ways.

a. Existing amount in aquifer. It is not a constant value, but mainly depends on parameters of porosity and depth.
b. The parameter in groundwater simulation model. That is a parameter of water volume compressibility with very small value.
c. What is the amount of the available groundwater for usage?

The answer for this concept is the same as the answer for groundwater development potential.

QUESTIONS AND ANSWERS ON WATER SUPPLY PLANNING

Q. The selected numbers and the small towns for priority are different between the Interim Report and the DF/R. The SNNPRs had already submitted the application of the priority small towns in accordance with the Interim Report for the Japanese Grant Project to Japanese Government.

A. The priority small towns on the Interim Report such as "Priority project towns" were selected during the hydrogeological study stage. On the Draft Final Report, these towns were revised by the result of hydrogeological study and which were prioritized.

The previous application document will remain to be valid.

2. The SC for DF/R

The questions and answers (Q&A) at the seminar for DF/R were compiled after the meeting as attached The Seminar for DF/R of Appendix 2. The records of this Q&A were further discussed with the C/P for the clarification of contents. This Q&A was also explained by the Team for further clarification. The contents of comments are compiled as follows;

1. In regard to the figure of isotope distribution, the regulation line will be deleted and the regulation line of Ethiopia will be added to the figure. The minor correction of characters will also be made.
2. It was requested to revise the legends and tables in the report, as its character is too small for reading. The Team replied to do so at some of the legends and tables in the report.
3. C/P asked the level of confidence about the hydrogeological survey results. The Team replied that they have confidence about what we done until today, but the survey results should be

updated by the C/P for the future.

4. C/P requested the list of reference and data should be attached to the Report. While the data is already indicated into Supporting Report and Data Book. The references shall be attached to the end of the main report.
5. The title of the Report. It was commented that the word of "Assessment" and "The Federal Democratic of Ethiopia" shall be deleted as it is indicated and known by the C/P. The Team replied that it is not possible as it is fixed officially as the title of the Project.
6. C/P asked the groundwater development potential for each basin has been calculated by water balance, and also how should it be considered about the 4m increasing of water level of Awasa Lake? The Team answered that as the standard method for hydrological analysis, the data used for the analysis should cover duration more than the hydrological circle. And then the average value for all kinds of data can be used for the analysis without large error. For Awassa Lake the main evaporation data used for water balance analysis covers 25 years from 1986 to 2010 about 2.5 times longer than the hydrological circle. Therefore, when conducting the hydrological analysis, lake's water level is set with average value. On the other hand, corresponding to the duration of evaporation data, the yearly water level change in Awassa lake is maximum 3.24m (1998), minimum 1.42 (1992) with difference of 1.83m. Even though the water level change is much smaller than 4 m but a lake water level increasing tendency can be found. And then the yearly water level increasing tendency can be calculated as 42mm/year by a linear regression equation. Comparing to the lakes evaporation amount of 1963mm/year, the lake's water level increasing value is less than 2%. Using the value of BFI 0.45 for Awasa Lake, the effect of water level change for groundwater recharge summarized in DFR report can be considered as less than 1%.
7. C/P questioned on the water potential in general in the study area; Abundant or scarce? The team mentioned that the potential differs by area in accordance with the hydrogeological map.
8. C/P mentioned that it is better to say the name of the reports instead of persons name such as "Dr Tenalem". The Team agreed on this issue.
9. C/P requested to mention on the particular area for the high potential aquifer. The Team replied to make additional descriptions in the Report of Cha 3.4 of the report about the high potential aquifer where identified during the Study.

KOKUSAI KOGYO CO., LTD. Addis Ababa Ethiopia

The Federal Democratic Republic of Ethiopia Ministry of Water & Energy

END