Chapter 8

2-Dimensional Profile Model

8 2-Dimensional Profile Model

8.1 Purpose and advantage of 2-dimensional profile model

For groundwater simulation 3-dimension groundwater model is the most popular model type. This type of model can be used for simulating the groundwater head distribution and to analyze the flow regime within the model domain, and also available for groundwater flow prediction. However, due to the limitation of the model structure and also to geological and hydrological information, this model type is usually applied to small to medium scale areas. It is normally difficult to apply this model to a large scale area. Meanwhile 2-dimensional model can be applied to large areas to analyze regional groundwater flow characteristics.

For example, in a 3-D model, the specification for constant head boundary needs to be done by the unit of cells that are specified according to the model domain size. This makes it difficult to recreate the natural distribution of rivers and lakes. Generally, the grid spacing (that dictates the cell size) is specified as several hundreds meters or several kilometers. There would generally be no big problem for this level of cell size specification to correspond constant water head boundaries that represents large lakes. However, this cell size is too large to realistically simulate the width of rivers in most cases. This problem might result in some difference between the model and real groundwater situation. For example, some wells in the top layer near the river have to be set in the second layer to avoid the constant head condition cells. This may result in much greater influence of the rivers in the model than actual conditions. Moreover, the layer specification in 3D model is based on the interpolation results of several surveyed geology profiles, and all the methods used for the interpolation tend to cause some difference in layers separation.

In contrast, a 2-dimensional profile model can be used for simulation along a geology profile with relatively longer extent and no matter whether the geology profile is a straight line or not. The constant head boundaries can be easily specified from several meters to several kilometers according to the type of water bodies. The layer types in this kind of model can also be specified to most fit the geological profile.

8.2 Selection of location for 2-dimensional model

One of the several geological profiles created for Rift Valley area was taken as the target profile for the 2-dimensional groundwater simulation model creation. The selected geology profile is one of the two longitude direction (north- south) profiles, N-N’ profile that is on the eastern side of Rift Valley area. The model domain does not cover the whole geological profile, but the main part in the northern side.

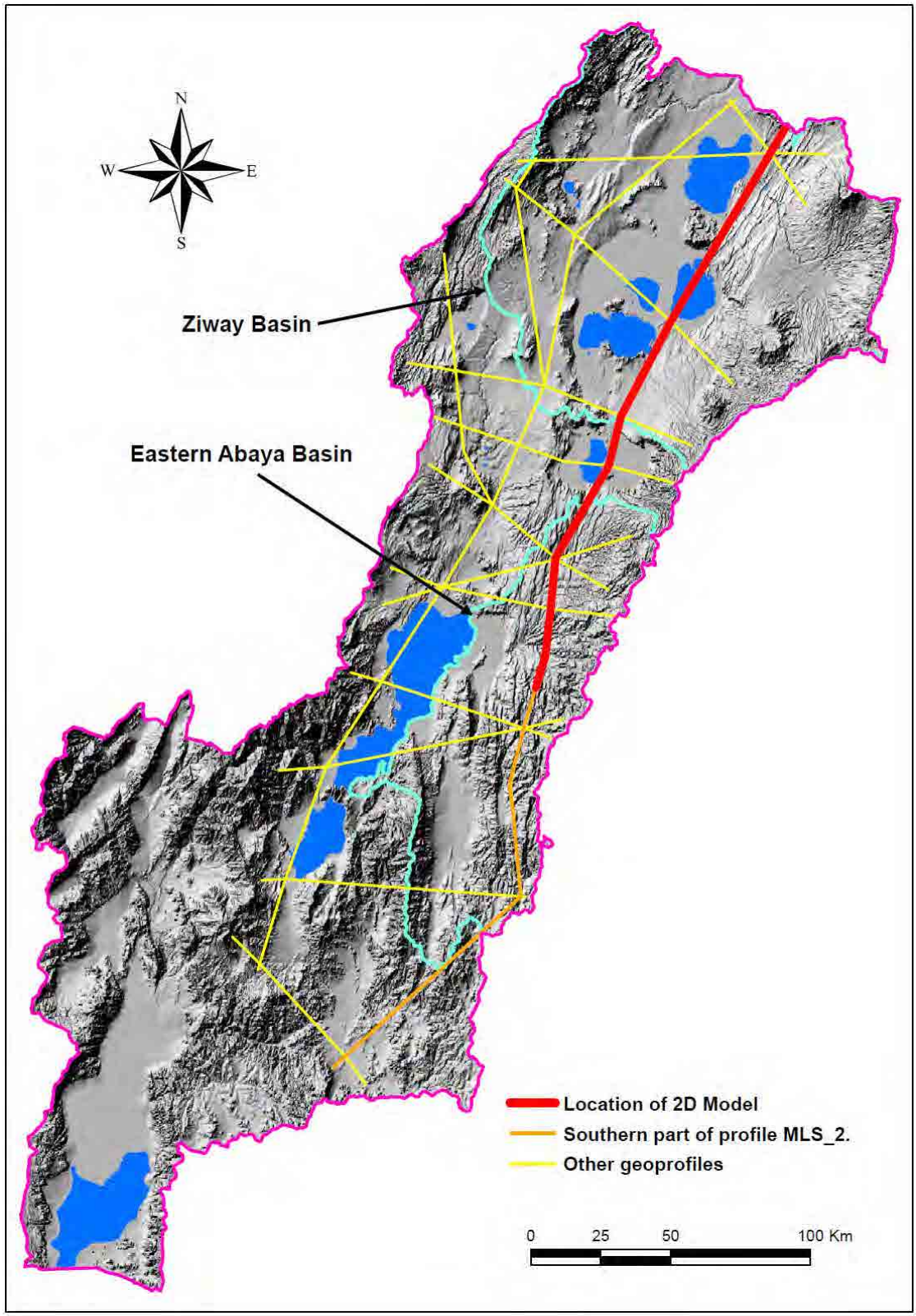


Figure 8.1: Location of 2-Dimensional Groundwater Simulation Model

As shown in Figure 8.1, the 2-dimensional groundwater model covers the main groundwater basins in Rift Valley area, Ziway, Awassa and Eastern Abaya. The reasons that the model was not created to cover the whole geology profile are as follows:

1. In the southern part of the geology profile, not enough geological information can be obtained for geological profile creation because of some limitation of the survey activities.

2. Most of the newly planned wells are distributes in the northern part in Rift Valley area.

8.3 Specifications of various conditions for the 2 D model

8.3.1 Length of the model profile

The model covers a distance of 220 km to the south starting form the northern boundary of Ziway groundwater basin, along the geological profile. The directions of the model row and column are set to north-south for row and west-east for columns.

As a 2-dimensional profile model, the model contains only one row. The basic specification of grid size is 1,000m, and thus, 220 basic model columns stretch to the model end point of 220km. However, 9 main rivers cross the model profile. Following the advantage of the 2-dimensional profile model, the constant head boundaries for the rivers can be specified following width of the river, and then the width of the river cells (columns) were set as 10 meters. To maintain the basic cell size specification, the widths of the remaining cell adjacent to the rivers were then set to 990 meters. As a result of this column specification, the 220 kilometers section contains 229 rows with 9 small cells corresponding to rivers.

8.3.2 Determination of ground surface elevation in the model

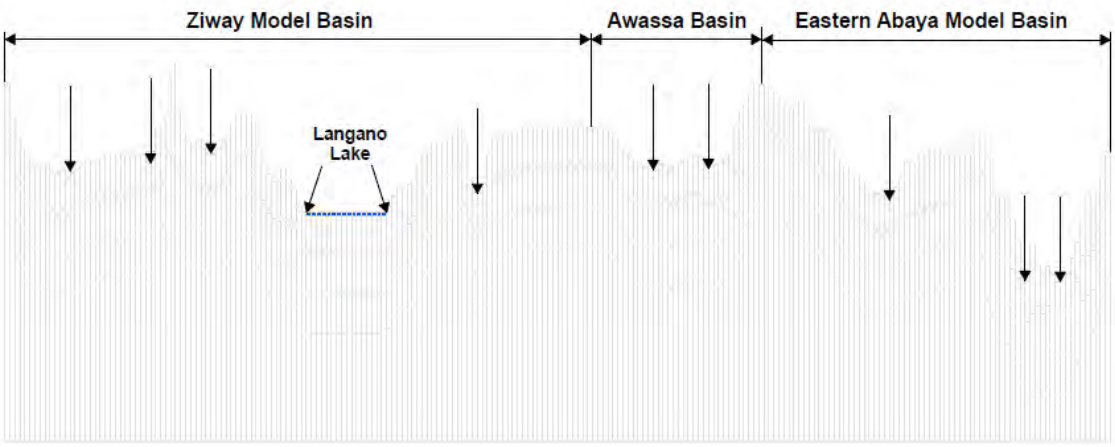
Similar to the 3-dimensional groundwater simulation models, the top layer's elevation was specified according to the DEM data of SRTM from NASA of the United States.

8.3.3 Model layer specification

The model was basically separated into 4 layers. And the basic layer thickness was specified as 100 meters. However, for the bottom layer, the elevation of 1014m (400 m below the lowest ground surface in the model) was used for the bottom specification of the whole layer 4. Moreover, the top layer includes some river and lake boundaries, and those boundaries are generally much shallower than the layer's basic depth specification of 100 meters. Therefore, similar to the way these conditions were specified in the 3 D models, the top layer was separated into two layers. For constant head boundaries cell of rivers and lakes, the thickness of the top layer was set as 10 meters and for calculation cells the layer were set as 90 meters from the ground surface. As the result of this layer specification, a total of 5 layers were involved in the model.

8.3.4 Specification of boundary conditions

As shown in Figure 8.2, the geological profile passes the lake Langano and intersects nine main rivers. Thus, these water bodies were integrated into the model as the constant head boundaries. The constant head boundary for the lake is shown in the figure by blue colored cells. For rivers, it is difficult to see them clearly in the figure unless the figure is shown in a much larger scale, because the cell size is as small as 10 meters. Therefore, the locations of constant head boundaries for rivers are shown by arrow markers.



Note: the arrow marks indicate river cells

Figure 8.2: Constant Head Boundary Specification in the Model

8.3.5 Aquifer specification

Similar to the 3-demensional models, it is impossible to specify any single model layers to correspond to a single geological feature. All the model layers consist of multiple different geologic strata. The geologic strata's classification in the model follows the geological profile (refer to the profile in another section) and shown in Figure 8.3. Specification of aquifer type is the same as that in the 3-dimensional models. The top layer is specified as unconfined aquifer and the other layers as confined aquifers.

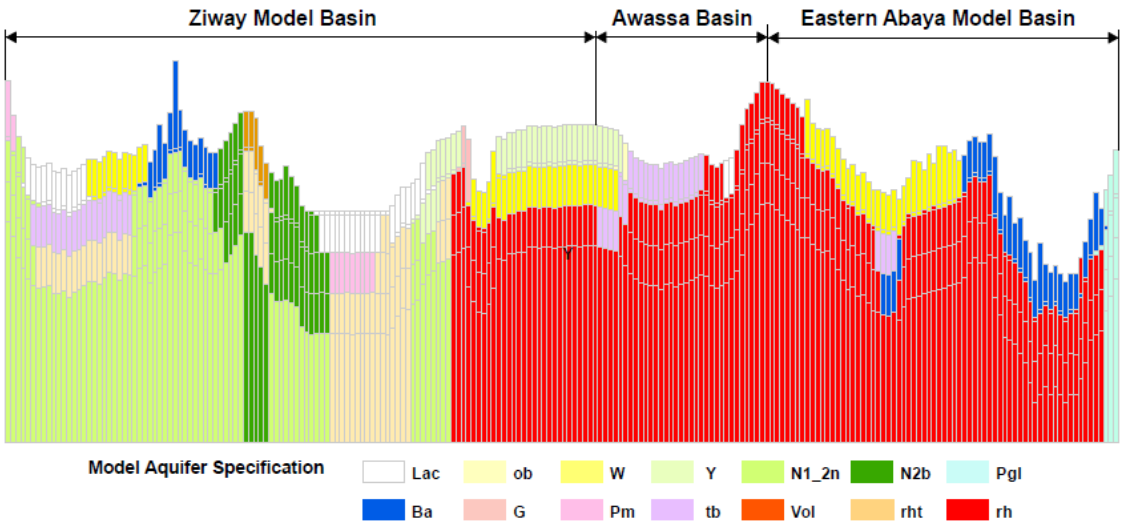


Figure 8.3: Aquifer Specification

8.3.6 Parameter specification

Because the model calibration employs the same method of steady flow calculation as in the 3-dimensional models, the necessary parameters are hydraulic conductivities and effective porosities. The specification for initial hydraulic conductivities is based on the characteristics of the geological strata classified in chapter 3 in the supporting report and the values are the same as those for the 3-dimensional models. The effective porosity values are specified as 0.1, also the same as those in the 3-dimensional models.

8.3.7 Package specification

Similar to the 3-dimensional models, recharge and well packages were employed in this 2-dimensional model.

a. Recharge package

The 2-dimensional profile model covers 3 main groundwater basins in the Rift Valley area of Ziway, Awassa and Eastern Abaya. For the two basins of Ziway and Eastern Abaya, the recharge specification is the same as those in the in the 3-dimensional models. For the part of Awassa basin, which is not involved in the 3-dimensional model, the recharge package was specified using the average values of the other two basins on both sides. The result of the recharge amount specification is shown in Figure 8.4.

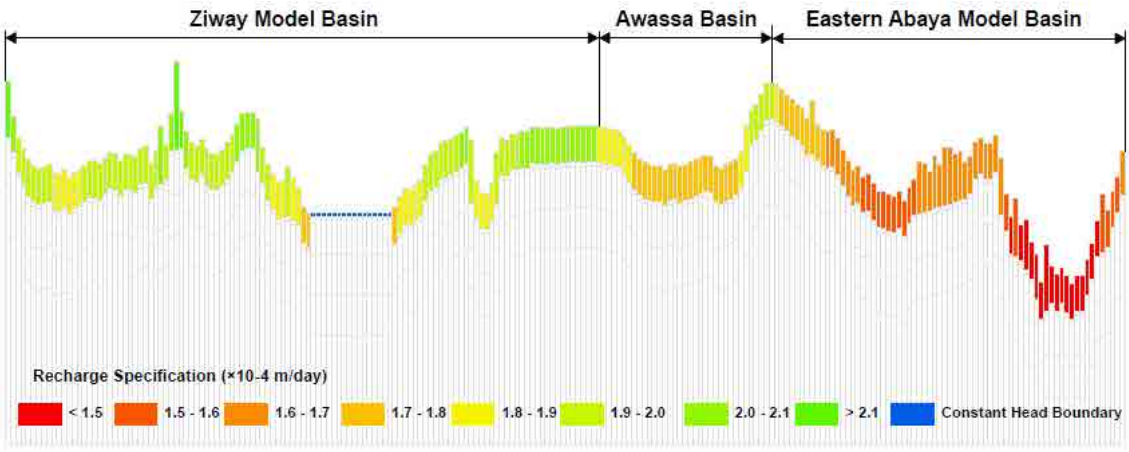


Figure 8.4: Specification of Recharge Package

b. Well package

Similar to the recharge package, for the part of 3-dimensional groundwater model area, the well parameters were specified according to the specification in the 3D models. For Awassa basin which is not involved in the 3D models, the well parameters were extracted from the existing GIS database and specified. The result of the well package specification is shown in Figure 8.5.

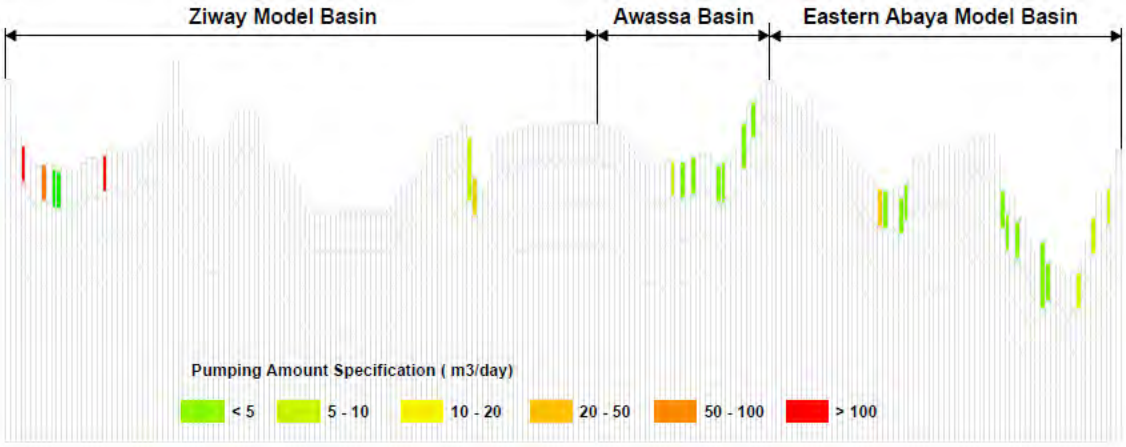


Figure 8.5: Specification of Well Package

8.4 Model calibration results

Steady flow method is used for model calibration in the same as in the 3-dimensional models. As the calibration result, water head distribution in each layer is shown in Figure 8.6.

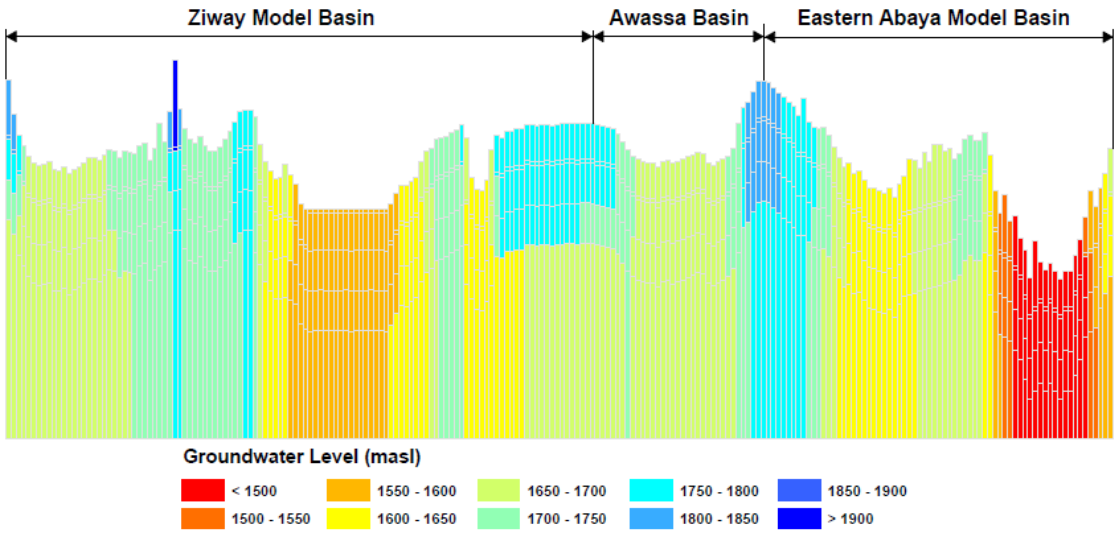


Figure 8.6: Groundwater Head Distribution in Model Layers

The water head shown in the above figure is expressed uniformly within each cell. This is because of the following reasons: as mentioned in the Main Report, following the method of the MODFLOW program, the calculation was conducted to evaluate the head value for the central point of each cell. Thus, if the actual water head in a cell was extracted from a point apart from the central point, the water head would generally be different from that obtained from the model calculation. Nevertheless, the water head contour map was created for the profile as shown in Figure 8.7 based on the water head in central points.

The characteristics of the groundwater flow system have been clearly shown in the figure. After obtaining the recharge from precipitation, the groundwater flow is largely affected by the topography. As commonly known, the formation of a groundwater basin also depends on the topography. Within each groundwater basin, relatively large head difference can be found over a relatively short distance. Then, the groundwater flow velocity and amount should be relatively large within a groundwater basin with larger head difference if the aquifer conditions are the same. In other words, the major groundwater movement occurs within each sub-basin.

However, the groundwater basin can be delineated by different scale, from a small basin for a single river to a large basin covering the whole Rift Valley area. Within a groundwater basin the groundwater flows from upstream to downstream. In comparison with the relatively rapid groundwater flow in shallow aquifers in a small to medium size basins, the groundwater flow from upper side to lower side in a large basin occurs shown by the thick arrow markers in the figure. However, the velocity and amount of this kind of groundwater flow are generally very small because of the very small hydraulic gradient, that is, a small water head difference over a long distance.

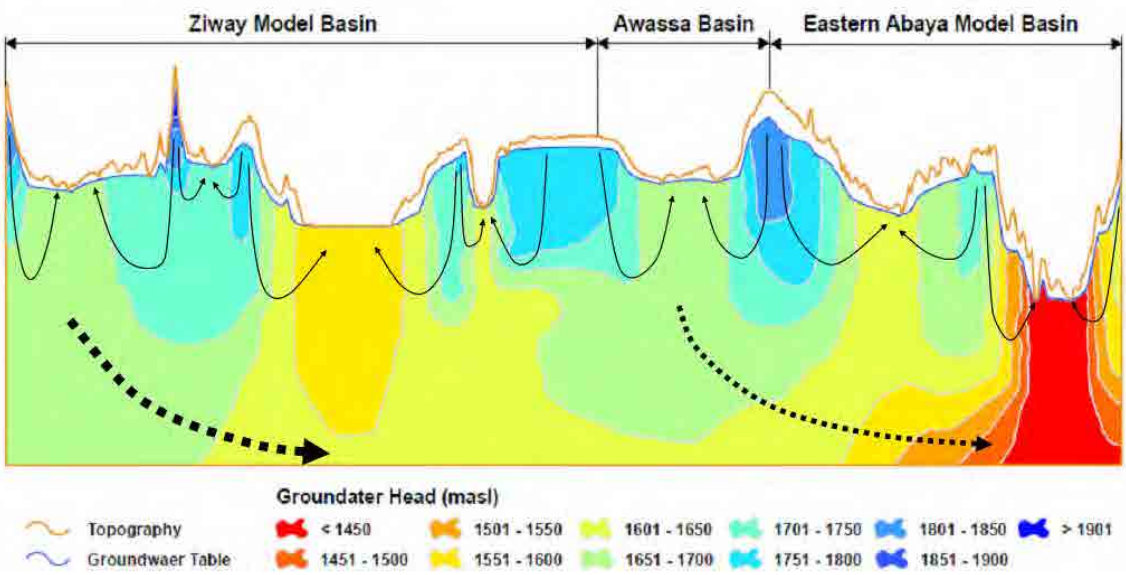


Figure 8.7: Water Head Contour in the Profile and Characteristics of Groundwater Flow.

Chapter 9

Small Town Water Usage Survey

9 Small Town Water Usage Survey

9.1 Introduction

9.1.1 Background and objectives

There is no detailed data and information available about the candidate towns of which the list was submitted to the team at the time of the JICA preliminary study in December 2008. Therefore, a small town water use survey was necessary to grasp actual conditions of the candidate towns.

For background information, the small town water use survey (hereinafter the Town Survey) was carried out to grasp the actual situation of the candidate towns in order to prepare water supply plans for small towns with a population of 10,000 or less.

Table 9.1: List of the Candidate Towns

Region (2)	Zone (12)	Woreda (57)	Town (82)
SNNPR	SZ-01 Gurage	SW-01 Sodo	S-01 Buei
			S-02 Kela
			S-03 Tiya
			S-04 Suten
		SW-02 Meskan	S-53 Hamus Gabaya
		SW-03 Mareqo	S-06 Koshe
	SZ-02 Hadiya	SW-04 Lemmo	S-07 Lisana
		SW-05 Shashago	S-09 Dosha
			S-54 Hirkofofo
		SW-06 Misrak Badawocho	S-55 Meyita Mazoria
		SW-07 Anelemmo	S-11 Fonko
		SW-08 Mirab Bodawocho	S-12 Wada
	SZ-03 Kembata Timbaro	SW-09 Anigacha	S-13 Anigacha
		SW-10 Kedia Gemela	S-14 Adilo
		SW-11 Dayiboya	S-15 Daniboya
	SZ-04 Sidama	SW-12 Shededio	S-16 Leku
		SW-13 Dara	S-17 Kebado
			S-18 Teferi Kela
		SW-14 Gorche	S-19 Gorche
		SW-15 Malga	S-20 Manicho
		SW-16 Wensho	S-21 Bokasa (Bokaso)
		SW-41 Alta Chuko	S-22 Chuko
		SW-18 Wondo Genet	S-23 Chuko (Cheko)
			S-24 Kela (Ela)
	SZ-05 Gedeo	SW-20 Kochore	S-27 Fiseha Genet
			S-56 Biloya
		SW-21 Gedeb	S-28 Gedeb
			S-57 Chorso Mazoria
	SZ-06 Wolayita	SW-23 Humbo	S-30 Humbo
		SW-24 Sodo Zuria	S-32 Dimtu
		SW-37 Damot Pulasa	S-58 Shento
		SW-38 Sodo Zuria	S-59 Dalbo Wegene Atowa
	SZ-07 Gamo Gofa	SW-26 Mirab Abaya	S-34 Birbir
		SW-27 Chencha	S-35 Chenicha
			S-36 Ezo
			S-37 Dorze

		SW-38 Amaro Special	S-38 Kele
		SW-29 Burji Special	S-39 Soyama
		SW-30 Konso Special	S-41 Segen
		SW-31 Darashe Special	S-42 Gidole
		SW-39 Arba Minch Zuria	S-60 Lanite
		SW-30 Konso Special	S-61 Gewada
	S-46 Silti	SZ-08 Silti	S-43 Kibet (Kibat)
			S-44 Alkeso
		SW-33 Lanifaro	S-46 Tora
			S-47 Mito
		SW-34 Dolocha	S-48 Dolocha
		SW-35 Sankura	S-49 Alem Gebeya
			S-51 Mazoria
		SW-36 Wilbareg	S-52 Bilbareg
		SW-32 Siliti	S-62 Udasa
		SW-40 Alicho Wuriro	S-63 Kawakoto

Oromia	OZ-01 Arsi	OW-01 Hitosa	O-01 Iteya
		OW-02 Ziway Dugda	O-02 Ogolcha
		OW-03 Tiyo	O-03 Gonde
		OW-04 Digaluna Tijo	O-05 Kidame DIgelu
			O-06 Sague
		OW-05 Munesa	O-07 Kersa
		OW-03 Tiyo	O-11 Kulumsa
		OW-01 Hitosa	O-12 Boru Jawi
		OW-03 Tiyo	O-29 Katar Genet
		OW-20 Limana Bilbilo	O-30 Lemo Sirba
	OZ-02 Borena	OW-09 Teltele	O-31 Milami
		OW-21 Bure Hara	O-32 Garaba
		OW-10 Yabelo	O-33 El Woyya
		OW-12 Mijo	O-43 Hidi-Lola
		OW-13 Dugda Dawa	O-44 Fincadaa
	OZ-03 East Shewa	OW-16 Adami Tulu & Jido Kombolcha	O-20 Abosa
			O-22 Adami Tulu
			O-28 Jido
		OW-15 Dugda Bora	O-35 Awash Mercasa
		OW-23 Bosat	O-36 Walanciti
			O-37 Doni
			O-38 Bofa (Bofa)
		OW-24 Liben	O-45 Adulala
	OZ-04 West Arsi	OW-20 Limana Bilbilo	O-09 Meraro
		OW-08 Kofele	O-10 Kofale
		OW-Wond	O-34 Bura
		OW-22 Wondo	O-39 Intaye
		OW-08 Kofele	O-40 Kabate
		OW-14 Sheshemane	O-41 Awasho-Dhanku
			O-42 Hursa

Legend of ID Number :

SZ-00 (Zone ID of SNNPR), OZ-00 (Zone ID of Oromia)

SW-00 (Woreda ID of SNNPR) , OW-00 (Woreda ID of Oromia)

S-00 (Town ID of SNNPR), O-00 (Town ID of Oromia)

* Missing ID Number of town are cancelled towns by a confirmation with SNNPR and Oromia before commencement of the Study.

9.1.2 Survey methodology

The candidate town list was confirmed and revised by SNNPR and Oromia in accordance with a request by the Study Team, which is to be the final list of candidate towns before commencement the Town Survey.

The Study Team commenced the Town Survey based on the final list of candidate towns with hired local consultant. The Study Team and the local consultant visited the candidate towns, Woreda offices, and Zonal offices and interviewed persons concerned of those towns and authorities.

Concrete survey methods are as follows,

- ✓ Various interviews with the persons concerned in towns based on the questionnaires, which were prepared by the Study Team.
- ✓ Monitoring of the existing water facilities in Towns in terms of technical, management and operation & maintenance.

9.1.3 General conditions

a. Ethiopian water policy

In accordance with Ethiopian Water Resources Management Policy 2007 and Ethiopian Water Sector Strategy 2001, water is considered a product and water users should bear water fees within the framework of equal water supply.

In rural areas difficult to supply water to, the above policies encourage development of water supply with support of the governments and NGOs. On the other hand, in the urban area of water supply, it emphasizes independent profit, development by self-acting effort, and development in connection with water users, companies and banks.

b. Administration systems in SNNPRS and Oromia RS

In SNNP, each zone performs the self-governance rules and the regional government is the adjustment organization for each zonal government. The cooperation contracts are to be undertaken by the regional governments, while requests regarding project priority are made from Kebele to Zones, and then to Woreda. Also, the project plans are to be made at the zonal level. Sidama Zone for example, has a database containing Woreda priority projects. Each Special Woreda is made up of distinct ethnicities, as, in fact, the region is made up of many different peoples. Special Woreda are on the same level as Zones, and even though two Special Woreda may geographically be neighboring, they will have no connections. The Water Resources Bureau (not including irrigation) that are in charge of water supply to these Woreda are attached to Water Resources, Mines and Energy Offices.

The Oromia regional government is connected vertically down from Zones to Woreda to Kebele. And these are also connected horizontally at each level. Also, Oromia Region is in charge of irrigation works in addition to water supply works.

c. Water supply organizations of SNNPR and Oromia Region

SNNPR has Southern Water Resource Development Bureau (SWRDB) and Woreda Water Desk (WWD) as water supply organizations. Oromia Region has Oromia Water Resource Bureau (OWRB), Zonal Water Resource Office (ZWRO), Woreda Water Office (WWO) as above organization.

d. General priority sector

The decentralization policy was presented as one of the basic policies established in the Constitution in 1994, and the Ethiopian government has been promoting further decentralization since 2002. And Woredas will play a leading role in decentralization under this policy.

The Town Survey found that, generally, the priority sectors for works according to budget allocation in most of Woredas were agriculture, education and hygiene. The water sector is below these in priority. Moreover, it is only allocated an annual administration budget, excluding salaries, from a minimum of 4,000 to approximately 30,000 Birr. This is though to be because the water supply measures are supported by NGOs and other organization in rural areas, and because of the policy encouraging independent efforts in urban areas. However, there were some Woreda, that have been allocated large budgets for projects by the government; they are:

- Konso Special Woreda (SNNPR)
- Adami Tilu & Jido Kombolcha Woreda (Oromia)
- Tiyo Woreda (Oromia)
- Kafale Woreda (Oromia)

Oromia Water Resource Bureau's duties include the irrigation sector; and projects in some areas, with the government strengthening its financing of irrigation as part of its national water strategy, are receiving greater budgetary funding.

9.1.4 Maintenance for water schemes

Town water offices, which operate and maintain existing water supply facilities, are generally assigned three to four engineers from Zonal offices, and three (specializing in water supply facilities, wells, and electrical/mechanical) from Woreda offices.

Engineers of Zonal offices give support, advice and training to the engineers of Woreda offices. And the engineers of Woreda offices undertake operation and maintenance in, and give advice to the engineers of Town water offices and/or Rural water committees that have water supply facilities.

Hitosa Woreda Water Committee, in Arsi Zone, Oromia, is one organization operating and maintaining water supply facilities that is worthy of special mention, having also received awards from Oromia Water Resource Bureau and a United Nations water agency in the past. As a result of having done the interview with this committee in this Town Survey, the Study Team got the impression that the staff of committee has a very high ability, knowledge and management skills concerning water supply facilities.

Usually, spare parts for the water supply facilities such as pumps, generators, and pipes are procured at markets in Addis Ababa and/or regional capitals (Awasa). The other procurement methods for spare parts as follows:

- ✓ Procure from Regional Water Resource Bureau (Oromia Region).
- ✓ Donation from NGO, Donors. (Projects, Technical Cooperation)

9.1.5 Others

a. The Boundaries of woreda administration

The Ethiopian government has been carrying out Business Process Re-engineering (BPR) and as result, the number of Woreda has been increased in SNNPR and Oromia Region. For instance, five Woreda were established in Wolayta zone in 2006.

Therefore, few Zonal water resources offices have up-to-date administrative maps.

b. Gender and water supply administration

The water policy and guidelines attaches great importance to highlighting gender issues and emphasizes that woman participate in the planning, development and supervision of water resources. And the participation of women in water supply projects is important due to the fact that it has traditionally been the role of women and children to fetch water. However, the Town Survey found that all of the Zonal and Woreda office heads and most of the employees were men.

9.2 Water supply coverage rate

Water supply coverage of Oromia Region is higher than SNNPR in the Study area (refer to Table 9.2). A possible reason for this could be the size of towns being larger in Oromia Region than in SNNPR because the target area is on the outskirts of Addis Ababa and is a along main road.

Dalocha Woreda in Siliti Zone, which has a comparatively high water coverage amongst Woreda in SNNPR, is the only place in this study to have introduced a Kiosk water supply system.

There are towns which have no water supply facilities, and are reliant on traditional water sources such as rivers, even in the Woredas that have average or high water supply coverage.

(Example: Katar Genet town in Tiyo, a Woreda with a 35% water coverage, has no water supply facilities)

Table 9.2: Comparison of Water Supply Coverage

	0-30%	31-60%	61% or more
Zone	<SNNPR> Gamogofa(20.6%) Sidama (30%)	<SNNPR> Silti (32%) Hadiya(40.3%) Waleyta(43%) Gedeo(46.12%) Gurage(48%) < Oromia Region＞ Arsi(49%) Borena(53%)	<SNNPR> <Oromia Region＞ East Shewa (77%)
Woreda	<SNNPR> Chencha(14.78%) Gedeb(19.72%) Arbaminch Zuria (22.19%) Marko(23%) Lemmo(25.36%) Humbo(26.13%) < OromiaRegion＞ Wondo (22%) Dugdadawa(29.3%)	<SNNPR> Sodo Zuria (28%) Shashago(33.2%) Lanfro(34%) Meskan(38%) Sodo(39%) Silti(39.6%) Derashe Special(41%) Kochore(43.84%) < Oromia Region＞ Bosat(30.8%) Kofale(32.1%) Tiyo(35%) Yabelo(37%) Digaluna Tijo(39.21%) Bulle Hora(40%) Teltele(42%) Adama (49.8%) Sheshemane(52%)	<SNNPR> Dolocha(63.5%) < Oromia Region＞ Hitosa (68.5%) Adami Tulu Jido Kombolcha (75%) Arsi Negele(78%)

9.3 Case studies of water supply systems

There were various water supply systems observed depending on their administrative scale and stage of development of the project. In the relatively big town, private pipe connection from distribution pipe has been installed and connected with houses. Further, public faucets (Bono system) have been installed widely throughout the Study area.

a. Undeveloped water supply system

In the town which does not have modern water supply system, residents use water of streams and/or springs that are polluted. In Ethiopia this is called the traditional system.

Collecting rainwater from puddles
Gidole Town, Dreshe Special Woreda

On-spot spring water source
Gidole Town, Dreshe Special Woreda

Figure 9.1: Undeveloped Water Supply System

b. Rural water supply system

In towns and rural areas which do not have piped water supply system, residents use groundwater by hand pump. In this case, Town or Rural offices have water committees to manage and maintain the hand pump facilities. Spare parts of hand pumps can be procured in Addis Ababa and/or Regional capitals or are donated by NGOs, Donors etc.

Hand pump system at Hams Gabaya

Figure 9.2: Rural Water Supply System

c. Town public water supply system

This water supply system has generally been adopted in Towns which has wide area and/or populous area. The general specifications of this system are as follows:

- ✓ Water source ; Spring, Groundwater
- ✓ Intake method & Power ; Gravity, Motorized pump with elec. power

- ✓ Transmission & Distribution ; Pipes with Reservoir Tanks
- ✓ Water supply methods ; Public Faucets, Private connections

Town office has a water supply service, and water committee to manage and maintain the above facilities. Water fee of users is fixed or categorized every water office, water committee depending on water demand and scale of the water supply facilities. However, there are cases where the government office made their water fee payments to the Town office.

Spare parts can be procured in Addis Ababa and/or regional capital or project donation by NGO, Donors etc.

Type of the public faucets and their water supply systems are the following three.

c.1 Open (Un-protected) pipeline water supply system

Faucets with connecting branch pipes on the ground from distribution main pipe without any of pipe protection and fence. Water supply of the faucets is controlled by upper stream of pipe line such as a valve at the Reservoir Tank.

Humbo town has this system in the farm land. Water is supplied for 1hour per day. Water fee charged is 3 birr / month/ household.

	
Pipeline supplying water to farmland. HumboToewn, Humbo Woreda	Pipeline installed at a private dwelling HumboToewn, Humbo Woreda

Figure 9.3: Open Pipeline Water Supply System

c.2 Bono system

This is a system of faucets connected to an underground main distribution pipe by branch pipes, which are protected above ground by a concrete or masonry structure. This system is spread widely throughout Ethiopia such as standard type of public faucet. Water supply of the faucets is controlled main valve at each structure by a member of the water committee premeditatedly and collects the water fee. In facilities that are being managed well, protection fences are installed around the structure by the water committee and/or Town water office.

As for the water fee system, one of the following 2 ways are adopted by each town.

- ✓ per water tank (20L, 25L) ; 0.1 - 1.0 birr per 20L (25L)
- ✓ per cubic meter (m^3) ; 1.0 – 5.0 birr per m^3.

	
"Bono" with water committee member. Kela Town, Wondo Genet Woreda	"Bono" with protective fence Tera Town, Silti Woreda

Figure 9.4: Bono System

c.3 Kiosk system

Water supply of the faucets is house in a concrete or brick building, a kiosk, where a member of the water committee controls the water supply and collects the water fee. Member of water committee who is in charge of the kiosk receives a daily allowance from the Water committee or Town water office. (20-25 birr/day)

	
Water discharge is controlled by a faucet valve installed inside of the kiosk	Water committee member in the kiosk manages the water supply and collects the water fee.

Figure 9.5: Kiosk System

d. Town water service system

The water supply facilities, which are in large towns where there is a large water capacity by residents and has large area to supply water, has private connections by piped water supply system. The Towns with such water facilities establishes the Town water office, Town water supply service, Town water enterprise for operation and maintenance.

Main operation and maintenance tasks by Town water office are as follows:

- ✓ Decision and levy of water fee.
- ✓ Management and use of levy fund.
- ✓ Operation and maintenance of the water supply facilities.
- ✓ Management of employee, water committee members.
- ✓ Procurement of spare parts.

Example of water fee:

(1) SNNPR

1) Buei Town, Sodo Woreda, Gurage Zone (870 households)

Table 9.3: Water Fee of Buei Town

Amount Category	Price
0~ 5 m^3	3.25 ETB/month
6~10 m^3	3.50 ETB/month
11~30 m^3	3.75 ETB/month
31m^3 and more	4.00 ETB/month

* At public faucets (bono) a water fee of 3birr/m^3 is collected.

2) Kibet Town, Silti Woreda, Silti Zone (456 households)

Table 9.4: Water Fee of Kibet Town

Amount Category	Price
0~ 5 m^3	2.25 ETB/month
6~10 m^3	2.75 ETB/month
11~30 m^3	3.00 ETB/month
31 m^3 and more	3.50 ETB/month

* At public faucets (bono) a water fee of 0.05birr/10L is collected.

(2) Oromia Region

1) Walanciti Town, Adama Woreda, East Shewa Zone (1,134 households)

Table 9.5: Water Fee of Walanciti Town

Amount Category	Price
0~3 m^3	2.25 ETB/month
4~5 m^3	2.60 ETB/month
6~8 m^3	3.15 ETB/month
9~11 m^3	3.75 ETB/month
11 m^3 and more	4.25 ETB/month

* At public faucets (bono) a water fee of is 0.1birr/10L collected.

2) Others (Uniform fee setting)

・ Garaba Town, Bulle Hora Woreda, Borena Zone... 4 birr / m^3

- Kofake Town, Kofale Woreda, West Arci Zone ... 3.5-4.0 birr / m3
- Sagure Town, Digaluna Tiyo Woreda, Arsi Zone... 4 birr / m3

Payment of water fee by water user at Bui Town water office, Sodo Woreda, Gurage Zone.

Water meter of private connection in Chuko Town, Wondo Genet Woreda, Sidama Zone.

Figure 9.6: Town Water Service System

e. Woredas water management board system

Hitosa Woreda water board is most developed water supply system, which was established in 1995 by support of an NGO. This board is constructed in 4 Woredas (Lote Hitosa Woreda, Hitosa Woreda, Dodotsire Woreda and Adama Woreda). Main board office is in Iteya Town, Hitosa Woreda, Arsi Zone which is one of the candidate towns of the Study. Iteya Town water supply facilities consist of 1,514 private connection and 15 public faucets (Bono system). Each public faucet has 250 household users.

The amount of water fee is decided finally by the board with town inhabitant committee, Woreda water office and Zone water office according to the guidelines of Oromia Water Resource Bureau. Woreda water office collects and manages the water fee.

This board is completely administered in a self-supporting accounting system, and the inhabitants committee controls the administration of this board.

The board has 25 office staff and 75 operation and maintenance staff. All four woreda offices, including Rural offices, have a common management system. That being a water committee consisting of 7 members.

The following water tariff that the Board decided is common throughout 4 Woredas.

Table 9.6: Water Tariff of the Board of Woreda Water Offices

Amount Category	Price
0~ 5 m^3	3.25ETB/month
6~10 m^3	3.50ETB/month
11~30 m^3	3.75ETB/month
30m^3 and more	4.00ETB/month

Hitosa Woreda water board received awards from Oromia Water Resource Bureau and Water section of United Nations as successful water management organization. This board attracts attention from an overseas researcher other than the Ethiopia whole country.

Certificate award of Hitosa Woreda Water Board
from Oromia Water Resource Bureau and Water sector of UN

Figure 9.7: Woredas Water Management Board System

9.4 Major donor's cooperation

As for the water supply project by the Donors (including NGOs), most are targeting rural areas in accordance with Ethiopia's water policy.

9.4.1 WASH program

WASH program by UNICEF, World Bank (IDA) and AfDB is carried out around Kebele of rural area in all 12 Zones that are the object of the project and rural areas in Konso Special Woreda (refer to Table 9.7).

Table 9.7: Area for the WASH Program

Region	Zone	Number of Woredas
SNNPR	Gurage	8
SNNPR	Hadiya	5 (**Lemmo**, Solo, Anelemo, Gombola , Misha)
SNNPR	Kambata Tamboro	6 (Damaroya, Kakidagayamiru, Kachabira, **Anigacha,** Adarotumto, Tambaro)
SNNPR	Sidama	5 (**Wond Genet**, **Malga**, **Shebadino**, **Dara**, **Gorche Wensho**)
SNNPR	Gedeo	? (**Kochore**, **Gedeb** and others)
SNNPR	Walayta	6 (**Sodo**, **Humbo**, Damo Sole, Bolososole, Damoto Weide, **Dugna Fango**)
SNNPR	Gamogofa	12 (Borda, M/Abaya, Kucha, Zala, ObaD/Tshay, Kamba, Bonke, Dita, Darmalo, Oyda, Damba Gofa, Geze Gofa)
SNNPR	Silti	4 (Alcho, **Lanflo**, East Azarnet, **Sankara**)
Oromia	West Arsi	2 (**Arsi Negele**, **Sheshemane**)
Oromia	Borena	3 (**Yabelo**, Dere, Galana)
Oromia	Adama	3 (Gibicu, Fantale, **Bosat**)
Oromia	Arsi	10 (Seru, Beb Gasgar, Amigna, Sudo, **Munesa**, **Hitosa**, Tene, Sire, Gololcha, Honkojuwobe)

*Data by Interview to the Regional office. Woredas in **bold** font have candidate towns of the Study.

9.4.2 EU and christian aid

EU and Christian Aid are carrying out a large scale water supply project, which amount 29 million ETB (73% of EU, 25% of Christian Aid, 2% Local Government) in 2 Woredas (Wibareg Woreda and Sankura Woreda) of Silti Zone. 2 candidate Towns of the Study (Alem Gebeya, Bilbareg) are included in the above project area.

Water is to be discharged at 150L/sec. from spring by gravity and motorized pump. Other scope of works are as follows.

- ✓ Term of the project : 2008-2011
- ✓ Total length of pipe line : 72km
- ✓ Reservoir tank : 500m^3, 100m^3 each
- ✓ Public faucet : 44
- ✓ Target of water user : 70,000 peoples

9.5 Other water supply projects in candidate small towns

87% (71/82 towns) of the candidate towns has existing water supply facilities which are being operated by Town water service and/or water committees. The other 11 towns do not have modern water supply facilities and perform traditional water intake method. (Town ID No. are S-12, S-19, S-51, S-61, S-63, O-29, O-37, O-39, O-41, O-43, O-45)

Current water supply condition and other project in the candidate towns of the Study are as follows.

a. SZ-01 Gurage Zone

1) S-01 Buei Town :
   Existing water sources are 2 boreholes with motorized well pumps by commercial electric line. And there is new bore hole plan near the existing bore hole (drilling point indicated at site). Existing reservoir tank is ground type reservoir (100m^3).
   There is a WASH project office of US Aid and Christian Children's Found in the Town.
2) S-02 Kela Town :
   Existing water source is spring with intake by gravity pipe line. Existing reservoir tanks are elevated reservoir (1m^3) and ground reservoir (10m^3). Water distribution facilities are public faucets and private connections.
   Town water office is drilling a new borehole in Town with SNNPR using a drilling rig which donated by UNICEF. World Vision is supporting this town for water development.
3) S-03 Tiya Town :
   Existing water source are 2 bore holes with motorized well pumps by commercial electric line. Existing reservoir tanks are elevated reservoirs. Water distribution facilities are public faucets and private connections. World Vision is supporting this town for water development.
4) S-04 Suten Town :
   Existing water source is 1 borehole located 6km from the Town office, with motorized well pumps by commercial electric line. Existing reservoir tank is a ground reservoir (50m^3) where in the primary school area. Water distribution facilities are public faucets and private connections.
   According to the interview from inhabitants, operation interruption of the water supply facility by the blackout is frequent. And the effective administration operation by the water committee is not carried out.
5) S-06 Koshe Town :
   Existing water sources are 2 boreholes with motorized well pumps by commercial

electric line. Existing reservoir tank is ground reservoirs (100m^3). Water distribution facilities are public faucets and private connections.

6) S-53 Hemus Gabeya(Bamo) Town :
Existing water sources are 5 bore holes with Hand pumps which constructed by Catholic church on 2009. However, 2 of the 5 Hand pumps are already out of order. And several wells are polluted by inflow of surface water due to the platform of Hand pumps were cracked.

b. SZ-02 Hadiya Zone

1) S-07 Lisana Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is elevated reservoirs (10m^3*2nos.). Water distribution facilities are public faucets and private connections.
2) S-09 Dosha Town :
Existing water sources are 3 boreholes with Hand pumps.
Access road to the Town is unpaved road. (Muddy during rainy season)
3) S-11 Fonko Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir (50m^3*1no.). Water distribution facilities are public faucets and private connections.
4) S-12 Wada Town :
Existing water source is surface water of small stream (Traditional water source). There are no water supply facilities in this Town.
5) S-54 Hirkofofo Town :
Existing water source is 1 borehole with Hand pump.
6) S-55 Meyira Mazoria Town :
Existing water source is 1 public faucet which is distributed from Shone Town by distribution pipe line.

c. SZ-03 Kembata Timbaro Zone

1) S-13 Anigacha Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoirs (50m^3*1no., 10m^3*1no.).
However, water yield has been decreased. New bore hole was drilled by an NGO (Inter Aid), but it is not yet in use.
2) S-14 AdiloTown :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tanks are elevated reservoirs (3m^3*2nos.).
New bore hole was drilled by NGO (World Vision, but it is not yet used.
3) S-15 Daniboya Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoir.

d. SZ-04 Sidama Zone

1) S-16 Leku Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. This borehole fund was supported by UNICEF. However, this water source is not functioning due to water level falls. New bore hole is under construction.
Operation and maintenance has been done by Leku water supply enterprise, which has an office in the Town and is supported by an NGO (Plan Ethiopia).
2) S-17 KabadoTown :

Existing water source is 1 borehole with motorized well pump by commercial electric line. This bore hole was constructed by SNNPR on 2009. Water yield is 8L/sec.)
Existing reservoir tank is ground reservoir ($75m^3$*1no.). Water distribution facilities are public faucets and private connections.

3) S-18 Teferi KelaTown :
Existing water source is 1 borehole with motorized well pump by commercial electric line. This bore hole was constructed by SNNPR. Existing reservoir tank is ground reservoir ($50m^3$*1no.) in the primary school grounds. Water distribution facilities are public faucets and private connections.
4) S-19 Goreche Town :
Town is located on the ridge. Existing water source is surface water of small stream where is bottom of the gorge (Traditional water source). There are no water supply facilities in this Town.
5) S-20 Manicho Town :
Existing water source is 1 bore hole with motorized well pump by commercial electric line. Existing reservoir tank is elevated reservoir ($3m^3$*1no.). Water distribution facilities are public faucets. However, those facilities are not functioning because the water quality is inappropriate (high density of Iron). SNNPR has designed a new borehole, but the construction is not yet carried out.
6) S-21 Bokasa(Bokaso) Town :
Existing water source is 1 borehole with motorized well pump by solar cell panels which was supported by UNICEF on 2008. Existing reservoir tank is ground reservoir. Water distribution facility is public faucet where is a water committee member controls and collects the water fee.
7) S-22 Chuko Town :
Existing water source is 1 bore hole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoir. Water distribution facilities are public faucets and private connections.
8) S-23 Chuko (Cheko) Town :
Existing water source is 1 bore hole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoir. Water distribution facilities are public faucets and private connections.
9) S-24 Ela(Kela) Town :
Existing water supply facilities are functioning.

e. SZ-05 Gedeo Zone

1) S-27 Fiseha Genet Town :
Existing water source is 1 bore hole with mono-pump powered by a diesel engine. However, pump operation time is 3hours per day due to the heating of above engine is remarkable. Existing reservoir tank is ground reservoir ($50m^3$*1no.). Water distribution facilities are public faucets and private connections; the distribution pipe network does not cover the whole Town.
2) S-28 Gedeb Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoir ($100m^3$*1no.). Water distribution facilities are public faucets and private connections.
3) S-56 Biloya Town :
Existing water sources are 3 boreholes with Hand pumps.
4) S-57 Chorso Mazoria Town :
Existing water source is spring with intake by gravity pipe line. Water distribution facilities are public faucets. Also, 2 bore holes with Hand pumps are functioning.
NGO (International Rescue Commission IRC) has been supporting to the Town water office.

f. SZ-06 Wolayita Zone

1) S-30 Humbo Town :
Existing water source is a spring with intake by gravity pipe line. Spring yield is 12L/sec.
Existing reservoir tank is ground reservoir ($10m^3$*4nos.). Water distribution facilities are public faucets and private connections.
2) S-32 Dimtu Town :
Existing water source was spring with intake with motorized pump by Generator, but it is not functioning because the pump is out of order. Current water source is an On-Spot system at the same spring.
3) S-58 Shento Town :
Existing water source is 1 public faucet which is distributed from Abota Town by distribution pipe line. Also, existing water sources are 7 boreholes with Hand pumps. (4 hand pumps are out of order)
4) S-59 Dablo Atowa Town :
Existing water source is spring with intake by gravity pipe line which spring is 5km from Town. Existing reservoir tank is ground reservoir ($10m^3$*1no.). Water distribution facility is public faucet. These water supply facilities were constructed by an NGO (World Vision) in 2006. However, inhabitants use surface water of small stream during dry season due to the above spring being dried up.

g. SZ-07 Gamo Gofa Zone

1) S-34 Birbir Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoir ($100m^3$*1no.). Water distribution facilities are public faucets and private connections.
New water supply facilities were completed by an NGO (World Vision) in 2005, but it has not yet been handed over and is not functioning due to electrical trouble between the motorized well pump and the control panel (electrical design is failure).
2) S-35 Chenicha Town :
Existing water sources are a spring, which is 4km from Town, with an intake by gravity pipe line and 1 borehole with motorized well pump by commercial electric line which constructed by an NGO (World Vision). Spring yield is 7.5L/sec. Existing reservoir tank is ground reservoir ($100m^3$*1no., $50m^3$*1no.). Water distribution facilities are 14 public faucets and 500 private connections.
However, capacity of water supply is insufficient due to failure design of pipe lines.
3) S-36 Ezo Town :
Existing water sources are 5 boreholes with Hand pumps. New water supply facilities, consisting of a borehole, reservoir, pipe lines and public faucets, are under construction by an NGO (World Vision).
4) S-37 Dorze Town :
Existing water sources are a spring, 0.4km from Town, with an intake by gravity pipe line and 2 bore holes with hand pumps. Existing reservoir tank is elevated reservoir ($1m^3$*1no.). Water distribution facility is public faucet. Town office has not collected water fees from users of the public faucets since the beginning. This office has a plan to collect water fee to accumulate a fund for maintenance of the facility.
5) S-38 Kele Town :
Existing water sources are 5 springs with intake by gravity pipe line. Existing reservoir tanks are ground reservoirs ($50m^3$*2nos.). Water distribution facilities are 21 public faucets and 600 private connections. However, capacity of water supply is insufficient due to the pipe lines having a faulty design.

6) S-39 Soyama Town :
Existing water sources are 3 springs with intake by gravity pipe line. Existing reservoir tank is ground reservoir ($50m^3$*1no., $25m^3$*2nos.). Water distribution facilities are 17 public faucets and private connection for government office. However, capacity of water supply is insufficient due to failure design of pipe lines.

7) S-41 Segen Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is ground reservoir ($100m^3$*1no.). Water distribution facilities are public faucets and private connections. This facility was constructed by the Nordic Church in 1995.

8) S-42 Gidole Town :
Existing water sources are 2 springs with intake by gravity pipe line. Existing reservoir tank is ground reservoir ($50m^3$*1no., $41m^3$*1no.). Water distribution facilities are 18 public faucets and 700 private connections.

9) S-60 Lanite Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir ($50m^3$*1no.). Water distribution facilities are 7 public faucets, 4 public showers and 120 private connections.

10) S-61 Gewada Town :
Existing water source is surface water of a small stream (Traditional water source). There are no water supply facilities or commercial electric lines in this Town.

h. SZ-08 Silti Zone

1) S-43 Kibat Town :
Existing water sources are 2 boreholes with motorized well pumps by commercial electric line. Existing reservoir tanks are a ground reservoir ($50m^3$*1no.) and an elevated reservoir ($3m^3$*1no.). Water distribution facilities are public faucets and private connections. These facilities were constructed in 2008.

2) S-44 Alkeso Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir ($50m^3$*1no.). Water distribution facilities are public faucets and private connections.

3) S-46 Tora Town :
Existing water source are 2 boreholes with motorized well pumps by commercial electric line. Existing reservoir tanks are ground reservoirs ($50m^3$*1no., $25m^3$*1no.). Water distribution facilities are 10 public faucets and 280 private connections.

4) S-47 Mito Town :
Existing water source is 1 borehole with motorized well pump by commercial electric line. Existing reservoir tank is elevated reservoir ($37m^3$*1no.). Water distribution facilities are 5 public faucets and 250 private connections.

5) S-48 Dalocha Town :
Existing water sources are 1 spring with intake by gravity pipeline and 6 boreholes with motorized well pumps (1 pump is out of order) by commercial electric line. Spring yield is 9.0L/sec. Existing reservoir tank is an elevated reservoir. Water distribution facilities are 7 public faucets and 317 private connections.
There are two types of water faucets: Bono and Kiosk.

6) S-49 Alem Gebeya Town :
Existing water source is 1 bore hole with motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir. Water distribution facilities are 5 public faucets and 52 private connections.

7) S-51 Mazoria Town :
Existing water source is the surface water of a small stream (Traditional water source). There are no water supply facilities in this Town.

8) S-52 Bilbareg Town :
Existing water source is spring with intake by gravity pipe line. Existing reservoir tank is a ground reservoir. Water distribution facilities are public faucet and 5 private connections. These water facilities were designed by an NGO (Water Action).
9) S-62 Usada Town :
Existing water source is 1 borehole with a motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir ($100m^3$*1no.). Water distribution facilities are 2 public faucets. Capacity of water distribution is insufficient due to lack of total head between the ground reservoir and public faucets.
10) S-63 Kawakoto Town :
Existing water source is surface water of small stream (Traditional water source). There are no water supply facilities in this Town.

i. OZ-01 Arsi Zone

1) O-01 Iteya Town :
Existing water source is a spring with an intake by gravity pipeline. Existing reservoir tanks are 3 ground reservoirs ($100m^3$*1no., $50m^3$*1no., $25m^3$*1no.). Water distribution facilities are 125 public faucet and private connections. Operation and maintenance of the facilities is done by Hitosa Water Supply and Sanitation Management Borad.
This water board received an award for effective management works from Oromia Water Resource Bureau and Water section of UN in 2010.
2) O-02 Ogolcha (Agolcho) Town:
Existing water source is 1 borehole with motorized well pump by generator. Existing reservoir tank is ground reservoir ($50m^3$*1no.). Water distribution facilities are public faucets and private connections.
3) O-03 Gonde Town :
Existing water source is a spring with an intake by gravity pipeline (Ductile Iron Pipe), the spring is 43km from Town. Existing reservoir tank is a ground reservoir ($25m^3$*1no.). Water distribution facilities are public faucets and private connections.
Pipes are used with DIP, SGP, PVC and PE for each purpose.
4) O-05 Kidame Digelu Town :
Existing water source is a spring with intake by gravity pipeline, the spring is 3km from Town. Existing reservoir tank is a ground reservoir. Water distribution facilities are public faucets.
5) O-06 Sagure town :
Existing water supply facilities are functioning.
6) O-07 Kersa Town :
Existing water source is a spring with an intake by gravity pipeline, the spring is 9km from Town. Existing reservoir tanks are 2 ground reservoirs ($100m^3$*1no., $25m^3$*1no.). Water distribution facilities are public faucets and private connections.
7) O-11 Kulumsa Town :
Existing water sources are public faucets, which are supplied from asela Town by a distribution pipeline.
8) O-12 Boru Jawi Town :
Existing water source is a spring, which is 3km from Town, with an intake by gravity pipeline, Existing reservoir tanks are ground reservoirs. Water distribution facilities are public faucets and private connections. However, above facilities are not functioning due to deterioration of intake facility.
9) O-29 Katar Genet Town :
Existing water source is the surface water of a small stream and an irrigation canal. (Traditional water source). JICA Irrigation project was done around this Town.
10) O-30 Lemo Sirba Town :
Existing water source is a spring with an intake (On-Spot system), which was

constructed by Donor in 1998. There is no charge for the water.

j. OZ-02 Borena Zone

1) O-31 Milami Town :
Existing water source is 1 bore hole with a motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir. Water distribution facilities are 4 public faucets and 20 private connections.
2) O-32 Garabe Town :
Existing water sources are 2 bore holes with motorized well pumps by commercial electric line. Existing reservoir tank is a ground reservoir ($100m^3$*1no.). Water distribution facilities are 10 public faucets and 210 private connections.
3) O-33 El Woyya(Wayya) Town :
Existing water source is 1 bore hole with motorized well pump by commercial electric line. Existing reservoir tank is a ground reservoir ($15m^3$*1no.). Water distribution facilities are 2 public faucets. This facility was constructed by US Aid in 2006.
4) O-43 Hidi-Lola Town :
Existing water source is surface water of a small stream (Traditional water source). There are no water supply facilities in this Town.
5) O-44 Fincadaa (Fincawaa) Town :
Existing water sources are 2 bore holes with motorized well pumps by commercial electric line. Existing reservoir tank is a ground reservoir ($50m^3$*1no.). Water distribution facilities are 8 public faucets and 94 private connections.

k. OZ-03 East Showa Zone

1) O-20 Abosa Town :
Existing water supply facilities are functioning.
2) O-22 Adami Tulu Town :
Existing water sources are 2 boreholes with motorized well pumps by commercial electric line. Existing reservoir tank is a ground reservoir ($50m^3$*1no.). Water distribution facilities are 10 public faucets and 556 private connections.
3) O-28 Jodo Town :
Existing water source is 1 borehole with a motorized well pump by commercial electric line. Existing reservoir tank is an elevated reservoir ($10m^3$*1no.). Water distribution facilities are public faucets and private connections.
4) O-35 Awash Mercasa Town :
Existing water sources are 2 bore holes with motorized well pumps by commercial electric line. Existing reservoir tanks are elevated reservoirs ($23m^3$*1no., $13m^3$*1no.). Water distribution facilities are 10 public faucets and 556 private connections.
There is a World Vision office in Town.
5) O-36 Walanciti Town :
Existing water sources are 5 bore holes with motorized well pumps by commercial electric line. Existing reservoir tank is an elevated reservoir ($50m^3$*1no.). Water distribution facilities are public faucets and private connections.
6) O-37 Doni Town :
Existing water source is surface water of a small stream (Traditional water source). There are no water supply facilities in this Town. Inhabitants buy water from water tank truck which comes from neighbouring towns.
7) O-38 Befa(Bofa) Town :
Existing water sources are 2 bore holes with motorized well pumps by commercial electric line. Existing reservoir tank is a ground reservoir. Water distribution facilities are public faucets and private connections.
8) O-45 Adulala Town :

Existing water source is surface water of a small stream (Traditional water source). There are no water supply facilities in this Town. Inhabitants buy water from water saler which comes from Adama town.

l. OZ-04 West Arsi Zone

1) O-09 Merano Town :
   Existing water source is a spring, which is 3 km from town, with an intake by gravity pipeline. Water distribution facilities are public faucets and private connections.
2) O-10 Kofele Town :
   Existing water source is 1 bore hole with a motorized well pump by generator. Existing reservoir tank is an elevated reservoir ($10m^3$*1no.). Water distribution facilities are public faucets and private connections.
3) O-34 Bura(Busa) Town :
   Existing water source is 1 borehole with a Hand pump.
4) O-39 Intaye Town :
   Existing water source is surface water of a small stream (Traditional water source). There are no water supply facilities in this Town.
5) O-40 Kabate Town :
   Existing water source are 2 boreholes with Hand pumps. (1hand pump is out of order)
6) O-41 Awash Dhanku Town :
   Existing water source is surface water of a small stream (Traditional water source). There are no water supply facilities in this Town.
7) O-42 Hursa Town :
   Existing water source is 1 bore hole with a Hand pump. (Static water level GL-12m)

9.6 Results of small town survey

a. Socio-economic and demographic data in zone

Based on the decentralization policy of the Ethiopian government, the substructure of the Regions is constructed in the Zones, Woreda, and Kebele in SNNPR and Oromia Region. However, Woreda named Special Woreda of SNNPR has the autonomy that is equal with Zone. Demographic data in Zone is described in Socio-Economic Survey.

About the population of each candidate Town, the population data that is obtained by small town survey often included rural residents around the Town and are uneven in the precision of these data. Therefore, the Study Team use the town population listed in the candidate towns which are submitted by SNNPR and Oromia Region.

b. Social service and infrastructure

As for the commercial electric lines, 3 phase lines are laid to the candidate towns except a few numbers of towns, and these lines supply 24 hours. However, these electric supplies are not stable due to limitation of the number and/or capacity of the hydropower stations.

Regarding to the road density is increasing from $0.03km/km^2$ (2005) to $0.07km/km^2$ (2009), major arterial roads are under construction for becoming whole asphalt pavement and branch roads are also under construction for sub base course (Gravel road). However, many local roads are still unpaved and difficult to access particularly in the rainy season.

As for the telecommunication, call zone area of mobile phone has been spreading to district are due to the relay station (relay antenna) has been building at each local area.

Number of the medical institutions has been increasing in the Towns by the support of

church, NGO etc. However, hospitals which provide relatively high treatment are only in the major cities.

Number of the educational institutions has been increasing such as above Medical institutions. There are secondary schools increasing in the Towns, as well as primary schools. Also, the sanitary and hygiene education is provided in each area by the WASH program.

c. Small town profile

Small town profiles of the candidate towns, which were made from the results of the town survey, are attached as Data book.

d. Water source and water usage conditions

Water source of the modern water supply facilities are categorized groundwater and spring except the traditional water source (surface water from small streams, ponds ...etc.).

The existing water supply facilities of the candidate towns cause a limit and/or hindrance of water supply functions for the following reasons:

- ✓ Increasing water demand (water user spread rural area of the Town.)
- ✓ Drawdown of groundwater level and decreasing water yields of groundwater and spring.
- ✓ Deterioration of facilities.
- ✓ Prolongation of the trouble periods due to the lack of management, shortage of spare parts.
- ✓ Insufficient capacity of water supply due to lack of design.

e. Health and water borne diseases

There are many water borne diseases in the candidate Towns, including many cases of typhoid, dysentery, and diarrhea. Also, incidence of malaria is high in this area. Even the Towns which have borehole water sources have incidences of the above diseases because some of the inhabitants use traditional water sources. Also, pollution of spring water is another cause of the above diseases.

f. Others

As a result of the small town water usage survey, the Study Team recognized that nearly 90% of the candidate towns (82 towns), which were submitted to us by the two regions in the beginning of the Study, have existing water supply facilities which are under operation. And these facilities were designed and constructed, and are now being operated by the projects of Ethiopian government and/or donors (Incl. NGOs).

However, these facilities cause a limit and/or hinder water supply functions. Therefore, for the screening of candidate towns and water supply facilities planning on the Detailed Study, it is necessary to perform the water supply plan in consideration of “improvement plan” for these existing water supply facilities while cooperating with the town water supply plans of donors (including NGOs).

Chapter 10

Water Supply Plan
for Small towns

10 Water Supply Plan for Small Towns

10.1 Outline and basic conditions of water supply plan

The candidate regions in the RVLB of this project are the SNNPRs and Oromia Region. As a result of confirmation of the final list of candidate small towns with these two regions and MoWR the original 80 small towns (SNNPRS=50, Oromia region=30) listed in the 2009 preliminary study were replaced with 82 small towns (SNNPRS=52, Oromia region=30). These 82 small towns are mostly in these two regions. This chapter outlines the water supply plan for these 82 small towns. The candidate small towns which were listed in the preliminary and this study are as follows.

Table 10.1: List of Candidate Small Towns

SNNPRS											
Region	No.		Zone ID	Zone name	Woreda ID	Woreda name	Town ID	Town name (BH…well) (SP…spring)	Population	
	preliminary study	The study							2010	Target year 2015 (3.3%/year)
SNNPRS	1	1	**SZ-01**	**Gurage**	**SW-01**	**Sodo**	**S-01**	**Buei (BH)**	**6,961**	**8,188**
	2	2	**SZ-01**	**Gurage**	**SW-01**	**Sodo**	**S-02**	**Kela (SP&BH)**	**3,519**	**4,139**
	3	3	**SZ-01**	**Gurage**	**SW-01**	**Sodo**	**S-03**	**Tiya (BH)**	**1,937**	**2,278**
	4	4	**SZ-01**	**Gurage**	**SW-01**	**Sodo**	**S-04**	**Suten (BH)**	**1,298**	**1,527**
	5		SZ-01	Gurage	SW-02	Meskan	S-05	Enseno	13,232	
	6	5	**SZ-01**	**Gurage**	**SW-03**	**Mareqo**	**S-06**	**Koshe (BH)**	**6,858**	**8,067**
	7	6	**SZ-02**	**Hadiya**	**SW-04**	**Lemmo**	**S-07**	**Lisana(BH)**	**1,711**	**2,013**
	8		SZ-02	Hadiya	SW-05	Shashago	S-08	Bonesha	5,641	
	9	7	**SZ-02**	**Hadiya**	**SW-05**	**Shashago**	**S-09**	**Dosha (BH)**	**1,881**	**2,213**
	10		SZ-02	Hadiya	SW-06	Misrak Badawocho	S-10	Shone	15,611	
	11	8	**SZ-02**	**Hadiya**	**SW-07**	**Analemmo**	**S-11**	**Fonko (BH)**	**2,380**	**2,799**
	12	9	**SZ-02**	**Hadiya**	**SW-08**	**Mirab Badawocho**	**S-12**	**Wada (SP&BH)**	**2,113**	**2,485**
	13	10	**SZ-03**	**Kembata Timbaro**	**SW-09**	**Anigacha**	**S-13**	**Anigacha (BH)**	**6,811**	**8,011**
	14	11	**SZ-03**	**Kembata Timbaro**	**SW-10**	**Kedia Gamela**	**S-14**	**Adilo (BH)**	**4,659**	**5,480**
	15	12	**SZ-03**	**Kembata Timbaro**	**SW-11**	**Dayiboya**	**S-15**	**Daniboya (BH)**	**8,111**	**9,541**
	16	13	**SZ-04**	**Sidama**	**SW-12**	**Shebedio**	**S-16**	**Leku (BH)**	**11,810**	**13,892**
	17	14	**SZ-04**	**Sidama**	**SW-13**	**Dara**	**S-17**	**Kebado (BH)**	**8,365**	**9,839**
	18	15	**SZ-04**	**Sidama**	**SW-13**	**Dara**	**S-18**	**Teferi-Kela (BH)**	**4,178**	**4,914**
	19	16	**SZ-04**	**Sidama**	**SW-14**	**Gorche**	**S-19**	**Goreche (SP)**	**2,986**	**3,512**
	20	17	**SZ-04**	**Sidama**	**SW-15**	**Malga**	**S-20**	**Manicho (BH)**	**4,017**	**4,725**
	21	18	**SZ-04**	**Sidama**	**SW-16**	**Wensho**	**S-21**	**Bokasa (Bokaso) (BH)**	**2,039**	**2,398**
	22	19	**SZ-04**	**Sidama**	**SW-41**	**Alta Chuko**	**S-22**	**Chuko (BH)**	**8,884**	**10,450**
	23	20	**SZ-04**	**Sidama**	**SW-18**	**Wendo Genet**	**S-23**	**Chuko**	**14,626**	**17,204**
	24	21	**SZ-04**	**Sidama**	**SW-18**	**Wendo Genet**	**S-24**	**Ela (Kela) (SP)**	**5,259**	**6,186**
	25		SZ-05	Gedeo	SW-19	Wenago	S-25	Wonago	9,196	
	26		SZ-05	Gedeo	SW-20	Kochore	S-26	Chelelektu	7,342	
	27	22	**SZ-05**	**Gedeo**	**SW-20**	**Kochore**	**S-27**	**Fiseha-Genet (BH)**	**4,189**	**4,927**
	28	23	**SZ-05**	**Gedeo**	**SW-21**	**Gedeb**	**S-28**	**Gedeb (BH)**	**10,021**	**11,787**
	29		SZ-06	Wolayita	SW-20	Damot Woyite	S-29	Bedesa	5,301	
	30	24	**SZ-06**	**Wolayita**	**SW-23**	**Humbo**	**S-30**	**Tabela (Humbo)(SP)**	**6,246**	**7,347**
	31		SZ-06	Wolayita	SW-24	Deguna Fanigo	S-31	Bitena	5,301	
	32	25	**SZ-06**	**Wolayita**	**SW-24**	**Deguna Fanigo**	**S-32**	**Dimtu (SP)**	**1,702**	**2,002**
	33		SZ-07	Gamo Gofa	SW-25	Boreda	S-33	Zefgne	2,761	
	34	26	**SZ-07**	**Gamo Gofa**	**SW-26**	**Mirab Abaya**	**S-34**	**Birbir (BH)**	**5,831**	**6,859**
	35	27	**SZ-07**	**Gamo Gofa**	**SW-27**	**Chencha**	**S-35**	**Chenicha (SP&BH)**	**10,223**	**12,025**
	36	28	**SZ-07**	**Gamo Gofa**	**SW-27**	**Chencha**	**S-36**	**Ezo (BH)**	**1,822**	**2,143**
	37	29	**SZ-07**	**Gamo Gofa**	**SW-27**	**Chencha**	**S-37**	**Dorze (BH&SP)**	**1,256**	**1,477**
	38	30	**SZ-07**	**Gamo Gofa**	**SW-28**	**Amaro Special**	**S-38**	**Kele (SP)**	**8,632**	**10,153**
	39	31	**SZ-07**	**Gamo Gofa**	**SW-29**	**Burji Special**	**S-39**	**Soyama (SP)**	**6,268**	**7,373**
	40		SZ-07	Gamo Gofa	SW-30	Konso Special	S-40	Karat	5,784	
	41	32	**SZ-07**	**Gamo Gofa**	**SW-30**	**Konso Special**	**S-41**	**Segen (BH)**	**3,626**	**4,265**
	42	33	**SZ-07**	**Gamo Gofa**	**SW-31**	**Darashe Special**	**S-42**	**Gidole (SP)**	**13,176**	**15,498**
	43	34	**SZ-08**	**Silite**	**SW-32**	**Siliti**	**S-43**	**Kibat (BH)**	**5,676**	**6,676**
	44	35	**SZ-08**	**Silite**	**SW-32**	**Siliti**	**S-44**	**Alkeso (BH)**	**1,028**	**1,209**
	45		SZ-08	Silite	SW-32	Siliti	S-45	Werabe	9,479	
	46	36	**SZ-08**	**Silite**	**SW-33**	**Lanifaro (Lanfuro)**	**S-46**	**Tora (BH)**	**9,163**	**10,778**
	47	37	**SZ-08**	**Silite**	**SW-33**	**Lanifaro (Lanfuro)**	**S-47**	**Mito (BH)**	**3,277**	**3,855**
	48	38	**SZ-08**	**Silite**	**SW-34**	**Dalocha**	**S-48**	**Dalocha (SP)**	**7,024**	**8,262**
	49	39	**SZ-08**	**Silite**	**SW-35**	**Sankura**	**S-49**	**Alem-Gebeya (BH)**	**3,656**	**4,300**
	50		SZ-08	Silite	SW-35	Sankura	S-50	Bonosha	2,377	
		40	**SZ-08**	**Silite**	**SW-35**	**Sankura**	**S-51**	**Mazoria (BH)**	**2,730**	**3,211**
		41	**SZ-08**	**Silite**	**SW-36**	**Wilbareg**	**S-52**	**Wilbareg (Bilbareg) (BH)**	**2,197**	**2,584**
		42	**SZ-01**	**Gurage**	**SW-02**	**Meskan**	**S-53**	**Hamus-Gabeya(Bamo)(BH)**	**4,152**	**4,884**
		43	**SZ-02**	**Hadiya**	**SW-05**	**Shashago**	**S-54**	**Hirkofofo (BH)**	**2,590**	**3,047**
		44	**SZ-02**	**Hadiya**	**SW-06**	**Misrak Badawocho**	**S-55**	**Weyira Mazoria (BH)**	**8,346**	**9,817**
		45	**SZ-05**	**Gedeo**	**SW-20**	**Kochore**	**S-56**	**Biloya (SP)**	**4,484**	**5,274**
		46	**SZ-05**	**Gedeo**	**SW-21**	**Gedeb**	**S-57**	**Chorso-Mazoria (BH&SP)**	**8,500**	**9,998**
		47	**SZ-06**	**Wolayita**	**SW-37**	**Damot Pulasa**	**S-58**	**Shento (BH)**	**5,345**	**6,287**
		48	**SZ-06**	**Wolayita**	**SW-38**	**Sodo Zuria**	**S-59**	**Dalbo-Atowa (SP)**	**4,007**	**4,713**
		49	**SZ-07**	**Gamo Gofa**	**SW-39**	**Arba Minch Zuria**	**S-60**	**Lanite (BH)**	**7,221**	**8,494**
		50	**SZ-07**	**Gamo Gofa**	**SW-30**	**Konso Special**	**S-61**	**Gewada (nil.)**	**5,967**	**7,019**
		51	**SZ-08**	**Silite**	**SW-32**	**Siliti**	**S-62**	**Udasa (BH)**	**4,470**	**5,258**
		52	**SZ-08**	**Silite**	**SW-40**	**Alicho wuriro**	**S-63**	**Kawakoto (SP)**	**783**	**921**

※Bold=Candidate small town on the Study

Orinmia region											
Region	No.		Zone ID	Zone name	Woreda ID	Woreda name	Town ID	Town name (BH…well) (SP…spring)	Population	
	preliminary study	The study							2010	Target year 2015 (3.3%/year)
Oromia	1	1	OZ-01	Arsi	OW-01	Hitosa	O-01	Iteya (SP)	14,239	16,749
	2	2	OZ-01	Arsi	OW-02	Ziway Dugda	O-02	Ogolcha (BH)	4,759	5,598
	3	3	OZ-01	Arsi	OW-03	Tiyo	O-03	Gonde (SP)	4,350	5,117
	4		OZ-01	Arsi	OW-03	Tiyo	O-04	Asela	44,496	
	5	4	OZ-01	Arsi	OW-04	Digaluna Tijo	O-05	Kidame-Digelu (SP)	1,780	2,094
	6	5	OZ-01	Arsi	OW-04	Digaluna Tijo	O-06	Sagure (SP)	10,926	12,852
	7	6	OZ-01	Arsi	OW-05	Munesa	O-07	Kersa (SP)	9,916	11,664
	8		OZ-01	Arsi	OW-06	Bekoji	O-08	Bekoji	8,777	
	9	7	OZ-04	West Arsi	OW-20	Limana Bilbilo	O-09	Meraro (SP)	4,725	5,558
	10	8	OZ-04	West Arsi	OW-08	Kofele	O-10	Kofele (BH)	14,401	16,939
	11	9	OZ-01	Arsi	OW-03	Tiyo	O-11	Kulumsa (nil)	3,472	4,084
	12	10	OZ-01	Arsi	OW-01	Hitosa	O-12	Boru Jawi (SP)	4,446	5,230
	13		OZ-01	Arsi	OW-07	Digaluna-Tijo	O-13	Tijo	1,038	
	14		OZ-02	Borena	OW-09	Teltele	O-14	Teltele	3,354	
	15		OZ-02	Borena	OW-10	Yabelo	O-15	Yabelo	10,480	
	16		OZ-02	Borena	OW-11	Hagermariam	O-16	Hagermariam	13,218	
	17		OZ-03	East Shewa	OW-14	Shashemene	O-17	Shashemene	51,442	
	18		OZ-03	East Shewa	OW-13	Dugda dawa	O-18	Alem-Tena	7,247	
	19		OZ-03	East Shewa	OW-13	Dugda dawa	O-19	Meki	20,214	
	20	11	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-20	Abosa (BH)	3,578	4,209
	21	12	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-22	Adami-Tulu (BH)	8,166	9,605
	22	13	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-28	Jido (BH)	2,659	3,128
	23	14	OZ-01	Arsi	OW-03	Tiyo	O-29	Katar-Genet (nil.)	3,953	4,650
	24	15	OZ-01	Arsi	OW-20	Limana Bilbilo	O-30	Lemo-Sirba (SP)	5,590	6,575
	25	16	OZ-02	Borena	OW-09	Teltele	O-31	Milami (BH)	4,510	5,305
	26	17	OZ-02	Borena	OW-21	Bure Hara	O-32	Garaba (BH)	7,500	8,822
	27	18	OZ-02	Borena	OW-10	Yabelo	O-33	El-Woyya (BH)	4,090	4,811
	28	19	OZ-04	West Arsi	OW-22	Wondo	O-34	Bura (BH)	5,112	6,013
	29	20	OZ-03	East Shewa	OW-19	Adama	O-35	Awash-Mercasa (BH)	10,200	11,998
	30	21	OZ-03	East Shewa	OW-23	Bosat	O-36	Walanciti (BH)	11,260	13,245
		22	OZ-03	East Shewa	OW-23	Bosat	O-37	Doni (nil.)	4,164	4,898
		23	OZ-03	East Shewa	OW-23	Bosat	O-38	Befa (Bofa) (BH)	7,040	8,281
		24	OZ-04	West Arsi	OW-22	Wondo	O-39	Intaye (nil.)	8,500	9,998
		25	OZ-04	West Arsi	OW-08	Kofele	O-40	Kabate (BH)	4,146	4,877
		26	OZ-04	West Arsi	OW-14	Sheshemane	O-41	Awasho-Dhanku (BH)	7,040	8,281
		27	OZ-04	West Arsi	OW-14	Sheshemane	O-42	Hursa (BH&SP)	5,700	6,705
		28	OZ-02	Borena	OW-12	Mijo (Miyo)	O-43	Hidi-Lola (BH)	6,550	7,704
		29	OZ-02	Borena	OW-13	Dugda dawa	O-44	Fincadaa (BH)	7,200	8,469
		30	OZ-03	East Shewa	OW-24	Liben	O-45	Adulala (nil.)	3,601	4,236
※Bold=Candidate small town on the Study										

10.1.1 Target year and estimated population

a. Target year

The Water Sector Development Program 2002-2016 (WSDP) was established in regard to the water supply area as a part of the effort to reduce poverty. The WSDP intends to attain a 76 % water supply ratio at the national level, namely 98.2% in urban, 70.9% in rural areas from 2002 to 2016. The main priorities of this program are: the drinking water supply in consideration of sanitation of urban and rural areas, water for the livestock of nomads, areas affected by drought, and water supply for industrial development. After that, the UAP (universal access program) was established in 2005, with a stated target of a 100% water supply ratio by 2012. It means that the target of WSDP is accelerated. The target of UAP is to attain a 98% water supply ratio (15 L/c/day) in rural areas by 2012. This is the plan to build 149,024 water supply facilities. About half of these, 69,745, are hand-dug wells that are 10m or shallower. Moreover, 38,568 are shallow wells of 15m or less in depth. Therefore, shallow wells account for two thirds of the wells in this plan. The remaining third are water resources such as tube wells, springs and ponds. The target of the urban water supply is to attain a 100% water supply ratio (20 L/c/day) by 2012. Plus, there is the EGRAP for the national master plan of the groundwater investigation, but this is not a water supply plan. The strategy of water resources in the future in Ethiopia was discussed in 2000 The UAP was amended to UAP-2 on 2009 and it was stated to be 100% of water coverage for villages and urban. Therefore, the target year of this project is 2015 so this project contributes to the attainment of the target of WSDP. This is the same as the Progress Report.

b. Estimated population in each year

Estimated annual population increase to be adopted is 3.3% (short term 2011~2015) in accordance with contents and results of the Study and in reference to the Master Plan of Halcrow, which is described in another chapter of this report on the socio economic survey.

The estimated populations of the candidate small towns in the target year (2015), which are based on the above population growth rate, are as follows.

Table 10.2: Estimated Population of the Candidate Small Towns (2015 as target year)

No.	SNNPRS						Population	
	Zone		Woreda		Town		2010	2015
	ID / Name		ID / Name		ID / Name		Total	Annual Growth 3.3%/year
							①	②=①×(1+3.3%)
1	SZ-3	Kembata Timbaro	SW-10	Kedia Gamela	S-14	Adilo	4,659	5,480
2	SZ-2	Hadiya	SW-06	Misrak Badawocho	S-55	Weyira Mazoria	8,346	9,817
3	SZ-4	Sidama	SW-13	Dara	S-17	Kebado	8,365	9,839
4	SZ-6	Wolayita	SW-38	Sodo Zuria	S-59	Dalbo (Wegene) Atowa	4,007	4,713
5	SZ-6	Wolayita	SW-23	Humbo	S-30	Tabela (Humbo)	6,246	7,347
6	SZ-7	Gamo Gofa	SW-39	Arba Minch Zuria	S-60	Lanite	7,221	8,494
7	SZ-6	Wolayita	SW-37	Damot Pulasa	S-58	Shento	5,345	6,287
8	SZ-4	Sidama	SW-13	Dara	S-18	Teferi Kela	4,178	4,914
9	SZ-5	Gedeo	SW-20	Kochore	S-27	Fiseha Genet	4,189	4,927
10	SZ-5	Gedeo	SW-21	Gedeb	S-28	Gedeb	10,021	11,787
11	SZ-3	Kembata Timbaro	SW-11	Dayiboya	S-15	Daniboya	8,111	9,541
12	SZ-8	Silite	SW-35	Sankura	S-51	Mazoria	2,730	3,211
13	SZ-7	Gamo Gofa	SW-27	Chencha	S-35	Chenicha	10,223	12,025
14	SZ-8	Silite	SW-33	Lanifaro (Lanfuro)	S-46	Tora	9,163	10,778
15	SZ-4	Sidama	SW-15	Malga	S-20	Manicho	4,017	4,725
16	SZ-5	Gedeo	SW-20	Kochore	S-56	Biloya	4,484	5,274
17	SZ-3	Kembata Timbaro	SW-09	Anigacha	S-13	Anigacha	6,811	8,011
18	SZ-5	Gedeo	SW-21	Gedeb	S-57	Chorso-Mazoria	8,500	9,998
19	SZ-4	Sidama	SW-14	Gorche	S-19	Goreche	2,986	3,512
20	SZ-8	Silite	SW-32	Siliti	S-43	Kibat	5,676	6,676
21	SZ-4	Sidama	SW-12	Shebedio	S-16	Leku	11,810	13,892
22	SZ-4	Sidama	SW-41	Alta Chuko	S-22	Chuko	8,884	10,450
23	SZ-7	Gamo Gofa	SW-27	Chencha	S-37	Dorze	1,256	1,477
24	SZ-7	Gamo Gofa	SW-26	Mirab Abaya	S-34	Birbir	5,831	6,859
25	SZ-2	Hadiya	SW-07	Analemmo	S-11	Fonko	2,380	2,799
26	SZ-7	Gamo Gofa	SW-27	Chencha	S-36	Ezo	1,822	2,143
27	SZ-8	Silite	SW-32	Siliti	S-44	Alkeso	1,028	1,209
28	SZ-8	Silite	SW-36	Wilbareg	S-52	Wilbareg (Bilbareg)	2,197	2,584
29	SZ-2	Hadiya	SW-04	Lemmo	S-07	Lisana	1,711	2,013
30	SZ-2	Hadiya	SW-05	Shashago	S-09	Dosha	1,881	2,213
31	SZ-1	Gurage	SW-03	Mareqo	S-06	Koshe	6,858	8,067
32	SZ-8	Silite	SW-34	Dalocha	S-48	Dalocha	7,024	8,262
33	SZ-8	Silite	SW-32	Siliti	S-62	Udasa	4,470	5,258
34	SZ-1	Gurage	SW-01	Sodo	S-02	Kela	3,519	4,139
35	SZ-1	Gurage	SW-01	Sodo	S-01	Buei	6,961	8,188
36	SZ-4	Sidama	SW-16	Wensho	S-21	Bokasa (Bokaso)	2,039	2,398
37	SZ-7	Gamo Gofa	SW-30	Konso Special	S-61	Gewada	5,967	7,019
38	SZ-7	Gamo Gofa	SW-30	Konso Special	S-41	Segen	3,626	4,265
39	SZ-7	Gamo Gofa	SW-29	Burji Special	S-39	Soyama	6,268	7,373
40	SZ-8	Silite	SW-35	Sankura	S-49	Alem Gebeya	3,656	4,300
41	SZ-1	Gurage	SW-02	Meskan	S-53	Hamus-Gabeya(Bamo)	4,152	4,884
42	SZ-2	Hadiya	SW-05	Shashago	S-54	Hirkofofo	2,590	3,047
43	SZ-8	Silite	SW-33	Lanifaro (Lanfuro)	S-47	Mito	3,277	3,855
44	SZ-8	Silite	SW-40	Alicho wuriro	S-63	Kawakoto	783	921
45	SZ-1	Gurage	SW-01	Sodo	S-04	Suten	1,298	1,527
46	SZ-1	Gurage	SW-01	Sodo	S-03	Tiya	1,937	2,278
47	SZ-7	Gamo Gofa	SW-28	Amaro Special	S-38	Kele	8,632	10,153
48	SZ-4	Sidama	SW-18	Wendo Genet	S-24	Ela (Kela)	5,259	6,186
49	SZ-6	Wolayita	SW-24	Deguna Fanigo	S-32	Dimtu	1,702	2,002
50	SZ-7	Gamo Gofa	SW-31	Darashe Special	S-42	Gidole	13,176	15,498
51	SZ-4	Sidama	SW-18	Wendo Genet	S-23	Chuko	14,626	17,204
52	SZ-2	Hadiya	SW-08	Mirab Badawocho	S-12	Wada	2,113	2,485

No.	Oromia Region						Population	
	Zone		Woreda		Town		2010	2015
	ID / Name		ID / Name		ID / Name		Total	Annual Growth 3.3%/year
							①	②=①×(1+3.3%)
1	OZ-1	Arsi	OW-03	Tiyo	O-11	Kulumsa	3,472	4,084
2	OZ-1	Arsi	OW-04	Digaluna Tijo	O-06	Sagure	10,926	12,852
3	OZ-4	West Arsi	OW-20	Limana Bilbilo	O-09	Meraro	4,725	5,558
4	OZ-1	Arsi	OW-03	Tiyo	O-29	Katar Genet	3,953	4,650
5	OZ-4	West Arsi	OW-14	Sheshemane	O-42	Hursa	5,700	6,705
6	OZ-4	West Arsi	OW-14	Sheshemane	O-41	Awasho-Dhanku	7,040	8,281
7	OZ-1	Arsi	OW-01	Hitosa	O-12	Boru Jawi	4,446	5,230
8	OZ-4	West Arsi	OW-08	Kofele	O-40	Kabate	4,146	4,877
9	OZ-1	Arsi	OW-20	Limana Bilbilo	O-30	Lemo Sirba	5,590	6,575
10	OZ-2	Borena	OW-21	Bure Hara	O-32	Garaba	7,500	8,822
11	OZ-1	Arsi	OW-05	Munesa	O-07	Kersa	9,916	11,664
12	OZ-1	Arsi	OW-03	Tiyo	O-03	Gonde	4,350	5,117
13	OZ-1	Arsi	OW-02	Ziway Dugda	O-02	Ogolcha (Agolcho)	4,759	5,598
14	OZ-1	Arsi	OW-04	Digaluna Tijo	O-05	Kidame Digelu	1,780	2,094
15	OZ-3	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-20	Abosa	3,578	4,209
16	OZ-2	Borena	OW-09	Teltele	O-31	Milami	4,510	5,305
17	OZ-2	Borena	OW-10	Yabelo	O-33	El Woyya(Wayya)	4,090	4,811
18	OZ-3	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-28	Jido	2,659	3,128
19	OZ-3	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-22	Adami Tulu	8,166	9,605
20	OZ-4	West Arsi	OW-22	Wondo	O-39	Intaye	8,500	9,998
21	OZ-4	West Arsi	OW-22	Wondo	O-34	Bura (Busa)	5,112	6,013
22	OZ-4	West Arsi	OW-08	Kofele	O-10	Kofele	14,401	16,939
23	OZ-1	Arsi	OW-01	Hitosa	O-01	Iteya	14,239	16,749
24	OZ-3	East Shewa	OW-24	Liben	O-45	Adulala	3,601	4,236
25	OZ-3	East Shewa	OW-23	Bosat	O-36	Walanciti	11,260	13,245
26	OZ-3	East Shewa	OW-23	Bosat	O-37	Doni	4,164	4,898
27	OZ-3	East Shewa	OW-23	Bosat	O-38	Befa (Bofa)	7,040	8,281
28	OZ-3	East Shewa	OW-19	Adama	O-35	Awash Mercasa	10,200	11,998
29	OZ-2	Borena	OW-13	Dugda dawa	O-44	Fincadaa (Fincawaa)	7,200	8,469
30	OZ-2	Borena	OW-12	Mijo (Miyo)	O-43	Hidi-Lola	6,550	7,704

10.1.2 Water demand

a. Unit water demand

On the basis of the towns' water needs (water coverage) and operation & maintenance ability for the existing water supply facilities, surveyed in the 2nd Stage of the Study, the unit water demand of 20L/c/day was adopted. This level is to ensure that residents of small towns can secure their minimum drinking water requirements. This unit water demand takes into account water losses and peak factor volume and does not take into account livestock, irrigation and factories because detailed information is lacking on the agriculture and industrial structure in the small towns.

Table 10.3: Water Coverage of the Selected Small Towns

No.	SNNPRS						Population	Water consumption	Water coverage
	Zone		Woreda		Town		2010	m3/day	%
	ID / Name		ID / Name		ID / Name			at total faucets	20Lcd.
							①	②	③=(②/0.02)/①
1	SZ-1	Gurage	SW-01	Sodo	S-01	Buei	6,961	208	149%
2	SZ-1	Gurage	SW-01	Sodo	S-02	Kela	3,519	57	81%
3	SZ-1	Gurage	SW-01	Sodo	S-03	Tiya	1,937	21	54%
4	SZ-1	Gurage	SW-01	Sodo	S-04	Suten	1,298	15	58%
5	SZ-1	Gurage	SW-03	Mareqo	S-06	Koshe	6,858	146	106%
6	SZ-2	Hadiya	SW-04	Lemmo	S-07	Lisana	1,711	97	283%
7	SZ-2	Hadiya	SW-05	Shashago	S-09	Dosha	1,881	3.6	10%
8	SZ-2	Hadiya	SW-07	Analemmo	S-11	Fonko	2,380	66	139%
9	SZ-2	Hadiya	SW-08	Mirab Badawocho	S-12	Wada	2,113	1	3%
10	SZ-3	Kembata Timbaro	SW-09	Anigacha	S-13	Anigacha	6,811	119	88%
11	SZ-3	Kembata Timbaro	SW-10	Kedia Gamela	S-14	Adilo	4,659	15	16%
12	SZ-3	Kembata Timbaro	SW-11	Dayiboya	S-15	Daniboya	8,111	69	43%
13	SZ-4	Sidama	SW-12	Shebedio	S-16	Leku	11,810	370	157%
14	SZ-4	Sidama	SW-13	Dara	S-17	Kebado	8,365	33	20%
15	SZ-4	Sidama	SW-13	Dara	S-18	Teferi Kela	4,178	33	39%
16	SZ-4	Sidama	SW-14	Gorche	S-19	Goreche	2,986	18	30%
17	SZ-4	Sidama	SW-15	Malga	S-20	Manicho	4,017	2	2%
18	SZ-4	Sidama	SW-16	Wensho	S-21	Bokasa (Bokaso)	2,039	2	5%
19	SZ-4	Sidama	SW-41	Alta Chuko	S-22	Chuko	8,884	1,977	1113%
20	SZ-4	Sidama	SW-18	Wendo Genet	S-23	Chuko	14,626	170	58%
21	SZ-4	Sidama	SW-18	Wendo Genet	S-24	Ela (Kela)	5,259	204	194%
22	SZ-5	Gedeo	SW-20	Kochore	S-27	Fiseha Genet	4,189	28	33%
23	SZ-5	Gedeo	SW-21	Gedeb	S-28	Gedeb	10,021	17	8%
24	SZ-6	Wolayita	SW-23	Humbo	S-30	Tabela (Humbo)	6,246	45	36%
25	SZ-6	Wolayita	SW-24	Deguna Fanigo	S-32	Dimtu	1,702	17	50%
26	SZ-7	Gamo Gofa	SW-26	Mirab Abaya	S-34	Birbir	5,831	293.8	252%
27	SZ-7	Gamo Gofa	SW-27	Chencha	S-35	Chenicha	10,223	67	33%
28	SZ-7	Gamo Gofa	SW-27	Chencha	S-36	Ezo	1,822	0	0%
29	SZ-7	Gamo Gofa	SW-27	Chencha	S-37	Dorze	1,256	0.14	0.6%
30	SZ-7	Gamo Gofa	SW-28	Amaro Special	S-38	Kele	8,632	154	89%
31	SZ-7	Gamo Gofa	SW-29	Burji Special	S-39	Soyama	6,268	1.5	1%
32	SZ-7	Gamo Gofa	SW-30	Konso Special	S-41	Segen	3,626	77	106%
33	SZ-7	Gamo Gofa	SW-31	Darashe Special	S-42	Gidole	13,176	90	34%
34	SZ-8	Silite	SW-32	Siliti	S-43	Kibat	5,676	199.7	176%
35	SZ-8	Silite	SW-32	Siliti	S-44	Alkeso	1,028	138.1	672%
36	SZ-8	Silite	SW-33	Lanifaro (Lanfuro)	S-46	Tora	9,163	55	30%
37	SZ-8	Silite	SW-33	Lanifaro (Lanfuro)	S-47	Mito	3,277	203	310%
38	SZ-8	Silite	SW-34	Dalocha	S-48	Dalocha	7,024	97	69%
39	SZ-8	Silite	SW-35	Sankura	S-49	Alem Gebeya	3,656	119	163%
40	SZ-8	Silite	SW-35	Sankura	S-51	Mazoria	2,730	8	15%
41	SZ-8	Silite	SW-36	Wilbareg	S-52	Wilbareg (Bilbareg)	2,197	34.1	78%
42	SZ-1	Gurage	SW-02	Meskan	S-53	Hamus-Gabeya(Bamo)	4,152	18	22%
43	SZ-2	Hadiya	SW-05	Shashago	S-54	Hirkofofo	2,590	6	12%
44	SZ-2	Hadiya	SW-06	Misrak Badawocho	S-55	Weyira Mazoria	8,346	0	0%
45	SZ-5	Gedeo	SW-20	Kochore	S-56	Biloya	4,484	4	4%
46	SZ-5	Gedeo	SW-21	Gedeb	S-57	Chorso-Mazoria	8,500	45	26%
47	SZ-6	Wolayita	SW-37	Damot Pulasa	S-58	Shento	5,345	14	13%
48	SZ-6	Wolayita	SW-38	Sodo Zuria	S-59	Dalbo (Wegene) Atowa	4,007	6	7%
49	SZ-7	Gamo Gofa	SW-39	Arba Minch Zuria	S-60	Lanite	7,221	34	24%
50	SZ-7	Gamo Gofa	SW-30	Konso Special	S-61	Gewada	5,967	0	0%
51	SZ-8	Silite	SW-32	Siliti	S-62	Udasa	4,470	18	20%
52	SZ-8	Silite	SW-40	Alicho wuriro	S-63	Kawakoto	783	4	27%
	Average						5,269		
	Total						274,011		

No.	Oromia region						Population	Water consumption	Water coverage
	Zone		Woreda		Town		2010	m3/day	%
	ID / Name		ID / Name		ID / Name			at total faucets	20Lcd.
							①	②	③=(②/0.02)/①
1	OZ-1	Arsi	OW-01	Hitosa	O-01	Iteya	14,239	390	137%
2	OZ-1	Arsi	OW-02	Ziway Dugda	O-02	Ogolcha (Agolcho)	4,759	123	129%
3	OZ-1	Arsi	OW-03	Tiyo	O-03	Gonde	4,350	349	401%
4	OZ-1	Arsi	OW-04	Digaluna Tijo	O-05	Kidame Digelu	1,780	190	535%
5	OZ-1	Arsi	OW-04	Digaluna Tijo	O-06	Sagure	10,926	190	87%
6	OZ-1	Arsi	OW-05	Munesa	O-07	Kersa	9,916	498	251%
7	OZ-4	West Arsi	OW-20	Limana Bilbilo	O-09	Meraro	4,725	16	17%
8	OZ-4	West Arsi	OW-08	Kofele	O-10	Kofele	14,401	109	38%
9	OZ-1	Arsi	OW-03	Tiyo	O-11	Kulumsa	3,472	8	12%
10	OZ-1	Arsi	OW-01	Hitosa	O-12	Boru Jawi	4,446	33	37%
11	OZ-3	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-20	Abosa	3,578	23	32%
12	OZ-3	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-22	Adami Tulu	8,166	421	258%
13	OZ-3	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-28	Jido	2,659	79	148%
14	OZ-1	Arsi	OW-03	Tiyo	O-29	Katar Genet	3,953	0	0%
15	OZ-1	Arsi	OW-20	Limana Bilbilo	O-30	Lemo Sirba	5,590	36	32%
16	OZ-2	Borena	OW-09	Teltele	O-31	Milami	4,510	26	29%
17	OZ-2	Borena	OW-21	Bure Hara	O-32	Garaba	7,500	223	149%
18	OZ-2	Borena	OW-10	Yabelo	O-33	El Woyya(Wayya)	4,090	6	7%
19	OZ-4	West Arsi	OW-22	Wondo	O-34	Bura (Busa)	5,112	0	0%
20	OZ-3	East Shewa	OW-19	Adama	O-35	Awash Mercasa	10,200	117	57%
21	OZ-3	East Shewa	OW-23	Bosat	O-36	Walanciti	11,260	761	338%
22	OZ-3	East Shewa	OW-23	Bosat	O-37	Doni	4,164	0	0%
23	OZ-3	East Shewa	OW-23	Bosat	O-38	Befa (Bofa)	7,040	257	183%
24	OZ-4	West Arsi	OW-22	Wondo	O-39	Intaye	8,500	0	0%
25	OZ-4	West Arsi	OW-08	Kofele	O-40	Kabate	4,146	6	7%
26	OZ-4	West Arsi	OW-14	Sheshemane	O-41	Awasho-Dhanku	7,040	0	0%
27	OZ-4	West Arsi	OW-14	Sheshemane	O-42	Hursa	5,700	4	4%
28	OZ-2	Borena	OW-12	Mijo (Miyo)	O-43	Hidi-Lola	6,550	30	23%
29	OZ-2	Borena	OW-13	Dugda dawa	O-44	Fincadaa (Fincawaa)	7,200	175	122%
30	OZ-3	East Shewa	OW-24	Liben	O-45	Adulala	3,601	0	0%
	Average						6,452		
	Total						193,573		

* 20Lpcd. = Daily water demand

The calculation method of water coverage is by the volume of water source (wells, springs) and water consumption at the end water supply facilities (actual water consumption by users). The values of water coverage on the above Table were calculated by water consumption at the end water supply facilities for the following reason.

- ✓ In most small towns, the detailed specifications and information of the water sources are not recorded or grasped.
- ✓ The information is based on the memory of the staff. Hence, there are sometimes discrepancies, mistakes and ambiguities in the information and figures they provided.

Data of water coverage by water consumption, which is based on the record of water sale at the each Public Faucet, House Connection and Business Connection, has higher accuracy than the abovementioned information of water sources.

b. Water demand projection

The target year of water supply plan in this study to be adopted is 2015. And design of the water supply facilities is to be for drinking water. Therefore, the water demand projection to be finally adopted is a value deduced from the current water coverage multiplied by target year and population growth rate (refer to .

Table 10.4: Water Demand Projection of the Small Towns in the Target Year (Plan of total volume)

No.	SNNPRS					Population (2010)	Population (2015) (Annual Growth 3.3%/year)	Water demand	Basic water projection	Water loss	Dauly average	Daily maximum
	Zone		Town Name			Total		20Lpcd	(m3/day)	(fc:0.15 m3/day)	(m3/day)	(fc:1.2 m3/day)
	ID / Name		Town ID			①	②=①×(1+3.3%)	③	④=②×③	⑤=④×15%	⑥=④+⑤	⑦=⑥×120%
1	SZ-3	Kembata Timbaro	S-14	(1)	Adilo	4,659	5,480	20	110	16	126	151
2	SZ-2	Hadiya	S-55	(2)	Weyira Mazoria	8,346	9,817	20	196	29	226	271
3	SZ-4	Sidama	S-17	(3)	Kebado	8,365	9,839	20	197	30	226	272
4	SZ-6	Wolayita	S-59	(4)	Dalbo (Wegene) Atowa	4,007	4,713	20	94	14	108	130
5	SZ-6	Wolayita	S-30	(5)	Tabela (Humbo)	6,246	7,347	20	147	22	169	203
6	SZ-7	Gamo Gofa	S-60	(6)	Lanite	7,221	8,494	20	170	25	195	235
7	SZ-6	Wolayita	S-58	(7)	Shento	5,345	6,287	20	126	19	145	174
8	SZ-4	Sidama	S-18	(8)	Teferi Kela	4,178	4,914	20	98	15	113	136
9	SZ-5	Gedeo	S-27	(9)	Fiseha Genet	4,189	4,927	20	99	15	113	136
10	SZ-5	Gedeo	S-28	(10)	Gedeb	10,021	11,787	20	236	35	271	325
11	SZ-3	Kembata Timbaro	S-15	(11)	Daniboya	8,111	9,541	20	191	29	219	263
12	SZ-8	Silite	S-51	(12)	(Welaya) Mazoria	2,730	3,211	20	64	10	74	89
13	SZ-7	Gamo Gofa	S-35	(13)	Chenicha	10,223	12,025	20	241	36	277	332
14	SZ-8	Silite	S-46	(14)	Tora	9,163	10,778	20	216	32	248	298
15	SZ-4	Sidama	S-20	(15)	Manicho	4,017	4,725	20	95	14	109	130
16	SZ-5	Gedeo	S-56	(16)	Biloya	4,484	5,274	20	106	16	121	146
17	SZ-3	Kembata Timbaro	S-13	(17)	Anigacha	6,811	8,011	20	160	24	184	221
18	SZ-5	Gedeo	S-57	(18)	Chorso-Mazoria	8,500	9,998	20	200	30	230	276
19	SZ-4	Sidama	S-19	(19)	Goreche	2,986	3,512	20	70	11	81	97
20	SZ-8	Silite	S-43	(20)	Kibat	5,676	6,676	20	134	20	154	184
21	SZ-4	Sidama	S-16	(21)	Leku	11,810	13,892	20	278	42	319	383
22	SZ-4	Sidama	S-22	(22)	Chuko	8,884	10,450	20	209	31	240	288
23	SZ-7	Gamo Gofa	S-37	(23)	Dorze	1,256	1,477	20	30	4	34	41
24	SZ-7	Gamo Gofa	S-34	(24)	Birbir	5,831	6,859	20	137	21	158	189
25	SZ-2	Hadiya	S-11	(25)	Fonko	2,380	2,799	20	56	8	64	77
26	SZ-7	Gamo Gofa	S-36	(26)	Ezo	1,822	2,143	20	43	6	49	59
27	SZ-8	Silite	S-44	(27)	Alkeso	1,028	1,209	20	24	4	28	33
28	SZ-8	Silite	S-52	(28)	Wilbareg (Bilbareg)	2,197	2,584	20	52	8	59	71
29	SZ-2	Hadiya	S-07	(29)	Lisana	1,711	2,013	20	40	6	46	56
30	SZ-2	Hadiya	S-09	(30)	Dosha	1,881	2,213	20	44	7	51	61
31	SZ-1	Gurage	S-06	(31)	Koshe	6,858	8,067	20	161	24	186	223
32	SZ-8	Silite	S-48	(32)	Dalocha	7,024	8,262	20	165	25	190	228
33	SZ-8	Silite	S-62	(33)	Udasa	4,470	5,258	20	105	16	121	145
34	SZ-1	Gurage	S-02	(34)	Kela	3,519	4,139	20	83	12	95	114
35	SZ-1	Gurage	S-01	(35)	Buei	6,961	8,188	20	164	25	188	226
36	SZ-4	Sidama	S-21	(36)	Bokasa (Bokaso)	2,039	2,398	20	48	7	55	66
37	SZ-7	Gamo Gofa	S-61	(37)	Gewada	5,967	7,019	20	140	21	161	194
38	SZ-7	Gamo Gofa	S-41	(38)	Segen	3,626	4,265	20	85	13	98	118
39	SZ-7	Gamo Gofa	S-39	(39)	Soyama	6,268	7,373	20	148	22	170	204
40	SZ-8	Silite	S-49	(40)	Alem Gebeya	3,656	4,300	20	86	13	99	119
41	SZ-1	Gurage	S-53	(41)	Hamus-Gabeya(Bamo)	4,152	4,884	20	98	15	112	135
42	SZ-2	Hadiya	S-54	(42)	Hirkofofo	2,590	3,047	20	61	9	70	84
43	SZ-8	Silite	S-47	(43)	Mito	3,277	3,855	20	77	12	89	106
44	SZ-8	Silite	S-63	(44)	Kawakoto	783	921	20	18	3	21	25
45	SZ-1	Gurage	S-04	(45)	Suten	1,298	1,527	20	31	5	35	42
46	SZ-1	Gurage	S-03	(46)	Tiya	1,937	2,278	20	46	7	52	63
47	SZ-7	Gamo Gofa	S-38	(47)	Kele	8,632	10,153	20	203	30	234	280
48	SZ-4	Sidama	S-24	(48)	Ela (Kela)	5,259	6,186	20	124	19	142	171
49	SZ-6	Wolayita	S-32	(49)	Dimtu	1,702	2,002	20	40	6	46	55
50	SZ-7	Gamo Gofa	S-42	(50)	Gidole	13,176	15,498	20	310	47	357	428
51	SZ-4	Sidama	S-23	(51)	Chuko	14,626	17,204	20	344	52	396	475
52	SZ-2	Hadiya	S-12	(52)	Wada	2,113	2,485	20	50	7	57	69

No.	Oromia Region					Population (2010)	Population (2015)	Water demand	Basic water projection	Water loss	Dauly average	Daily maximum
	Zone		Town Name			Total	(Annual Growth 3.3%/year)	20Lpcd	(m3/day)	(fc:0.15 m3/day)	(m3/day)	(fc:1.2 m3/day)
	ID / Name		Town ID			①	②=①×(1+3.3%)	③	④=②×③	⑤=④×15%	⑥=④+⑤	⑦=⑥×120%
1	OZ-1	Arsi	O-11	(1)	Kulumsa	3,472	4,084	82	20	12	94	113
2	OZ-1	Arsi	O-06	(2)	Sagure	10,926	12,852	257	20	39	296	355
3	OZ-4	West Arsi	O-09	(3)	Meraro	4,725	5,558	111	20	17	128	154
4	OZ-1	Arsi	O-29	(4)	Katar Genet	3,953	4,650	93	20	14	107	128
5	OZ-4	West Arsi	O-42	(5)	Hursa	5,700	6,705	134	20	20	154	185
6	OZ-4	West Arsi	O-41	(6)	Awasho-Dhanku	7,040	8,281	166	20	25	190	229
7	OZ-1	Arsi	O-12	(7)	Boru Jawi	4,446	5,230	105	20	16	120	144
8	OZ-4	West Arsi	O-40	(8)	Kabate	4,146	4,877	98	20	15	112	135
9	OZ-1	Arsi	O-30	(9)	Lemo Sirba	5,590	6,575	132	20	20	151	182
10	OZ-2	Borena	O-32	(10)	Garaba	7,500	8,822	176	20	26	203	243
11	OZ-1	Arsi	O-07	(11)	Kersa	9,916	11,664	233	20	35	268	322
12	OZ-1	Arsi	O-03	(12)	Gonde	4,350	5,117	102	20	15	118	141
13	OZ-1	Arsi	O-02	(13)	Ogolcha (Agolcho)	4,759	5,598	112	20	17	129	155
14	OZ-1	Arsi	O-05	(14)	Kidame Digelu	1,780	2,094	42	20	6	48	58
15	OZ-3	East Shewa	O-20	(15)	Abosa	3,578	4,209	84	20	13	97	116
16	OZ-2	Borena	O-31	(16)	Milami	4,510	5,305	106	20	16	122	146
17	OZ-2	Borena	O-33	(17)	El Woyya(Wayya)	4,090	4,811	96	20	14	111	133
18	OZ-3	East Shewa	O-28	(18)	Jido	2,659	3,128	63	20	9	72	86
19	OZ-3	East Shewa	O-22	(19)	Adami Tulu	8,166	9,605	192	20	29	221	265
20	OZ-4	West Arsi	O-39	(20)	Intaye	8,500	9,998	200	20	30	230	276
21	OZ-4	West Arsi	O-34	(21)	Bura (Busa)	5,112	6,013	120	20	18	138	166
22	OZ-4	West Arsi	O-10	(22)	Kofele	14,401	16,939	339	20	51	390	468
23	OZ-1	Arsi	O-01	(23)	Iteya	14,239	16,749	335	20	50	385	462
24	OZ-3	East Shewa	O-45	(24)	Adulala	3,601	4,236	85	20	13	97	117
25	OZ-3	East Shewa	O-36	(25)	Walanciti	11,260	13,245	265	20	40	305	366
26	OZ-3	East Shewa	O-37	(26)	Doni	4,164	4,898	98	20	15	113	135
27	OZ-3	East Shewa	O-38	(27)	Befa (Bofa)	7,040	8,281	166	20	25	190	229
28	OZ-3	East Shewa	O-35	(28)	Awash Mercasa	10,200	11,998	240	20	36	276	331
29	OZ-2	Borena	O-44	(29)	Fincadaa (Fincawaa)	7,200	8,469	169	20	25	195	234
30	OZ-2	Borena	O-43	(30)	Hidi-Lola	6,550	7,704	154	20	23	177	213

10.1.3 Groundwater development

a. Groundwater potential evaluation

a.1 Comparing groundwater recharge with consumption

The advantage of groundwater as a potential potable water source is summarized as follows; 1) Generally, the water is clean for drinking water in terms of water quality, 2) the amount of water is steady throughout the year and there is no dry up of water in the dry season, and 3) it is possible to use water sustainably.

The groundwater recharge in RVLB is speculated using the data of hydrology in the major lake sub-basins. The groundwater recharge in the major lake sub-basins are calculated from the net evaporation of each lake using the base flow index (BFI) as shown in Table 10.5.

Table 10.5: Groundwater Recharge in Major Lakes Basin

Sub-basin	Ziway	Langano	Abijata	Shalla	Awasa	Abaya	Chamo	Chew Bahir
Groundwater recharge	611.1	285.5	66.6	54.8	43.1	377.4	199.0	315.7

Each sub-basin is as shown in Figure 10.1.

The groundwater usage in those major sub-basins is calculated using the yield of wells by clarifying the current yield and the estimated yield in each small town at the time of 2025 (although target year of priority project is 2015 for design program, 2025 is used for this yield estimation). And then the groundwater usage is compared with the amount of groundwater recharge in each sub-basin. The results are given in Table 10.6.

The ratio of yield to the groundwater recharge is about less than 5% in each sub-basin, except Awasa sub-basin, in cases where the existing well yield is unchangeable, even after the estimated yield for 2025 is added. Furthermore those ratios are higher as a whole, because the values of 24 hours yield are applied for the yield of existing wells. The Awasa sub-basin area is small, and the recharge of groundwater is low. However, the region capital of SNNPRS exists in this sub-basin, and population is more than 0.11 million. So the ratio of yield to the groundwater recharge is higher than the other areas. In any event, the groundwater in RVLB is sufficiently able to use for the quantity at least for the time being in terms of the relation between the amount of yield and the groundwater recharge.

Table 10.6: Ratio of Yield to Groundwater Recharge

Sub-basin		Yield (existing wells)				Planned Yield (2025)		Ammount of Yield	Groundwater Recharge	Ratio to Groundwater Recharge(%)
		L/sec		m3/year	Mm3/year	m3/year	Mm3/year	Mm3/year	Mm3/year	
Ziway	Western Ziway	216.08	238.72	7528273.92	7.53	1317650	1.32	8.85	611.1	1.45
	Eastern Ziway	22.64								
Langano		6.8	6.8	214444.8	0.21	152570	0.15	0.36	285.5	0.13
Abijata		17.66	17.66	556925.76	0.56	213160	0.21	0.77	66.6	1.16
Shalla		22.63	22.63	713659.68	0.71	734745	0.73	1.44	54.8	2.63
Awasa		272.93	272.93	8607120.48	8.61	508445	0.51	9.12	43.1	21.16
Abaya	Bilate	190.15	523.65	16513826.4	16.51	2059695	2.06	18.57	377.4	4.92
	Gidabo	198.15								
	Galana	129.85								
	Kulfo Gina	5.5								
Chamo	Sife Chamo	6	14	441504	0.44	295285	0.3	0.74	199	0.37
	Konso Localzed	8								
Chew Bahir		29	29	914544	0.91	206225	0.21	1.12	315.7	0.35

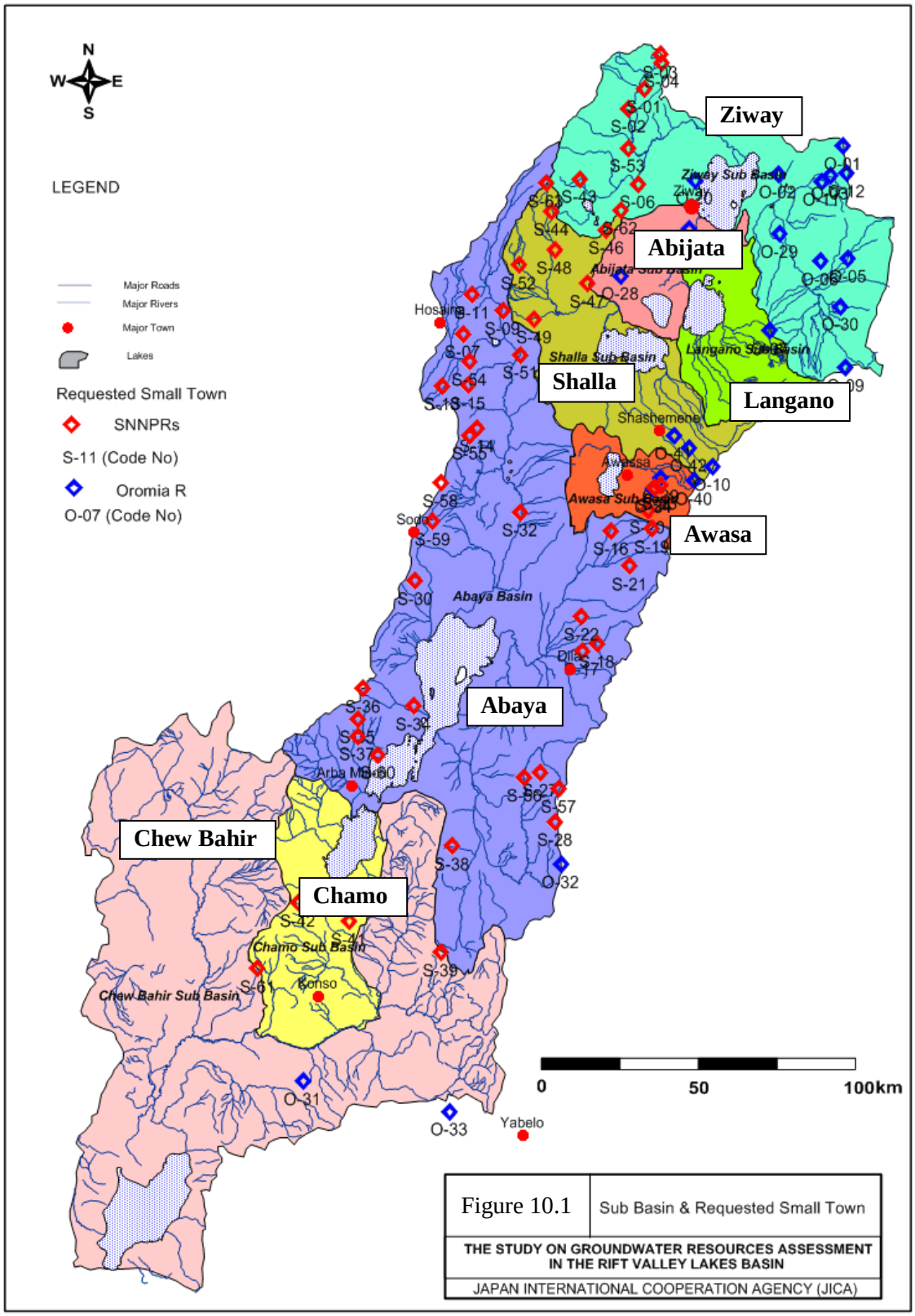


Figure 10.1: Sub-basin and Distribution of Requested Small Towns

b. Aquifer clarification and hydrogeological map

The aquifer clarification by aquifer units which indicates the bellwether for the groundwater potential is shown in Table 10.7. As the results of hydrogeological survey, aquifer units can be subdivided into the following three lithofacies;

1) Alluvium and lacustrine deposits

2) Pleistocene tuff, tuff breccia and basaltic rock units

3) Plio-Pleistocene tuff and basalt

The hydrogeological map described by the geology and the aquifer clarification is also shown in Figure 10.3. The distribution of requested small towns is illustrated in the hydrogeological map for reference of the groundwater potential (estimation of yield).

Table 10.7: Aquifer Clarification of RVLB

Period/Epoch		Stratigraphy	Name of strata	Major Lithology	Aquifer Code	Nature of Aquifer	Remarks
Cenozoic	Quartenary	Al / Q	Alluvium, unclassified fluvial deposits	Fine sand - mud	1B	Aquifers with intergranular permeability	Good permeability at the sand layer and aquiclude at clay
	Holocene	lac 2	Bulbula Lacustrine Deposits	Lake deposits such as gravel, sand and mud	1C	Aquifers with intergranular permeability	Permeability is high at sand and gravel. Clayey layer may become aquictard
		Pm volcan	Corbetti Pumice Flow & Fall Deposits/ Corbetti Rhyolitic	Rhyolite lava flows, pumice falls, pumice flow deposits and Obsidian lava flows	3C	Aquifers with fracture permeability	It may be good aquifer if the lower layer become aquitard
		rb	Butajira Recent Basalt	Basalt lavas and reddish brown basaltic scoria	3C	Aquifers with fracture permeability	Low permeability at the massive basalt. It may be good aquifer if the lower layer become aquitard
		lac 1	Meki Lacustrine Deposits	Lake deposits such as poorly-sorted gravel, sand, pumice, tuff, and volcanic sand	1B	Aquifers with intergranular permeability	It may be good aquifer if the lower layer become aquitard
	Pleistcene	Y	Langano Poorly Welded Pumiceous Pyroclastics	Yellowish white rhyolitic pumice tuff	1B	Aquifers with intergranular permeability	Partialy good aquifer at the exsistance of lower aquitard
		ob	Kulmusa Highly Welded Tuff	Rhyolitic to andestic welded tuff	3B	Aquifers with fracture permeability	The lower aquitard is essential, however it has good potential aquifer
		W	Ketar River Acidic Volcanic Sedimentary Rocks	Rhyolitic tuffs and pumice tuffs	1B	Aquifers with intergranular permeability	The permeability is high knowing that the massive aquited existance at lower layer
		G	Gonde Strongly Green Welded Tuff	Rhyolitic to andestic welded tuff	3A	Aquifers with fracture permeability	The fractures and fissures are well developped and form good aquifer in the area
		tb	Adami Tulu Basaltic Pyroclastics	Basaltic tuff breccias and lapilli tuffs	3A	Aquifers with fracture permeability	The fractures and fissures are well developped and form good aquifer in the area
		ba	Ogolche Pleistocene Basalt	Massive basalt lavas	3B	Aquifers with fracture permeability	Even massive basalt, fracture and fissures are partialy developped. The fissure zones are recognized as good aquifer
		lak e	Lekansho Lacustrine Deposits	Lake deposits such as gravel, sand and mud	1C	Aquifers with intergranular permeability	Semi consolidated formation. Partialy good aquifer has been formed
	Tertiary Plio-Pleistcene	rh	Gademotta Rhyolite	Rhyolite lava flows and rhyolitic tuffs	3A	Aquifers with fracture permeability	The layer is defined as the upper portion of hydrogeological basement. Fracture basalt, ehyolite and permeable pumice layer has capacity of good aquifer
		N2b	N2b Basal	Basalt lavas and basaltic pyroclastics			
		NOs	NQ s Rhyolite	Rhyolitic tuffs			
	Pliocene	rht/N1_2n	N1_2n Rhyolite	Plagiocrase rhyolite tuff	3C	Localized aquifers with fracture and intergranular permeability	The basic nature of these formations are not cleary understood. Alternation of basalt and rhyolitic tuff. The possible aquifer may be localy developped fracture rich rocks and tuff
		N1n	N1n Basalt	Anchar Basalt	3B	Localized aquifers with fracture and intergranular permeability	
		N1ar	N1ar Rhyolite	Rhyolite			
	Miocene	Ngs	Sharenga Rhyolite	Rhyolite piles and necks	3C	Localized aquifers with fracture and intergranular permeability	
		Ngu	Upper Basalt	Porous basalt lavas			
		Ngb	Beyana Tuff	Lapilli tuff with minor laminated tuff			
		Ngm	Middle Basalt	Porphyritic basalt lavas			
	Eocene-Origocene	Pgs	Shole Welded Tuff	Densely-welded rhyolitic welded tuff	3C	Localized aquifers with fracture and intergranular permeability	
		Pgl	Lower Basalt	Porphyritic basalt lavas			
Mesozoic		Mes	Adigrat Sandstone, Antaro Limestone	Sandstone, Shale and Limestone	4D	Localized aquifers with fracture and intergranular permeability	
Pre-Cambrian		Pre	Biotite Gneiss, Pegmatite	Biotite Gneiss, Granite, Biotite Metagranite			

References: (1) Laury and Albritton 1975, (2) Mohr et al. 1980, (3) EIGS-GLE 1985, (4) Woldegabriel et al. 1990, (5) GSE 1994, (6) GSE 2002, (7) EWTEC 2008

c. Water demand and development budget

The water demand projection in regard to the water supply plan of 2015 was mentioned above; the basic data for the future simulation of the usage of groundwater are described in here. First of all, population growth is estimated from a base year of 2010 up until 2025 to predict future water demand for groundwater usage. The growth rate of population is as follows based on the socio-economic survey: 2010-2015: 3.3%, 2016-2020: 2.8%, and 2021-2025: 2.5%. The daily maximum domestic water demand is estimated by multiplying the unit water demand per capita in a town with its estimated population for each year. The transition of the amount of water is shown in Figure 10.2 below. The high priority small town might be implemented in SNNPRS for the target year of 2015. After that, a high priority constructions of Oromia Region might be conducted in 2017, 2018, but this is just a plan. The other small towns which are not selected for the high priority might be drilled using the budget of Ethiopian government from 2016. According to UAP (Universal Access Program), the target is to attain the 100% water supply in the town areas by 2012. However, it has now become impossible to attain this goal. After that, UAP2 was adopted newly as the target year from 2011 to 2015. Although it is unclear how to use and change the expected water supply facilities budget, the budget which was planned for the construction of facilities in the towns is distributed according to the budget of 2015 allocated to SNNPRS and Oromia Region. The result of comparing the above budget distributed with the projects budget calculated by the construction fees planned from 2015 to 2025 is shown in Table 10.8. If the government budget except the priority projects will be leveraged on schedule, the groundwater development plan will be implemented through this plan.

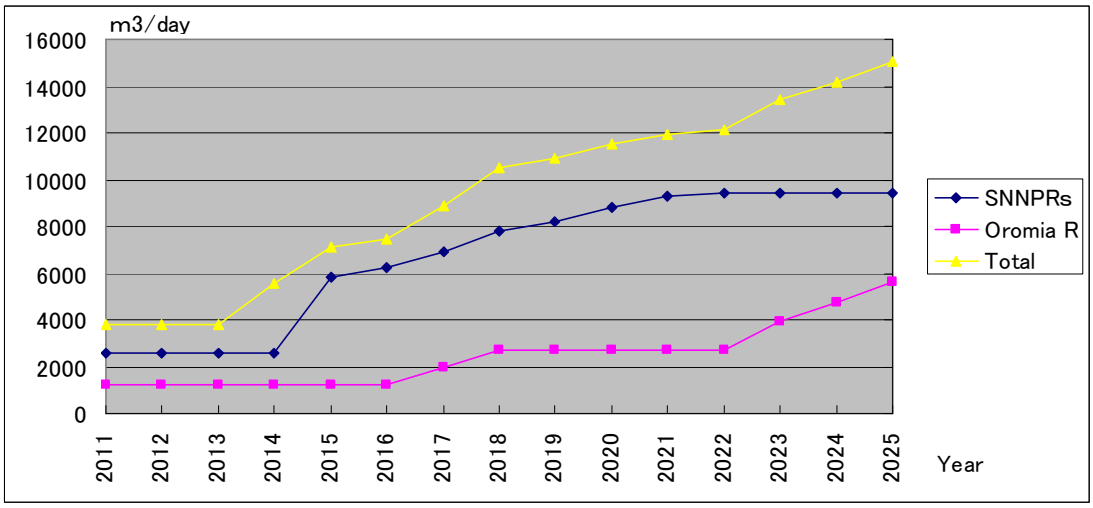


Figure 10.2: Estimated Annual Water Demand of Two Regions (daily maximum)

Table 10.8: Estimated Annual Budget

(USD million)

Type of Scheme	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
High Priority Town (Deep well)	–	–	–	–		–			–	–	–	–	–	–	–
Expanded Piped Scheme (Deep Well)	–	–	–	–	–										
Existing wells (continuance)															
Budget of Scheme	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
High Priority Town	–	–	–	–	12	–	7.85	7.85	–	–	–	–	–	–	–
Expanded Piped Scheme (Deep Well)	–	–	–	–	0	8.23	13.08	14.63	5.49	5.49	6.86	5.49	6.22	6.22	9.33
Expected Financing of External	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Assumed to be implemented as JGA	–	–	–	–	12	0	7.85	7.85	–	–	–	–	–	–	–
GOE (from UAP)	–	–	–	–	0	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7

1USD=75.84Yen、1Birr=4.451Yen（JICA Rate:2011, Nov.）

d. Possibility of groundwater development

The groundwater potential of the northern part of Lake Abaya and its surrounding area will be able to expect a moderate to high production capacity except the northeast-east side of Lake Awasa in accordance with the hydrogeological map. The point is quality, not quantity; the areas that exceed the water quality standard are recognized in Lake Ziway and its surrounding area of Oromia Region, southeast of Butajila, and Lake Awasa and its surrounding area of SNNPRS. On the other hand, the basalt and tuff of Miocene of Pre Tertiary and the gneiss and granite of Pre-Cambrian is mainly distributed in the southern part from Lake Abaya and its surrounding area, so the capacity of the aquifer is predicted to be poor to moderate in these areas. The Quaternary deposits distributed in the lowland of above area and the water potential is estimated as the moderate productivity in those areas. The necessary daily yield of water resources in reference to the estimated water demands regarding the requested small towns is planned until 2025 based on a standard population of 2010. And also, the hydrogeological conditions of each small town are shown in the following Table 10.7 in consideration of the relation between the location of each small town and hydrogeological map.

The high priority small towns are located in the area of northern Lake Abaya and its surrounds, which consists of Pleistocene deposits, and has a moderate to high productivity of water resources. The aquifer depths of wells (screen depth) estimated by the hydrogeological map is mainly 130m-150m, 50-70m in depth. Well drilling depth is estimated to be from 100m to 200m. The yield predicted is 3L/sec~7L/sec. The remaining high priority small towns are located in the area south of Lake Abaya and its surrounds, and the aquifer capacity shows a low to moderate productivity. The aquifer of wells assumed by the hydrogeological map is 80m-100m in depth and well drilling depth is 150m in depth probably. The yield is estimated to be about 2L/sec~5L/sec. All small towns targeted for the priority project in Oromia Region are located in the area north of Lake Awasa and its surrounds, and almost all in particular in east of Lake Ziway. The groundwater potential has a low to moderate production capacity, and aquifer depth is extensively about 30m-100m and 130m-150m. The well depth is assumed to be 150m-200m in depth.

The small towns requested except the high priority small town in SNNPRS are all within the RVLB, and in Oromia Region most of the small towns are located in the northern part of Lake Abaya. The groundwater potential in SNNPRS for the requested small towns is mainly of moderate productivity; however, in the small towns of southern area of Lake Awasa and its surrounding area, the aquifer capacity indicates poor to low productivity. The groundwater potential in Oromia Region for the requested small towns is low to moderate productivity. The detailed hydrogeological conditions of each small town are shown in the below table.

Table 10.9: Hydrogeological Conditions of Small Towns

No.	SNNPRS Zone ID	Zone Name	Town ID		Town Name	Easting	Northing	Elevation	Population 2,010	2,011 (m3/day)	2,012 (m3/day)	2,013 (m3/day)	2,014 (m3/day)	2,015 (m3/day)	2,016 (m3/day)	2,017 (m3/day)	2,018 (m3/day)	2,019 (m3/day)	2,020 (m3/day)	2,021 (m3/day)	2,022 (m3/day)	2,023 (m3/day)	2,024 (m3/day)	2,025 (m3/day)
1	SZ-3	Kembata Timbaro	S-14	(1)	Adilo	387502	796712	1,955	4,659	15	15	15	15	151	151	151	151	151	151	151	151	151	151	151
2	SZ-2	Hadiya	S-55	(2)	Weyira Mazoria	384678	793963	2,028	8,346	0	0	0	0	271	271	271	271	271	271	271	271	271	271	271
3	SZ-4	Sidama	S-17	(3)	Kebado	427292	715624	1,804	8,365	33	33	33	33	272	272	272	272	272	272	272	272	272	272	272
4	SZ-6	Wolayita	S-59	(4)	Dalbo (Wegene) Atowa	370680	762721	2,144	4,772	6	6	6	6	155	155	155	155	155	155	155	155	155	155	155
5	SZ-6	Wolayita	S-30	(5)	Tabela (Humbo)	364091	741131	1,628	6,246	45	45	45	45	203	203	203	203	203	203	203	203	203	203	203
6	SZ-7	Gamo Gofa	S-60	(6)	Lanite	350026	678098	1,198	7,221	35	35	35	35	235	235	235	235	235	235	235	235	235	235	235
7	SZ-6	Wolayita	S-58	(7)	Shento	373639	776639	1,966	5,345	14	14	14	14	174	174	174	174	174	174	174	174	174	174	174
8	SZ-4	Sidama	S-18	(8)	Teferi Kela	432846	718356	1,874	4,178	33	33	33	33	136	136	136	136	136	136	136	136	136	136	136
9	SZ-5	Gedeo	S-27	(9)	Fiseha Genet	411345	671729	2,202	4,189	28	28	28	28	136	136	136	136	136	136	136	136	136	136	136
10	SZ-5	Gedeo	S-28	(10)	Gedeb	416921	653784	2,251	10,021	16	16	16	16	325	325	325	325	325	325	325	325	325	325	325
11	SZ-3	Kembata Timbaro	S-15	(11)	Daniboya	383977	812084	2,165	8,111	68	68	68	68	263	263	263	263	263	263	263	263	263	263	263
12	SZ-8	Silite	S-51	(12)	(Welaya) Mazoria	403911	823298	1,829	2,730	8	8	8	8	89	89	89	89	89	89	89	89	89	89	89
13	SZ-7	Gamo Gofa	S-35	(13)	Chenicha	342198	691040	2,730	10,223	67	67	67	67	332	332	332	332	332	332	332	332	332	332	332
14	SZ-8	Silite	S-46	(14)	Tora	436358	868558	1,997	9,163	55	55	55	55	298	298	298	298	298	298	298	298	298	298	298
15	SZ-4	Sidama	S-20	(15)	Manicho	451882	767072	2,164	4,017	2	2	2	2	130	130	130	130	130	130	130	130	130	130	130
16	SZ-5	Gedeo	S-56	(16)	Biloya	405405	669769	1,965	4,484	4	4	4	4	146	146	146	146	146	146	146	146	146	146	146
17	SZ-3	Kembata Timbaro	S-13	(17)	Anigacha	374202	811859	2,313	6,811	120	120	120	120	221	221	221	221	221	221	221	221	221	221	221
18	SZ-5	Gedeo	S-57	(18)	Chorso-Mazoria	418355	665767	2,445	8,500	44	44	44	44	276	276	276	276	276	276	276	276	276	276	276
19	SZ-4	Sidama	S-19	(19)	Goreche	453653	759991	2,387	2,986	18	18	18	18	97	97	97	97	97	97	97	97	97	97	97
20	SZ-8	Silite	S-43	(20)	Kibat	426149	887107	2,108	5,676	114	114	114	114	114	114	114	114	114	114	217	217	217	217	217
21	SZ-4	Sidama	S-16	(21)	Leku	438137	759326	1,868	11,810	236	236	236	236	236	236	236	236	236	440	440	440	440	440	440
22	SZ-4	Sidama	S-22	(22)	Chuko	426989	728189	1,868	8,884	178	178	178	178	178	178	178	178	178	331	331	331	331	331	331
23	SZ-7	Gamo Gofa	S-37	(23)	Dorze	342151	684810	2,466	1,256	0	0	0	0	0	42	42	42	42	42	42	42	42	42	42
24	SZ-7	Gamo Gofa	S-34	(24)	Birbir	363450	695658	1,239	5,831	117	117	117	117	117	117	117	117	117	117	223	223	223	223	223
25	SZ-2	Hadiya	S-11	(25)	Fonko	385587	844936	2,284	2,380	48	48	48	48	48	48	48	48	48	48	48	93	93	93	93
26	SZ-7	Gamo Gofa	S-36	(26)	Ezo	344386	702079	2,825	1,822	0	0	0	0	0	61	61	61	61	61	61	61	61	61	61
27	SZ-8	Silite	S-44	(27)	Alkeso	415670	875249	2,283	1,028	21	21	21	21	21	21	21	21	21	21	21	40	40	40	40
28	SZ-8	Silite	S-52	(28)	Wilbareg (Bilbareg)	403219	855693	2,004	2,197	29	29	29	29	29	29	29	29	80	80	80	80	80	80	80
29	SZ-2	Hadiya	S-07	(29)	Lisana	382047	830873	2,157	1,711	34	34	34	34	34	34	34	34	34	34	34	67	67	67	67
30	SZ-2	Hadiya	S-09	(30)	Dosha	397071	839228	1,930	1,881	0	0	0	0	0	63	63	63	63	63	63	63	63	63	63
31	SZ-1	Gurage	S-06	(31)	Koshe	448175	885173	1,891	6,858	129	129	129	129	129	129	129	129	129	256	256	256	256	256	256
32	SZ-8	Silite	S-48	(32)	Dalocha	416683	861330	1,957	7,024	97	97	97	97	97	97	97	97	255	255	255	255	255	255	255
33	SZ-8	Silite	S-62	(33)	Udasa	441600	875629	2,040	4,470	18	18	18	18	18	18	18	158	158	158	158	158	158	158	158
34	SZ-1	Gurage	S-02	(34)	Kela	444689	912633	1,927	3,519	57	57	57	57	57	57	57	57	128	128	128	128	128	128	128
35	SZ-1	Gurage	S-01	(35)	Buei	450564	919685	2,029	6,961	139	139	139	139	139	139	139	139	139	259	259	259	259	259	259
36	SZ-4	Sidama	S-21	(36)	Bokasa (Bokaso)	445220	746447	2,010	2,039	2	2	2	2	2	68	68	68	68	68	68	68	68	68	68
37	SZ-7	Gamo Gofa	S-61	(37)	Gewada	304567	600363	1,612	5,967	0	0	0	0	0	0	205	205	205	205	205	205	205	205	205
38	SZ-7	Gamo Gofa	S-41	(38)	Segen	338910	617582	1,628	3,626	73	73	73	73	73	73	73	73	73	73	139	139	139	139	139
39	SZ-7	Gamo Gofa	S-39	(39)	Soyama	373669	606300	1,902	6,268	0	0	0	0	0	0	215	215	215	215	215	215	215	215	215
40	SZ-8	Silite	S-49	(40)	Alem Gebeya	409074	836119	1,718	3,656	73	73	73	73	73	73	73	73	73	73	140	140	140	140	140
41	SZ-1	Gurage	S-53	(41)	Hamus-Gabeya(Bamo)	444381	898358	1,839	4,152	0	0	0	0	0	0	142	142	142	142	142	142	142	142	142
42	SZ-2	Hadiya	S-54	(42)	Hirkofofo	384570	820680	1,896	2,590	0	0	0	0	0	0	89	89	89	89	89	89	89	89	89
43	SZ-8	Silite	S-47	(43)	Mito	429240	848987	1,718	3,277	66	66	66	66	66	66	66	66	66	66	66	128	128	128	128
44	SZ-8	Silite	S-63	(44)	Kawakoto	413574	885422	1,718	783	4	4	4	4	4	4	4	28	28	28	28	28	28	28	28
45	SZ-1	Gurage	S-04	(45)	Suten	457353	928959	2,289	1,298	0	0	0	0	0	0	45	45	45	45	45	45	45	45	45
46	SZ-1	Gurage	S-03	(46)	Tiya	456768	932196	2,320	1,937	0	0	0	0	0	65	65	65	65	65	65	65	65	65	65
47	SZ-7	Gamo Gofa	S-38	(47)	Kele	377988	644892	1,648	8,632	154	154	154	154	154	154	154	154	313	313	313	313	313	313	313
48	SZ-4	Sidama	S-24	(48)	Ela (Kela)	454618	775068	1,700	5,259	105	105	105	105	105	105	105	105	105	105	201	201	201	201	201
49	SZ-6	Wolayita	S-32	(49)	Dimtu	403721	766084	1,521	1,702	0	0	0	0	0	57	57	57	57	57	57	57	57	57	57
50	SZ-7	Gamo Gofa	S-42	(50)	Gidole	319680	624237	2,066	13,176	90	90	90	90	90	90	90	465	465	465	465	465	465	465	465
51	SZ-4	Sidama	S-23	(51)	Chuko	456586	775754	1,718	14,626	170	170	170	170	170	170	170	516	516	516	516	516	516	516	516
	SNNPRs 計									2,565	2,565	2,565	2,565	5,862	6,215	6,911	7,794	8,232	8,836	9,273	9,433	9,433	9,433	9,433

No.	Town Name	Unit Water Demand Lpcd	Water Supply Ratio (2010) (%)	Existing Water Consumption (2010) (m3/day)	Candidate Water Sources	Necessary Water Amount (L/sec)	Number of Wells	Predicted Yield of Wells (L/sec)	Predicted Well Depth (m)	Predicted Aquifer Depth (m)	Drilling Depth (m)	Anticipated Hydrogeological Conditions
1	Adilo	20	16	15	Deep Tube Well	4.7	1	4.7	200	130-150	200	Hydrogeological productivity: Moderate, Geology: Rhyolite and high permeability acidic volcanic sedimentary rocks, Aquifer: Upper part of rhyolite
2	Weyira Mazoria	20	0	0	Deep Tube Well	9.4	2	5.6	200	130-150	400	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
3	Kebado	20	20	33	Deep Tube Well	8.3	2	5	150	80-100	300	Hydrogeological productivity: Moderate, Geology: Rhyolite and Ogolche Pleistocene Basalt, Aquifer: Same as geology, but lower part of Rhyolite is impermeable layer
4	Dalbo (Wegene) Atowa	20	6	6	Deep Tube Well	5.2	2	5	100	50-70	200	Hydrogeological productivity: High, Geology: Gademotta Rhyolite, Aquifer: Gademotta Rhyolite, but lower part of Rhyolite is aquitard
5	Tabela (Humbo)	20	36	45	Deep Tube Well	5.5	2	2.8	100	50-70	200	Hydrogeological productivity: Moderate-High, Geology: Gademotta Rhyolite and welded tuff, Aquifer: both geology, but lower part of Rhyolite is impermeable layer
6	Lanite	20	24	35	Deep Tube Well	6.9	2	5	150	80-120	300	Hydrogeological productivity: Less than moderate, Geology: Tertiary basalt and rhyolite and Quaternary deposits, Aquifer: Fissures in rocks are very important
7	Shento	20	13	14	Deep Tube Well	5.5	1	7.5	200	130-150	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
8	Teferi Kela	20	40	33	Deep Tube Well	3.6	1	5	150	80-100	150	Hydrogeological productivity: Low-Moderate, Geology: Rhyolite and Ogolche Pleistocene Basalt, Aquifer: Same as geology, but lower part of Rhyolite is impermeable layer
9	Fiseha Genet	20	33	28	Deep Tube Well	3.7	3	1.7	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basalt, Aquifer: Fissure of rocks are very important
10	Gedeb	20	8	16	Deep Tube Well	10.7	3	5	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basalt, Aquifer: Fissures in rocks are very important
11	Daniboya	20	42	68	Deep Tube Well	6.8	2	3.6	200	130-150	400	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
12	(Welaya) Mazoria	20	14	8	Deep Tube Well	2.8	1	3.4	150	30-80	150	Hydrogeological productivity: High, Geology: Distribution of welded tuff, Aquifer: Welded tuff, acidic volcanic sedimentary rocks distributed in surrounding area
13	Chenicha	20	33	67	Deep Tube Well	9.2	2	5	150	80-100	300	Hydrogeological productivity: Low, Geology: Tertiary basult, Aquifer: Fissures in rocks are very important
14	Tora	20	30	55	Deep Tube Well	8.4	3	3	150	80-100	450	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
15	Manicho	20	2	2	Deep Tube Well	4.5	1	5.8	100	50-70	100	Hydrogeological productivity: Low, Geology: N1_2n Rhyolitic Volcanics, Aquifer: Upper part of this rhyolite, but permeability of lower part of rhyolite is unclear
16	Biloya	20	4	4	Deep Tube Well	4.9	3	2.4	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basalt, Aquifer: Fissures in rocks are very important
17	Anigacha	20	88	120	Deep Tube Well	3.5	1	5.5	200	130-150	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
18	Chorso-Mazoria	20	26	44	Deep Tube Well	8.1	2	5	150	80-100	300	Hydrogeological productivity: Low, Geology: Tertiary basult, Aquifer: Fissures in rocks are very important
19	Goreche	20	30	18	Deep Tube Well	2.7	1	5	100	50-70	100	Hydrogeological productivity: Low, Geology: N1_2n Rhyolitic Volcanics, Aquifer: Upper part of this rhyolite, but permeability of lower part of rhyolite is unclear
20	Kibat	20	100	114	Deep Tube Well	3.6	3	1.7	200	130-150	600	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
21	Leku	20	100	236	Deep Tube Well	7.1	4	2	100	50-70	400	Hydrogeological productivity: High, Geology: N1_2n Rhyolitic Volcanics, Aquifer: Upper part of this rhyolite, but permeability of lower part of rhyolite is unclear
22	Chuko	20	100	178	Deep Tube Well	5.3	2	5.1	200	100-150	400	Hydrogeological productivity: Moderate, Geology: Rhyolite, Ogolche Pleistocene Basalt and acidic volcanic sedimentary rocks, Aquifer: Ogolche Pleistocene Basalt
23	Dorze	20	0.6	0	Deep Tube Well	1.5	2	1	150	80-100	300	Hydrogeological productivity: Low, Geology: Tertiary basalt, Aquifer: Fissures in rocks are very important
24	Birbir	20	100	117	Deep Tube Well	3.7	1	5.5	150	80-100	150	Hydrogeological productivity: Less than moderate, Geology: Tertiary basalt and rhyolite and Quaternary deposits, Aquifer: Fissure of rocks are very important
25	Fonko	20	100	48	Deep Tube Well	1.6	1	4	200	130-150	200	Hydrogeological productivity: Less than moderate, Geology: Tertiary basalt and rhyolite and Quaternary deposits, Aquifer: Fissure of rocks are very important
26	Ezo	20	0	0	Deep Tube Well	2.1	3	1	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basalt, Aquifer: Fissure of rocks are very important
27	Alkeso	20	100	21	Deep Tube Well	0.7	1	5	150	50-100	150	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
28	Wilbareg (Bilbareg)	20	66	29	Deep Tube Well	1.8	2	1.2	150	50-100	300	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
29	Lisana	20	100	34	Deep Tube Well	1.1	1	5	200	130-170	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
30	Dosha	20	0	0	Deep Tube Well	2.2	1	5	150	80-120	150	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
31	Koshe	20	94	129	Deep Tube Well	4.4	2	2.3	200	80-150	400	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
32	Dalocha	20	69	97	Deep Tube Well	5.5	2	5	220	130-180	440	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
33	Udasa	20	20	18	Deep Tube Well	4.8	1	5	150	80-100	150	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
34	Kela	20	81	57	Deep Tube Well	2.4	1	3	150	80-120	150	Hydrogeological productivity: Low-a part of moderate, Geology: Tertiary basalt, rhyolite and acidic volcanic sedimentary rocks, Aquifer: Fissure of rocks are very important
35	Buei	20	100	139	Deep Tube Well	4.2	1	5	150	80-100	150	Hydrogeological productivity: Low-Moderate, Geology: Tertiary basalt and Rhyolite, Aquifer: Fissure of rocks are very important
36	Bokasa (Bokaso)	20	5	2	Deep Tube Well	2.3	3	1	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basalt, Aquifer: Fissures in rocks are very important
37	Gewada	20	0	0	Deep Tube Well	7.1	8	1	150	80-100	1200	Hydrogeological productivity: Low, Geology: Pre-combrian deposits and Tertiary basalt, Aquifer: Fissures in rocks are very important
38	Segen	20	100	73	Deep Tube Well	2.3	3	1	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basult, Aquifer: Fissure of rocks is very important
39	Soyama	20	0	0	Deep Tube Well	7.5	2	5	150	80-100	300	Hydrogeological productivity: Low, Geology: Pre-combrian deposits, Tertiary basult and Quaternary deposits, Aquifer: Fissure of rocks is very important
40	Alem Gebeya	20	100	73	Deep Tube Well	2.3	1	4	300	200-250	300	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
41	Hamus-Gabeya(Bamo)	20	0	0	Deep Tube Well	4.9	4	1.5	200	80-150	800	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
42	Hirkofofo	20	0	0	Deep Tube Well	3.1	1	3.6	200	130-150	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
43	Mito	20	100	66	Deep Tube Well	2.2	1	3.4	200	80-150	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
44	Kawakoto	20	27	4	Deep Tube Well	0.8	1	3.5	150	30-100	150	Hydrogeological productivity: Low-Moderate, Geology: Mainly high permeability acidic volcanic sedimentary rocks, Aquifer: If welded tuff exists, one is aquifer
45	Suten	20	0	0	Deep Tube Well	1.5	1	5	150	80-100	150	Hydrogeological productivity: Low, Geology: Tertiary basult and N1_2n Rhyolitic Volcanics, Aquifer: If upper part of those layers is high permeability, productivity will increase
46	Tiya	20	0	0	Deep Tube Well	2.2	2	1.5	150	80-100	300	Hydrogeological productivity: Poor, Geology: Tertiary basult and N1_2n Rhyolitic Volcanics, Aquifer: If upper part of those layers is high permeability, productivity will increase
47	Kele	20	89	154	Deep Tube Well	5.5	6	1	150	80-100	900	Hydrogeological productivity: Low, Geology: Pre-combrian deposits and Tertiary basult, Aquifer: Fissure of rocks is very important
48	Ela (Kela)	20	100	105	Deep Tube Well	3.3	1	5	150	30-100	150	Hydrogeological productivity: Poor-Low, Geology: Lacastrine Deposits, Aquifer: If basalt and tuff breccia exist, productivity is high, Rhyolite distributes below. A part of Rhyolite.
49	Dimtu	20	0	0	Deep Tube Well	2	2	1	150	80-100	300	Hydrogeological productivity: Low, Geology: Pre-combrian deposits and Tertiary basult, Aquifer: Fissure of rocks is very important
50	Gidole	20	34	90	Deep Tube Well	13	3	5.3	150	80-100	450	Hydrogeological productivity: Low, Geology: Tertiary basult, Aquifer: Fissure of rocks is very important
51	Chuko	20	58	170	Deep Tube Well	12	3	5	150	30-100	450	Hydrogeological productivity: Poor-Low, Geology: Lacastrine Deposits, Aquifer: If basalt and tuff breccia exist, productivity is high, Rhyolite distributes below. A part of Rhyolite.
	SNNPRs 計										16,640	

No.	Oromia Region Zone ID	Zone Name	Town ID		Town Name	Easting	Northing	Elevation	2,010 ①	2,011 (m3/day)	2,012 (m3/day)	2,013 (m3/day)	2,014 (m3/day)	2,015 (m3/day)	2,016 (m3/day)	2,017 (m3/day)	2,018 (m3/day)	2,019 (m3/day)	2,020 (m3/day)	2,021 (m3/day)	2,022 (m3/day)	2,023 (m3/day)	2,024 (m3/day)	2,025 (m3/day)
1	OZ-1	Arsi	O-11	(1)	Kulumsa	517670	886130	2,215	3,472	8	8	8	8	8	8	8	122	122	122	122	122	122	122	122
2	OZ-1	Arsi	O-06	(2)	Sagure	517142	857073	2,521	10,926	190	190	190	190	190	190	190	385	385	385	385	385	385	385	385
3	OZ-4	West Arsi	O-09	(3)	Meraro	526870	818549	2,979	4,725	16	16	16	16	16	16	16	167	167	167	167	167	167	167	167
4	OZ-1	Arsi	O-29	(4)	Katar Genet	501766	867164	2,195	3,953	0	0	0	0	0	0	136	136	136	136	136	136	136	136	136
5	OZ-4	West Arsi	O-42	(5)	Hursa	467482	789539	2,395	5,700	4	4	4	4	4	4	196	196	196	196	196	196	196	196	196
6	OZ-4	West Arsi	O-41	(6)	Awasho-Dhanku	461770	793962	2,129	7,040	0	0	0	0	0	0	242	242	242	242	242	242	242	242	242
7	OZ-1	Arsi	O-12	(7)	Boru Jawi	527151	889046	2,370	4,446	33	33	33	33	33	33	33	157	157	157	157	157	157	157	157
8	OZ-4	West Arsi	O-40	(8)	Kabate	469466	777475	-	4,146	0	0	0	0	0	0	142	142	142	142	142	142	142	142	142
9	OZ-1	Arsi	O-30	(9)	Lemo Sirba	524802	840806	2,554	5,590	36	36	36	36	36	36	36	197	197	197	197	197	197	197	197
10	OZ-2	Borena	O-32	(10)	Garaba	419060	638333	2,224	7,500	150	150	150	150	150	150	150	150	150	150	150	150	150	150	316
11	OZ-1	Arsi	O-07	(11)	Kersa	498043	831878	2,728	9,916	198	198	198	198	198	198	198	198	198	198	198	198	198	198	418
12	OZ-1	Arsi	O-03	(12)	Gonde	520879	888380	2,258	4,350	87	87	87	87	87	87	87	87	87	87	87	87	87	87	183
13	OZ-1	Arsi	O-02	(13)	Ogolcha (Agolcho)	501151	888795	1,707	4,759	95	95	95	95	95	95	95	95	95	95	95	95	95	95	201
14	OZ-1	Arsi	O-05	(14)	Kidame Digelu	527753	858194	2,677	1,780	36	36	36	36	36	36	36	36	36	36	36	36	36	73	73
15	OZ-3	East Shewa	O-20	(15)	Abosa	469693	886574	1,677	3,578	22	22	22	22	22	22	22	22	22	22	22	22	22	147	147
16	OZ-2	Borena	O-31	(16)	Milami	321466	559600	1,401	4,510	26	26	26	26	26	26	26	26	26	26	26	26	26	186	186
17	OZ-2	Borena	O-33	(17)	El Woyya(Wayya)	376956	548609	1,381	4,090	6	6	6	6	6	6	6	6	6	6	6	6	164	164	164
18	OZ-3	East Shewa	O-28	(18)	Jido	441606	852012	1,642	2,659	53	53	53	53	53	53	53	53	53	53	53	53	53	53	112
19	OZ-3	East Shewa	O-22	(19)	Adami Tulu	467669	869137	1,665	8,166	163	163	163	163	163	163	163	163	163	163	163	163	163	163	344
20	OZ-4	West Arsi	O-39	(20)	Intaye	456917	778457	1,743	8,500	0	0	0	0	0	0	0	0	0	0	0	0	341	341	341
21	OZ-4	West Arsi	O-34	(21)	Bura (Busa)	454170	774515	1,721	5,112	0	0	0	0	0	0	0	0	0	0	0	0	205	205	205
22	OZ-4	West Arsi	O-10	(22)	Kofele	476343	782584	2,648	14,401	109	109	109	109	109	109	109	109	109	109	109	109	109	592	592
23	OZ-1	Arsi	O-01	(23)	Iteya	525789	898989	2,159	14,239	0	0	0	0	0	0	0	0	0	0	0	0	572	572	572
		Oromia R 計								1,232	1,232	1,232	1,232	1,232	1,232	1,943	2,689	2,689	2,689	2,689	2,689	3,965	4,770	5,599
		合計								3,797	3,797	3,797	3,797	7,094	7,447	8,854	10,483	10,920	11,525	11,962	12,121	13,397	14,203	15,032

No.	Town Name	Unit Water Demand Lpcd	Water Supply Ratio (2010) (%)	Existing Water Consumption (2010) (m3/day)	Candidated Water Sources	Necessary Water Amount (L/sec)	Number of Wells	Predicted Yield of Wells (L/sec)	Predicted Well Depth (m)	Predicted Aquifer Depth (m)	Amount of Drilling Depth (m)	Anticipated Hydrogeological Conditions
1	Kulumsa	20	12	8	Deep Tube Well	4	1	5	150	30-100	150	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
2	Sagure	20	87	190	Deep Tube Well	6.8	2	5	200	130-150	400	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
3	Meraro	20	17	16	Deep Tube Well	5.2	2	5	150	80-100	300	Hydrogeological productivity: Low, Geology: High permeability acidic volcanic sedimentary rocks (Mainly pumice layer), Aquifer: If Strongly welded tuff exists below, productivity will increase
4	Katar Genet	20	0	0	Deep Tube Well	4.7	1	5	200	130-150	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
5	Hursa	20	3.5	4	Deep Tube Well	6.7	2	5	150	50-110	300	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
6	Awasho-Dhanku	20	0	0	Deep Tube Well	8.4	2	5	150	50-110	300	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
7	Boru Jawi	20	37	33	Deep Tube Well	4.3	1	5	150	80-100	150	Hydrogeological productivity: Low, Geology: High permeability acidic volcanic sedimentary rocks (Mainly pumice layer), Aquifer: If Strongly welded tuff exists below, productivity will increase
8	Kabate	20	0	0	Deep Tube Well	4.9	1	5	150	50-110	150	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
9	Lemo Sirba	20	32	36	Deep Tube Well	5.6	2	5	200	130-150	400	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
10	Garaba	20	100	150	Deep Tube Well	5.8	1	6	150	80-100	150	Hydrogeological productivity: Low, Geology: Tertiary basult, Aquifer: Fissure of rocks is very important. Spring is also one of water source.
11	Kersa	20	100	198	Deep Tube Well	7.6	2	5	150	50-110	300	Hydrogeological productivity: Low-moderate, Geology: High permeability acidic volcanic sedimentary rocks (Mainly pumice layer), Aquifer: If Strongly welded tuff exists below, productivity will
12	Gonde	20	100	87	Deep Tube Well	3.3	1	5	150	30-100	150	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
13	Ogolcha (Agolcho)	20	100	95	Deep Tube Well	3.7	1	11.3	200	60-140	200	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
14	Kidame Digelu	20	100	36	Deep Tube Well	1.3	1	5	150	80-100	150	Hydrogeological productivity: Low, Geology: High permeability acidic volcanic sedimentary rocks (Mainly pumice layer), Aquifer: If Strongly welded tuff exists below, productivity will increase
15	Abosa	20	31	22	Deep Tube Well	4.4	1	5	150	50-120	150	Hydrogeological productivity: Low, Geology: Lacastrine Deposits, Strongly welded tuff below, Aquifer: Strongly welded tuff, but high concentration of Fluoride
16	Milami	20	29	26	Deep Tube Well	5.5	2	4.8	150	80-100	300	Hydrogeological productivity: Poor, Geology: Tertiary basult, Aquifer: Fissure of rocks is very important. Spring is also one of water source.
17	El Woyya(Wayya)	20	7	6	Deep Tube Well	5.5	1	6.9	150	80-100	150	Hydrogeological productivity: Low, Geology: Pre-combrian deposits and Tertiary basult, Aquifer: Fissure of rocks is very important. Spring is also one of water source
18	Jido	20	100	53	Deep Tube Well	2.1	1	4.7	150	50-120	150	Hydrogeological productivity: Low-moderate, Geology: Lacastrine Deposits and acdic volcanic deposits, Aquifer: If strongly welded tuff exists, productivity will increase. High concentration of
19	Adami Tulu	20	100	163	Deep Tube Well	6.3	2	3.6	200	100-150	400	Hydrogeological productivity: Low, Geology: Lacastrine Deposits, Tuff breccia and strongly welded tuff below, Aquifer: Strongly welded tuff, but high concentration of Fluoride
20	Intaye	20	0	0	Deep Tube Well	11.8	2	7.3	150	30-100	300	Hydrogeological productivity: Poor-Low, Geology: Lacastrine Deposits, Aquifer: If basalt and tuff breccia exist, productivity is high, Rhyolite distributes below. A part of Rhyolite.
21	Bura (Busa)	20	0	0	Deep Tube Well	7.1	2	5	150	30-100	300	Hydrogeological productivity: Poor-Low, Geology: Lacastrine Deposits, Aquifer: If basalt and tuff breccia exist, productivity is high, Rhyolite distributes below. A part of Rhyolite.
22	Kofele	20	38	109	Deep Tube Well	16.8	4	5	150	50-110	600	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
23	Iteya	20	0	0	Deep Tube Well	19.8	4	5	150	30-100	600	Hydrogeological productivity: Moderate, Geology: Rhyolite, strongly welded tuff and high permeability acidic volcanic sedimentary rocks, Aquifer: Strongly welded tuff
	Oromia R 計										6,250	
	合計										22,890	

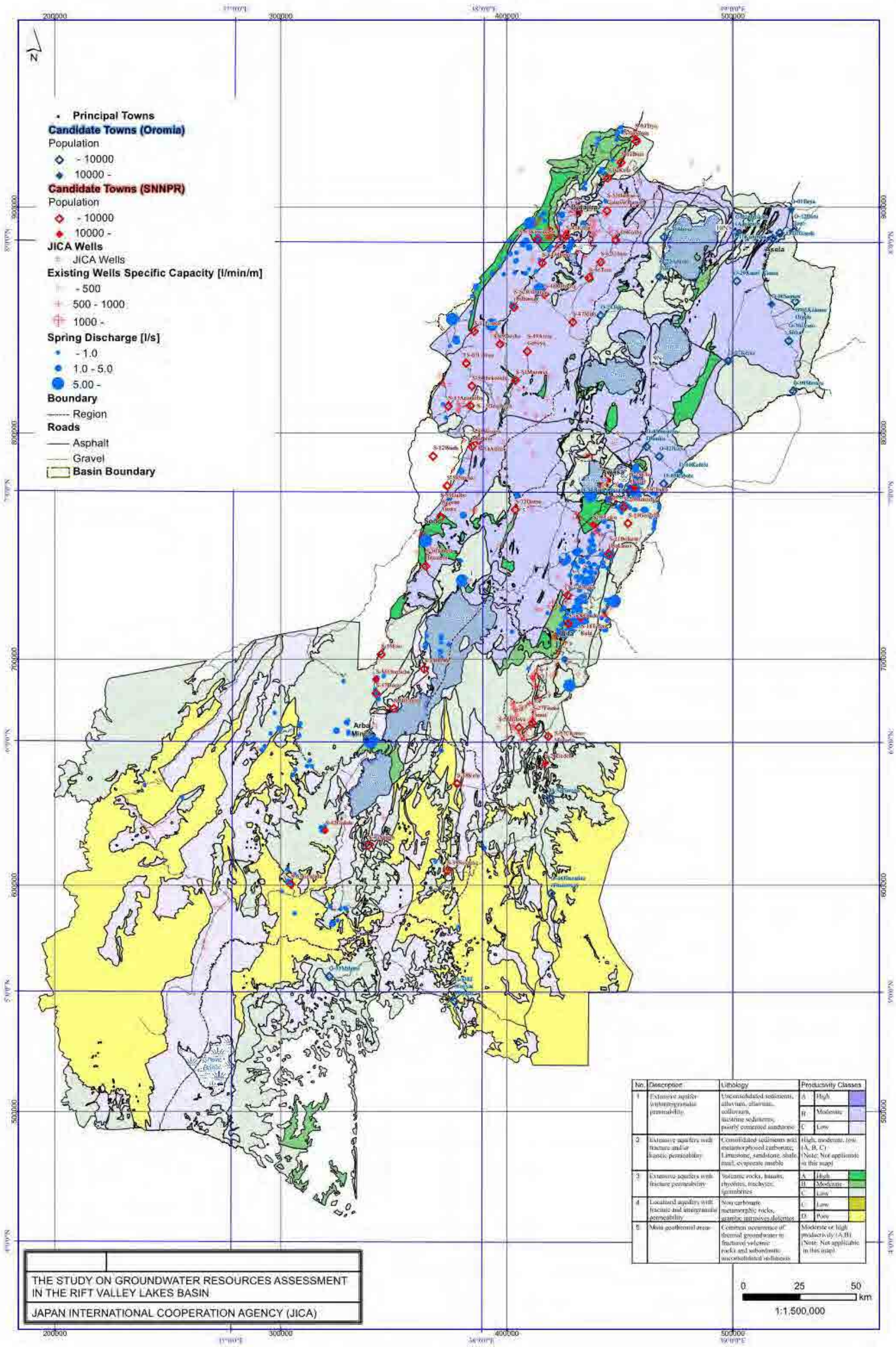


Figure 10.3: Hydrogeological Map and Small Towns Location

10.2 Water supply plan

10.2.1 Water resources

Water resources of the candidate small towns are categorized into the following types.

- Small town with an existing water supply facility ;

  Tube well with motorized pump or Hand pump / Shallow well with Hand pump / Gravity-fed spring water.

- Small towns without an existing water supply facility ;

  Surface water (stream, pond) / buy from water sellers who come from another town.

Regarding to the field survey, before considering whether there are water shortages or surpluses, the water resources that can secure a stable quantity throughout the year are mostly wells (groundwater). Spring sources are often far from a town and therefore length of conveyance pipelines need to be 2~10km, or more (20km, 30km…). Hence, alternative spring sources are even farther from the town and design of the water supply facility becomes large scale to secure stable water resources. About surface water resources such as rivers and streams, the amount of water is not stable due to seasonal variation, and turbidity is extremely high. Depending on the place, there can be a lot of water pollution caused by grazing of livestock, washing plant of coffee beans, leather tanning facilities.

In terms of the above reasons, surface water resources have high risk as drinking water, due to their unstable amount of water and poor water quality which requires a treatment plant. Therefore, the water resource adopted by the study's water supply plan is to be groundwater. The usage of groundwater is also reasonable from the groundwater potential as mentioned above.

10.2.2 Policy and outline of design for water supply plan

Unit water demand is considered 20 L/c/day in accordance with design criteria of water supply plan which is for the target year 2015. Urban Water Supply Design Criteria 2006" issued by MoWE is applied to design criteria of water supply facilities as a general rule.

a. Basic policy

And the following matters are the conditions for outline of design of the implementation of the water supply plan.

- To keep the cost of operation & maintenance to a minimum, the water supply plan will avoid as much as possible using items that require large amounts of power. For example:

① Booster pump systems are not used.

② Measurement of the amount of water supply and measurement of water level in reservoir tank are visually performed using a flow meter, and it is not to use an electric measurement device.

- Complicated water supply systems and high technology equipment will be avoided as much as possible so that the villagers are capable of operation and maintenance, such as the following examples.

① Transmission and distribution pipelines are not to use circulatory network systems.

② Measurement of the amount of water supply and measurement of water level in reservoir tank are visually performed using a flow meter, and an electric measurement device is not to be used.

③ Diesel engine generator and motorized pump will adopt models which are popular in Ethiopia.

- In order to suppress initial investment (construction cost), a plan is made with as much local materials and equipment as possible while also being able to be constructed locally. Specifically, pipes, valves, steel materials and concrete materials which can be supplied as much as possible in local markets. It is considered as a plan to hold down initial investment expense by adopting local products which are available to procure in local markets, such as a polyethylene pipes & water tanks, faucets. However, it is feasible that a practical approach be taken towards new materials and construction methods (e.g. precast-concrete, PE pipes) to reduce operation & maintenance needs as well as environmental impact.

- Structure of pipeline does not apply the pipe network system in terms of degree of difficulty for construction and operation & maintenance. Hence, each pipeline is basically to be separate, for conveyance, transmission and distribution.

- Water sources for the candidate small towns to be applied basically tube wells with casing and screen which to be drawn out by motorized submersible pumps. Water quality of wells is relatively good in comparison with lake and river water. The study team of the basic design shall in future examine the necessity of the purification (treatment) facility due to water quality of the existing wells which contain Iron and/or other items that block the supply of drinking water. However, in case of existence of the spring water sources which produce sufficient quantity and good quality of drinking water for the candidate small towns, these spring water sources to be adopted as a new water source of water supply facility.

- Water supply facility from water source to public faucets such as water distribution to residents is structured of water intake (well pump…etc.), pipelines (conveyance, transmission, distribution) and water reservoir tank. The conveyance pipeline, which is installed from water source to water reservoir tank, conveys water by pressure of motorized submersible pump in the well (water source). The transmission and distribution pipelines, which are installed from water reservoir tank to public faucets (pipe end) transfer and distribute by gravity, using the difference in altitude between water reservoir tank and public faucets (pipe end).

b. Outline of design

Out line of design is as follows;

b.1 Number of new wells

The number of new wells for each selected small town is to be calculated by the design of water quantity which is as a prospect based on the results of capability of well production around the small towns in Ethiopia. In addition, about existing wells which have secured sufficient water discharge can be considered to be re-used (when quality of the well structure is not a problem). The number of wells and water yields for selected small towns for the target year are as follows. New water yield means to take the recent used yield from the total demand.

Table 10.10: Necessary Yields and Number of Wells for Requested Small Towns (by new water supply facilities)

No.	Town Name & ID		Population 2010	Population (2015) (Annual Growth 3.3% /year)	Basic water projection	Water loss	Daily average	Daily maximum	Current water supplu (by consumption data)	Yield of water sources		
			Total		(m3/day)	(fc:0.15 m3/day)	(m3/day)	(fc:1.2 m3/day)	(m3/day)	BH demand (L/sec.)	BH potential (L/sec.)	No. of wells
			①	②=①×(1+3.3%)	③=②×0.02MCD	④=③×15%	⑤=③+④	⑥=⑤×120%	⑦	⑧=(⑥−⑦)÷8hrs÷3600sec.	⑧=Result of Hydrogeological. survey	⑨=⑦÷⑧
1	S-01	Buei	6,961	8,188	164	25	188	226	208	0.6	5.0	1
2	S-02	Kela	3,519	4,139	83	12	95	114	57	2.0	3.0	1
3	S-03	Tiya	1,937	2,278	46	7	52	63	21	1.5	4.0	1
4	S-04	Suten	1,298	1,527	31	5	35	42	15	0.9	5.0	1
5	S-06	Koshe	6,858	8,067	161	24	186	223	146	2.7	2.3	2
6	S-07	Lisana	1,711	2,013	40	6	46	56	97	-1.4	5.0	-1
7	S-09	Dosha	1,881	2,213	44	7	51	61	3.6	2.0	3.0	1
8	S-11	Fonko	2,380	2,799	56	8	64	77	66	0.4	4.0	1
9	S-12	Wada	2,113	2,485	50	7	57	69	1	2.3	5.0	1
10	S-13	Anigacha	6,811	8,011	160	24	184	221	119	3.5	5.5	1
11	S-14	Adilo	4,659	5,480	110	16	126	151	15	4.7	4.7	1
12	S-15	Daniboya	8,111	9,541	191	29	219	263	69	6.7	3.6	2
13	S-16	Leku	11,810	13,892	278	42	319	383	370	0.5	2.0	1
14	S-17	Kebado	8,365	9,839	197	30	226	272	33	8.3	5.0	2
15	S-18	Teferi Kela	4,178	4,914	98	15	113	136	33	3.5	5.0	1
16	S-19	Goreche	2,986	3,512	70	11	81	97	18	2.7	5.0	1
17	S-20	Manicho	4,017	4,725	95	14	109	130	2	4.5	5.8	1
18	S-21	Bokasa (Bokaso)	2,039	2,398	48	7	55	66	2	2.2	1.0	3
19	S-22	Chuko	8,884	10,450	209	31	240	288	1,977	-58.6	5.1	-12
20	S-23	Chuko	14,626	17,204	344	52	396	475	170	10.6	5.0	3
21	S-24	Ela (Kela)	5,259	6,186	124	19	142	171	204	-1.2	5.0	-1
22	S-27	Fiseha Genet	4,189	4,927	99	15	113	136	28	3.7	1.7	3
23	S-28	Gedeb	10,021	11,787	236	35	271	325	17	10.7	5.0	3
24	S-30	Tabela (Humbo)	6,246	7,347	147	22	169	203	45	5.5	2.8	2
25	S-32	Dimtu	1,702	2,002	40	6	46	55	17	1.3	1.0	2
26	S-34	Birbir	5,831	6,859	137	21	158	189	293.8	-3.6	6.5	-1
27	S-35	Chenicha	10,223	12,025	241	36	277	332	67	9.2	5.0	2
28	S-36	Ezo	1,822	2,143	43	6	49	59	0	2.1	1.0	3
29	S-37	Dorze	1,256	1,477	30	4	34	41	0.14	1.4	1.0	2
30	S-38	Kele	8,632	10,153	203	30	234	280	154	4.4	1.0	5
31	S-39	Soyama	6,268	7,373	148	22	170	204	1.5	7.0	2.0	4
32	S-41	Segen	3,626	4,265	85	13	98	118	77	1.4	1.0	2
33	S-42	Gidole	13,176	15,498	310	47	357	428	90	11.7	5.3	3
34	S-43	Kibat	5,676	6,676	134	20	154	184	199.7	-0.5	1.7	-1
35	S-44	Alkeso	1,028	1,209	24	4	28	33	138.1	-3.6	5.0	-1
36	S-46	Tora	9,163	10,778	216	32	248	298	55	8.4	3.0	3
37	S-47	Mito	3,277	3,855	77	12	89	106	203	-3.4	3.4	-1
38	S-48	Dalocha	7,024	8,262	165	25	190	228	97	4.5	5.0	1
39	S-49	Alem Gebeya	3,656	4,300	86	13	99	119	119	0.0	4.0	0
40	S-51	(Welaya) Mazoria	2,730	3,211	64	10	74	89	8	2.8	3.4	1
41	S-52	Wilbareg (Bilbareg)	2,197	2,584	52	8	59	71	34.1	1.3	1.2	2
42	S-53	Hamus-Gabeya(Bamo)	4,152	4,884	98	15	112	135	18	4.1	2.2	2
43	S-54	Hirkofofo	2,590	3,047	61	9	70	84	6	2.7	3.2	1
44	S-55	Weyira Mazoria	8,346	9,817	196	29	226	271	0	9.4	5.6	2
45	S-56	Biloya	4,484	5,274	106	16	121	146	4	4.9	2.4	3
46	S-57	Chorso-Mazoria	8,500	9,998	200	30	230	276	45	8.0	5.0	2
47	S-58	Shento	5,345	6,287	126	19	145	174	14	5.5	7.5	1
48	S-59	Dalbo (Wegene) Atowa	4,772	5,613	112	17	129	155	6	5.2	5.0	2
49	S-60	Lanite	7,221	8,494	170	25	195	235	34	6.9	5.0	2
50	S-61	Gewada	5,967	7,019	140	21	161	194	0	6.7	1.0	7
51	S-62	Udasa	4,470	5,258	105	16	121	145	18	4.4	5.0	1
52	S-63	Kawakoto	783	921	18	3	21	25	4	0.7	3.5	1

1	O-01	Iteya	14,239	16,749	335	50	385	462	390	2.5	4.5	1
2	O-02	Ogolcha (Agolcho)	4,759	5,598	112	17	129	155	123	5.4	11.3	1
3	O-03	Gonde	4,350	5,117	102	15	118	141	349	4.9	5.0	1
4	O-05	Kidame Digelu	1,780	2,094	42	6	48	58	190	2.0	5.0	1
5	O-06	Sagure	10,926	12,852	257	39	296	355	190	5.7	5.0	2
6	O-07	Kersa	9,916	11,664	233	35	268	322	498	11.2	5.0	3
7	O-09	Meraro	4,725	5,558	111	17	128	154	16	4.8	5.0	1
8	O-10	Kofele	14,401	16,939	339	51	390	468	109	16.2	5.0	4
9	O-11	Kulumsa	3,472	4,084	82	12	94	113	8	3.6	5.0	1
10	O-12	Boru Jawi	4,446	5,230	105	16	120	144	33	3.9	6.0	1
11	O-20	Abosa	3,578	4,209	84	13	97	116	23	4.0	5.0	1
12	O-22	Adami Tulu	8,166	9,605	192	29	221	265	421	9.2	3.6	3
13	O-28	Jido	2,659	3,128	63	9	72	86	79	3.0	4.7	1
14	O-29	Katar Genet	3,953	4,650	93	14	107	128	0	4.5	5.0	1
15	O-30	Lemo Sirba	5,590	6,575	132	20	151	182	36	5.1	5.0	2
16	O-31	Milami	4,510	5,305	106	16	122	146	26	5.1	4.8	2
17	O-32	Garaba	7,500	8,822	176	26	203	243	223	8.5	6.0	2
18	O-33	El Woyya(Wayya)	4,090	4,811	96	14	111	133	6	4.6	6.9	1
19	O-34	Bura (Busa)	5,112	6,013	120	18	138	166	0	5.8	5.0	2
20	O-35	Awash Mercasa	10,200	11,998	240	36	276	331	117	11.5	6.0	2
21	O-36	Walanciti	11,260	13,245	265	40	305	366	761	12.7	5.0	3
22	O-37	Doni	4,164	4,898	98	15	113	135	0	4.7	5.0	1
23	O-38	Befa (Bofa)	7,040	8,281	166	25	190	229	257	7.9	6.0	2
24	O-39	Intaye	8,500	9,998	200	30	230	276	0	9.6	7.0	2
25	O-40	Kabate	4,146	4,877	98	15	112	135	6	4.7	8.0	1
26	O-41	Awasho-Dhanku	7,040	8,281	166	25	190	229	0	7.9	9.0	1
27	O-42	Hursa	5,700	6,705	134	20	154	185	4	6.4	10.0	1
28	O-43	Hidi-Lola	6,550	7,704	154	23	177	213	30	7.4	11.0	1
29	O-44	Fincadaa (Fincawaa)	7,200	8,469	169	25	195	234	175	8.1	12.0	1
30	O-45	Adulala	3,601	4,236	85	13	97	117	0	4.1	5.0	1

b.2 Power source of motorized pump

The high-output motorized pump is needed in the water supply facility which performs pumping with motorized pump among the water supply scheme for the reason the groundwater level is low or the vertical interval of groundwater level is high. Electric power suitable for such motorized pump systems is commercial electric power and/or diesel engine generator. From the viewpoint of operation and maintenance cost, commercial electricity supply is very effective, however, because of the unreliability of the Ethiopian power supply, a pumping system with an engine generator as a standby power source is planned (refer to Table 10.11).

Solar panel systems are very effective for reducing operation costs, environmental impact of CO_2 and so on. However, this system is not adopted for the plan for the reasons of shortage of power generation capacity and there being no established service network for repairs when it breaks down or is out of order.

Table 10.11: Comparison of Power Sources for Motorized Pumps

	Commercial Electricity	Engine Generator	Solar Panel power system
Merit	• Electric fee is cheap	• Stable power supply • Stable voltage	• Low operation and maintenance cost • Doesn't emit CO_2
Demerit	• Necessary initial investment to install cable, etc. • There are many power failures. • Unstable voltage	• Necessary fuel. • Running cost is high to buy fuel. • Maintenance necessary for the consumable parts. • Needs spare parts for repairs.	• Generation is restricted to daytime. • A production of electricity is influenced by the amount of insolation. • Initial cost is high. • Solar module life is as short as 10-15 years. • Solar panels have a low electricity generation capacity, about 60W each. • A large number of solar panes are required to operate high head motorized pumps. • Unsuitable for operation of high head pumps • Expertise is required for repairs. • Distribution of spare parts is not established.

b.3 Duration of pump operation

Duration of pump operation is planned as 8 hours/day (in the morning for 2~4 hours + in the evening for 2~4 hours) out of consideration of electricity consumption and time water supply is needed for daily life (times faucets are usable).

b.4 Observation pipe for monitoring groundwater level

Observation pipe is to be installed in the well for monitoring the groundwater level regularly.

b.5 Accessories on rising pipes of well head and their positions

In terms of protection of pump and operation & maintenance: air valve / pressure meter / sluice valve / follow meter / check valve / tee for drainage shall be equipped on the well top (well mouth). And straight pipes shall be installed, as a rule, on either side of a flow meter to avoid water turbulence, which is important for maintaining accuracy of the flow meter.

b.6 Protection from lightning strikes at well head

Well top (well mouth has a risk of being struck by lightning because it is made of metal (e.g. steel casing, rising pipes, pump, valves …etc.). Therefore, it is necessary to consider some form of lighting protection such as the well mouth being covered by a generator house or installing a lightning rod on the roof of the generator house when it is constructed near the well.

b.7 Type and capacity of reservoir tank

Types of reservoir tank to be considered are Ground Reservoir or Elevated Reservoir according to the topographical conditions and the size of the small town. Ground reservoir tank is to be a rectangle RC (reinforced concrete) with waterproof coating and/or circle piling-stone (masonry) structure with waterproofing core wall which is standard type in Ethiopia. Capacity of reservoir tank is to be approximately 30% of daily maximum water supply volume based on 8 hours/day pump operation and with reference to the standard volume of reservoir tanks in Ethiopia.

b.8 Water treatment facility

The water supply facility of this plan will not adopt a treatment facility basically because the water source to be used is groundwater from wells. However, the small scheme of treatment facility or device for reduction Iron (Fe) is to be examined because there are areas where water quality is expected to affect taste.

b.9 Method of water distribution and pipe networks

Methods of water distribution are the following 2 types.

(a) Pressure mains which are distributed by pump pressure.

(b) Gravity mains which are distributed by gravity from reservoir tank.

Pressure mains involves more difficult operation of pump with valve and management of the pipelines (e.g. water hammer, water leakages…etc.) than gravity mains. Therefore, gravity mains are to be adopted for water distribution line. A closed distribution pipe network is not to be adopted. Gravity mains are to be installed parallel and independently from the reservoir tank to each pipe end.

b.10 Interference between pipelines and the road project

The number of road projects being carried out around the candidate small towns is increasing. (e.g. road widening, base course construction, asphalt pavement, line marking …etc.) And some existing pipelines were damaged by such construction. Therefore, at the time of Basic Design Study, the persons concerned shall consider to avoid interference between road projects and the water supply project.

b.11 Material of pipes

Steel pipes have generally been used (e.g. Galvanized Iron Pipe, GIP). And besides PVC pipe, PE pipe (Polyethylene Pipe) has become popular recently, which is easy to handle. Therefore, these new materials are to be examined for use in the water supply plan in terms of construction, maintenance and economical matters.

b.12 Method of water supply

The method of water supply to be adopted is Public Faucets (PF), the structure of which is to be based on Ethiopian standards.

Quantity and distribution of public faucets in towns are to be based on the conditions of the

Design Criteria of MoWR, SNNPR and Oromia Region and UAP (e.g. accessibility, distance, coverage population…etc.). Other considerations are avoiding overlaps, duplication and interference with existing water services (e.g. Public Faucets, House Connections).

b.13 Management of water consumption

For accurate management of water facilities and consumption, water flow meters are to be installed at the following facilities.

- Well top (between the end of rising pipe and beginning of conveyance pipeline) to grasp production volume of the water resource.
- On the outlet pipe (transmission, distribution pipe) of reservoir tank to grasp total water discharge.
- On the water supply pipe of Public Faucets and House Connections to grasp each water consumption.

Above management is very effective to discover water leaks or water theft from the water supply facility.

b.14 Consideration of residents living around the water source

Wells as the water source are often constructed in the suburbs of the towns which are agricultural areas, small villages and so on. Because the residents and villagers do not receive benefit from their local water sources, disputes and trouble sometimes arise such as land occupation and/or water rights.

To mitigate the above issues, it is effective to also construct a small scale water supply facility near each well to give the local residents access to safe water. This is also effective in improving awareness of water facility management amongst all residents.

There are two methods of water service. These are gravity mains (from the main reservoir to sub reservoir) and by the pressure mains (from conveyance pipeline to sub reservoir with valve operation). These methods shall be examined later on according to the condition of topography, cost estimation and difficulty of operation.

b.15 Models of water supply facilities

Ten models of water supply facility are planned, taking into account the topographical condition of each small town based on the above criteria and technical specifications.

The motorized pumps are to be able to be run on both commercial electricity and generators.

In consideration of the water service to the residents around water sources (wells), a small water supply facility is to be constructed around these water sources (small reservoirs, public faucets) (refer to Figure 10.4).

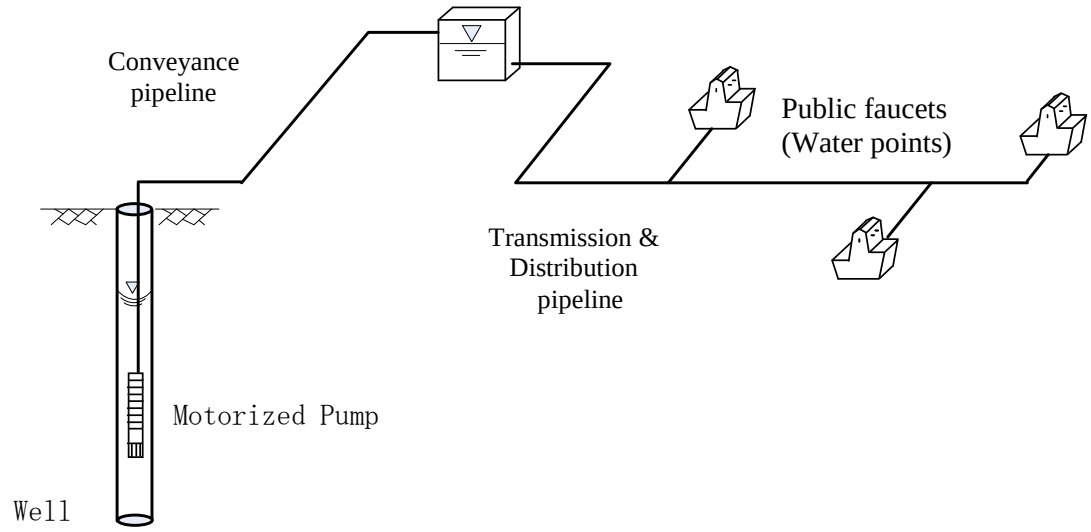


Figure 10.4: Model of Water Supply System

The outline of the water supply systems (refer to Table 10.12) and facility layouts (refer to of the candidate small towns are as follows.

Table 10.12: Outline of Water Supply Systems of the Candidate Small Towns

Model-01 & 06		Conveyance* 1 line & Transmission * 1 line
1.	Water source	Tube well with casing & screen * 1no.
2.	Draw water	Submersible motor pump able to run on both commercial electricity supply and stand-by generator * 1 set.
3.	Conveyance	Conveyance pipeline * 1 line (single line)
4.	Reservoir	Ground (or Elevated) main reservoir tank * 1 no.
5.	Transmission	Transmission pipeline * 1 line (single line)
6.	Distribution	Distribution main & branch pipeline * several; Water supply pipeline * several, Public faucets (Water points)
7.	others	
SNNPR Town ID & Name		S01 Buei, S02 Kela, S03 Tiya, S09 Dosha, S11 Fonko, S12 Wada, S13 Anigacha, S14 Alio, S16 Leku, S18 Teferi-Kela, S19 Goreche, S20 Manicho, S48 Dalocha, S51 Mazoria, S58 Shento, S62 Udasa, S63 Kawakoto
Oromia region Town ID & Name		O01 Iteya, O02 Ogolcha, O03 Gonde, O05 Kidame, O09 Merano, O11 Kuumusa, O20 Abosa, O28 Jido, O29 Katar-Genet, O33 El-Woyya, O37 Doni, O45 Adulala

Model-02 & 07		Conveyance* 2 lines & Transmission * 1 line
1.	Water source	Tube well with casing & screen * 2no.
2.	Draw water	Submersible motor pump able to run on both commercial electricity supply

		and stand-by generator * 2 set.
3.	Conveyance	Transmission pipeline * 2 lines (1 line each well)
4.	Reservoir	Ground (or Elevated) main reservoir tank * 1 no.
5.	Transmission	Transmission pipeline * 1 line (single line)
6.	Distribution	Distribution main & branch pipeline * several, Water supply pipeline * several, Public faucets (Water points)
7.	others	
SNNPR Town ID & Name		S04 Suten, S06 Koshe, S17 Kabado, S30 Tabera, S35 Chenicha, S37 Dorze, S39 Soyama, S41 Segen, S52 Wilbareg, S53 Hamus-Gebaya, S54 Hirokofofo, S57 Chorso-Mazoria,S59 Dalbo-Atowa, S60 Lanite
Oromia region Town ID & Name		O12 Boru-Jawi, O30 Lemo-Sirba, O31 Milami, O32 Garaba, O34 Bura, O35 Awash-Mercasa, O38 Befa, O39 Intaye, O40 Kabate, O43 Hidi-Lola, O44 Fincadaa

Model-03 & 08		Conveyance* 3～5 lines & Transmission * several lines
1.	Water source	Tube well with casing & screen * 3～5 nos.
2.	Draw water	Submersible motor pump able to run on both commercial electricity supply and stand-by generator * same number as above wells.
3.	Conveyance	Transmission pipeline * 2～5 lines (1 line each well)
4.	Reservoir	Ground (or Elevated) main reservoir tank * 1 no.
5.	Transmission	Transmission pipeline * several lines
6.	Distribution	Distribution main & branch pipeline * several, Water supply pipeline * several, Public faucets (Water points)
7.	others	
SNNPR Town ID & Name		S21 Bokasa, S23 Chuko, S27 Fisha-Genet, S28 Gedeb, S36 Ezo, S38 Kele, S42 Gidole, S46 Tora, S56 Biloya
Oromia region Town ID & Name		O07 Kersa, O22 Adami-Tulu, O41 Awasho-Dhanku, O42 Hursa

Model-04 & 09		Conveyance* 2 lines & Transmission * several lines
1.	Water source	Tube well with casing & screen * 2 nos.
2.	Draw water	Submersible motor pump able to run on both commercial electricity supply and stand-by generator * 2 sets.
3.	Conveyance	Transmission pipeline * 2 lines (1 line each well)
4.	Reservoir	Ground (or Elevated) main reservoir tank * 2 nos.
5.	Transmission	Transmission pipeline * several lines
6.	Distribution	Distribution main & branch pipeline * several, Water supply pipeline * several, Public faucets (Water points)
7.	others	

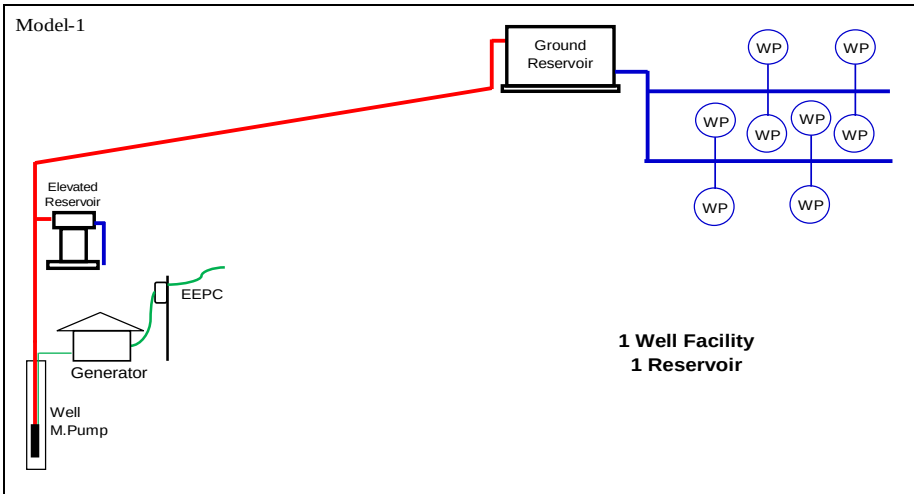
SNNPR Town ID & Name	S15 Daniboya, S55 Weyiya-Mazoria
Oromia region Town ID & Name	O06 Sague

Model-05 & 10		Conveyance* 2 lines & Transmission * several lines
1.	Water source	Tube well with casing & screen * 3～7 nos.
2.	Draw water	Submersible motor pump able to run on both commercial electricity supply and stand-by generator * same number of above wells.
3.	Conveyance	Transmission pipeline * 2 lines (1 line each well)
4.	Reservoir	Ground (or Elevated) main reservoir tank * 2 nos.
5.	Transmission	Transmission pipeline * several lines
6.	Distribution	Distribution main & branch pipeline * several, Water supply pipeline * several, Public faucets (Water points)
7.	others	
SNNPR Town ID & Name		S61 Gewada
Oromia region Town ID & Name		O10 Kofele, O36 Walanciti

No. Facility		Expansion, Rehabilitation of the principal facilities.
1.	Water source	Nil.（Repair, Rehabilitation）
2.	Draw water	Nil.（Restoration of pump and/or Elec. Equipment）
3.	Conveyance	Nil（Repair, Rehabilitation）
4.	Reservoir	Nil.（Expansion）
5.	Transmission	Nil.（Repair, Rehabilitation）
6.	Distribution	Nil.（Repair, Rehabilitation）
7.	others	Reconstruction of O&M and management plan
SNNPR Town ID & Name		S07 Lisana, S22 Chuko, S24 Ela, S32 Dimtu, S34 Birbir, S43 Kibat, S44 Alkeso, S47 Mito, S49 Alem-Gebeya
Oromia region Town ID & Name		Nil.

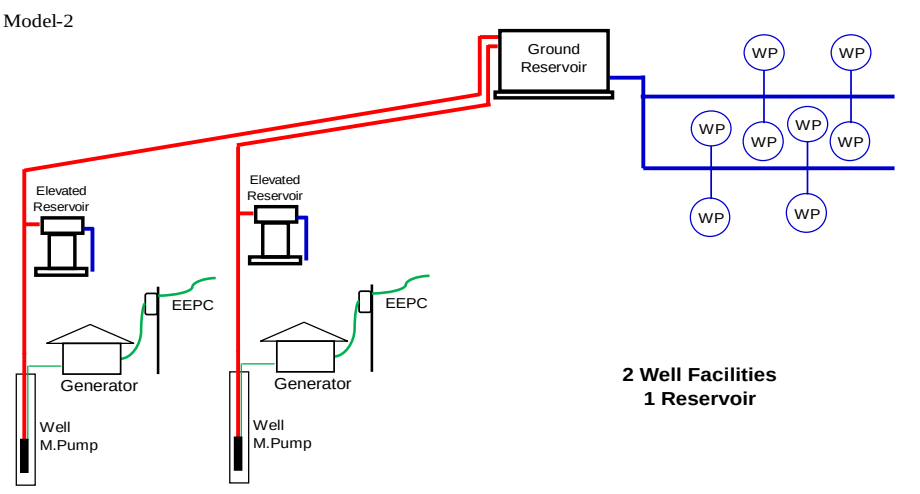
Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-1	1 Well * 1no. 2 Generator & House, EEPC Commercial Elec. Power Supply * 1 3 Conveyance, Transmission and Distribution pipe line 4 Ground Reservoir (Main) * 1no. 5 Elevated Reservoir (Sub.) * 1no. 6 Water Point (Public Faucet) *1sum.	SNNPR S- 01 Buei S- 02 Kela S- 09 Dosha S- 11 Fonko S- 12 Wada S- 13 Anigacha S- 16 Leku S- 18 Teferi Kela S- 19 Goreche S- 20 Manicho S- 48 Dalocha Oromia Region O- 01 Iteya O- 02 Ogolcha O- 03 Gonde O- 09 Merano O- 11 Kulumusa O- 33 El Woyya

Model-1



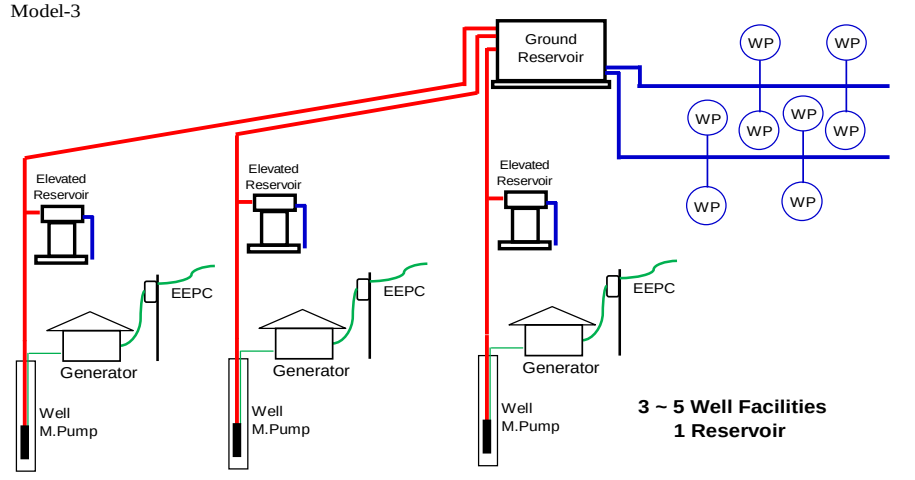
Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-2	1 Well * 2nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 1 3 Conveyance, Transmission and Distribution pipe line 4 Ground Reservoir (Main) * 1no. 5 Elevated Reservoir (Sub.) * 2nos. 6 Water Point (Public Faucet) *1sum.	SNNPR S- 04 Suten S- 06 Koshe S- 17 Kebado S- 30 Tebera (Humbo) S- 35 Cenicha S- 37 Dorze S- 39 Soyama S- 41 Segen S- 52 Wilbareg S- 57 Chorso Mazoria S- 60 Lanite Oromia Region O- 12 Boru Jawi O- 30 Lemo Sirba O- 32 Garaba O- 34 Bura O- 35 Awash Mercasa O- 39 Intaye O- 43 Hidi Lola O- 44 Fincadaa

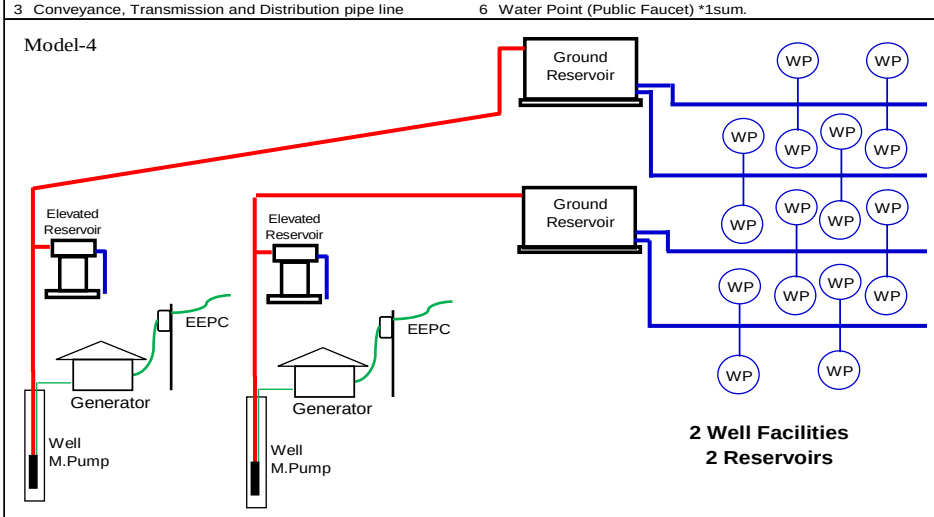
Model-2

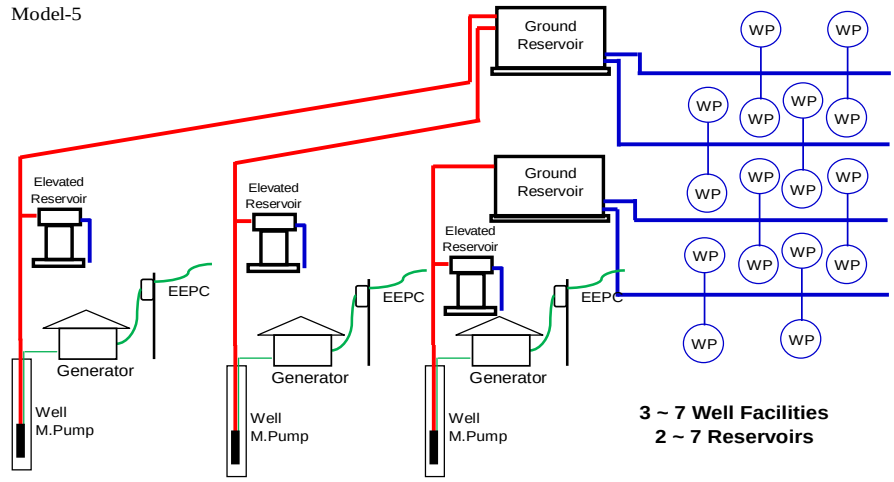


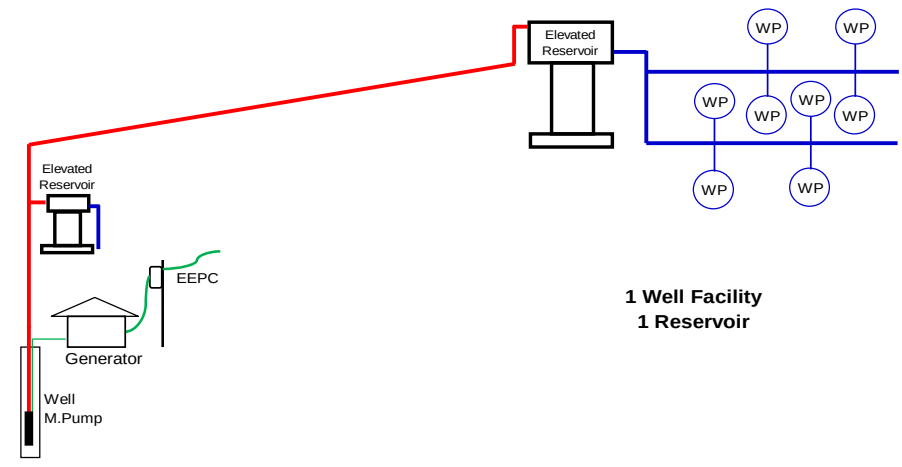
Models No.	Principal facilities & Figures of the water supply system	Applied towns Town ID & Name
Model-3	1 Well * 3 ~ 5nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 3 3 Conveyance, Transmission and Distribution pipe line 4 Ground Reservoir (Main) * 1no. 5 Elevated Reservoir (Sub.) * 3 ~ 5 nos. 6 Water Point (Public Faucet) *1sum.	SNNPR S- 23 Chuko S- 27 Fisha Genet S- 28 Gedeb S- 36 Ezo S- 38 Kele S- 42 Gidole S- 46 Tora S- 56 Biloya Oromia Region O- 07 Kersa O- 22 Adami Tulu

Model-3



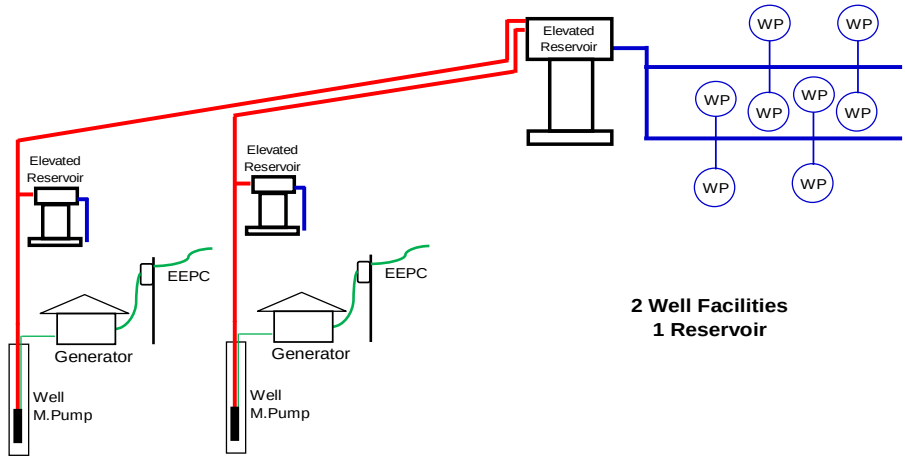
Models No.	Principal facilities & Figures of the water supply system	Applied towns Town ID & Name
Model-4	1 Well * 2nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 2 3 Conveyance, Transmission and Distribution pipe line 4 Ground Reservoir (Main) * 2 nos. 5 Elevated Reservoir (Sub.) * 2nos. 6 Water Point (Public Faucet) *1sum. 	SNNPR Oromia Region

Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-5	1 Well * 3~7nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 3 3 Conveyance, Transmission and Distribution pipe line 4 Ground Reservoir (Main) * 2~7nos. 5 Elevated Reservoir (Sub.) * 3 nos. 6 Water Point (Public Faucet) *1sum. 	SNNPR S- 61 Gewada Oromia Region

Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-6	1 Well * 1no. 2 Generator & House, EEPC Commercial Elec. Power Supply * 1 3 Conveyance, Transmission and Distribution pipe line 4 Elevated Reservoir (Main) * 1no. 5 Elevated Reservoir (Sub.) * 1no. 6 Water Point (Public Faucet) *1sum. 	SNNPR S- 03 Tiya S- 14 Ailo S- 51 (Webya) Mazoria S- 58 Shento S- 62 Udasa S- 63 Kawakoto Oromia Region O- 05 Kidame O- 20 Abosa O- 28 Jodo O- 29 Katar Genet O- 37 Doni O- 45 Adilala

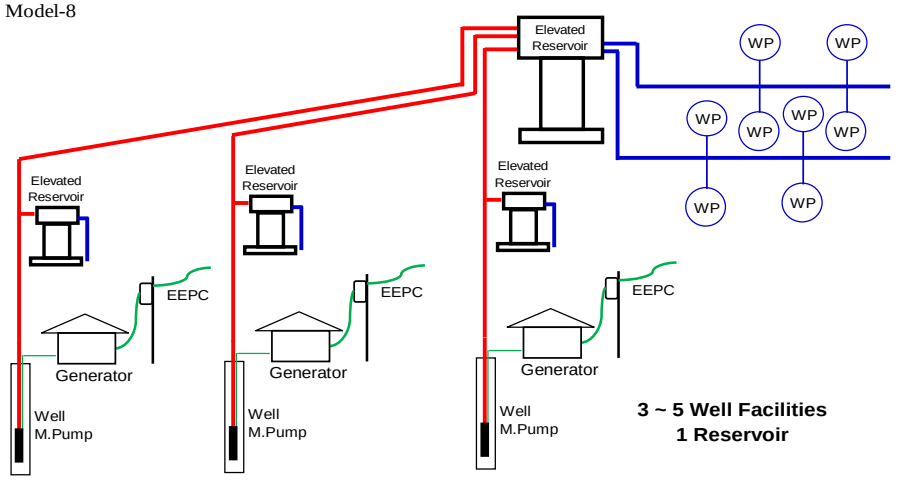
Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-7	1 Well * 2 nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 2 3 Conveyance, Transmission and Distribution pipe line 4 Elevated Reservoir (Main) * 1no. 5 Elevated Reservoir (Sub.) * 2nos. 6 Water Point (Public Faucet) *1sum.	SNNPR S- 53 Hamus Gebeya S- 54 Hirokofofo S- 59 Dalbo Atowa Oromia Region O- 31 Milami O- 38 Befa O- 40 Kabate

Model-7



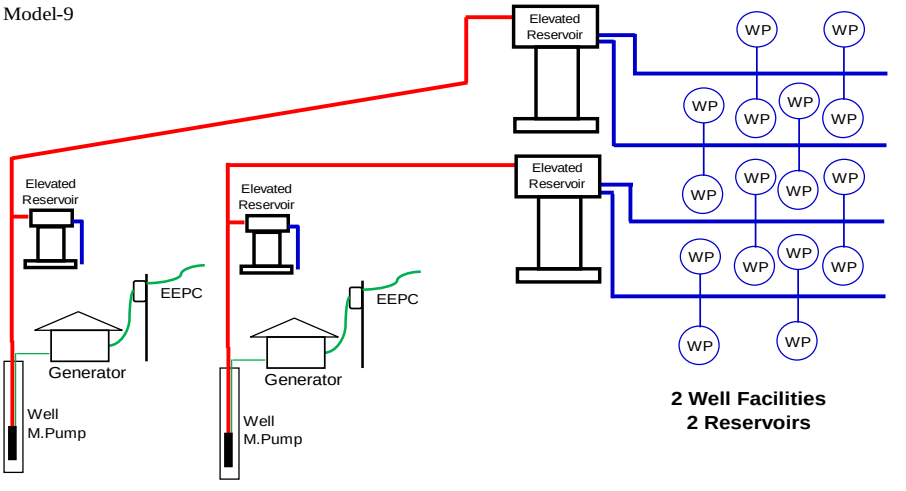
Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-8	1 Well * 3 nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 3 3 Conveyance, Transmission and Distribution pipe line 4 Elevated Reservoir (Main) * 1no. 5 Elevated Reservoir (Sub.) * 3 nos. 6 Water Point (Public Faucet) *1sum.	SNNPR S- 21 Bokasa Oromia Region O- 41 Awasho-Dhanku O- 42 Hursa

Model-8



Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-9	1 Well * 2 nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 2 3 Conveyance, Transmission and Distribution pipe line 4 Elevated Reservoir (Main) * 2 nos. 5 Elevated Reservoir (Sub.) * 2 nos. 6 Water Point (Public Faucet) *1sum.	SNNPR S- 15 Daniboya S- 55 Weyiya Mazoria Oromia Region O- 06 Sague

Model-9



Models No.	Principal facilities & Figures of the water supply system	Applied towns (Draft) Town ID & Name
Model-10	1 Well * 3~5 nos. 2 Generator & House, EEPC Commercial Elec. Power Supply * 3 3 Conveyance, Transmission and Distribution pipe line 4 Elevated Reservoir (Main) * 2~5 nos. 5 Elevated Reservoir (Sub.) * 3 nos. 6 Water Point (Public Faucet) *1sum.	SNNPR Oromia Region O- 10 Kofele O- 36 Walanciti

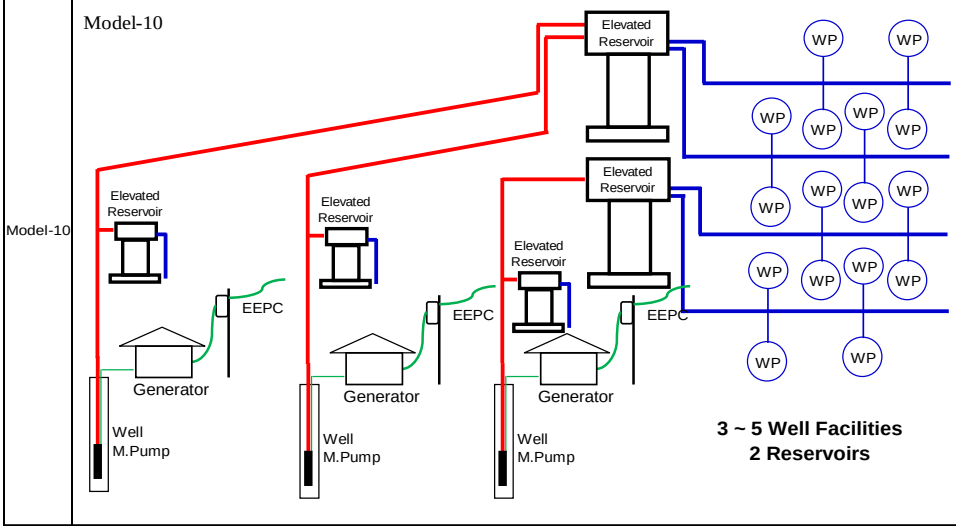


Figure 10.5: The Outline of Facility Layouts of the Candidate Small Towns

10.3 Current status and problems of the operation and maintenance plan for water supply facilities, and suggestions

10.3.1 Current organization and administration of existing water offices

a. Organization

a.1 Existence of administrative organizations

Among 82 small towns, there is an organization for operation & maintenance in most of the small towns which have an existing water supply facility. Scale of the organizations varies such as Enterprise (self-supporting accounting system), Water Committee, Water office under the administration of Woreda …etc.

a.2 Activities of water supply organizations

Activities of the organizations are comprised of the technical squad and administrative squad. The technical squads usually provide services such as pump operation, plumbing and repairing; and the administrative squads services such as cash collection (water fee), bill issues and budget management.

a.3 Personnel of organizations

Number of office personnel and their duties are different from one to more than ten persons by the scale of organization and the existing water supply facility.

b. Administration

b.1 Collection and setting of water tariff

At public faucets, generally staff collects water fees according to the size of the water tank

(fee per 20L poly-tank) of water users. And there are also systems of monthly contract between the organization and each user or water salesperson of public faucet such as a fixed amount per month. Details of the contract between the organization and water salesperson of public faucet is that the water salesperson pays a fixed amount to the organization from income of water sale, and remaining income to be his/her salary and/or maintenance cost for the public faucet. About the private connection and business connection, the user pays water fee based on a contract they have with the water organization. This is paid monthly in accordance with the tariff which is categorized by the amount of consumption. Towns that supply houses and businesses with groundwater by motorized pump or spring water, charge a tariff as set by the town, zone or regional water office. This is based on a contract format made by the regional office. The unit price is prescribed in cost charged by quantity in cubic meters, and is sorted from $1m^3$ ~ $30m^3$/month. The fee of the water meter is often charged as a monthly lease. The hand pump and on-spot facilities are charged a fixed rate per month for each household.

b.2 Budget balance

Amount of the income by water fee, depending on the scale of the water supply facility, is approximately between 1,000 ~ 16,000 Birr/month. Most of expenditures are fuel cost of the engine generator and cost of pipes & fittings. Balance of income and expenditure is deficit tendency in many organizations due to increase of cost for maintenance of deteriorated facilities and/or expansion of pipe networks. Each organization pays its own personnel (staff) expenses (through income) and these expenses are increasing. Personnel expenses of the staff of town and Woreda water offices, government employees, are not borne by water fee income, but borne by the government office.

10.3.2 Issues of administrative organizations

The current problems of the organization in terms of their activities of management for the existing water supply facilities are as follows.

a. Shortage of manpower

Most organizations have staff shortages in comparison to the scale of their water facilities as shown in the following

Table 10.13: Current Manpower of Water Offices

SNNPRS							Staff of the water office								
							① Current				② Plan				
No.	Zone ID	Zone Name	Wored a ID	Woreda Name	Town ID	Town Name (BH…well) (SP…spring)	OP	Facility	Admin.	Total	OP	Facility	Admin.	Total	Balance (①−②)
1	SZ-01	Gurage	SW-01	Sodo	S-01	Buei (BH)	1	0	3	4	1	3	5	9	**-5**
2	SZ-01	Gurage	SW-01	Sodo	S-02	Kela (SP&BH)	1	0	1	2	1	3	5	9	**-7**
3	SZ-01	Gurage	SW-01	Sodo	S-03	Tiya (BH)	1	0	0	1	1	3	5	9	**-8**
4	SZ-01	Gurage	SW-01	Sodo	S-04	Suten (BH)	1	0	0	1	1	3	5	9	**-8**
5	SZ-01	Gurage	SW-03	Mareqo	S-06	Koshe (BH)	2	0	3	5	2	3	5	10	**-5**
6	SZ-02	Hadiya	SW-04	Lemmo	S-07	Lisana(BH)	1	0	1	2	1	3	5	9	**-7**
7	SZ-02	Hadiya	SW-05	Shashago	S-09	Dosha (BH)	1	0	0	1	1	3	5	9	**-8**
8	SZ-02	Hadiya	SW-07	Analemmo	S-11	Fonko (BH)	1	0	0	1	1	3	5	9	**-8**
9	SZ-02	Hadiya	SW-08	Mirab Badawocho	S-12	Wada (SP&BH)	0	0	0	0	1	3	5	9	**-9**
10	SZ-03	Kembata Timbaro	SW-09	Anigacha	S-13	Anigacha (BH)	2	0	1	3	1	3	5	9	**-6**
11	SZ-03	Kembata Timbaro	SW-10	Kedia Gamela	S-14	Adilo (BH)	1	0	2	3	1	3	5	9	**-6**
12	SZ-03	Kembata Timbaro	SW-11	Dayiboya	S-15	Daniboya (BH)	1	0	2	3	2	3	5	10	**-7**
13	SZ-04	Sidama	SW-12	Shebedio	S-16	Leku (BH)	2	0	2	4	1	3	5	9	**-5**
14	SZ-04	Sidama	SW-13	Dara	S-17	Kebado (BH)	1	0	2	3	2	3	5	10	**-7**
15	SZ-04	Sidama	SW-13	Dara	S-18	Teferi Kela (BH)	1	0	0	1	1	3	5	9	**-8**
16	SZ-04	Sidama	SW-14	Gorche	S-19	Goreche (SP)	0	0	0	0	1	3	5	9	**-9**
17	SZ-04	Sidama	SW-15	Malga	S-20	Manicho (BH)	1	0	0	1	1	3	5	9	**-8**
18	SZ-04	Sidama	SW-16	Wensho	S-21	Bokasa (Bokaso) (BH)	1	0	0	1	3	3	5	11	**-10**
19	SZ-04	Sidama	SW-41	Alta Chuko	S-22	Chuko (BH)	1	1	2	4	5	3	5	13	**-9**
20	SZ-04	Sidama	SW-18	Wendo Genet	S-23	Chuko	2	0	0	2	3	3	5	11	**-9**
21	SZ-04	Sidama	SW-18	Wendo Genet	S-24	Ela (Kela) (SP)	0	0	3	3	1	3	5	9	**-6**
22	SZ-05	Gedeo	SW-20	Kochore	S-27	Fiseha Genet (BH)	1		2	3	3	3	5	11	**-8**
23	SZ-05	Gedeo	SW-21	Gedeb	S-28	Gedeb (BH)	2	0	0	2	3	3	5	11	**-9**
24	SZ-06	Wolayita	SW-23	Humbo	S-30	Tabela (Humbo)(SP)	0	0	1	1	2	3	5	10	**-9**
25	SZ-06	Wolayita	SW-24	Deguna Fanigo	S-32	Dimtu (SP)	0	0	0	0	1	3	5	9	**-9**
26	SZ-07	Gamo Gofa	SW-26	Mirab Abaya	S-34	Birbir (BH)	1	0	3	4	1	3	5	9	**-5**
27	SZ-07	Gamo Gofa	SW-27	Chencha	S-35	Chenicha (SP&BH)	2	0	0	2	2	3	5	10	**-8**
28	SZ-07	Gamo Gofa	SW-27	Chencha	S-36	Ezo (BH)	0	0	0	0	3	3	5	11	**-11**
29	SZ-07	Gamo Gofa	SW-27	Chencha	S-37	Dorze (BH&SP)	0	0	0	0	2	3	5	10	**-10**
30	SZ-07	Gamo Gofa	SW-28	Amaro Special	S-38	Kele (SP)	0	0	3	3	5	3	5	13	**-10**
31	SZ-07	Gamo Gofa	SW-29	Burji Special	S-39	Soyama (SP)	0	0	3	3	1	3	5	9	**-6**
32	SZ-07	Gamo Gofa	SW-30	Konso Special	S-41	Segen (BH)	1	0	0	1	2	3	5	10	**-9**
33	SZ-07	Gamo Gofa	SW-31	Darashe Special	S-42	Gidole (SP)	0	0	2	2	3	3	5	11	**-9**
34	SZ-08	Silite	SW-32	Siliti	S-43	Kibat (BH)	1	0	2	3	1	3	5	9	**-6**
35	SZ-08	Silite	SW-32	Siliti	S-44	Alkeso (BH)	1	0	3	4	1	3	5	9	**-5**
36	SZ-08	Silite	SW-33	Lanifaro (Lanfuro)	S-46	Tora (BH)	1	0	3	4	3	3	5	11	**-7**
37	SZ-08	Silite	SW-33	Lanifaro (Lanfuro)	S-47	Mito (BH)	1	0	0	1	1	3	5	9	**-8**
38	SZ-08	Silite	SW-34	Dalocha	S-48	Dalocha (SP)	1	0	3	4	1	3	5	9	**-5**
39	SZ-08	Silite	SW-35	Sankura	S-49	Alem Gebeya (BH)	1	0	2	3	0	3	5	8	**-5**
40	SZ-08	Silite	SW-35	Sankura	S-51	Mazoria (BH)	1	0	0	1	1	3	5	9	**-8**
41	SZ-08	Silite	SW-36	Wilbareg	S-52	Wilbareg (Bilbareg) (BH)	1	0	0	1	2	3	5	10	**-9**
42	SZ-01	Gurage	SW-02	Meskan	S-53	Hamus-Gabeya(Bamo)(BH)	0	0	0	0	1	3	5	9	**-9**
43	SZ-02	Hadiya	SW-05	Shashago	S-54	Hirkofofo (BH)	0	0	0	0	1	3	5	9	**-9**
44	SZ-02	Hadiya	SW-06	Misrak Badawocho	S-55	Weyira Mazoria (BH)	1	0	1	2	2	3	5	10	**-8**
45	SZ-05	Gedeo	SW-20	Kochore	S-56	Biloya (SP)	0	0	3	3	3	3	5	11	**-8**
46	SZ-05	Gedeo	SW-21	Gedeb	S-57	Chorso-Mazoria (BH&SP)	0	0	2	2	2	3	5	10	**-8**
47	SZ-06	Wolayita	SW-37	Damot Pulasa	S-58	Shento (BH)	1	0	3	4	1	3	5	9	**-5**
48	SZ-06	Wolayita	SW-38	Sodo Zuria	S-59	Dalbo ~~Wegere~~ Atowa (SP)	0	0	2	2	2	3	5	10	**-8**
49	SZ-07	Gamo Gofa	SW-39	Arba Minch Zuria	S-60	Lanite (BH)	1	0	2	3	2	3	5	10	**-7**
50	SZ-07	Gamo Gofa	SW-30	Konso Special	S-61	Gewada (nil.)	0	0	0	0	7	3	5	15	**-15**
51	SZ-08	Silite	SW-32	Siliti	S-62	Udasa (BH)	1	0	0	1	1	3	5	9	**-8**
52	SZ-08	Silite	SW-40	Alicho wuriro	S-63	Kawakoto (SP)	0	0	1	1	1	3	5	9	**-8**

Oromia Region							Staff of the water office								
							① Current				② Plan				
No.	Zone ID	Zone Name	Wored a ID	Woreda Name	Town ID	Town Name (BH…well) (SP…spring)	OP	Facility	Admin.	Total	OP	Facility	Admin.	Total	Balance (①−②)
1	OZ-01	Arsi	OW-01	Hitosa	O-01	Iteya (SP)	0	1	3	4	1	3	5	9	**-5**
2	OZ-01	Arsi	OW-02	Ziway Dugda	O-02	Ogolcha (Agolcho)(BH)	1	0	2	3	1	3	5	9	**-6**
3	OZ-01	Arsi	OW-03	Tiyo	O-03	Gonde (SP)	0	2	3	5	1	3	5	9	**-4**
4	OZ-01	Arsi	OW-04	Digaluna Tijo	O-05	Kidame Digelu (SP)	0	1	2	3	1	3	5	9	**-6**
5	OZ-01	Arsi	OW-04	Digaluna Tijo	O-06	Sagure (SP)	0	1	2	3	2	3	5	10	**-7**
6	OZ-01	Arsi	OW-05	Munesa	O-07	Kersa (SP)	0	1	3	4	3	3	5	11	**-7**
7	OZ-04	West Arsi	OW-20	Limana Bilbilo	O-09	Meraro (SP)	0	0	1	1	1	3	5	9	**-8**
8	OZ-04	West Arsi	OW-08	Kofele	O-10	Kofele (BH)	1	0	1	2	4	3	5	12	**-10**
9	OZ-01	Arsi	OW-03	Tiyo	O-11	Kulumsa (nil)	0	0	1	1	1	3	5	9	**-8**
10	OZ-01	Arsi	OW-01	Hitosa	O-12	Boru Jawi (SP)	0	0	3	3	1	3	5	9	**-6**
11	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-20	Abosa (BH)	1	0	1	2	1	3	5	9	**-7**
12	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-22	Adami Tulu (BH)	1	0	2	3	3	3	5	11	**-8**
13	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-28	Jido (BH)	1	0	2	3	1	3	5	9	**-6**
14	OZ-01	Arsi	OW-03	Tiyo	O-29	Katar Genet (nil.)	0	0	0	0	1	3	5	9	**-9**
15	OZ-01	Arsi	OW-20	Limana Bilbilo	O-30	Lemo Sirba (SP)	0	0	1	1	2	3	5	10	**-9**
16	OZ-02	Borena	OW-09	Teltele	O-31	Milami (BH)	1	0	1	2	2	3	5	10	**-8**
17	OZ-02	Borena	OW-21	Bure Hara	O-32	Garaba (BH)	1	0	1	2	2	3	5	10	**-8**
18	OZ-02	Borena	OW-10	Yabelo	O-33	El Woyya(Wayya) (BH)	1	0	0	1	1	3	5	9	**-8**
19	OZ-04	West Arsi	OW-22	Wondo	O-34	Bura (Busa) (BH)	0	0	0	0	2	3	5	10	**-10**
20	OZ-03	East Shewa	OW-19	Adama	O-35	Awash Mercasa (BH)	1	0	2	3	1	3	5	9	**-6**
21	OZ-03	East Shewa	OW-23	Bosat	O-36	Walanciti (BH)	2	0	3	5	3	3	5	11	**-6**
22	OZ-03	East Shewa	OW-23	Bosat	O-37	Doni (nil.)	0	0	0	0	1	3	5	9	**-9**
23	OZ-03	East Shewa	OW-23	Bosat	O-38	Befa (Bofa) (BH)	1	0	1	2	1	3	5	9	**-7**
24	OZ-04	West Arsi	OW-22	Wondo	O-39	Intaye (nil.)	0	0	0	0	1	3	5	9	**-9**
25	OZ-04	West Arsi	OW-08	Kofele	O-40	Kabate (BH)	1	0	1	2	1	3	5	9	**-7**
26	OZ-04	West Arsi	OW-14	Sheshemane	O-41	Awasho-Dhanku (BH)	0	0	0	0	1	3	5	9	**-9**
27	OZ-04	West Arsi	OW-14	Sheshemane	O-42	Hursa (BH&SP)	1	0	2	3	1	3	5	9	**-6**
28	OZ-02	Borena	OW-12	Mijo (Miyo)	O-43	Hidi-Lola (BH)	1	0	2	3	1	3	5	9	**-6**
29	OZ-02	Borena	OW-13	Dugda dawa	O-44	Fincadaa (Fincawaa) (BH)	1	0	2	3	1	3	5	9	**-6**
30	OZ-03	East Shewa	OW-24	Liben	O-45	Adulala (nil.)	0	0	0	0	1	3	5	9	**-9**

b. Shortage and/or lack of data and records for the facilities

The following information is totally lacking because no information or records are kept in written form (document, drawing). This information is dependant on the memory of the staff. Hence, it is not accurate.

1) Data of water sources (well specifications, water yields, pump specifications…etc.)

2) Data of existing water supply facilities (information of pipe network…etc.)

c. Budget for operation & maintenance not grasped

The contents of the main expenditure are not recorded in written form, only memory by staff. Hence, trends of expenditure items and expenses cannot be grasped.

d. Water tariff not reviewed based on budget balance

Appropriate income (water fee) is necessary to cover expenditure of operation & maintenance. However, validity of the current water tariff is not examined.

e. Deterioration of equipment

Facilities have limitation of operation time, water leakage, shortage of water supply amount due to deterioration of the facilities. Water demand cannot be met due to deterioration of pumps and/or generators. Water leakages occur due to deterioration of pipes, poor

construction. The existing water supply facilities do not have enough water reserves or supply capacity due to faulty design.

f. Low skill of manpower

The facilities are not performed appropriate repair, maintenance, accounting due to the lack of the technical and administrative knowledge (e.g. repair of leakage, plumbing, material choice, irregular levy of water fee, error in calculation…etc.)

10.3.3 Suggestions for substantial plan of operation & maintenance

As regards to the above problems which are some of the current problems of the organizations, the following measures are necessary for sustainable improvement of the organizations.

a. Securing and assigning personnel

Operation & maintenance involves both technical and administrative works; and both need to be functioning well for it to be managed sustainably. Therefore, securing sufficient personnel for the scale of the facility and their appropriate assignment is important (refer to Figure 10.6).

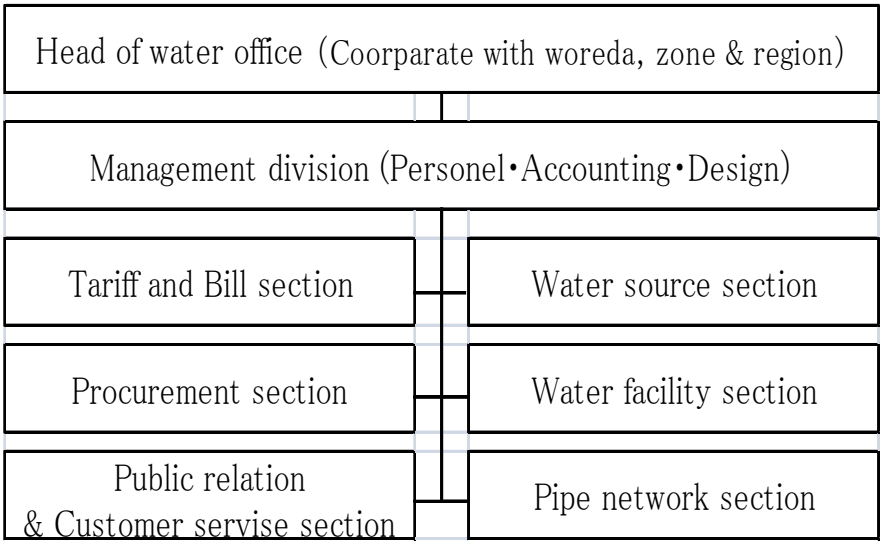


Figure 10.6: Organization of Water Office (plan)

b. Draw up the management & record books and their periodical renewal

Operation & Maintenance of water supply facilities shall have all information concerning the management of water organization documented in record books. And this information shall be periodically updated. Therefore, it is necessary to draw up this information of various facilities and work sections such as in management books.

Principal management books (drawings) are as follows,

- Water source (Data, Specifications, Yields, maintenance & repair records …etc.)

- Operation of the Pump & Generator (Operation hours, Fuel consumption, Maintenance & repair records)
- Pipeline network (Material, Length, Layout, Maintenance & repair records …etc.)
- Water service (Water consumption at each faucet, house connection, Maintenance & repair records…etc.)
- Customer list (Contract, Payment, Water consumption …etc.)
- Financial statement (Income, Expenditure, Balance, Item breakdown…etc.)
- Procurement record (Spare parts, Supplier list, Unit price list, Consumption records…etc.)

c. Budget estimation and periodical review & renew

In calculation of the cost of operation & maintenance, the items of the following considered to be indispensable for operation & maintenance of water supply facilities.

Principal items and value for operation & maintenance are as follows,

- Repair machine (pump, generator …etc.) : 3% of equipment (Annual savings)
- Fixtures for facilities (Reservoir, pipes …etc.) : 1% of direct cost of construction (Annual savings)
- Commercial electric consumption : 100% of Elec. cost
- Fuel for stand-by generator : 100% of fuel cost
- Personnel expense for operators : ea. Facility
- Personnel expense for other staff : ea. Facility
- Sundry expenses : Communication, Office cost

d. Periodical inspection, review and revise of water tariff

Water tariff shall be inspected periodically based on the balance of income and expenditure of the current budget which takes into consideration price escalation of fuel, materials, personnel…etc. and whether to revise it shall be examined.

e. Reduction of water loss

Based on the management & record books, shall grasp water leaks and water theft from the water supply facilities and perform appropriate repairs, reinforcement and prevention of theft. It is effective in reduction of sustained water loss to let these data feed back to the various management & record books.

10.4 Categorization and selection of candidate small towns

10.4.1 Details of candidate small town profiles

The selection of candidate small towns is to use the town profiles which were collected based on field surveys. The town profiles were compiled to include information about the following items necessary to categorize towns and the water supply plan. (Refer to the town profiles in the Data Book)

- Administrative organization
- Town location, whether in RVLB or not (GPS coordinates).
- Water sources (numbers, quintiles, borehole specifications, system of water collection, duration of operation …etc.).
- Existing water supply facilities (specifications of the principal structures, water consumption…etc.).
- Operation & maintenance (organization of water supply management, water fee and collection, method of operation & maintenance …etc.).
- Problems of water supply for small towns (technical、accounting, Management …etc.).
- Water coverage (calculated by water consumption and/or products).
- Accessibility to the town (distance from the principal town, road conditions).
- Technical specification of new water supply facilities
- Name of interviewees.
- Topographical conditions (location of buildings, roads determined by satellite imagery or GPS).

Basic water supply plans will be proposed at a later date for the other small towns not prioritized by the Study, so that the Ethiopian government, other donors and NGOs are able to conduct projects in future.

10.4.2 Categorization of candidate small towns

Each clarification level of the categories is basically divided into 5 levels maximum (A to E) and whole small towns are clarified in accordance with the town profile. The small towns which are out of study area are clarified to lowest level of each category. (SNNPRS 2 towns, Oromia region 8 towns)

a. Categorization by administrative organization

The categorization by administrative organization is shown in Table 10.14 below.

Table 10.14: Categorization by Administrative Organization

Level	Type of organization	Candidate small towns	
		Region	ID, Name
1A	Woreda Capital	SNNPRS (26)	S01 Buei, S06 Koshe, S09 Dosha, S13 Anigacha, S15 Daniboya, S16 Leku, S17 Kebado, S19 Goreche, S20 Manicho, S21 Bokasa, S22 Chuko, S23 Chuko, S28 Gedeb, S30 Tabela, S34 Birbir, S35 Chenicha, S39 Soyama, S42 Gidole, S43 Kibat, S46 Tora, S48 Dalocha, S49 Alem-Gebeya, S52 Wilbareg, S61 Gewada, S62 Udasa, S63 Kawakoto
		Oromia (8)	O01 Iteya, O02 Ogolcha, O06 Sague, O07 Kersa, O10 Kofele, O22 Adami-Tulu, O31 Milami, O39 Intaye
1B	Municipal	SNNPRS (10)	S03 Tiya, S14 Adilo, S18 Teferi-Kela, S24 Ela, S27 Fisha-Genet, S36 Ezo, S37 Dorze, S38 Kele, S47 Mito, S57 Chorso-Mazoria
		Oromia (2)	O09 Merano, O32 Gerada
1C	Town Admin.	SNNPRS (11)	S02 Kela, S04 Suten, S07 Lisana, S11 Fonko, S32 Dimtu, S41 Segen, S44 Alkeso, S54 Hirkofofo, S55 Weyira-Mazoria, S56 Biloya, S59 Dalbo-Atowa
		Oromia (10)	O03 Gonde, O05 Kidame-Digelu, O11 Kurumusa, O12 Boru-Jawi, O20 Abosa, O28 Jido, O29 Katar-Genet, O30 Lemo-Sirba, O34 Busa, O40 Kabate
1D	Kebele	SNNPRS (3)	S51 Mazoria, S53 Hamus-Gabeya, S60 Lanite
		Oromia (2)	O41 Awasho-Ghanku, O42 Hursa
1E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El-Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

b. Categorization by water potential (water quantity)

The small towns are classed as “Feasible” or higher account for 83% of total towns (SNNPRS 56%, Oromia region 47%), based on the results of the water potential by the hydrogeological survey. And the results of the classification are as follow;

Table 10.15: Categorization by Water Potential (quantity)

Level	water potential (quantity)	Candidate small towns	
		Region	Region
2A	High	SNNPRS (5)	S16 Leku, S17 Kebado, S51 Mazoria, S59 Dalbo-Atowa, S63 Kawakoto
		Oromia (0)	Nil.
2B	Feasible	SNNPRS (24)	S01 Buei, S02 Kela, S06 Koshe, S07 Lisana, S09 Dosha, S11 Foknko, S13 Anigacha, S14 Adilo, S15 Daniboya, S22 Chuko, S24 Ela, S30 Tabela, S32 Dimtu, S43 Kibat, S44 Aleso, S46 Tora, S47 Mito, S48 Dalocha, S49 Alem-Gebeya, S52 Wilbareg, S53 Hamus-Gebeya, S54 Hirkofofo, S55 Weyira-Mazoria, S62 Udasa
		Oromia (14)	O01 Iteya, O03 Gonde, O06 Sague, O07 Kersa, O10 Kofele, O11 Kulumusa, O12 Boru-Jawi, O28 Jido, O29 Katar-Genet, O30 Lemo-Sirba, O34 Bura, O40 Kabate, O41 Awasho-Dhanku, O42 Hursa

2C	Low	SNNPRS (21)	S03 Tiya, S04 Suten, S18 Teferi Kela, S19 Goreche, S20 Manicho, S21 Bokasa, S23 Chuko, S27 Fisha Genet, S28 Gedeb, S34 Birbir, S35 Chenicha, S36 Ezo, S37 Dorze, S38 Kele, S39 Soyama, S41 Segen, S42 Gidole, S56 Biloya, S57 Chorso-Mazoria, S60 Lanite, S61 Gewada
		Oromia (8)	O02 Ogolcha, O05 Kidamu-Digelu, O09 Meraro, O20 Abosa, O22 Adami-Tulu, O31 Milami, O32 Garaba, O39 Intaye
2E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El-Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

c. Categorization by water quality

The small towns are classed as “Permissible” or higher account for 57% of total towns (SNNPRS 78%, Oromia region 20%), based on the results of the water potential by the water quality survey. And the results of the categorization are shown in Table 10.16.

Table 10.16: Categorization by Water Quality

Level	Water quality	Candidate small towns	
		Region	Region
3A	Good	SNNPRS (38)	S01 Buei, S02 Kela, S03 Tiya, S04 Suten, S07 Lisana, S09 Dosha, S11 Fonko, S13 Anigacha, S14 Adilo, S15 Daniboya, S16 Leku, S17 Kebado, S18 Teferi-Kala, S19 Goreche, S21 Bokasa, S22 Chuko, S23 Chuko, S27 Fisha-Genet, S28 Gedeb, S34 Birbir, S35 Chenicha, S37 Dorze, S39 Soyama, S41 Segen, S43 Kibat, S44 Alkeso, S46 Tora, S47 Mito, S49 Alem-Gebeya, S51 Mazoria, S52 Wilbareg, S53 Hemus-Gabeya, S54 Hirkofofo, S55 Weyira-Mazoria, S56 Biloya, S57 Chrso-Mazoria, S60 Lanite, S63 Kawakoto
		Oromia (0)	Nil.
3B	Permissible	SNNPRS (3)	S20 Manicho, S30 Tabela, S59 Dalbo Atowa
		Oromia (6)	O31 Milami, O32 Geraba, O34 Bura, O40 Kabale, O41 Awasho-Dhanku, O42 Hursa,
3C	No Data (ND) Around boundary of the study area Exist area of Fluoride	SNNPRS (4)	S36 Ezo, S38 Kele, S42 Gidole, S61 Gewada
		Oromia (12)	O01 Iteya, O03 Gonde, O05 Kidame-Digelu, O06 Sague, O07 Kersa, O09 Merano, O10 Kofele, O11 Kulumusa, O12 Boru-Jawi, O28 Jido, O29 Kata-Genet, O30 Lemo-Sirba
3D	Unfeasible (Fluoride…etc)	SNNPRS (5)	S06 Koshe, S24 Ela, S32 Dimtu, S48 Dalocha, S62 Usada
		Oromia (4)	O02 Ogolcha, O20 Abosa, O22 Adami-Tulu, O39 Intaye
3E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

d. Categorization by water coverage

The small towns are classed as less than "60%" account for 44% of total towns (SNNPRS 48%, Oromia region 36%), based on the results of the water coverage by the field survey. The results of the classification are as follows;

Table 10.17: Categorization by Water Coverage

Level	Water coverage	Candidate small towns	
		Region	Region
4A	＜10%	SNNPRS (10)	S20 Manicho, S21 Bokasa, S28 Gedeb, S36 Ezo, S37 Dorze, S39 Soyama, S55 Weyira Mazoria, S56 Biloya, S59 Balbo-Atowa, S61 Gewada
		Oromia (6)	O29 Katar Genet, O34 Bura, O39 Inytaye, O40 Kabate, O41 Awasho Dhanku, O42 Hursa
4B	10%≦ ＜60%	SNNPRS (22)	S03 Tiya, S04 Suten, S09 Dosha, S14 Adilo, S15 Daniboya, S17 Kebado, S18 Teferi Kala, S19 Goreche, S23 Chuko, S27 Fiseha Genet, S30 Tebela, S32 Dimtu, S35 Chenicha, S42 Gidole, S46 Tora, S51 Maroria, S53 Hamus Gabeya, S54 Hikofofo, S57 Chorso Mazoria, S60 Lanite, S62 Udasa, S63 Kawakoto
		Oromia (7)	O09 Meraro, O10 Kofele, O11 Kulumsa, O12 Boru Jawi, O20 Abosa, O30 Lemo Sirba, O31 Milami
4C	60%≦ ＜100%	SNNPRS (6)	S02 Kela, S06 Koshe, S13 Anigacha, S38 Kele, S48 Dalocha, S52 Wilbareg
		Oromia (1)	O06 Sague
4D	100%≦ ND (No Data)	SNNPRS (12)	S01 Buei, S07 Lisana, S11 Fonko, S16 Leku, S22 Chuko, S24 Kela, S34 Birbir, S41 Segen, S43 Kibat, S44 Alkeso, S47 Mito, S49 Alem Gebeya,
		Oromia (8)	O01 Iteya, O02 Ogolcha, O03 Gonde, O05 Kidame Digelu, O07 Kersa, O22 Adami Tulu, O28 Jido, O32 Garaba,
4E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

e. Categorization by beneficiary population and ratio (beneficial effect)

Based on the results of the beneficiary population by the field survey, small towns have "2,000" or more persons with 100% access to water account for 40% of total towns. (SNNPRS 42%, Oromia region 37%).

- Beneficiary population (persons)
  = Population of 2015 – (Population of 2015 × current water coverage %)
- Beneficial ratio (%)

= Beneficiary population ÷ Population of 2015

The results of classification are shown in Table 10.18 and Table 10.19 below.

Table 10.18: Categorization by Beneficiary Population

Level	Beneficiary population (100%、20Lpcd.)	Candidate small towns	
		Region	Region
5-1A	4,000 psn.≦	SNNPRS	S14 Adilo, S15 Daniboya, S17 Kebado, S20 Manicho, S23 Chuko,

		(18)	S28 Gedeb, S30 Tebela, S35 Chenicha, S39 Soyama, S42 Gidole, S46 Tora, S55 Weyira-Mazoria, S56 Biloya, S57 Chorso-Mazoria, S59 Dalbo-Atowa, S60 Lanite, S61 Gewada, S62 Udasa
		Oromia (9)	O09 Meraro, O10 Kofele, O29 Katar Genet, O30 Lemo-Sirba, O34 Bura, O39 Inytaye, O40 Kabate, O41 Awasho-Dhanku, O42 Hursa
5-1B	2,000 psn.≦ ＜4,000 psn.	SNNPRS (10)	S14 Adilo, S18 Teferi Kala, S19 Goreche, S20 Manicho, S27 Fiseha-Genet, S30 Tebela, S48 Dalocha, S51 Maroria, S59 Dalbo-Atowa, S62 Udasa
		Oromia (7)	O09 Meraro, O11 Kulumsa, O12 Boru-Jawi, O20 Abosa, O29 Katar Genet, O30 Lemo-Sirba, O31 Milami
5-1C	1,000 psn.≦ ＜2,000 psn.	SNNPRS (3)	S03 Tiya, S37 Dorze, S38 Kele
		Oromia (1)	O06 Sague
5-1D	＜1,000 psn. No Data (ND)	SNNPRS (19)	S01 Buei, S02 Kela, S04 Suten, S06 Koshe, S07 Lisana, S11 Fonko, S13 Anigacha, S16 Leku, S22 Chuko, S24 Kela, S32 Dimtu, S34 Birbir, S41 Segen, S43 Kibat, S44 Alkeso, S47 Mito, S49 Alem Gebeya, S52 Wilbareg, S63 Kawakoto
		Oromia (8)	O01 Iteya, O02 Ogolcha, O03 Gonde, O05 Kidame Digelu, O07 Kersa, O22 Adami Tulu, O28 Jido, O32 Garaba,
5-1E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

Table 10.19: Categorization by Beneficial Ratio

Level	Beneficial ratio (100%、 20Lpcd.)	Candidate small towns	
		Region	Region
5-2A	80%≦	SNNPRS (19)	S09 Dosha, S14 Adilo, S17 Kebado, S20 Manicho, S21 Bokasa, S27 Fiseha-Genet, S28 Gedeb, S35 Chenicha, S36 Ezo, S37 Dorze, S39 Soyama, S42 Gidole, S51 Maroria, S54 Hikofofo, S55 Weyira-Mazoria, S56 Biloya, S59 Dalbo-Atowa, S61 Gewada, S62 Udasa
		Oromia (9)	O09 Meraro, O11 Kulumsa, O29 Katar Genet, O30 Lemo-Sirba, O34 Bura, O39 Inytaye, O40 Kabate, O41 Awasho-Dhanku, O42 Hursa
5-2B	50%≦ ＜80%	SNNPRS (9)	S15 Daniboya, S18 Teferi Kala, S19 Goreche, S30 Tebela, S46 Tora, S53 Hamus Gabeya, S57 Chorso-Mazoria, S60 Lanite, S63 Kawakoto
		Oromia (4)	O10 Kofele, O12 Boru-Jawi, O20 Abosa, O31 Milami
5-2C	40%≦ ＜50%	SNNPRS (4)	S03 Tiya, S04 Suten, S23 Chuko, S32 Dimtu
		Oromia (0)	Nil.
5-2D	＜40% ND (No Data)	SNNPRS (18)	S01 Buei, S02 Kela, S06 Koshe, S07 Lisana, S11 Fonko, S13 Anigacha, S16 Leku, S22 Chuko, S24 Kela, S34 Birbir, S38 Kele, S41 Segen, S43 Kibat, S44 Alkeso, S47 Mito, S48 Dalocha, S49 Alem Gebeya, S52 Wilbareg,
		Oromia (9)	O01 Iteya, O02 Ogolcha, O03 Gonde, O05 Kidame Digelu, O06 Sague, O07 Kersa, O22 Adami Tulu, O28 Jido, O32 Garaba,
5-2E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

f. Categorization by accessibility (road condition, distance)

The small towns are classed as passable all year around account for 77% of total towns (SNNPRS 83 %, Oromia region 67%), based on the results of the accessibility (road conditions) by the field survey. And the result of the accessibility (distance from local principal city) by the field survey, small towns that are less than 50km account for 70% of total towns (SNNPRS 75 %, Oromia region 60%). The results of categorization are as follows;

Table 10.20: Categorization by Accessibility (road condition, distance)

Level	Road condition (pavement)	Candidate small towns	
		Region	Region
6-1A	All Paved	SNNPRS (19)	S01 Buei, S02 Kela, S03 Tiya, S04 Suten, S06 Koshe, S11 Fonko, S14 Adilo, S16 Leku, S18 Teferi Kala, S22 Chuko, S27 Fiseha Genet S28 Gedeb, S30 Tebela, S43 Kibat, S44 Alkeso, S52 Wilbareg, S55 Weyira Mazoria, S57 Chorso-Mazoria, S60 Lanite,
		Oromia (8)	O01 Iteya, O03 Gonde O10 Kofele, O11 Kulumsa, O20 Abosa, O22 Adami Tulu, O41 Awasho Dhanku,O42 Hursa
6-1B	Paved & Base course & Sub grade	SNNPRS (24)	S07 Lisana, S09 Dosha, S13 Anigacha, S17 Kebado, S19 Goreche, S20 Manicho, S21 Bokasa, S23 Chuko, S24 Kela, S32 Dimtu, S34 Birbir, S35 Chenicha, S36 Ezo, S37 Dorze, S38 Kele, S41 Segen, S42 Gidole, S46 Tora, S49 Alem-Gebeya S51 Maroria, S53 Hamus-Gabeya, S59 Dalbo-Atowa, S62 Udasa, S63 Kawakoto
		Oromia (12)	O02 Ogolcha, O05 Kidame-Digelu, O06 Sague, O09 Meraro, O12 Boru Jawi, O28 Jido, O29 Katar-Genet, O30 Lemo- Sirba, O32 Garaba, O34 Bura,O39 Intaye, O40 Kabate
6-1C	Paved & Sub grade & Dry season	SNNPRS (6)	S15 Daniboya, S39 Soyama, S47 Mito, S48 Dalocha, S56 Biloya, S61 Gewada,
		Oromia (2)	O07 Kersa, O31 Milami
6-1D	Sub grade & Dry season (Long distance)	SNNPRS (1)	S54 Hikofofo
		Oromia (0)	Nil.
6-1E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

Level	Distance from local principal city	Candidate small towns	
		Region	Region
6-2A	＜25km	SNNPRS (16)	S02 Kela, S06 Koshe, S07 Lisana, S11 Fonko, S16 Leku, S17 Kebado, S18 Teferi Kala, S22 Chuko, S23 Chuko, S24 Kela, S30 Tebela, S43 Kibat, S53 Hamus- Gabeya, S54 Hikofofo, S59 Dalbo-Atowa, S60 Lanite,
		Oromia (9)	O01 Iteya, O03 Gonde, O11 Kulumsa, O12 Boru Jawi, O20 Abosa, O22 Adami Tulu, O34 Bura, O41 Awasho Dhanku, O42 Hursa,
6-2B	25 ㎞≦ ＜50 ㎞	SNNPRS (23)	S01 Buei, S03 Tiya, S04 Suten, S09 Dosha, S13 Anigacha, S14 Adilo, S19 Goreche, S20 Manicho, S21 Bokasa, S27 Fiseha Genet S32 Dimtu, S34 Birbir, S35 Chenicha, S36 Ezo, S37 Dorze, S42 Gidole, S44 Alkeso, S48 Dalocha, S49 Alem-Gebeya, S51 Maroria, S55 Weyira Mazoria, S62 Udasa, S63 Kawakoto,
		Oromia	O02 Ogolcha, O05 Kidame-Digelu, O06 Sague, O10 Kofele, O28

		(9)	Jido, O29 Katar-Genet, O30 Lemo- Sirba, O39 Intaye, O40 Kabate
6-2C	50 km≦ ＜100 km	SNNPRS (9)	S15 Daniboya, S28 Gedeb, S38 Kele, S41 Segen, S46 Tora, S47 Mito, S52 Wilbareg, S56 Biloya, S57 Chorso-Mazoria,
		Oromia (3)	O07 Kersa, O09 Meraro, O32 Garaba,
6-2D	100 km≦	SNNPRS (2)	S39 Soyama, S61 Gewada,
		Oromia (1)	O31 Milami
6-2E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

g. Categorization by the identification of existing rights and disputes

Based on the results of the identification of the existing rights and disputes by the field survey, small towns are classed as unidentified account for 79% of total towns. (SNNPRS 87 %, Oromia region 67%) This category is divided into 3 levels. The results of classification are shown in Table 10.21.

Table 10.21: Categorization by the Identification of Existing Rights and Disputes

Level	Existence	Candidate small towns	
		Region	Region
7A	Nil. Unidentified	SNNPRS (45)	Except below towns.
		Oromia (20)	Except below towns.
7D	Often / Continuous	SNNPRS (5)	S23 Chuko, S24 Ela, S32 Dimtu, S38 Kele, S39 Soyama
		Oromia (2)	O34 Bura, O39 Intaye
7E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

h. Categorization by technical specifications and implementation for the new water supply facilities

Based on the results of difficulty of technical specifications and implementation for the new water supply facilities by the field survey, small towns apply to the following items account for 62% of total towns. (SNNPRS 65 %, Oromia region 57 %).

- ✓ Possible to plan by the Ethiopian standard (design criteria) and not demand high technology schemes.
- ✓ Feasible ground condition to access and construct. (flat area, gentle slope area…etc.)

The results of classification are shown in Table 10.22.

Table 10.22: Categorization by Technical Specifications of New Water Supply Facilities

Level	Difficulty	Candidate small towns	
		Region	Region
8A	Readily (13)	SNNPRS (6)	S14 Adilo, S17 Kebado, S22 Chuko, S30 Tabela, S43 Kibat, S60 Lanite
		Oromia (5)	O02 Ogolcha, O31 Milami, O40 Kabate, O41 Awasho-Dhanku, O42 Hursa
8B	Feasible (12~11)	SNNPRS (28)	S01 Buei, S03 Tiya, S04 Suten, S07 Lisana, S09 Dosha, S13 Anigacha, S15 Daniboya, S16 Leku, S18 Teferi-Kela, S19 Goreche, S24 Ela, S32 Dimtu, S34 Birbir, S35 Chenicha, S41 Segen, S44 Alkeso, S46 Tora, S47 Mito, S49 Alem-Gebeya, S51 Mazoria, S53 Hemus-Gebeya, S54 Hirkofofo, S55 Weyira-Mazoria, S56 Biloya, S57 Chorso-Mazoria, S59 Dalbo-Atowa, S62 Udasa, S63 Kawakoto
		Oromia (12)	O03 Gonde, O06 Sague, O07 Kersa, O09 Meraro, O11 Kulumsa, O12 Boru-Jawi, O20 Abosa, O22 Adami-Tulu, O28 Jido, O29 Katar-Genet, O34 Bura, O39 Intaye,
8C	Quite difficult (10)	SNNPRS (9)	S02 Kela, S06 Koshe, S11 Fonko, S23 Chuko, S28 Gedeb, S37 Dorze, S38 Kele, S42 Gidole, S48 Dalocha
		Oromia (5)	O01 Iteya,O05 Kidame-Digelu, O10 Kofele, O30 Lemo-Sirba, O32 Garaba,
8D	Difficult (～9)	SNNPRS (7)	S20 Manicho, S21 Bokasa, S27 Fisha-Genet, S36 Ezo, S39 Soyama, S52 Wilbareg, S61 Gewada
		Oromia (0)	Nil.
8E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

i. Categorization by existing water management organizations

Based on the results of the identification of water management organization by the field survey, water facilities of small towns that are managed by a water committee, woreda office or enterprise (exclusively involved in water management, i.e. not managed by the municipality) account for 77% of total towns (SNNPRS 87 %, Oromia region 18%). The results of classification are shown in Table 10.23.

Table 10.23: Categorization by Existing Water Management Organization

Level	water management organization	Candidate small towns	
		Region	Region
9A	Enterprise	SNNPRS (3)	S01 Buei, S16 Leku, S24 Ela,
		Oromia (2)	O01 Iteya, O03 Gonde
9B	Woreda Office	SNNPRS (17)	S02 Kela, S11 Fonko, S13 Anigacha, S15 Daniboya, S17 Kebado, S18 Teferi-Kela, S22 Chuko, S23 Chuko, S30 Tabela, S34 Birbir, S35 Chenicha, S37 Dorze, S38 Kele, S39 Soyama, S42 Gidole, S43 Kibat, S55 Weyira-Mazoria
		Oromia	O06 Sague, O07 Kersa, O10 Kofele, O12 Boru-Jawi, O22

		(6)	Adami-Tulu, O32 Garaba
9C	Water Committee	SNNPRS (25)	S03 Tiya, S04 Suten, S06 Koshe, S07 Lisana, S09 Dosha, S14 Adilo, S20 Manicho, S21 Bokasa, S27 Fisha-Genet, S28 Gedeb, S36 Ezo, S44 Alkeso, S46 Tora, S47 Mito, S48 Dalocha S49 Alem-Gebeya, S51 Mazoria, S52 Wilbareg, S53 Hemus-Gebeya, S54 Hirkofofo, S56 Biloya, S57 Chorso-Mazoria, S60 Lanite, S62 Udasa, S63 Kawakoto
		Oromia (10)	O02 Ogolcha, O05 Kidame-Digelu, O09 Meraro, O11 Kulumsa, O20 Abosa, O28 Jido, O30 Lemo-Sirba, O31 Milami, O40 Kabate, O42 Hursa
9D	Municipal Or Nil.	SNNPRS (5)	S19 Goreche (Nil.), S32 Dimtu, S41 Segen, S59 Dalbo-Atowa, S61 Gewada(Nil.)
		Oromia (4)	O29 Katar-Genet (Nil.), O34 Bura (Nil.), O39 Intaye(Nil.), O41 Awasho-Dhanku(Nil.)
9E	Out of the study area	SNNPRS (2)	S12 Wada, S58 Shento
		Oromia (8)	O33 El Wayya, O35 Awash Mercasa, O36 Walanciti, O37 Doni, O38 Befa, O43 Hidi-Lola, O44 Fincadaa, O45 Adulala

10.4.3 Selection of high priority small towns

a. Criteria of prioritization

The small towns were prioritized by combinations of upper level of following 10 categories (refer to Table 10.14 to Table 10.23) which are categorized in the above paragraph.

1. Town status;

The category of Town status is divided into 5 levels. And the upper levels (A~C) are prioritized.

2. Ground water potential;

The category of ground water potential is divided into 4 levels. And the upper levels (A~B) are prioritized.

3. Water quality;

The category of Water quality is divided into 5 levels. And the upper levels (A~B) are prioritize.

4. Water coverage;

The category of Water coverage is divided into 5 levels. And the upper levels (A~B) are prioritized.

5. Beneficiary population and ratio (beneficial effect);

The category of beneficiary population and ratio are divided into 5 levels. And the upper levels (A~B) are prioritized.

6. Accessibility (Road condition & Distance);

The category of Accessibility is divided into 5 levels. And the upper levels (A~B) are

prioritized.

7. Existing rights, Disputes;

The category of Existing rights, Disputes is divided into 3 levels. And only A levels is prioritized.

8. Technical spec. & implementation for the new water supply facilities;

The category of Technical spec. & implementation are divided into 5 levels. And the upper levels (A~B) are prioritized.

9. Existing water management organization;

The category of existing water management organization is divided into 5 levels. And the upper levels (A~C) are prioritized.

Table 10.24: Categorization of the Candidate Small Towns

No.	Item of category			Priority	No.of towns	
					SNNPRS	Oromia
1	Towns status	A	Woreda Capital	○	26	8
		B	Municipality	○	10	2
		C	Town Admin.	○	11	10
		D	Kebele	×	3	2
		E	Out of study area	×	2	8
2	Ground water Potential	A	High	○	5	0
		B	Suitable	○	24	14
		C	Low	×	21	8
		D	Out of study area	×	2	8
3	Water quality	A	Good	○	38	0
		B	No problem	○	3	6
		C	Not available	×	4	12
		D	Not good	×	5	4
		E	Out of study area	×	2	8
4	Water coverage	A	＜10%	○	9	4
		B	10%≦－＜60%	○	16	7
		C	60%≦－＜100%	×	6	1
		D	100 % ≦ & ND (No Data)	×	19	10
		E	Out of study area	×	2	8
5-1	Beneficiary population (Beneficial effect)	A	4,000≦	○	12	4
		B	2,000≦－＜4,000	○	10	7
		C	1,000≦－＜2,000	×	4	1
		D	＜ 1,000 & ND (No Data)	×	24	10
		E	Out of study area	×	2	8
5-2	Beneficial ratio (Beneficial effect)	A	80%≦	○	19	9
		B	50%≦-＜80%	○	9	4
		C	40%≦-＜50%	×	4	0
		D	＜ 40% & ND (No Data)	×	18	9
		E	Out of study area	×	2	8
6-1	Accessibility (Road surface)	A	All Paved	○	19	8
		B	Pave & Base course &	○	24	12

			Sub-grade			
		C	Pave & Sub-grade (passable Dry season only)	×	6	2
		D	Sub-grade (passable Dry season only)	×	1	0
		E	Out of study area	×	2	8
6-2	Accessibility （Distance from the local principal city）	A	＜25km	○	16	9
		B	25 ㎞≦-＜50 ㎞	○	23	9
		C	50 ㎞≦-＜100 ㎞	×	9	3
		D	100 ㎞≦	×	2	1
		E	Out of study area	×	2	8
7	Existing rights, Disputes	A	Nil. Unidentified	○	45	20
		D	Often／Continuous	×	5	2
		E	Out of study area	×	2	8
8	Technical specifications & Implementation for the new water supply facilities	A	Readily	○	6	5
		B	Feasible	○	28	12
		C	Quite difficult	×	9	5
		D	Difficult	×	7	0
		E	Out of study area	×	2	8
9	Existing water management organization (Current)	A	Enterprise	○	3	2
		B	Woreda Office	○	17	6
		C	Water Committee	○	25	10
		D	Municipal or Nil.	×	5	4
		E	Out of study area	×	2	8

b. Methodology and results of selection

The prioritization process described above (see to Table 10.24) resulted in selection of only 4 towns in SNNPR (that satisfied all the required conditions) and no towns in Oromia region. Hence, priority small towns were selected by using the following five criteria that were considered important.

- SNNPR ; Ground water potential, Water quality, Water coverage, Beneficiary population & ratio
- Oromia region ; Ground water potential, Water coverage, Beneficiary population & ratio

Finally, 11 towns in SNNPR and 9 towns in Oromia Region (refer to the Data book for detail) were selected. Note that the water quality was not adopted as a condition for prioritization for Oromia Region because there was insufficient water quality data to use in the evaluation.

10.4.4 Approximate scale of water supply facilities

Approximate scale of the 82 small towns, including high priority small towns, based on the results of water planning and water potential in the previous chapter were as the following Table 10.25 (Yellow color: high priority small town). Approximate project costs of these towns are shown in the Data book for reference.

Table 10.25: Approximate Scale of Water Supply Facilities (82 small towns)

SNNPRS							Population		Well	Pump	Generater	Generater room	T pipe	Tank	W pipe	D pipe	Tap
No.	Zone		Woreda		Small Town		2010	2015	nos.	nos.	nos.	nos.	m	nos.	m	m	nos.
1	SZ-01	Gurage	SW-01	Sodo	S-01	Buei	6,961	8,188	1	1	1	1	1,140	1	3,800	11,400	23
2	SZ-01	Gurage	SW-01	Sodo	S-02	Kela	3,519	4,139	1	1	1	1	690	1	2,300	6,900	12
3	SZ-01	Gurage	SW-01	Sodo	S-03	Tiya	1,937	2,278	1	1	1	1	450	1	1,500	4,500	7
4	SZ-01	Gurage	SW-01	Sodo	S-04	Suten	1,298	1,527	2	2	2	2	1,080	1	1,800	5,400	4
5	SZ-01	Gurage	SW-03	Mareqo	S-06	Koshe	6,858	8,067	2	2	2	2	900	1	1,500	4,500	23
6	SZ-02	Hadiya	SW-04	Lemmo	S-07	Lisana	1,711	2,013	1	1	1	1	450	1	1,500	4,500	6
7	SZ-02	Hadiya	SW-05	Shashago	S-09	Dosha	1,881	2,213	1	1	1	1	450	1	1,500	4,500	6
8	SZ-02	Hadiya	SW-07	Analemmo	S-11	Fonko	2,380	2,799	1	1	1	1	600	1	2,000	6,000	8
9	SZ-02	Hadiya	SW-08	Mirab Badawocho	S-12	Wada	2,113	2,485	1	1	1	1	510	1	1,700	5,100	7
10	SZ-03	Kembata Timbaro	SW-09	Anigacha	S-13	Anigacha	6811	8,011	1	1	1	1	1,050	1	3,500	10,500	23
11	SZ-03	Kembata Timbaro	SW-10	Kedia Gamela	S-14	Adilo	4,659	5,480	1	1	1	1	450	1	1,500	4,500	16
12	SZ-03	Kembata Timbaro	SW-11	Dayiboya	S-15	Daniboya	8,111	9,541	2	2	2	2	1,200	2	2,000	6,000	27
13	SZ-04	Sidama	SW-12	Shebedio	S-16	Leku	11,810	13,892	1	1	1	1	1,200	1	4,000	12,000	40
14	SZ-04	Sidama	SW-13	Dara	S-17	Kebado	8,365	9,839	2	2	2	2	1,200	1	2,000	6,000	28
15	SZ-04	Sidama	SW-13	Dara	S-18	Teferi Kela	4,178	4,914	1	1	1	1	900	1	3,000	9,000	14
16	SZ-04	Sidama	SW-14	Gorche	S-19	Goreche	2986	3,512	1	1	1	1	450	1	1,500	4,500	10
17	SZ-04	Sidama	SW-15	Malga	S-20	Manicho	4,017	4,725	1	1	1	1	450	1	1,500	4,500	14
18	SZ-04	Sidama	SW-16	Wensho	S-21	Bokasa (Bokaso)	2,039	2,398	4	4	4	4	1,200	1	1,000	3,000	7
19	SZ-04	Sidama	SW-41	Alta Chuko	S-22	Chuko	8,884	10,450	2	2	2	2	3,000	1	5,000	15,000	30
20	SZ-04	Sidama	SW-18	Wendo Genet	S-23	Chuko	14,626	17,204	4	4	4	4	4,200	1	3,500	10,500	49
21	SZ-04	Sidama	SW-18	Wendo Genet	S-24	Ela (Kela)	5,259	6,186	2	2	2	2	600	1	1,000	3,000	18
22	SZ-05	Gedeo	SW-20	Kochore	S-27	Fiseha Genet	4,189	4,927	4	4	4	4	3,600	1	3,000	9,000	14
23	SZ-05	Gedeo	SW-21	Gedeb	S-28	Gedeb	10,021	11,787	4	4	4	4	3,600	1	3,000	9,000	34
24	SZ-06	Wolayita	SW-23	Humbo	S-30	Tabela (Humbo)	6,246	7,347	2	2	2	2	2,100	1	3,500	10,500	21
25	SZ-06	Wolayita	SW-24	Deguna Fanigo	S-32	Dimtu	1,702	2,002	2	2	2	2	600	1	1,000	3,000	6
26	SZ-07	Gamo Gofa	SW-26	Mirab Abaya	S-34	Birbir	5,831	6,859	2	2	2	2	1,500	1	2,500	7,500	20
27	SZ-07	Gamo Gofa	SW-27	Chencha	S-35	Chenicha	10,223	12,025	2	2	2	2	2,040	1	3,400	10,200	34
28	SZ-07	Gamo Gofa	SW-27	Chencha	S-36	Ezo	1,822	2,143	4	4	4	4	960	1	800	2,400	6
29	SZ-07	Gamo Gofa	SW-27	Chencha	S-37	Dorze	1,256	1,477	2	2	2	2	360	1	600	1,800	4
30	SZ-07	Gamo Gofa	SW-28	Amaro Special	S-38	Kele	8,632	10,153	4	4	4	4	1,800	1	1,500	4,500	29
31	SZ-07	Gamo Gofa	SW-29	Burji Special	S-39	Soyama	6,268	7,373	2	2	2	2	1,500	1	2,500	7,500	21
32	SZ-07	Gamo Gofa	SW-30	Konso Special	S-41	Segen	3,626	4,265	2	2	2	2	900	1	1,500	4,500	12
33	SZ-07	Gamo Gofa	SW-31	Darashe Special	S-42	Gidole	13,176	15,498	4	4	4	4	3,000	1	2,500	7,500	44
34	SZ-08	Silite	SW-32	Siliti	S-43	Kibat	5,676	6,676	4	4	4	4	3,000	2	2,500	7,500	19
35	SZ-08	Silite	SW-32	Siliti	S-44	Alkeso	1,028	1,209	1	1	1	1	750	1	2,500	7,500	3
36	SZ-08	Silite	SW-33	Lanifaro (Lanfuro)	S-46	Tora	9,163	10,778	4	4	4	4	3,360	1	2,800	8,400	31
37	SZ-08	Silite	SW-33	Lanifaro (Lanfuro)	S-47	Mito	3,277	3,855	2	2	2	2	1,200	1	2,000	6,000	11
38	SZ-08	Silite	SW-34	Dalocha	S-48	Dalocha	7,024	8,262	1	1	1	1	810	1	2,700	8,100	24
39	SZ-08	Silite	SW-35	Sankura	S-49	Alem Gebeya	3,656	4,300	2	2	2	2	1,500	1	2,500	7,500	12
40	SZ-08	Silite	SW-35	Sankura	S-51	Mazoria	2,730	3,211	1	1	1	1	360	1	1,200	3,600	9
41	SZ-08	Silite	SW-36	Wilbareg	S-52	Wilbareg (Bilbareg)	2,197	2,584	2	2	2	2	1,200	1	2,000	6,000	7
42	SZ-01	Gurage	SW-02	Meskan	S-53	Hamus-Gabeya(Bamo)	4,152	4,884	2	2	2	2	480	1	800	2,400	14
43	SZ-02	Hadiya	SW-05	Shashago	S-54	Hirkofofo	2,590	3,047	2	2	2	2	300	1	500	1,500	9
44	SZ-02	Hadiya	SW-06	Misrak Badawocho	S-55	Weyira Mazoria	8,346	9,817	2	2	2	2	900	2	1,500	4,500	28
45	SZ-05	Gedeo	SW-20	Kochore	S-56	Biloya	4,484	5,274	4	4	4	4	1,560	1	1,300	3,900	15
46	SZ-05	Gedeo	SW-21	Gedeb	S-57	Chorso-Mazoria	8500	9,998	2	2	2	2	1,200	1	2,000	6,000	29
47	SZ-06	Wolayita	SW-37	Damot Pulasa	S-58	Shento	5,345	6,287	1	1	1	1	540	1	1,800	5,400	18
48	SZ-06	Wolayita	SW-38	Sodo Zuria	S-59	Dalbo Atowa	4,772	5,613	2	2	2	2	900	1	1,500	4,500	16
49	SZ-07	Gamo Gofa	SW-39	Arba Minch Zuria	S-60	Lanite	7,221	8,494	2	2	2	2	1,080	1	1,800	5,400	24
50	SZ-07	Gamo Gofa	SW-30	Konso Special	S-61	Gewada	5,967	7,019	5	5	5	5	1,500	2	1,000	3,000	20
51	SZ-08	Silite	SW-32	Siliti	S-62	Udasa	4,470	5,258	1	1	1	1	600	1	2,000	6,000	15
52	SZ-08	Silite	SW-40	Alicho wuriro	S-63	Kawakoto	783	921	1	1	1	1	540	1	1,800	5,400	3
SNNPRS Average							**5,284**	**6,215**	**2**	**2**	**2**	**2**	**1,268**	**1**	**2,060**	**6,179**	**18**
SNNPRS Total							**274,776**	**323,204**	108	108	108	108	**65,910**	**56**	**107,100**	**321,300**	**923**

Oromia region							Population		Well	Pump	Generater	Generater room	T pipe	Tank	W pipe	D pipe	Tap
No.	Zone		Woreda		Small Town		2010	2015	nos.	nos.	nos.	nos.	m	nos.	m	m	nos.
1	OZ-01	Arsi	OW-01	Hitosa	O-01	Iteya	14,239	16,749	1	1	1	1	1,650	1	5,500	16,500	48
2	OZ-01	Arsi	OW-02	Ziway Dugda	O-02	Ogolcha (Agolcho)	4,759	5,598	1	1	1	1	1,050	1	3,500	10,500	16
3	OZ-01	Arsi	OW-03	Tiyo	O-03	Gonde	4,350	5,117	1	1	1	1	1,200	1	4,000	12,000	15
4	OZ-01	Arsi	OW-04	Digaluna Tijo	O-05	Kidame Digelu	1,780	2,094	1	1	1	1	540	1	1,800	5,400	6
5	OZ-01	Arsi	OW-04	Digaluna Tijo	O-06	Sagure	10,926	12,852	2	2	2	2	1,200	2	2,000	6,000	37
6	OZ-01	Arsi	OW-05	Munesa	O-07	Kersa	9,916	11,664	4	4	4	4	5,400	1	4,500	13,500	33
7	OZ-04	West Arsi	OW-20	Limana Bilbilo	O-09	Meraro	4,725	5,558	1	1	1	1	960	1	3,200	9,600	16
8	OZ-04	West Arsi	OW-08	Kofele	O-10	Kofele	14,401	16,939	5	5	5	5	7,500	2	5,000	15,000	48
9	OZ-01	Arsi	OW-03	Tiyo	O-11	Kulumsa	3,472	4,084	1	1	1	1	600	1	2,000	6,000	12
10	OZ-01	Arsi	OW-01	Hitosa	O-12	Boru Jawi	4,446	5,230	2	2	2	2	1,200	1	2,000	6,000	15
11	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-20	Abosa	3,578	4,209	1	1	1	1	330	1	1,100	3,300	12
12	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-22	Adami Tulu	8,166	9,605	4	4	4	4	4,200	1	3,500	10,500	27
13	OZ-03	East Shewa	OW-16	Adami Tulu & Jido Kombolcha	O-28	Jido	2,659	3,128	1	1	1	1	540	1	1,800	5,400	9
14	OZ-01	Arsi	OW-03	Tiyo	O-29	Katar Genet	3,953	4,650	1	1	1	1	960	1	3,200	9,600	13
15	OZ-01	Arsi	OW-20	Limana Bilbilo	O-30	Lemo Sirba	5,590	6,575	2	2	2	2	1,500	1	2,500	7,500	19
16	OZ-02	Borena	OW-09	Teltele	O-31	Milami	4,510	5,305	2	2	2	2	1,260	1	2,100	6,300	15
17	OZ-02	Borena	OW-21	Bure Hara	O-32	Garaba	7,500	8,822	2	2	2	2	1,800	1	3,000	9,000	25
18	OZ-02	Borena	OW-10	Yabelo	O-33	El Woyya(Wayya)	4,090	4,811	1	1	1	1	300	1	1,000	3,000	14
19	OZ-04	West Arsi	OW-22	Wondo	O-34	Bura (Busa)	5,112	6,013	2	2	2	2	1,500	1	2,500	7,500	17
20	OZ-03	East Shewa	OW-19	Adama	O-35	Awash Mercasa	10,200	11,998	2	2	2	2	1,800	1	3,000	9,000	34
21	OZ-03	East Shewa	OW-23	Bosat	O-36	Walanciti	11,260	13,245	5	5	5	5	9,750	2	6,500	19,500	38
22	OZ-03	East Shewa	OW-23	Bosat	O-37	Doni	4,164	4,898	1	1	1	1	600	1	2,000	6,000	14
23	OZ-03	East Shewa	OW-23	Bosat	O-38	Befa (Bofa)	7,040	8,281	2	2	2	2	1,620	1	2,700	8,100	24
24	OZ-04	West Arsi	OW-22	Wondo	O-39	Intaye	8,500	9,998	2	2	2	2	1,680	1	2,800	8,400	29
25	OZ-04	West Arsi	OW-08	Kofele	O-40	Kabate	4,146	4,877	2	2	2	2	1,080	1	1,800	5,400	14
26	OZ-04	West Arsi	OW-14	Sheshemane	O-41	Awasho-Dhanku	7,040	8,281	4	4	4	4	2,880	1	2,400	7,200	24
27	OZ-04	West Arsi	OW-14	Sheshemane	O-42	Hursa	5,700	6,705	4	4	4	4	2,400	1	2,000	6,000	19
28	OZ-02	Borena	OW-12	Mijo (Miyo)	O-43	Hidi-Lola	6,550	7,704	2	2	2	2	1,500	1	2,500	7,500	22
29	OZ-02	Borena	OW-13	Dugda dawa	O-44	Fincadaa (Fincawaa)	7,200	8,469	2	2	2	2	1,500	1	2,500	7,500	24
30	OZ-03	East Shewa	OW-24	Liben	O-45	Adulala	3,601	4,236	1	1	1	1	450	1	1,500	4,500	12
Oromia Region Average							**6,452**	**7,590**	**2**	**2**	**2**	**2**	**1,965**	**1**	**2,797**	**8,390**	**22**
Oromia Region Total							**193,573**	**227,695**	**62**	**62**	**62**	**62**	**58,950**	**33**	**83,900**	**251,700**	**651**
2 Regions Avarega (SNNPRS+Oromia)							**5,868**	**6,903**	**2**	**2**	**2**	**2**	**1,616**	**1**	**2,428**	**7,284**	**20**
2 Regions Total (SNNPRS+Oromia)							468,349	550,899	170	170	170	170	124,860	89	191,000	573,000	1,574

10.5 Evaluation of high priority small towns

10.5.1 General

Project evaluation procedures were conducted after completing the selection process of the 82 Towns proposed for the Groundwater Assessment Study in the Rift Valley Lakes Basin, according to the specified selection criteria. High priority small towns were the subject of the relevant financial analysis referred to their ability to pay for the operation and maintenance costs of water supply facilities.

The RVLB Groundwater Resources Assessment Study targeted towns of less than 10,000 residents. Considering drinking water as a basic human need, an Ethiopian policy paper on water supply indicated the obligations of water supply beneficiaries depending on the population size of the communities where water supply facilities were constructed. When the population was less than 5,000, the government would assume responsibilities for both the investment costs and the operation and maintenance costs of the facilities. Meanwhile, when the population was between 5,000 and 10,000, the government would be responsible for the investment costs of water supply facilities, and the beneficiaries would be expected to be responsible for the operation and maintenance costs. Finally, when the population was over 10,000 residents, the beneficiaries would be expected to finance both the investment costs and the operation and maintenance costs.

Taking into account the above considerations, and the limited financial capabilities of the future beneficiaries of water supply in the 82 Towns of the Rift Valley Lakes Basin, the logical conclusion would be for the beneficiaries of water supply service to assume financial responsibilities for the operation and maintenance costs of the water supply facilities.

10.5.2 Social and economic evaluation

The usual economic evaluation measures the value of the project for the society or the economy at large. The socioeconomic evaluation takes into account some benefits of the project that permit time savings in water fetching, thereby allowing more time to be devoted to economic activities, or the expanded "free" time allows more leisure or education, all of which are considered to improve the quality of life. Another type of benefit that is considered in socioeconomic evaluation is the decrease in medical expenditures on water borne diseases, which are savings derived from the improved water quality.

a. Data Requirement for Economic Evaluation

Economic evaluation usually requires the use of macroeconomic and microeconomic data. In the RVLB Study, macroeconomic data were collected during the first stage of socio-economic survey in Ethiopia, with a view to using the data also in the economic evaluation.

a.1 Foreign Trade Data

Macroeconomic data on foreign trade of the country were necessary to assess the distortion existing between prices in the Ethiopian domestic market and the prices in international markets. This index is known as "Standard Conversion Factor" (SCF), and is calculated using the data on the values of imports and exports, as well as the values of import taxes and export taxes, as indicated in the following formula:

SCF (Standard Conversion Factor) = (M+X) / (M+Tm) + (X-Tx)

where,

M: Imports
X: Exports
Tm: Import Taxes
Tx: Export Taxes

The application of the above formula to the latest available Ethiopian foreign trade data, 2004 to 2006, collected during the first stage of socio-economic survey, gave the following result shown in Table 10.26.

Table 10.26: Standard Conversion Factor (SCF) Calculation

Year	Imports	Domestic Exports & Re-Exports	Import Taxes	SCF
	(Million Birr)			(Index)
2004	24,830.6	5,309.3	5,746.0	0.840
2005	35,365.9	8,028.3	6,587.0	0.868
2006	46,141.9	9,082.2	8,188.0	0.871
2004-2006	**211,783.7**	**54,980.8**	**20,521.0**	**0.929**
	Source: Calculated from data in Statistical Abstract 2007			

It can be seen in Table 10.26 that SCF increased year to year, from 0.840 in 2004, to 0.868 in 2005, and 0.871 in 2006, thereby indicating the narrowing trend in the distortion between prices in the Ethiopian domestic market and the prices in the international market. Moreover, when the total values of the 3 year-period 2004-2006 were taken together, then the value of SCF became 0.929. The narrowing trend in the gap between domestic prices and international prices was expected to have continued after 2006. In fact, the "2011 Index of Economic Freedom", published by the Heritage Foundation in the United States, reported that the weighted average tariff rate in Ethiopia's trade was only 9.7% in 2009. On the other hand, the simple import tariff rate was 23.1% in 2004, 18.6% in 2005, 17.7% in 2006, and coincidentally the same 9.7% of the Heritage Foundation when the 2004-2006 data were taken together.

Accordingly, it was concluded that the market prices in Ethiopia reflected the international prices fairly well, and therefore, there was no need to calculate and apply correction factors to the financial or market prices in order to obtain the "shadow prices". This implied that financial or market prices could be used in the economic evaluation, just like in the financial evaluation of the Project. However, the cost figures of the economic evaluation would exclude such transfer costs as taxes, interest rate allowances, inflation rate allowances, and subsidies.

a.2 Socioeconomic and Water Usage Survey Data

The Socio-economic and Water Usage Survey conducted by the RVLB Groundwater Study Team also contained questions on the time spent by a household member on one trip to fetch water, the number of trips per day to fetch water, and the household expenditures on medical care. All these data, together with the published data on the frequency of incidence of different types of diseases, especially water borne diseases, were intended for use in the socioeconomic evaluation.

b. Socioeconomic Evaluation Benefits

The calculation of the Standard Conversion Factor (SCF), which was explained above, indicated that the difference between the domestic prices and the border prices in Ethiopia was negligible. This meant that there was no such a need to make a conversion from financial or market prices to economic or shadow prices (the "true" economic values of goods and services). Then, using financial or market prices without the transfer costs, attempts could be made to quantify the socioeconomic benefits from improved water supply, in order to assess the total benefits of water supply as compared with the total cost of constructing and operating the water supply facilities. As mentioned above, the identified socioeconomic benefits from water supply were as follows.

b.1 Time Savings in Water Fetching

The rationale for this type of benefits was that water sources under existing conditions are located at quite a distance from the residence of water users. This meant that one or more members of a household had to devote a large part of their time to fetch water for the family. Then, if water supply facilities were constructed within a Town, the time spent in water fetching would be considerably reduced, and the additional "free" time made available could be used in economic activities or for leisure purposes. This economic benefit is usually quantified as the time savings multiplied by 50% of the minimum salary or minimum wages, generally accepted by international aid organizations as the economic value of unskilled

labor.

The time savings in water fetching was summarized by Regional State from the data collected in the Socioeconomic and Water Usage Survey by the Study Team as shown in Table 10.27.

Table 10.27: Basic Data for the Evaluation of Water Supply Facilities

SNNPRS & Oromia Characteristics for Project Evaluation in RVLB			
	Unit	**SNNPRS**	**Oromia**
Household annual income	Birr	12,357.00	18,891.00
Ability to pay per month: 5.0%	Birr	51.49	78.71
WTP per 20 liter container	Birr	0.30	0.20
WTP per month per household	Birr	20.40	29.84
Household proportion with WTP by 20 liter container	%	31.00	18.00
Household proportion with WTP monthly	%	69.00	82.00
Water consumption by per household per day	liter	104.01	76.10
Average household size	Person	6.33	7.03
Water Fetching			
Distance in km one way			
Traditional water source: rainy season	km	0.66	2.00
Traditional water source: dry season	km	0.68	2.00
Public water faucet: rainy season	km	0.37	1.00
Public water faucet: dry season	km	0.38	1.00
Time one way			
Traditional water source: rainy season		0.17	
Traditional water source: dry season		0.17	
Public water faucet: rainy season		0.10	
Public water faucet: dry season		0.10	
Frequency of water fetching			
Rainy season	times/day	2.06	2.00
Dry season	times/day	2.58	2.00
Health expenditures by household			
Medical expenditures	Birr	313.26	125.00
Transportation expenditures	Birr	170.43	21.00
Source: Socioeconomic & Water Usage Survey			

One difficult problem was that Ethiopia does not have the legal and institutional basis for minimum salary or minimum wages. Inquiries made by the Study Team revealed that the salary was the product of negotiations between an employer and a prospective employee. There was internet information on minimum salary by country, including Ethiopia (0.47 US Dollar per hour or 6Birr per hour), but there was no way to assess the reliability of the information. Therefore, it is very difficult to attempt to quantify the Time Savings Benefits from Reduction in Water Fetching. However, it is a fact that time will be saved in water fetching after construction of water supply facilities.

b.2 Health Improvement Benefits

The water quality in the RVLB shows diverse problems, the most visible of which is the Fluoride content in the drinking water. Consumption of this Fluoride contaminated water over some time produces a characteristic tint in the teeth of the affected population who have no option but to drink water with Fluoride content above the minimum permitted values.

In general, national statistics on Regional States showed that in SNNP and Oromia Regional States, water borne diseases were not ranked among the top causes of morbidity and mortality. As already reported in Progress Report 1, in SNNP Regional State, the highest cause of morbidity was malaria, which is water related but not directly to drinking water. If gastritis and duodenitis are considered as diseases related to drinking water, these diseases were ranked 4 in Oromia Regional State and 5 in SNNP Regional State.

As indicated by the Socioeconomic & Water Usage Survey, yearly medical expenditures by household amounted to 313Birr in SNNP Regional State and 125Birr in Oromia Regional State. Closely linked to medical expenditures were transportation expenditures amounting to 170 Birr per year in SNNP Regional State and 21 Birr in Oromia Regional State. Respondents in SNNP Regional State remarked the distance to the nearest medical facilities, which made transportation expenditures necessary to receive medical care.

Although medical expenditures by household could be ascertained from the results of the Socioeconomic and Water Usage Survey conducted by the Study Team, a difficult methodological problem existed in the allocation of a specific part of the total medical expenditures to water borne diseases. Then, not only medical expenditures had to be allocated but also the transportation expenditures, thereby introducing two strong biases that were regarded as difficult to correct. In any event, taking into account the possible application of arbitrary allocation of medical expenditures and transportation expenditures, the quantification of this benefit has to be discussed.

c. Qualitative Socioeconomic Evaluation

The difficulties in quantifying the socioeconomic benefits to be derived from the water supply facilities left the option of qualitative socioeconomic evaluation, as follows.

c.1 Improvement of the Low Water Supply Coverage

By improving the coverage of water supply service in the high priority small towns, a contribution is made toward increasing the total coverage of the water supply service in the country.

c.2 Water Supply with Quality Water

Simple observation in the Study Area showed the high prevalence of drinking water with Fluoride contamination as indicated by the tint in their teeth. The wells to be drilled as a result of the reliable selection for points of wells in this Study will be water sources that will be free from Fluoride contamination.

c.3 Increased Population with Water Supply

The beneficiary population of improved water supply services would amount to about 200,000 persons in the high priority ranked towns in the target year of 2015. This means that the coverage of water supply service is improved for these beneficiaries in terms of quantity

and quality of water, as well as the service being free of time restricted water supply.

c.4 Improved Health from Expanded Quality Water Supply

The health of the people with improved water supply services is expected to improve, since the water sources will be chosen so as to avoid the Fluoride contamination. Other water borne diseases that are frequent are diarrhea and intestinal diseases, which will certainly diminish through the use of quality water sources.

c.5 Expanded Economic Opportunities

Improving the health of the beneficiary population will permit them to be more productive, more productive workers may attract new business opportunities demanding more employees. This could become a virtuous circle.

10.5.3 Financial aspects

The usual financial evaluation takes into account the financial income from a project and the financial expenditures incurred in the implementation of the same project, by using the "market or financial prices". It gives a measure of the "self-sustainability" of a project because it computes the money in and the money out of the project.

For the RVLB Groundwater Resources Assessment Study, the financial evaluation was considered as most relevant for the operation and maintenance of the recommended water supply facilities in the high priority towns. This evaluation gives an indication of the income generation potential of water supply facilities in a given town, as compared with the operation and maintenance cost required for the water supply facilities.

A frequently used method to compute the potential income from a given water supply facility is the willingness to pay (WTP) of the beneficiary population for these water supply facilities. Likewise, the Ability to Pay (ATP), calculated as a given % of the household income, is used to assess the potential of a water supply project to cover its operation and maintenance cost.

The average household income per year resulting from the Socioeconomic & Water Usage Survey, conducted by the Study Team in 2010, including both Regional States, was used for the financial evaluation. This was the most recent data, and the only available data, because the most recent Household Income, Consumption and Expenditures Survey 2004-2005, by the National Statistical Agency, did not contain household income data.

Therefore, the income potential was estimated by using the primary data from the Socioeconomic and Water Usage Survey, while the cost estimation originated from the water supply plans for each of the proposed 82 Towns. For the financial analyses, the emphasis was placed on the operation and maintenance cost of the water supply facilities, while a different source of funding had to be found to cover the investment cost.

a. Data for Financial Evaluation

The answers to the question on the "Willingness to Pay" for water supply services reflected the value of the water supply service to the beneficiaries. Accordingly, the Willingness to Pay usually gives origin to a stream of income or revenues that would be generated for the purpose of paying for the costs of water supply services during their operation years. The

results obtained from the survey on Willingness to Pay, in conjunction with the estimation results of the Ability to Pay, calculated from the household income, and the costs of constructing and operating the water supply facilities were the key elements in the financial evaluation of the Project.

The household income data, resulting also from the Socioeconomic and Water Usage Survey, was used to assess how much a household can afford to pay for water supply services. This is the household "Ability to Pay", which is defined on the basis of "reference values" given as a percentage of household income, determined from numerous previous projects by international aid agencies. For this analysis, the reference value of the household "Ability to Pay" for water supply services was calculated as 5% of the average household income indicated in the Table above.

b. Income Sources for Financial Evaluation

The Operation and Maintenance Costs of the water supply facilities were estimated by the water supply engineer in the Study Team. The estimated O&M Costs were compared with the potential income estimated using the following criteria.

c. Willingness to Pay (WTP)

Willingness to Pay has 2 components, namely, the monthly willingness to pay, and the willingness to pay per 20 liter container.

c.1 Monthly WTP

The monthly willingness to pay depended on the amount of WTP per household, and the percentage of households that wanted to pay on a monthly basis. In reality, there are always a number of households that fall behind in their payments. In order to keep these late payments to a minimum, an effective education campaign is needed for the beneficiaries, before, during and after construction of water supply facilities. This is an absolute requirement for the sake of fairness, because the people that prefer to pay for water each time they fill a 20 liter container pay for water on the spot, that is, 100% payment. In other words, the monthly water fee collection rate was assumed to be 100%, so as to make it fair for the group of water users paying per 20 liter container.

The monthly WTP in SNNP Regional State was 20.40Birr, wished by 69% of the households.

The monthly WTP in Oromia Regional State was 29.84Birr, wished by 82% of the households.

c.2 WTP per 20 Liter Container

The payment per 20 liter container is cash payment to the water supply caretaker at the site of the water supply facility, thereby implying 100% collection rate. The Socioeconomic and Water Usage Survey gave the proportion of the population who prefer to pay for water on the basis of 20 liter container.

In SNNP Regional State, 31% of the households wished to pay per 20 liter container at a price of 0.30Birr per container.

In Oromia Regional State, 18% of the households wished to pay per 20 liter container at a

price of 0.20Birr per container.

The sum of these two components of water supply income would be compared with the Operation and Maintenance Cost required in each high priority town. If a given town does not meet the requirement of the Operation and Maintenance Cost, it means that the government offices in the water supply sector will have to conduct stronger education campaigns to increase the awareness of the people on the benefits of water supply with good quality water, so as to improve the level of their WTP. Alternatively, the government will have to be ready to increase the financial support to those income-deficit towns.

d. Ability to Pay (ATP)

The Ability to Pay (ATP) was estimated on the basis of 5% of the annual household income derived from the Socioeconomic and Water Usage Survey conducted by the Study Team in 2010. The resulting annual figure was converted to the equivalent monthly figure.

e. Selection of Ability to Pay (ATP)

The Ability to Pay (ATP) was regarded as the appropriate figure for income estimation, based on the following considerations.

- The prospective beneficiaries of water supply facilities have not known water supply facilities that provide sufficient water of good quality. Instead, they have only known water supply service that is time restricted, or supply water of unsatisfactory quality. Then, it was regarded as difficult for them to visualize an improved water supply service. The reasoning was that if they could not visualize the improved service, there was no way for them to put a precise value on the improved water supply facilities.

- On the contrary, the ATP was based on the average household income that was computed as a result of household survey in the proposed 82 Town.

For the sake of simplicity, the same proportion of households wishing to pay monthly in the survey on WTP was assumed to pay monthly the amount estimated as the ATP.

f. Financial Aspects

g. Financial Evaluation

In this time, there is no selection of target small towns for Grant Aid project from Japan. On the contrary, taking into account the high priority small towns, this project compare the ATP (5% of household income, 100% collecting) in target year of 2015 with the operation & maintenance cost by the construction fee. The annual household income for the ATP that resulted from the Socioeconomic and Water Usage Survey was 12,357 Birr in SNNP Regional State, and 18,891 Birr in Oromia Regional State. Consequently, ability to pay in SNNP Regional State was estimated to be 51.49Birr per month and in Oromia Regional State was assumed to be 78.71 Birr per month. The total O & M cost is 90.7 million Yen. As the amount of the annual ability to pay is 91.3 million Yen, about 7% is going over the budget finally.

h. Recovery of Operation & Maintenance and Replacement Cost

Principal structures (ex. reservoirs, pipelines …etc.) of water supply facilities can require a large amount of budget to repair and/or maintenance caused by miss operation of these facilities. This is a heavy burden on the town's water management organization (ex. water office, water committee). Therefore, to achieve sound management and maintenance it is important that expenditures are kept under control by undertaking maintenance in a planned and periodic manner as well as building up a savings fund for sustainable maintenance. In case of the financial burden that cannot be supported by the water management organization of the town, they shall keep sound management so as to receive financial support from the government (Regional …etc.).

10.5.4 Organization / institutional evaluation

A plan for organizational and institutional improvement is necessary for the effective implementation of the project for highest priority towns and to maintain the water supply facilities. The following propositions can be included in the abovementioned improvement.

i. Institutional improvement, development and relationships between the water management organizations (ex. water office, water committee) of the towns for sharing knowledge and expertise of technical fields which are adopted during implementation of the water supply facilities.

ii. Institutional improvement, development and relationships between the communities for operation & maintenance.

iii. Capacity building of technical and administrative management for staff of the water management organization (ex. water office, water committee) of the towns.

iv. Establishment of the supporting section in the regional office to promote community participation. (ex. maintain water faucets…etc.)

10.5.5 Natural / social environment evaluation

The study has concluded that there is no need to conduct an environmental impact assessment (EIA) as a next step because this project has no significant detrimental impact in the study area.

10.5.6 Technical aspects

New water supply facilities are proposed as schemes of pipelines and deep wells with casing and motorized submersible pumps. Regarding the technical adequacy, it is essential to consider not only “hard” (equipment, implementation), but also “soft” (capacity building of manpower) aspects. The technical adequacy is evaluated by the components such as implementation (construction), operation & maintenance, procurement, management …etc.

The proposed schemes of water supply facilities have been planned and designed similarly to other schemes in the study area, and do not require advanced technology. However, these existing water supply facilities require technical support to compensate for the lack of management of operation & maintenance, accuracy of technical specifications, and facility planning and design.

Chapter 11

Socio-Economic Survey

11 Socio-Economic Survey

11.1 Introduction

The 2009 Human Development Report of UNDP placed Ethiopia among Low Human Development countries, more precisely in place 171 among 181 countries of the world. Worse placed than Ethiopia were countries like Mozambique (172), Burkina Faso (177), Sierra Leone (180) and Afghanistan (181). The World Bank, for its part, in July 2009 classified Ethiopia as a "low income" and "heavily indebted poor country", based on the 2008 gross national income (GNI).

11.2 Economic and social characteristics a national Level

The Government of Ethiopia has a decentralized structure, and consists of Federal level Ministries, 9 Regional States Administrations, 2 Administrative Areas (Addis Ababa and Dire Dawa), and about 550 Woreda (District) level administrations. Each Woreda consists of a number of *Kebeles* (villages), which is the lowest level of government at the community level.

11.2.1 Economic conditions

a. Population and economically active population (EAP)

The World Development Indicators estimated the total population of Ethiopia at 80.7 million persons in 2008. On the other hand, the Statistical Abstract 2011, published in January 2011 by the Central Statistical Agency (CSA) of Ethiopia projected total population for 1 July 2011 at 82.1 million persons, which results in population density of 110.7 persons per square kilometer. Three Regional States (Amhara, Oromia and SNNPRs) accounted for 80% of the total population in 2008.

The data provided by the Statistical Abstract 2007 indicated a population growth rate of cumulative yearly 2.78% between 2002 and 2008. On a year to year basis, the population growth rate has been declining steadily from 2.84% in 2002-2003 to 2.72% in 2007-2008. The latest yearly population growth rate of 2.72% between 2007 and 2008 is closer to the World Bank estimated growth rate of 2.6%.

The CSA data classified 83% of the total population as rural, leaving urban population at a relatively low 17%. Urban centers were defined as localities with 2,000 or more residents, plus capital cities of administrative units (Region, Zone, Woreda), localities with Urban Dweller's Association (UDAs) commonly known as Kebele, and localities with a population of 1,000 or more whose residents are primarily engaged in non-agricultural activities.

The data in Household Income, Consumption and Expenditure Survey (HICE), Statistical Bulletin 394 Volume II, published in July 2007, indicated the existence of 13,365,937 households in Ethiopia, which by dividing into the estimated population of 79.2 million gave an average household size of about 6. Around 3 in 4 household heads were males, while 1 in 4 households had female heads.

The EAP was assumed to comprise the population group aged 15 to 64 years old, and was estimated at 43.129 million persons in 2008, equivalent to 54.4% of the total population. The distribution within EAP was 19% urban and 81% rural. Urban EAP comprised 62% of the total urban population, while rural EAP comprised 53% of the total rural population.
The population that was not economically active, which included those younger than 15 years

of age and older than 65 years, comprised around 42.8% and 2.8%, respectively, of the total population. The relative distribution of the population or the EAP in rural areas appeared to determine the relative distribution in the country as a whole. This is a logical consequence of the high proportion of rural population.

b. Labor force participation rate

HICE, Volume II, published in July 2007, reported the number of persons aged 10 years or older engaged in economic activities during the 12 months prior to the HICE survey. The results indicated 29,246,900 persons engaged in economic activities, meaning effectively employed economically active population. This was equivalent to a labor force participation rate of 36.9% of the total population of 79.2 million as estimated by the CSA. Further, of all economic activities, 26,114,225 or 89% took place in rural areas, and only 3,132,666 or 11% in urban areas.

The data indicated that work opportunities depended mainly on family connections and businesses established by the workers themselves, as almost half of the persons engaged in economic activities (44.5%) fell under the category of "Unpaid family worker", while 36% was described as "Self-employed in the Formal Sector". These two work categories comprised 80% of all work opportunities.

Reflecting the predominance of rural area work, 82% of those engaged in economic activities were in "Agriculture, Hunting & Fishing", while the second most important employment activity was the "Repair of Motor Vehicles and Personal & Household Goods" with a distant 5.4%, followed by "Construction" with 4.1% of employment. "Hotels & Restaurants", which accounted for nearly 15% of GDP, provided work to only 1.2% of working EAP. The above contents are as follows in

Table 11.1: Economic Activities of Each Category for Business

Economic Activities	% of Employed Persons
Agriculture, hunting & fishing	82.0
Repair of motor vehicles & household goods	5.4
Construction	4.1
Hotels & restaurants	1.2

c. Gross domestic product and structure of the economy

The GDP at constant factor cost amounted to 152,405 million Birr in 2009-10. The equivalent per capita GDP at constant factor cost was 1,362 Birr. During the ten year period between 2000-01 and 2009-10, the GDP grew at an annual cumulative rate of 7.76%(see Table 11.2), which on a year to year basis stood at more impressive rates varying between 9.39% and 13.9%.

Table 11.2: GDP and Growing Rate

Gross Domestic Product	Value
GDP at constant factor cost (2009-10)	152,405 Million Birr
GDP per capita	1,739 Birr
GDP cumulative growth rate 2000-01 to 2009-10	7.76%

Sources Statistical Abstract 2011

The distribution of GDP among economic sectors in 2006-07 was 39% primary sector, 12% secondary sector, and 43% tertiary sector. This general distribution pattern was quite constant

during the last 5 years.

Table 11.3: GDP Sector Distribution

GDP Sector Distribution	%	%
GDP Primary Sector 2009-10	39	
Crop production		26
Livestock production		10
Forestry		3
GDP Secondary Sector 2009-10	12	
Manufacturing		5
Construction		5
Mining		2
GDP Tertiary Sector 2009-10	43	
Commence		13
Hotels and restaurants		4
Real estate		9
Transport & communications		5
Health & Education		4
Publish administration		4
Financial intermediation		3

Sources: Statistical Abstract 2011

The structure of GDP indicated that economic activities depended heavily on crop and livestock production, hotels and restaurants, and the financial subsector. The said economic subsectors added up to roughly two-thirds of total GDP (refer to Table 11.3).

d. Road infrastructure

The road network provides the basis for the main transportation mode of the country. The all-weather roads consist of gravel roads and asphalt paved roads, in addition to another road category consisting of rural roads, as indicated in the following Table 11.4.

Table 11.4: All Weather Roads in Major Towns (including rural roads)

All Weather Roads by Maintenance District (km)									
Maintenance	2004-2005			2005-2006			2006-2007		
District	Gravel	Asphalt	Total	Gravel	Asphalt	Total	Gravel	Asphalt	Total
Alemgena	2,253	1,287	3,540	2,261	1,292	3,553	2,264	1,292	3,556
Combolcha	1,786	379	2,165	1,443	561	2,004	1,443	561	2,004
Shashemene	1,283	654	1,937	2,037	379	2,416	2,157	379	2,536
Dire Dawa	2,184	626	2,810	2,184	626	2,810	2,184	626	2,810
Gonder	950	169	1,119	950	169	1,119	977	169	1,146
Debre Markos	743	355	1,098	743	355	1,098	743	355	1,098
Jima	1,495	298	1,793	1,783	343	2,126	1,783	343	2,126
Adigrat	1,218	316	1,534	1,218	316	1,534	1,218	316	1,534
Nekemte	1,184	141	1,325	1,184	141	1,325	1,184	141	1,325
Sodo	1,247	499	1,746	1,537	499	2,036	1,446	499	1,945
Sub-total	**14,343**	**4,724**	**19,067**	**15,340**	**4,681**	**20,021**	**15,399**	**4,681**	**20,080**
Rural Roads	17,956	0	17,956	22,349	0	22,349	20,164	0	20,164
Total	**32,299**	**4,724**	**37,023**	**37,689**	**4,681**	**42,370**	**35,563**	**4,681**	**40,244**
	Source: Statistical Abstract 2007								

As can be seen in the Table above, asphalt paved roads in Ethiopia comprised less than 5,000 kilometers in 2006-07, while gravel roads comprised around 15,000 kilometers, for a total of 20,000 kilometers of all-weather roads. The rural roads accounted for around 20,000 kilometers, resulting in a total of around 40,000 kilometers of road network in the country.

e. Foreign trade

The foreign trade data of Ethiopia showed a persistent negative trade balance between 1995 and 2010, as indicated in the Table below. The value of total yearly exports during the said period reached the highest value in 2010 at 32,260 Million Birr, while the value of imports increased dramatically from 90,310 Million Birr in 2009 to 123,271 Million Birr in 2010, resulting in a trade deficit of 91,011 Million Birr, equivalent to almost 3 times the value of total exports of the year 2010.

Table 11.5: Import and Export and Trade Balance

Imports, Domestic Exports & Re-Exports and Visible Balance of Trade (Million Birr)			
Year	Imports	Domestic Exports & Re-Exports	Visible Balance of Trade
1995	7,041.7	2,602.3	-4,439.4
1996	7,103.1	2,782.3	-4,320.8
1997	7,490.6	3,719.3	-3,771.3
1998	10,387.0	3,966.0	-6,421.0
1999	11,070.1	3,552.9	-7,517.2
2000	10,369.7	3,959.0	-6,410.7
2001	15,347.4	3,658.7	-11,688.7
2002	13,566.5	3,849.6	-9,716.9
2003	23,069.2	4,470.9	-18,598.3
2004	24,830.6	5,309.3	-19,521.3
2005	35,365.9	8,028.3	-27,337.6
2006	46,141.9	9,082.2	-37,059.7
2007	52,007.4	11,474.8	-40,532.6
2008	79,453.0	14,946.0	-64,507.0
2009	90,310.2	17,732.3	-72,577.9
2010	123,270.8	32,259.9	-91,010.9
	Source: Statistical Abstract 2011		

The breakdown of exports by commodity group in 2006 showed the dominant importance of agriculture and livestock and their processing activities in the Ethiopian economy (refer to Table 11.6).

Table 11.6: Export of Commodity Group

Export Commodity Group	Relative Importance (%)
Vegetable products	76.6
Hide & leather	7.4
Live animals & animal products	5.1
Textiles	1.8
Foodstuff, beverage, spirits, tobacco	1.2

The same exercise of breaking down the imports of 2006 by commodity group did not show an overwhelming dominance of a commodity group (refer to Table 11.7).

Table 11.7: Import of Commodity Group

Import Commodity Group	Relative Importance (%)
Mineral products	21.6
Machinery & equipment	19.6
Vehicles & transport equipment	15.0
Chemical products	9.2
Basic metal	8.5
Vegetable products	6.1
Textiles	5.2
Plastics & rubber	4.2
Foodstuff, beverage, spirits, tobacco	1.9

f. Public finance

At the national level in 2009-10, total revenue amounted to 67,079 Million Birr while expenditure amounted to 72,433 Million Birr, leaving a negative balance of 5,355 Million Birr. The financial deficit of the Government occurred during every year from 2000-01 to 2009-10, as can be seen in the following Table 11.8.

Table 11.8: Revenue & Expenditure of Government

Imports, Domestic Exports & Re-Exports and Visible Balance of Trade (Million Birr)			
Year	Imports	Domestic Exports & Re-Exports	Visible Balance of Trade
1995	7,041.7	2,602.3	-4,439.4
1996	7,103.1	2,782.3	-4,320.8
1997	7,490.6	3,719.3	-3,771.3
1998	10,387.0	3,966.0	-6,421.0
1999	11,070.1	3,552.9	-7,517.2
2000	10,369.7	3,959.0	-6,410.7
2001	15,347.4	3,658.7	-11,688.7
2002	13,566.5	3,849.6	-9,716.9
2003	23,069.2	4,470.9	-18,598.3
2004	24,830.6	5,309.3	-19,521.3
2005	35,365.9	8,028.3	-27,337.6
2006	46,141.9	9,082.2	-37,059.7
2007	52,007.4	11,474.8	-40,532.6
2008	79,453.0	14,946.0	-64,507.0
2009	90,310.2	17,732.3	-72,577.9
2010	123,270.8	32,259.9	-91,010.9
	Source: Statistical Abstract 2011		

As for Revenue sources presented in Table 11.9 below, taxes amounted to around 47%, non-tax revenues to around 11% and external grants around 23% of total expenditure in 2006-2007. The most important revenue generating tax was Import Duties and Taxes accounting for around 22% of total expenditure, followed by Income and Profit Taxes for around 17%, and Domestic Indirect Taxes for around 11%. Export Taxes were not specifically indicated.

Table 11.9: Federal Government Expenditure & Revenue by Purpose

Federal Government Expenditure & Revenue by Purpose						
Expenditure & Revenue	2004/05	2005/06	2006/07	2004/05	2005/06	2006/07
	(Million Birr)			(% of Total Expenditure)		
1. Total Expenditure	**25,911.0**	**30,536.0**	**36,789.1**	**1.000**	**1.000**	**1.000**
1.1 Recurrent Expenditure	**14,342.0**	**16,444.0**	**18,347.8**	**0.5535**	**0.5385**	**0.4987**
1.1.1 General services	5,816.0	6,522.0	7,041.0	0.2245	0.2136	0.1914
1.1.2 Social services	3,839.0	4,996.0	6,193.0	0.1482	0.1636	0.1683
1.1.3 Economic services	1,523.0	2,009.0	2,198.0	0.0588	0.0658	0.0597
1.1.4 Pension	0.0	0.0	0.0	0.0000	0.0000	0.0000
1.1.5 Public debt	2,118.0	2,264.0	2,429.8	0.0817	0.0741	0.0660
1.1.6 Miscellaneous expenditures	325.0	67.0	75.0	0.0125	0.0022	0.0020
1.1.7 Subsidies	0.0	0.0	0.0	0.0000	0.0000	0.0000
1.1.8 External assistance	721.0	586.0	411.0	0.0278	0.0192	0.0112
1.1.9 Safety net	0.0	0.0	0.0	0.0000	0.0000	0.0000
1.2 Capital Expenditure	**11,345.0**	**14,042.0**	**18,397.0**	**0.4378**	**0.4599**	**0.5001**
1.2.1 Economic development	7,656.0	10,426.0	11,367.0	0.2955	0.3414	0.3090
1.2.2 Social development	3,291.0	3,099.0	5,997.0	0.1270	0.1015	0.1630
1.2.3 General services	398.0	517.0	1,033.0	0.0154	0.0169	0.0281
1.2.4 Others	0.0	0.0	0.0	0.0000	0.0000	0.0000
1.3 Sink Fund	**224.0**	**50.0**	**44.3**	**0.0086**	**0.0016**	**0.0012**
2. Total Revenues & Grants	**20,884.0**	**24,151.0**	**30,064.1**	**0.8060**	**0.7909**	**0.8172**
2.1 Ordinary Revenue	**15,390.0**	**19,183.0**	**21,487.1**	**0.5940**	**0.6282**	**0.5841**
2.1.1 Direct taxes	3,930.0	4,424.0	5,168.0	0.1517	0.1449	0.1405
2.1.2 Indirect taxes	2,721.0	3,111.0	3,997.0	0.1050	0.1019	0.1086
2.1.3 Foreign trade taxes	5,746.0	6,587.0	8,188.0	0.2218	0.2157	0.2226
2.1.4 Non-tax revenue	2,993.0	5,061.0	4,134.1	0.1155	0.1657	0.1124
2.2 Capital Receipts	**201.0**	**310.0**	**168.0**	**0.0078**	**0.0102**	**0.0046**
2.3 External Assistance	**5,293.0**	**4,658.0**	**8,409.0**	**0.2043**	**0.1525**	**0.2286**
2.4 Cash Balance	**-5,027.0**	**-6,385.0**	**-6,725.0**	**-0.1940**	**-0.2091**	**-0.1828**
2.5 Borrowings	**6,764.0**	**4,531.0**	**6,247.0**	**0.2610**	**0.1484**	**0.1698**
2.5.1 External	2,507.0	1,520.0	4,259.0	0.0968	0.0498	0.1158
2.5.2 Internal	4,257.0	3,011.0	1,988.0	0.1643	0.0986	0.0540
	Source: Statistical Abstract 2007					

The following points can be highlighted about Government expenditures.

- Public Debt service was quite low at 6.6% of Current Expenditure.
- Economic Development received the bulk of Capital Expenditure (30.9%) and 5.97% of Current Expenditure.
- Social Services accounted for 16.8% of Current Expenditure and 16.3% of Capital Expenditure.

g. Foreign trade taxes

No export taxes were specifically reported in Public Finance data. However, Foreign Trade Taxes, consisting of Import Duties and Taxes, were the most important source of tax revenues, covering 22% of total revenue of the Federal Government in 2006-07. The following Table 11.10 shows the data on the values of imports, exports and Foreign Trade Taxes (Import Tax).

Table 11.10: Import Duties and Taxes

Value of Imports & Exports, and Foreign Trade Tax			
(Million Birr)			
Year	Imports	Domestic Exports & Re-Exports	Import Taxes
2004	24,830.6	5,309.3	5,746.0
2005	35,365.9	8,028.3	6,587.0
2006	46,141.9	9,082.2	8,188.0
	Source: Statistical Abstract 2007		

h. Consumer price index

The Statistical Abstract 2007 presented the yearly Consumer Price Index (CPI) for the country and the Regional States, corresponding to the year 2006-07, having 2000 as the base year. By calculating the cumulative yearly inflation rate between the base year 2000 and the year 2006-07, it could be seen that for Ethiopia as a whole, the CPI grew at a yearly 9.2% during those years. The inflation rate was the highest for "Food", which reached a cumulative inflation rate of 11.2% between 2000 and 2006-07. The next highest inflation rate was registered in "House Rental, Water & Energy", followed by "Personal Care" and "Transport & Communications". Among foodstuff, the highest inflation rate was registered for "Meat", followed by "Cereals" and "Spices", all of which exceeded the inflation rate for foodstuff as a whole.

Curiously, the inflation rate for the country was higher than for the capital city Addis Ababa, which registered a cumulative yearly average of 6.5% as the general index, and 8.6% for foodstuff.

i. Household income, consumption and expenditure

This Section is based on Household Income, Consumption and Expenditure (HICE) Survey 2004-05, Volume I dated May 2007, and Volume II dated July 2007.
The Survey reported 13,365,937 households in the country, the household size of 4 prevailing with 16.9% (Vol II Table 01 p.25). The Survey reported that the national average household size decreased from 5 in 1995-6 to 4.8 in 2004-05. Urban households decreased in size from 4.7 in 1995 to 4.3 in 2005, while rural household size decreased from 5.1 in 1995 to 4.9 in 2005. By Region, the household size was 5.2 in Oromia, 4.8 in SNNP and 4.9 in Addis Ababa.

The average expenditure per capita in 2004-05 amounted to 1,697.35 Birr/year, varying from 1,557.45 Birr/per capita/year in rural areas to 2,533.25 Birr/per capita/year in urban areas. The difference was equivalent to around 10% less than the national average in rural areas and around 50% more than the national average in urban areas, as indicated in the following Table.

As for the goods and services consumed in the country in 2004-05, three major component groups accounted for 84% of total expenditures: "food and non-alcoholic beverage" comprising 51% of total expenditures, followed by "housing, water, energy" comprising 19%, and "transport, communication" comprising 14%. Education and "health, medical treatment" comprised less than 1% each of total expenditures (refer to Table 11.11).

Table 11.11: Expenditure Items

Expenditure Group	Birr/yr	%
Food and non-alcohol bev.	863.86	50.9
Alcohol & tobacco	18.83	1.1
Clothing & footwear	127.26	7.5
Housing, water, energy	320.51	18.9
Household equip. & maint.	72.32	4.3
HH maint goods & services	25.87	1.5
Health, medical treatment	12.48	0.7
Education	14.30	0.8
Other (transp., comm., misc.)	241.92	14.3
Total	1,697.35	100

As for the sources of income to finance these household expenditures, the four major sources were: “household agricultural enterprises” showing an overwhelming importance in rural areas (65%), “household non-agricultural enterprises” showing a relative importance of 36% in urban areas, “wages and salaries” showing a relative importance of 37% in urban areas, and “remittances” showing similar relative weights in rural and urban areas (7% and 9%, respectively). These data indicated the importance of household enterprises as sources of employment and income. A household enterprise was defined as “an economic enterprise run by the household/member of a household, with the primary aim to manage the livelihood of the household, without any distinct demarcation between its income/expenditure and the household’s income/expenditure”.

11.2.2 Social conditions

a. Social infrastructure

a.1 Hospitals

Medical and health care facilities were classified into Clinics, Health Centers, Hospitals and Health Posts, operated by the Ministry of Health or others, as indicated in the following Table 11.12 which includes the data of these facilities by Regional State for 2006-07.

Table 11.12: Medical and Health Care Facilities

2006-2007								
Regional State	Clinics		Health Centers		Hospitals		Hospital	Health
	MoH	Others	MoH	Others	MoH	Others	Beds	Post
Tigray	113	16	41	1	13	3	1,417	529
Afar	45	6	14	0	2	0	122	154
Ahmara	122	69	169	0	16	3	1,615	2,590
Oromia	701	195	197	5	22	8	3,513	1,985
Somalie	95	0	20	0	6	0	436	149
Benishangul Gumuz	94	8	15	2	2	0	205	88
SNNPR	167	77	176	4	14	6	1,897	4,258
Gambella	26	0	5	4	1	0	100	64
Harari	3	10	3	0	2	2	710	22
Addis Ababa	7	8	24	5	5	25	927	37
Dire Dawa	3	8	7	0	1	3	232	38
Central					4	5	2,460	0
Total	**1,376**	**397**	**671**	**21**	**88**	**55**	**13,634**	**9,914**

The number of hospital beds reached 13,634 in 2006-07 as shown in Table 11.12, which on the basis of a total population of 79,200,000, resulted in around 5,800 persons per hospital bed. The number of medical doctors reached 973 in 2006-07, equivalent to around 81,400 persons per doctor, while the number of nurses reached 13,011, resulting in around 6,000 persons per nurse as shown in Table 11.13.

Table 11.13: Number of medical staff of each region

2006-2007									
Regional	Professionals						Technicians		
State	Doctors	Health Officers	Nurses	Pharmacists	Sanitarians	Health Assistant	Laboratory	X-Ray	Pharmacy
Tigray	59	163	2,094	12	77	0	152	11	215
Afar	10	16	208	4	16	42	7	2	25
Ahmara	133	273	1,973	0	304	647	259	13	329
Oromia	149	522	3,278	48	336	1,540	434	44	318
Somalie	53	23	476	6	34	97	69	4	22
Benishangul Gumuz	6	18	397	4	17	13	31	2	22
SNNPR	155	150	2,143	12	277	313	304	29	250
Gambella	4	10	156	2	13	10	13	2	6
Harari	41	11	277	2	8	76	47	11	22
Addis Ababa	118	13	1,201	23	14	444	106	36	61
Dire Dawa	31	8	226	13	17	42	28	8	23
Central	214	12	582	49	20	70	73	16	15
Total	**973**	**1,219**	**13,011**	**175**	**1,133**	**3,294**	**1,523**	**178**	**1,308**
	Source: Statistical Abstract 2007								

a.2 Schools

The new education system classified primary school as comprising years 1-8, secondary school comprising years 9-10 and 11-12 (Preparatory), and Technical Vocational Education Training (TVET) comprising years 10+1, 10+2 and 10+3.

Excluding kindergarten and higher education, the number of students in 2006-07 reached 13,236,622, distributed in 19,074 schools with 189,272 classrooms served by 216,192 teachers. The education system was divided into the Government System and Non-Government System, but the Government System accounted for over 90% of schools, students, teachers and classrooms.

The Non-Government Schools seemed to have a larger student body, as the average exceeded 1,000 students per school, while the Government-run schools averaged around 700 students per school. On the other hand, the number of students per teacher averaged over 60 in Government schools, and slightly over 30 in Non-Government schools (refer to Table 11.14).

Table 11.14: Number of School Staff

Number of Schools, Teachers, Students & Classrooms by School Type (excluding kindergarten & higher education)							
School Type	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Government							
Schools	11,600	11,871	12,217	12,920	16,240	16,629	17,642
Teachers	126,719	131,424	137,248	147,344	176,390	181,065	197,657
Students	7,571,436	8,282,408	8,783,287	9,634,166	11,715,717	11,908,447	12,642,998
Classrooms	0	0	85,976	0	114,291	118,203	141,149
Non-Government							
Schools	604	673	745	855	979	1,063	1,432
Teachers	8,387	9,549	9,378	11,045	12,327	13,394	18,535
Students	351,906	384,982	415,742	439,907	465,058	482,677	593,624
Classrooms	0	0	6,733	0	8,032	3,836	48,123
Total							
Schools	12,204	12,544	12,962	13,775	17,219	17,692	19,074
Teachers	135,106	140,973	146,626	158,389	188,717	194,459	216,192
Students	7,923,342	8,667,390	9,199,029	10,074,073	12,180,775	12,391,124	13,236,622
Classrooms	0	0	92,709	0	122,323	122,039	189,272
	Source: Statistical Abstract 2007						

Of the enrolled students excluding those in the graduate and extension programs, 91% were in Grades 1-8, while those in Grade 9-10 accounted for around 7% of the total enrollment, and those in Preparatory program (Grades 11-12), in Vocational Education and in Universities/College accounted for less than 1% each group. The number of students in University/College was quite similar to the number of students in the Preparatory program (Grades 11-12) (refer to Table 11.15).

Table 11.15: Students Enrollment of Each School

Students Enrollment by Level in Government and Non-Government Schools						
(university students exclude graduate and extension programs)						
Education Level	2006-2007			2005-2006		
	Government	Non-Govern.	Total	Government	Non-Govern.	Total
Years 1-8	11,601,658	520,285	12,121,943	10,949,998	426,961	11,376,959
Years 9-10	878,187	35,003	913,190	800,200	22,518	822,718
Preparatory (Years 11-12)	114,693	10,759	125,452	89,164	6,004	95,168
TVET (10+1 - 10+3)	48,460	27,577	76,037	69,085	27,194	96,279
University/Colleges	93,547	11,026	104,573	85,068	6,587	91,655
Total	**12,736,545**	**604,650**	**13,341,195**	**11,993,515**	**489,264**	**12,482,779**
	Source: Statistical Abstract 2007					

The male-female gap in enrollment appeared to widen as the education level increased, being 55% to 45% in Grades 1-8, 63% and 37% in Grades 9-10, 65% to 35% in Grades 11-12, and 76% to 24% in University/College. An exception was in Vocational Education which showed an almost even male-female distribution ratio of 52% to 48% (refer to Table 11.16).

Table 11.16: Number of Male & Female of Each Level

Students Enrollment by Level and Sex				
(university students exclude graduate and extension programs)				
Education Level	2004/2005	2005/2006	2006/2007	
Years 1-8				
Male	6,276,921	6,356,523	6,704,292	0.553
Female	4,948,390	5,020,436	5,417,651	0.447
Total	11,225,311	11,376,959	12,121,943	1.000
Years 9-10				
Male	521,931	533,687	576,021	0.631
Female	279,728	289,031	337,169	0.369
Total	801,659	822,718	913,190	1.000
Preparatory (Years 11-12)				
Male	66,279	69,397	82,176	0.655
Female	24,480	25,771	43,276	0.345
Total	90,759	95,168	125,452	1.000
TVET (10+1 - 10+3)				
Male	30,450	47,775	39,569	0.520
Female	32,596	48,504	36,468	0.480
Total	63,046	96,279	76,037	1.000
University/Colleges				
Male	70,388	70,388	79,465	0.760
Female	21,267	21,267	25,108	0.240
Total	91,655	91,655	104,573	1.000
Total				
Male	6,965,969	7,077,770	7,481,523	0.561
Female	5,306,461	5,405,009	5,859,672	0.439
Total	**12,272,430**	**12,482,779**	**13,341,195**	1.000
	Source: Statistical Abstract 2007			

b. Prevalent Diseases

There were no morbidity data for the country as a whole, but the leading 10 causes of morbidity were ranked for each Regional State.

11.3 Regional socio-economy in RVLB

11.3.1 SNNPRS regional socio-economic conditions

This Section is based on the Annual Regional Statistical Abstract 1997 E.C. (2004-5).

a. Land area and administration

The Southern Nations, Nationalities and People's Region (SNNPR) is one of the nine Federal Regional States of Ethiopia. The Region covers an area of about 110,931 sq km, which is almost 10% of the total size of Ethiopia.

The capital of the Region is Awassa, 275 km from Addis Ababa, the national capital. Based on ethnicity and language identities, the Region is divided into: 13 Zones (Sidama, Gedeo, Gamogofa, South Omo, Wolayta, Dawero, Kembata -Tembaro, Hadiya, Keffa, Sheka, Benchi Maji, Gurage and Siltie), under which there are 125 Woredas, 8 Special Woredas (Alaba, Konso, Burji, Amaro, Derashe, Konta, Basketo, and Yem), and 19 autonomous town administrations. There are 3,561 rural Kebeles and 90 towns which have a municipality.

The Region's projected population was 14.5 million in 2005, equivalent to about 20% of the total national population. More than half of Ethiopia's ethnic composition is in SNNPR; so far about 56 ethnic groups (with distinct languages, culture and traditions) have been identified, which makes the region a mosaic of people and culture.

b. Gross regional product (GRP)

The per-capita gross regional product at current factor cost in SNNP Region in 2004-05 was about 1,059 Birr.

As shown in the following Table 11.17, the General Price Trend in the SNNPR remained below 6% over the period 1994 to 1999, but increased to over 7% since 2002.

Table 11.17: General Price Trend

EFY	GRP Current factor cost	GRP 1992 Constant factor cost	Price Index 1992 EFY=100	Inflation (%)
1994	7,308,302,830	7,696,973,854	94.95	
1995	8,313,940,922	8,589,834,789	96.79	1.94
1996	9,079,786,519	9,487,491,049	95.70	(1.12)
1997	8,824,038,220	8,889,987,440	99.26	3.72
1998	8,379,192,647	8,309,324,634	100.84	1.59
1999	8,885,245,080	8,885,245,080	100.00	(0.83)
2000	8,579,021,444	8,088,051,513	106.07	6.07

2001	9,767,062,663	9,312,118,943	104.89	(1.12)
2002	10,367,725,948	9,236,214,562	112.25	7.02
2003	12,416,091,815	10,291,324,162	120.65	7.48
2004	16,679,459,346	12,694,735,526	131.39	8.90

b.1 Composition of GRP

The average contribution of Agriculture to the regional economy (measured at constant factor cost) has declined from 63% in the period of 1992-1994 EFY to 47% in the period 1995-97. On the other hand, the contribution of Industry increased from 15% to 24% during the same period, while Services increased from 22% to 29% during the same period, thereby indicating the structural transformation of the economy from agriculture toward industry and services.

b.2 Agriculture

It can be seen that tillable land comprises less than half of the total land area, three-fourths of farmers undertake crop and livestock activities at the same time, farms of less than 1.0 ha comprise 80% of all farms, main crops are corn, potatoes and sweet potatoes, and main livestock are cattle, poultry and sheep. It can be concluded that the agriculture in the SNNP Region is small scale subsistence farming, producing products mostly for family consumption. Although land plowing is done with hand-made wooden plows and a pair of oxen, farmers who own 2 oxen or more comprised only 20% of the total.

c. Education

The student-teacher ratio indicated that there were 71 students per teacher in the first cycle primary, 59 students per teacher in the second cycle primary, and 54 students per teacher in the secondary schools.

The enrollment ratio for the age group 7-14 in primary school (Grade 1-8) was estimated to be 78.7%. For male students this ratio was 91.5% and for female students 65.7%.

The dropout rate, as indicated in the following Table 11.18, was higher for male students than for female students in all education levels.

Table 11.18: Dropout Ratio

Grade	Dropout Rate (%)		
	Total	Male	Female
Grade 1 – 4	11.7	12.5	10.7
Grade 5 – 8	10.9	12.1	8.8
Grade 9 – 10	7.1	7.8	5.2

d. Health

d.1 Health care facilities

There were a total of 16 hospitals, 162 health centers, 191 growing health stations, 151 downgrading health stations, and 1,316 health posts in the Region (refer to Table 11.19).

Table 11.19: Staff of Health Care Facilities

Professionals	Number
Physician	96
Nurse	2,308
Health Assistant	537
Pharmacist	8
Health Officer	115
Sanitarian	6
Pharmacy Technician	181
Laboratory Technician	100
Total	3,351

d.2 Leading causes of death

The 20 leading causes of death, as indicated in the following Table, account for around 85% of all deaths as shown in Table 11.20. The most important cause is malaria, accounting for around one-third of the deaths, followed by pneumonia, these two causes are responsible for 45% of total deaths.

Table 11.20: Main Causes of Death

Causes of Death	%
1. Malaria of all types	31.69
2. Pneumonia	13.44
3. TB of all types	8.09
4. Accidents	5.64
5. Gastro-enteritis and colitis	3.82
6. Hypertrophy of tonsils & adenoids	3.20
7. Genito-urinary diseases	2.85
8. Skin diseases	2.44
9. Gastritis & duodenitis	2.20
10. Infectious & parasitic diseases	2.04
11. Tetanus	1.47
12. Intestinal obstruction without hernia	1.21
13. Muscular rheumatism & unspecified rheumatism	1.12
14. Unspecified anemia	0.99
15. Hypertension	0.90
16. Typhoid fever	0.90
17. Skin & subcutaneous infection	0.85
18. Dysentery	0.82
19. Ruptured uterus	0.72
20. Digestive system disease	0.68
Total	85.07

e. Infrastructure

e.1 Roads

The road density of the Region was 0.074 Km^2 per 1.0 sq km in 2004. Except the remote Woredas of Bench Maji, Debub Omo, and Gamo Fofa Zones, the Region has more or less access to public transport.
The road network of the Region in 2004 is summarized in the following Table 11.21.

Table 11.21: Length of each Road Type

Road Type	Length (km)	%
Asphalt	421	5
Gravel Federal	2,180	26
Gravel Regional	2,598	32
Dry weather road Track	1,162	14
Dry weather road Earth	1,890	23

e.2 Telecommunications

Telephone communications in the Region covers 21 Zones and Special Woredas, plus 126 Woredas, through 140 telephone stations, resulting in 38,403 lines connected to exchanges.

e.3 Electricity

The electricity service is provided through hydropower or generator, but only 125,975 customers have access to this service. If customers are interpreted as households, and a household size of 6 is estimated, then the beneficiary population would be 755,850, which, in relation to the total population of 14,489,705, is equivalent to 5.2% of the Region's population, still quite a low coverage of this service.

f. Water supply and sanitation

f.1 Clean water supply service

The coverage of water supply service was 60% in urban areas, 45% in rural areas, and 48% for the Region.

f.2 Type of water facilities and beneficiary population in 2005

The type of the water supply service, and the number of beneficiaries in urban and rural areas are indicated in the following Table. Water supply sources are hand-dug wells, medium-dug wells, deep wells and springs, the beneficiary population being 6,935,649 persons out of the total population of 14,507,098 in 2005, equivalent to 48% coverage.

Table 11.22: Type of water facilities and beneficiary population

No.	WOREDA/ZONE	EXISTING WATER SUPPLIES						Total population	Clean Water Users Pop.	Clean Water Coverage (%)
		Hand Dug Well	Medium Dug Well	Deep Dug Well	Developed Springs With Water Point Distribution	Developed Springs Net Work With Water Distribution	Total			
1	S.N.N.P.R	1,304	1,678	421	2,688	255	6,346	14,507,098	6,935,649	48
	Rural	1,205	1,534	307	2,367	231	5,644	13,265,324	5,918,544	45
	Urban	99	144	115	319	24	701	1,236,053	1,023,853	60

11.3.2 Oromia state regional socio-economic conditions

This Section is based on "Brief Description" by Oromia BoFED, July 2008.

a. General

Oromia is the largest of the 9 national Regional States of Ethiopia, in terms of the population size (28,067,000 in 2008, equivalent to 35.4% of the country's total population), and also in terms of the land area (363,136km^2, equivalent to 34.3% of the country's total area), as indicated in the following Table 11.23.

Table 11.23: Population and Area in each Region

Regional State	Population Size on 1 July 2008	Area (km2)
Tigray	4,5655,000	50,078.64
Afar	1,449,000	77,000
Amhara	20,136,000	159,173.66
Oromia	28,067,000*	363,136
Somali	4,560,000	215,900
Benishangul	656,000	49,289.46
SNNPSE	15,745,000	112,343.19
Gambela	259,000	25,802.01
Harari	209,000	311.25
Addis Ababa City Administration	3,147,000	530.14
D.Dawa Administrative Council	428,000	1,213.20
Total	79,221,000	1,059,149.55

Source: CSA, Statistical Abstract, 2007 and UNCRD, Text Book Series No.6, 2006

Oromia Regional State is administratively divided into 17 Zones, 301 Districts (262 rural districts and 39 urban centers under reform) and more than 6,630 Peasant and Urban Dwellers Associations/Gandas.

b. Natural Resources Endowment

Oromia has a rich natural resource endowment, which provides a head start for high development opportunities. The favorable resource endowment includes large population size, large arable land/agricultural resource base, surface water resources, energy resources,

mineral resources, wildlife resources, tourism resources and historical and cultural resources.

Although Oromia's agriculture is rain-fed subsistence type at present, its fertile soils, diverse geographical setting and varied agro-climatic zones make it suitable for the cultivation of different food and cash crops. The potentially irrigable land of the Region is estimated at 1.7 million hectares, of which a maximum of 3% is effectively irrigated at present. Irrigation development is given a priority attention by the Regional State Government in order to ensure food security.

The Region is blessed with different agro-climatic zones, including tropical (50.7%), sub-tropical (41.5%), temperate (7.3%) and Wurch (0.5%). Oromia has four growing seasons, namely, Summer, Autumn, Winter & Spring (Summer and Winter are the major ones).

Oromia has large cultivated land area (about 28.4% of its total area), large natural forest (8.5%), areas covered with wood, shrub, and bush, in addition to grassland and plantation (about 59. 7% of its total area), water courses, rocky and swamp areas, plus urban centers (about 2.9% of its total area).

Water resource potential is abundant in Oromia, being estimated at about 58 billion cubic meters. The heaviest rainfall in the country (2400mm/annum) occurs in this Regional State. The Region has 8 major river basins, about 68 major rivers and 688 tributaries that drain into the Indian Ocean, the Blue Nile and inland drainage systems/lakes. The Region has 12 major lakes (covering an area of 3,135km^2), some of which are currently used for small scale fish production.

c. Population size

On 1 July 2008 Oromia Region had a population estimated at about 28,067,000, according to the projection of the 1994 population and housing census data, as indicated in the following Table 11.24.

Table 11.24: Ratio of Population by Age

General Population		Population by Age		
Area	%	< 15 years old	15 – 65 years	> 65 years old
Urban	12	46.6%	49.9%	3.5%
Rural	88			

d. Economy

d.1 Sector Composition

Within the Oromia Regional State, agriculture is the main economic activity, providing livelihood to about 89% of the population. The small scale peasant holder farming type accounts for about 98% of the total agricultural production in the Regional State.

Agriculture contributes with 66.7% of the Region's gross regional product (GRP), while Services contribute with 21.2% and Industry with 12.1%. For the years 1999/00 to 2005/06, the average annual growth rates of agriculture, industry and service were, respectively, 7.7%, 3.5% and 5.6% (refer to Table 11.25). During the latest consecutive three years 2003/04 to 2005/06, the average annual growth rates of the three sectors (agriculture, industry and services) were 18.4%, 3.5% and 8.3%, respectively.

Table 11.25: Sector Composition

Gross Regional Product (GRP)	Composition (%)	Growth Rate 1999-2005 (%)
Primary Sector (Agriculture)	66.7	7.7
Secondary Sector (Industry)	12.1	3.5
Tertiary Sector (Services)	21.2	5.6

In the year 2001/02 the land area cultivated with cereals, pulses, oilseeds, vegetables and root crops totaled 3,532,670 hectares (44.2% of the country's total cultivated land), while the production volume of these crops reached 54,338,050 quintals (47.8% of the country's total production). The contribution of the Region increased in the year 2004/05, when, according to the Agricultural Sample Survey, the Region's contribution was 46.6% and 52.3% of the country's total cultivated land area and production volume, respectively.

d.2 Livestock population

According to the Statistical Abstract 2007, Oromia had about 41% of the country's total livestock population, consisting of the following Table 11.26.

Table 11.26: Livestock Population

Livestock Species	Number (Million Heads)
Cattle	19.7
Sheep	9.3
Goats	5.9
Horses	1.05
Mules	0.161
Donkeys	2.1
Camels	0.131
Poultry	13
Beehives	3

Despite the high potential, there were problems of low productivity, widespread animal diseases, poor feeding system, unimproved animal husbandry practices, etc.

d.3 Industry

The industrial development in the Regional State of Oromia is at its infancy stage, providing employment to less than 1% of the Region's total population. Industrial facilities

are concentrated in the central part of Oromia, mainly in major towns like Adama, Bishoftu, Mojo, etc. The industrial sector consisted of light industries.

Table 11.27: Industry Type

Industry Type	Composition (%)
Food & beverage processing	45.4
Textiles	16.6
Furniture & wood processing	12.6
Metal & metal products	15.0
Others	10.4

There were 210 large and medium scale manufacturing industries (government, public and privately owned) in 2005/06, which created job opportunities for more than 49,000 people.

d.4 Oromia contribution to Ethiopia's National Economy

Oromia made the largest industrial contribution to Ethiopia's economy, with an estimated 60% of foreign exchange earnings. The largest proportion of Ethiopia's export commodities originated in Oromia, including the following products: coffee, oilseeds, leather products, fruits and vegetables, flower, gold, etc. The Oromia Regional State accounted for about 40% of the country's GDP, to which the industrial sector contributed with about 12.1% of the total Regional GDP.

e. Social facilities and infrastructure

e.1 Education

The Oromia Education Bureau reported the following government sector education data in 2008 (refer to Table 11.28).

Table 11.28: Number of Education Facilities of each Level

Education Level	Number of Schools	Number of Sections	Enrolled Students	Number of Teachers
Grades 1-8	9,450	80,327	5,623,413	104,451
Grades 9-12	364	6,137	484,005	9,687
Technical & Vocational	53	–	24,743	1,445
University	5	–	–	–
College	1	–	–	–
Veterinary College	1	–	–	–
Teacher Train. College	7	–	–	–

e.2 Water supply and sanitation

The water supply situation in Oromia In 2008 is presented in the following Table 11.29.

Table 11.29: Situation of Water Supply

Water Source		Water Supply Coverage		
Type	Number	Total	Rural	Urban
Wells	810	54.96%	48.8%	92.7%
Protected Springs	86			

e.3 Telecommunication

According to the 2004/05 statistical data, Oromia had the following telecommunication infrastructure (refer to Table 11.30).

Table 11.30: Conditions of Telecommunication

Type of Exchange	No. of Exchange	Capacity（Lines ）	Subscriber Lines
Manual	8	250	100
Automatic digital	112	175,523	114,197
Semi-automatic	111	7,066	3,094
Pay station	132	—	—
RRC	1	—	—

e.4 Roads

According to the 2006 statistical data, Oromia had the following road network as shown in Table 11.31.

Table 11.31: Road Condition

Type of Road	Length (km)
Asphalt paved	2,339
Gravel	1,979
Rural road	8,126

e.5 Postal Service

In 2004/05, Oromia had 52 Permanent Post Offices and 222 regular postal agents.

e.6 Health

According to the 2008 statistical data, the health care situation under government jurisdiction in Oromia is characterized as follows.

Table 11.32: Government Health Facilities

Type of Health Care Facilities	Number of Health Care Facilities
Hospitals	22
Health centers	308
Government clinics	642
Health posts	2,394

Table 11.33: Health Personnel Government Health facilities

Health Care Personnel	Number of Health Care Personnel
Doctors	267
Health officers	384
Nurses	7,039
Laboratory technician	443
X-Ray technician	23
Pharmacists	216
Sanitarians	346
Frontline health workers	110
Health assistants	1,540
Health extension workers	2,035
Malaria workers	276

11.4 Analysis of socio-economic survey

11.4.1 Analysis of socio-economic framework

The analysis of socioeconomic framework entails the need to establish the socioeconomic conditions that are estimated to prevail during the period of implementation of a project. Basically, this implies the estimation of the economic growth rates during the anticipated project implementation period, in order to estimate the increase in water demand that should be incorporated into the project formulation so as to take into account the effect of economic growth on the increasing water demand.

The projection of past data into the future is the procedure usually applied in the estimation of future economic conditions. This implies assuming that the past conditions will continue into the future, which is not usually the case. Also, past data on economic performance refer to overall data on the country economy, not on a specific geographic area defined for a particular project. Alternatively, future economic conditions can be ascertained as a result of detailed studies that take into account the estimated shift in resource use and their mobility in the specified project area in response to the requirements of economic growth in specified sub-areas within the project area.

The method of projecting past trends into the future depend on the data source, because it is equivalent to projecting past trends. This implies that the outcome will depend on the base years of the data to be projected. In Ethiopia, the Central Statistical Agency is the office that publishes statistical data, and this source was used for the projection of past data. Two

sources of statistical data were used: Statistical Abstract 2007 and Statistical Abstract 2011. While the base years covered in the Statistical Abstract 2007 resulted in a mildly declining trend of economic growth, the base years covered in the Statistical Abstract 2011 resulted in an increasing trend. These trends continued in the calculated projections, with a mildly declining trend for the 2007 base years and more significant increasing trend for the 2011 base years.

Another data source was the African Development Bank with a slightly stronger declining trend, which resulted also in a slightly stronger declining projection. The CIA Factbook on Ethiopia contained only 3 years of past data, with a strong declining trend, which resulted in the projections quickly becoming negative growth rates. One smart data source was IMF, as reported in African Business Magazine, which estimated a constant growth rate for a 5-year period. All the above projections are presented in the following Table 11.34.

Table 11.34: GDP Growth Rate & Estimated GDP for Ethiopia

GDP Growth Rate Sources & Estimated GDP Projection for Ethiopia (%)								
Data Source	Year	StatAbs2007	StatAbs2011	African	CIA	IMF/Afric	Halcrow	RVLB
		GDP Growth	GDP Growth	Dev Bank	Factbook	Business M	Projection	Framework
		(%)	(%)	17-Sep-10	2011	18-Apr-11	(%)	(%)
Statistical data	2001		1.28					
Statistical data	2002		-2.00					
Statistical data	2003	11.78	11.78	11.7				
Statistical data	2004	12.67	12.67	12.6				
Statistical data	2005	11.78	9.39	11.5				
Statistical data	2006	11.28	13.90	11.8				
Projection/Stat data	2007	11.28	11.43	11.2				
Projection/Stat data	2008	11.04	10.32	9.9	11.6			
Projection/Stat data	2009	10.80	10.42	10.16	8.7			
Projection	2010	10.56	14.97	9.79	7.0			
Projection	2011	10.32	16.20	9.42	4.50	8.1	5% - 7%	7%
Projection	2012	10.09	17.44	9.05	2.20	8.1	5% - 7%	7%
Projection	2013	9.85	18.67	8.69	-0.10	8.1	5% - 7%	7%
Projection	2014	9.61	19.91	8.32	-2.40	8.1	5% - 7%	7%
Projection	2015	9.37	21.14	7.95	-4.70	8.1	5% - 7%	7%
Projection	2016	9.13		7.58			5% - 7%	6%
Projection	2017	8.89		7.21			5% - 7%	6%
Projection	2018	8.65		6.84			5% - 7%	6%
Projection	2019	8.41		6.47			5% - 7%	6%
Projection	2020	8.17		6.11			5% - 7%	6%
Projection	2021	7.93		5.74			5% - 7%	6%
Projection	2022	7.69		5.37			5% - 7%	6%
Projection	2023	7.46		5.00			5% - 7%	6%
Projection	2024	7.22		4.63			5% - 7%	6%
Projection	2025	6.98		4.26			5% - 7%	6%
Projection	2026	6.74		3.89			5% - 7%	5%
Projection	2027	6.50		3.53			5% - 7%	5%
Projection	2028	6.26		3.16			5% - 7%	5%
Projection	2029	6.02		2.79			5% - 7%	5%
Projection	2030	5.78		2.42			5% - 7%	5%
Projection	2031	5.54		2.05			5% - 7%	5%
Projection	2032	5.31		1.68			5% - 7%	5%
Projection	2033	5.07		1.31			5% - 7%	5%
Projection	2034	4.83		0.95			5% - 7%	5%
Projection	2035	4.59		0.58			5% - 7%	5%
	Sources:							
		Statistical Abstract 2007, Statistical Abstract 2011, CSA						
		Own Projection based on statistical data						
		Ethiopia's Economic Growth, AfDB, 17 September 2010						
		Ethiopia, CIA Factbook 2011						
		African Business Magazine, 18 April 2011						
		RVLB Integrated Resources Development Master Plan, Halcrow						
		Statitical Data						
		Projection						
		Short term growth rate						
		Medium term growth rate						
		Long term growth rate						

It can be seen in the above Table that the projection using past economic data in the Statistical Abstract 2011 started with around 15% predicted economic growth rate for 2010, and increased to nearly 20% predicted economic growth rate for 2014. This defies the most optimistic predictions and is not credible. On the contrary, the most credible projections result from the data in Statistical Abstract 2007 and those from the African Development Bank, which coincidentally use similar base years and similar (not equal) statistical data. Both data sources result in mildly declining trend, which is generally accepted as it is understood that the future becomes harder to predict as the time to predict extends further into the future.

The above Table also presents the results of economic growth predictions that are specific for the Rift Valley Lakes Basin. These economic growth predictions were made in a study entitled "Rift Valley Integrated Resources Development Master Plan Study Project" submitted by Halcrow in January 2009. Although the predicted economic growth rates are invariable at 5%-7% for the 25-year period between 2010 and 2035, the estimation resulted from the changes foreseen in the economic structure and the ensuing changes in resource use. As the predictions are specific for the Rift Valley Lakes Basin, it is deemed appropriate to use those predictions as the socioeconomic framework for the Groundwater Resources Assessment Project. A slight adjustment or precision to be made in this Groundwater Resources Assessment Project is to use 7% growth rate for the first 5 years 2010-2015, 6% growth rate for the next 10 years 2016-2025, and 5% growth rate for the last 10 years 2026-2036, as indicated in the following Table 11.35.

Table 11.35: Economic Growth Rate Discussed for the Study

Period	Economic Growth Rate (%)
2010 - 2015	7%
2016 - 2025	6%
2026 - 2035	5%

11.4.2 Socioeconomic framework for the Study

The RVLB Integrated Resources Development Master Plan (Halclow 2008) in its final version was submitted to the Ethiopian Government less than a year before the start of the JICA Groundwater Resources Assessment Study. The said Master Plan was intended to be incorporated into the actual development plans of the two Regional States where the Rift Valley Lakes Basin is located, that is, Oromia and SNPP. Assuming that such a procedure has taken place, the said Master Plan is understood to be operational. Then, taking into consideration that the RVLB Master Plan optimized the use of natural resources, including water resources, it is fully appropriate to approach the RVLB groundwater development within the broad lines, or the road map, indicated by the RVLB Integrated Resources Development Master Plan. Consequently, the socioeconomic framework for the JICA Groundwater Resources Assessment Study will use the data from the RVLB Integrated Resources Development Master Plan (by Halcrow), corresponding to their Short Term planning period 2011 to 2015. The result would be to coordinate and frame the Groundwater Resources Assessment Study within the overall development lines indicated by the RVLB Integrated Resources Development Master Plan. The year 2015 is the end of the Short Term period in the RVLB Integrated Resources Development Master Plan, and it is also the target year of the JICA Groundwater Resources Assessment Study, coinciding with the target year of the Millennium Development Goals.

a. Population Growth Rates for the Study

The low variant population growth rates, indicated by the RVLB Integrated Resources Development Master Plan (by Halcrow), will be applied to the baseline population data, provided by the Ministry of Water Resources for each of the 80 plus communities or towns proposed for the JICA Groundwater Resources Assessment Study.

Table 11.36: Population Growth Rates for the Study

Year	Adopted Low Population Growth Rates		
	Total	Rural	Urban
2011-2015	3.30%	3.00%	5.20%
2016-2020	2.80%	2.50%	4.70%
2021-2025	2.50%	2.10%	4.40%
2026-2030	2.30%	1.80%	4.20%
2031-2035	2.10%	1.60%	4.00%

b. Economic Growth Rates for the Study

The JICA Groundwater Resources Assessment Study will use the growth rates of the RVLB economy in the Short Term, as indicated by the RVLB Integrated Resources Development Master Plan, resulting from the economic structure in the short term of the Master Plan, with the corresponding changes in sectoral employment, which would produce the economic growth rate of 7%, as indicated in the table below. The yearly economic growth rate of 7% is consistent with the historical growth rate of annualized 7.02% for the country as a whole, concerning the growth rate of per capita GDP (9.39% for Total GDP), found during the early stages of this Study and reported in Progress Report 1. The annual economic growth rate of 7% will be applied to the GDP data published by the Central Statistical Agency (CSA), in order to estimate the future growth of the Ethiopian economy.

Table 11.37: Economic Growth Rates & Economic Structure for the Study

Basin Economy & Development Sectors	Baseline (2008)	Short Term (2011-2015)	Med. Term (2016-2025)	Long Term (2026-2035)
Annual growth rate	7%	7%	6%	5%
Economic Structure				
Agriculture	69%	58%	47%	36%
Industry	8%	10%	12%	13%
Services	23%	32%	41%	51%
Employment				
Agriculture	74%	62%	50%	38%
Industry	7%	12%	17%	23%
Services	19%	26%	33%	39%

11.5 International aid (Funds) for the drinking water sector in Ethiopia

International cooperation in drinking water supply activities in Ethiopia originates from different sources, such as multi-lateral cooperation, bilateral cooperation, and international NGOs. Funds from international sources may be channeled through Water Resources Development Fund or other government agencies at the federal and regional levels, or directly from the donor to the operators or implementation entities of a water supply project, according to the classification described below.

Channel 1: funds from international assistance are incorporated into the government budget, and, therefore, are regarded as 'on-budget', managed by the federal Ministry of Finance and Economic Development (MoFED), regional Bureaus of Finance and Economic Development (BoFEDs) and Woreda Finance Offices;
Channel 2: funds are made available directly to sector ministries such as the Ministry of Water Resources (MoWR), and further allocated to regional bureaus, such as the Bureaus of Water Resources (BoWRs), and from there the funds are channeled to Woreda sector offices such as Water Offices;
Channel 3: resources are transferred directly to those responsible for the implementation, without passing through MoFED or BoFED, and are often entirely 'off-budget'.

The preceding classification of the varied sources of international aid, and the diverse ways to channel the aid funds into projects, make it difficult to track down and precisely determine the number and size of international cooperation in water supply in different geographic areas of Ethiopia. Therefore, instead of pretending to compile exhaustively the list of international water supply aid projects, a selected sample of drinking water sector projects under international aid will be presented as indicative examples from the donor agencies that responded to our request for information on such aid projects.

11.6 Indicative examples of international aid in the Ethiopian drinking water sector

The following table presents the list of Woredas in Oromia and SNNP Regional States, which are beneficiaries of water supply projects assisted by international cooperation (World Bank).

Table 11.38: List of Woredas beneficiaries of of Water Supply Projects under International Cooperation (WB) in Oromia and SNNP Regional States

Woreda (Oromia Region)			
Habro	Gaba Koricha	Chiro	Seru
Sude	Amigna	Tole	Wonchi
Amaya	Jarso	Deder	Melka Bello
Bako	Gindeberet	Mida kogni	Sululta
Bereka	Degem	Boniya Boshe	Nunu Kumba
Leqa Dulecha	Akaki	Gimbichu	Fentale
Begi	Gidame	Jima Horo	Abaya
Moyale	Bule Hora	Adola	Odoshakiso
Wadara	Limu Kossa	Limu Seka	Seka Chekorsa
Kokosa	Dodola	Goba	Borecha
Dega Meko	Didessa	Me-eso	Gemechis
Mesela	Kofele	Munessa	Balee
Alemgena	Weliso	Goro	Moyou Muluge
Meta	Gole Oda	Cheliya	Nuno
Tikur Inchini	Debrelibanos	Mulo	Aleltu
Ebinat	Gida Kiremu	Wama Agello	Shasemene
Siraro	Arisi Negele	Mana Sibu	Kiltu Kara
Gaba Detno	Arero	Dire	Dugda Dawa
Liban	Gurji	Dama	Settema
Shabe	Begee	Sawena	Lege Hinda
Mana	Gechi	Mekko	Dabo
Woreda (SNNPRs)			
Awassa Zuriga	Shebedino	Dalle	Arbegona

Dara	Aroressa	Oha	Kudra
Mirab Abaya	OMO Sheleko	Soro	Misha
Abesheghe	Kebena	Cheha	Sodo
Ezga	Alicho Wuriro	Lemo	Enemor &Ener
Mihur&Akel	Endegagne	Anderachea	Yeki
Gaha	Cbena	Bila	Gimbo
Decha	Mijawo	Sheko	Shewa Beuch
Masha	Uba Debretsehai	Boreda	Zala
Melga	Chire	Gorchei	Loko Ababya
Bona Zuria	Wonasho	WondoGenet	Hadaro Zuria
Gombera	Analimu	-	-

Yellow mark: Overlap with Woreda aided by AfDB (refer to Table 11.39)

Green mark: Overlap with Woreda where towns requested belong to in this Study

11.6.1 Multilateral international aid in Ethiopian water supply

Multilateral aid in water supply comes from such international organizations as the World Bank, the African Development Bank (AfDB), UNICEF and other United Nations organizations, the United States Agency for International Development (USAID), and the European Union.

a. World Bank

According to the World Bank Office in Addis Ababa, the information on World Bank assisted projects in water supply is being handled by UNICEF on the basis of an inter-institutional agreement. Consequently, the request for the relevant information on World Bank water supply projects in Ethiopia was addressed to UNICEF, but no reply was received. Therefore, available documents were used as information sources on water supply and sanitation projects financed by the World Bank, UNICEF, and the United Nations.

The assistance in water supply from the World Bank is identified more with the urban WASH systems, but the aid for the period 2005-2015 included village water supply facilities in 230 Woredas for a total of US$116Million as soft loan. The assistance during 2007-2010 resulted in the construction of 1,288 hand dug wells, 835 protected springs, 576 shallow wells, 75 rural piped systems, and 35 rainwater harvesting schemes.

b. African Development Bank

b.1 AfDB financed Rural Water Supply and Sanitation (WSS) Program

- The Rural WSS Program is carried out in 125 Woredas in all 9 Regions.
- For the Regional States of the Rift Valley Lakes Basin, the beneficiary Woredas are 47 in Oromia and 24 in SNNP.
- The total project cost is 64 Million US$.
- The capacity building component and program support have been successfully completed.
- Implementation of 1,503 water supply schemes has been completed, serving a population of more than half a million people. At the end of the project, about 2.7 million people are expected to get access to safe water and sanitation services.

Sanitation awareness has been increased. Sanitation facilities have been constructed in schools and health institutions.

- The project implementation is scheduled between 25 February 2006 and June 2012.

b.2 Harari WSS Project

- The project is in Harari Region. The project serves the towns of Harar, Alemaya, Awedaye, Adelle, and the nearby rural communities.
- The total project cost is 33 Million US$.
- The project implementation is scheduled between June 2003 and September 2011.

b.3 Utilization of Solar and Wind Energy for Rural Water Supply

- Location is in the four Regional States of Amhara, Tigray, Oromia and SNNP, but the beneficiary Woredas have not yet been identified.
- The project implementation is scheduled between August 2009 and March 2013.
- The total Project cost is 1.99 Million Euro.

The following is the list of Woredas within the RVLB, which are beneficiaries of the WASH programs supported by the African Development Bank.

Table 11.39: List of Woredas Beneficiaries of of Water Supply Projects under AfDB

Woreda (Oromia Region)			
Tena	Gelana	Gura Damole	Aurega
Bure	Goma	Genede Berete	Dawo
Amuru	Ymaloge Welele	Hidabu Abote	Ware Jareso
Gneji	Gobu Seyo	Becho	Meta Robi
Mana	Darimu	Bore	Gasra
Yabelo	Hetosa	Gololecha	Sachi
Tiro Afeta	Anefilo	Aduberega	Sdene Sodo
Guderu	Nenesebo	Kuyu	Limu
Keresa Malima	Wlemra	Gera	Ale
Nole Kaba	Wechale	Horo	Dedo
Nono	-	-	-
Woreda (SNNPRs)			
Bensa	Bursa	Boricha	Damot Gale
Sodo Zyriya	Gibe	Badewacho	Gofa Zuriya
Dita	Deremalo	Kemeba	Azerenet Berebere
Seleti	Gumre	Wnago	Kochore
Bule	Yerega Cefe	Tocha	Isera
Kedida Galeme	Amaro	Burji	Yem

Yellow mark: Overlap with Woreda aided by WB (refer to Table 11.38)

Green mark: Overlap with Woreda where the towns requested belong to in this Study

c. UNICEF & Other United Nations Agencies

The following information on water supply and sanitation projects under the assistance of UNICEF and UNDP is based on available documents.

c.1 Capacity Building Project in the WASH Sector: Three Donor Countries & UNICEF

(From: "*Technical Update, UNICEF, November 2010")*

UNICEF and bilateral cooperation from 3 countries have reached agreements for UNICEF to administer the pooled funds from the 3 countries: Italy, United Kingdom and Finland, in the Capacity Building Project in Water, Sanitation and Hygiene Sector.

The Capacity Building Project is structured to support three mutually supporting components: (1) Organizational Development: capacity of local, regional and national WASH training institutes; (2) Continuous Professional Development: upgrading skills of the individuals responsible for planning, managing, implementing and monitoring WASH programs; and (3) Strategic Sector Support: WASH policy, implemented through studies, sector reviews, systems development, and specialist inputs. Financial support comes from the Italian Development Corporation (IDC) for Euro 1,400,000 between December 2008 and December 2011 to provide support to 25 Woredas in 4 Regions: Benishangul-Gumuz, Gambella, Oromia, and SNNP; the United Kingdom Government Department for International Development (DfID) for £2,000,000 between March 2009 and March 2011 to provide support to strengthen the capacity of Federal WASH Ministries; and the Government of Finland (GoF) for Euro 2,200,000 between July 2010 and June 2013 to provide support to develop critical capacity at Woreda, Zonal and Regional levels. The three financial sources add up to a total of nearly US$8Million. A National WASH Coordination Office (NWCO) was established in early 2007 to manage the Capacity Building Pooled Fund from IDC, DfID and GoF. Later, UNICEF entered into bilateral agreements with IDC, DfID and GoF to support the NWCO and to administer the Capacity Building Fund.

Table 11.40: Pooled Funds: IDC, DfID, GoF & Administered by UNICEF

Source of Funds	Amount of Funds (US$)	Implementation Period
IDC	1,822,445.88	10 Dec. 2008 – 31 Dec. 2011
DfID	3,076,923.08	13 March 2009 – 31 March 2011
GoF	3,098,478.00	01 July 2010 – 30 June 2013

Another United Nations project, the **UNDP** funded Water Resources Development and Utilization Project, aims at strengthening capacity building for the implementation of the 15-year water sector development program at the community and federal levels, which will provide long-term rehabilitation of water supply and small-scale irrigation schemes.

c.2 European Union

The information regarding the only project managed by the Infrastructure Section of the European Union Delegation Office is as follows:

a) Name of the Project: 15 Small Towns Water and Sanitation Project

b) Location of the Project: SNNP, Amhara, Oromia and Tigray Regional States

c) Implementation Period of the Project: 24 months

d) Total Cost of the Project: Euros 37.5 Million (EU contribution = Euros 16.5 million only, the rest from European Investment Bank and government budgets)

The European Union has no other water projects planned to be implemented in the near future.

On the other hand, the water supply and sanitation interventions being implemented by NGOs through EU support are distributed in Oromia, Amhara and SNNPR. There are currently 9 interventions with a total budget of Euros 18.5 Million. The implementation periods of the projects range from 3 to 5 years

c.3 USAID

*(*From: *"2008 Report on USAID Water Sector Activities, September 2009")*

USAID has been involved in water supply activities on a worldwide scale, Africa being a major zone targeted for the aid in water supply sector, and Ethiopia is a beneficiary country within Africa. Water sector activities by USAID are divided into the following sub-sectors: Water Supply and Sanitation, and Water Management Activities encompassing Water Resources Management, Water Productivity Improvement, and Disaster Risk Reduction.

In 2008, USAID had a worldwide budget of US$489.606 Million for assistance in water related activities, of which 43.2% (US$211.651 Million) were destined to Africa. Within Africa, 82.13% (US$173.829 Million) were devoted to assistance in Water Supply and Sanitation. Specifically on Ethiopia, the USAID report stated the following: *"In approximately 90 percent of Ethiopian households, women shoulder the responsibility of water collection, often having to walk for several hours each day to fetch water from unclean sources."*

To help improve the above critical situation in Ethiopia, USAID in 2008 applied US$13.8 Million to Ethiopia, equivalent to (8.4%) of the assistance for Africa in Water Supply and Sanitation. This resulted in the supply of safe water to nearly 70,000 people, and improved sanitation to more than 35,000 people. Water, sanitation, and hygiene (WASH) committees were established at each water scheme and were made responsible for overall water management and the promotion of sanitation and hygiene in their communities. USAID trained 888 WASH committee members in water scheme operation, maintenance, and financial management, and trained nearly 77,000 people in sanitation and hygiene education. USAID also helped the Southern Nations, Nationalities and Peoples (SNNP) Regional Health Bureau control a cholera epidemic, and strengthened case management in affected villages.

11.6.2 International NGOs in Ethiopian water supply

Some projects formulated as multilateral aid in water supply are implemented through international NGOs, two of which, with continued activities lasting more than 30 years in Ethiopia, are Catholic Relief Services (CRS), and World Vision.

a. Catholic Relief Services (CRS)

With interventions in multiple fields in Ethiopia since 1958, CRS has water supply activities in the Rift Valley, using springs as water sources for their water supply projects, but

sometimes they have to resort to boreholes. The CRS representatives remarked the difficulties of water supply in the Rift Valley due to the high concentration of Fluoride in the water, and they explained the techniques they use to lower the Fluoride concentration to acceptable levels for human consumption, such as the use of additives with such ingredients as Aluminum, clay or cow bone in the water. Fluoride adheres to the cow bone and settles down, but the bone smell remains in the water, thereby making the water unpalatable. The CRS representatives explained that the cases of cooperation between two or more NGOs are quite common in Ethiopia, and that CRS has cooperative projects with Oxfam America.

b. World Vision

World Vision explained that they basically use surface water in their water supply schemes. They do not drill deep wells in the Oromia Regional State due to its geology, but they do drill deep wells in the SNNP Regional State. World Vision has been operating for over 30 years in Ethiopia.

World Vision operates in the following areas:

SNNP Regional State:

Demboya: drilling of a deep wells

Adilo: implementation of WASH project

Chencha, Ezo, Dorze, Birbir and Hulla: World Vision operation areas

Oromia Regional State:

Boset, Abaya, Wonchi are some of the sites where World Vision will implement WASH projects within the next 5 years.

11.6.3 Bilateral cooperation in Ethiopian water supply: the case of Japanese Aid

Bilateral aid in water supply comes from different cooperating countries, sometimes operating directly with the relevant government institutions of Ethiopia, other times operating in cooperation with multi-lateral agencies like UNICEF, or with NGOs. In the case of Japan, its foreign aid agency, Japan International Cooperation Agency (JICA), is financing the Groundwater Resources Assessment Study in the RVLB. Other projects assisted by JICA in the water sector of Ethiopia in recent years include the following:

a. EWTEC Technical Cooperation

The on-going Japanese assistance to the Ethiopian Water Technology Center is a long-lasting aid by a multi-disciplinary team of experts, mostly Japanese nationals. The cooperation agreement is periodically renewed. It is an internationally recognized training center, where specialized training is provided to domestic and international trainees, in such aspects as groundwater resources development, water supply technology focused on personnel responsible for regional water supply facilities, water management, application of appropriate technology in water supply, and capacity development of water supply personnel. These

assistance activities, implemented over several multi-year agreement periods, have been strengthening the EWTEC organization.

b. SNNP Technical Cooperation in Capacity Building 2007-2011

This is an on-going technical assistance to the Bureau of Water Resources of SNNP Regional State by a multi-disciplinary team of Japanese experts. The technical assistance seeks to strengthen the regional organization for water supply, the operation and maintenance of hand pumps, the application of appropriate technology in water supply, and the implementation of pilot projects and training of water supply personnel.

c. Tigray Grant Aid in Rural Water Supply

The grant aid amounting to some 700 Million Yen targeted the improvement of water supply facilities in 10 zones and 98 towns in Tigray Regional State.

d. Oromia Grant Aid in Rural Water Supply

This grant aid amounting to some 900 Million Yen began implementation in 2010, after completion of the required preliminary stages of basic design and detailed design studies. The goal is the improvement of water supply facilities in 3 Zones and 46 communities, mostly villages to be supplied drinking water with hand pumps, in Oromia Regional State, with a beneficiary population of 90,000, which at 2.3% annual growth rate would result in 101,000 beneficiary population with access to improved water supply facilities.

e. Afar Grant Aid in Rural Water Supply

This grant aid amounted to some 500 Million Yen and improved water supply facilities in 9 towns in Afar Regional State.

f. SNNPRs Grant Aid in Rural Water Supply

This grant aid amounting to almost 1,100 Million Yen provided benefits to the residents of 10 Zones and 14 Woredas in SNNP Regional State, through the improvement of 103 rural water supply facilities, in addition to the donation of a drilling rig and other complementary equipment.

g. Amhara Grant Aid in Rural Water Supply

This grant aid amounting to some 500 Million Yen targeted the improvement of water supply facilities for the beneficiary population in 6 Zones, 20 Woredas, and 140 towns in Amhara Regional State.

Chapter 12

Social and Environmental Consideration

12 Social and Environmental Consideration

The purpose of environment and social consideration is to assist the Ethiopian counterpart personnel to estimate environmental and social impact of installation of facilities designed by the Study, based on JICA Environment and Social Consideration Guideline and Ethiopian EIA Guideline. Alternative plans and mitigations would also be studied if the impacts are not evitable. The summary of the environmental impact assessment study is to be feed back to the Study Team.

12.1 Environmental policy in Ethiopia

Environmental Protection Policy in Ethiopia (1997) was derived from the thoughts of Ethiopian Constitution, mainly the following particulars.

- The government and all Ethiopian citizens shall have the duty to protect the country's environment and natural resources;
- The design and implementation of programmes and projects of development shall not damage or destroy the environment; and
- The People have the right to full consultation and expression of views in the planning and implementation of environment policies and projects that affect them directly.

The Environmental Protection Policy of Ethiopia (1997) was developed from the Conservation Strategy of Ethiopia 1997 (CSE), which consists mainly of guiding principles and various sector and cross-sector policies for sustainable environmental management. The following are principles of CSE.

- Provides for the protection of human and natural environments;
- Provides for an early consideration of environmental impacts in projects and program design;
- Recognizes the role of public consultation;
- Includes mitigation and contingency plans;
- Provides for auditing and monitoring;
- Establishes legally binding requirement; and,
- Institutionalizes the policy implementation.

12.2 Environmental legislation

The Environmental Protection Authority (EPA) of Ethiopia, established by a proclamation of 1995, which is now the main administrative body for EIA in Ethiopia. The enabling legislation for EIA in Ethiopia is the EIA proclamation of 2002 (Environmental Impact Assessment Proclamation, Proclamation No.299/2002). EIA procedures and framework guidelines were clarified by Environmental Impact Assessment Procedural Guideline 2003 (Draft) at various stages of development. The EIA proclamation sees public participation as one of the most important factors to conduct transparent procedure of the EIA. The Proclamation includes offences and penalties, comprising:

- Any violation of the provisions of the proclamation;

- Failure to obtain authorization from the Authority or makes false presentations in an EIS report – Penalty: a fine of 50,000 to a maximum 100,000 birr;
- Failure to keep records or to fulfill conditions of the authorization – Penalty: a fine of 10,000 to 20,000 birr;
- Any juridical person who commits an offence is subject to additional penalties of 5,000 to 10,000 birr; and,
- The court may order the convicted person to restore or make good any damages.

The table below shows list of acts and laws in fields of policy, organization, environmental assessment, and water resources management.

Table 12.1: Related Laws and Regulations

Field	Name	Serial Number and Year
Policy	Environmental Policy	April 1997 (EPA)
Organization	Environmental Authority Establishment Protection Proclamation	Proclamation No.9/1995
	Environmental Protection Organs Establishment Proclamation	Proclamation No.295/2002
EIA	Environmental Impact Assessment Proclamation	Proclamation No.299/2002
	Environmental Impact Assessment Procedural Guideline (Draft)	December 2003 (EPA)
	Integrated Environmental and Social Impact Assessment Guidelines Water Supply	July 2004 (EPA)
	Guidelines to Prepare Environmental and Social Management Plan	November 2004 (EPA)
Pollution Control	Environmental Pollution Control Proclamation	Proclamation No.300/2002
Water Resources Management	Ethiopian Water Resources Management Proclamation	Proclamation No.197/2000
	Ethiopian Water Resources Management Regulations	Council of Ministers Regulation No.115/2005
	Ethiopian Guidelines, Specification for Drinking Water Quality	March 2002 (Ministry of Water Resources)

12.3 Environmental Institutions

12.3.1 The environmental protection authority

The Environmental Protection Authority (EPA) was founded by Environmental Authority Establishment Protection Proclamation (1995). EPA administrates Ethiopian Environmental Assessment system, being given authorizing power by a law, Environmental Impact Assessment Proclamation No. 299/2002. However, it conducts EIA for large-scale inter regional projects only. Therefore EPA is not going to conduct EIA for this project but the

Regional Governments' respective organization will conduct EIAs, and the project proponent (PP), who is to formulate environmental impact reports, will be the Ministry of Water Resources.

12.3.2 The environmental protection council

The Environmental Protection Council (EPC) was established by the Environmental Protection Organs Establishment Proclamation No.295/2002 for supervising EPA. The Director General of the EPA was to serve as the Secretary to the Council, and the committee members are representatives from respective ministries. EPC was expected to review environmental policies, and issuing recommendations to the government; however, the EPC has only met once since its inception. The Council is to meet on a regular basis, but the EPC is not functioning; it is said to be in a transition period, according to responsible person in the Ministry of Water Resources.

12.3.3 Regional organizations for EIA

a. Oromia Region

For projects in Oromia Region, Environment Protection Department, (EPD) Oromia Land and Environmental Protection Bureau will review EIA and make decision of acceptance of it. The Oromia Regional government is the final decision maker; and the federal EPA will not review the report. According to hearing with an official of EPD, it has never received application of preliminary environmental assessment report on rural water facility project so far, although it is mandatory according to EPA guidelines. The organization chart is shown in Figure 12.1.

b. SNNPRS

Likewise in Oromia Region, the Regional government of SNNPRS will be the final decision maker of the acceptance of EIA reports; however, the project which spans over two regions will fall in mandate of federal EPA. The organization chart of Land Administration, Uses and Environmental Protection Authority is shown in Figure 12.2.

12.3.4 Environmental protection division in Ministry of Water and Energy

There is no department dealing with EIA in Ministry of Water and Energy. There are separate EIA teams in each department. Rural water supply project is required to file Preliminary Environmental Impact Study Report, according to Environmental Impact Assessment Procedural Guideline, Schedule II of Series I, by project proponent, Department of Water Supply, Ministry of Water and Energy. Organization chart of the Ministry is shown in Figure 12.3.

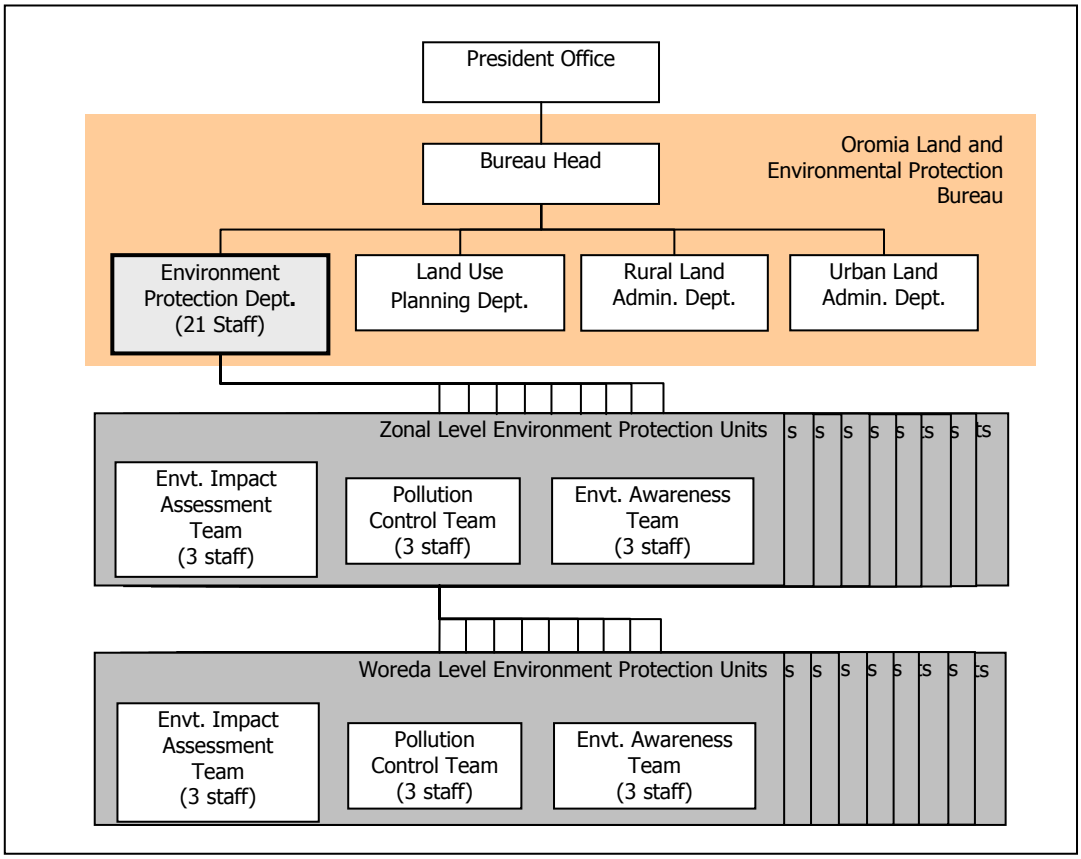


Figure 12.1: Environmental Assessment Organizations of Oromia Region

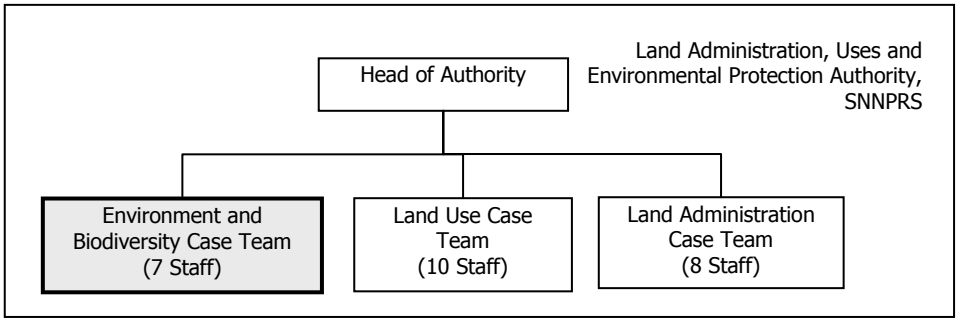


Figure 12.2: Environmental Assessment Organizations of SNNPRS.

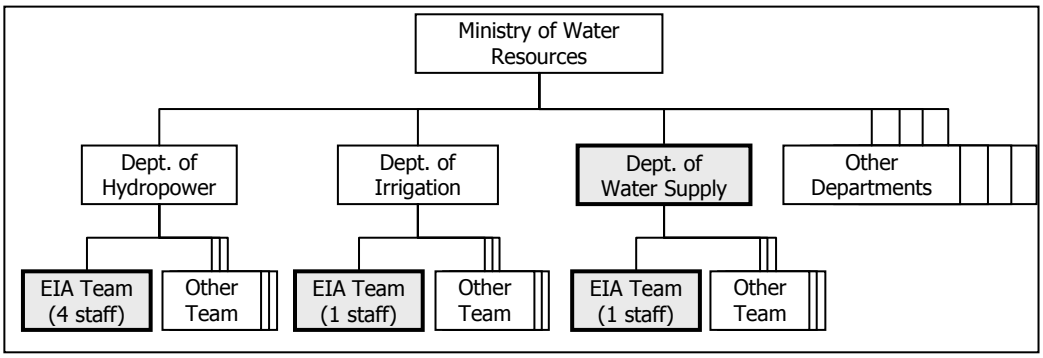


Figure 12.3: EIA Team and Staffs in MoWE

12.3.5 EIA in federal ministries

Environmental Impact Assessment (EIA) is conducted according to the Environmental Impact Assessment Procedural Guideline (Draft) 2003. Figure 12.4 shows the flow-chart of the EIA procedure. Sectoral guidelines, such as Integrated Environmental and Social Impact Assessment Guidelines Water Supply (2004), are also provided, but it contains general guidance of impacts, effects, and remedies: there is no procedural explanation.

a. Prescreening consultation

Prescreening consultation is not mandatory, but holding a discussion with a representative from reviewing organization makes whole procedure effective for a project proponent, and it is recommended.

b. Screening

Screening is a process in which the reviewer determines whether the proposed project needs an environmental assessment, and, if it does, the level of assessment. In this process, the project proponent formulates a project description (it is called Initial Environmental Examination (IEE) in Ethiopia, but the nature is different from the IEE of JICA), and submit it to a regional office. The contents of project description are as follows:

* Activities and their potential impacts,

* Characteristics of the location (sensitivity of the area),

* Size (small, medium and large scale),

* Degree of public interest, and

* Institutional requirement, environmental enhancement and monitoring considerations.

Either one of the following will be reported to the project proponent as the result of screening.

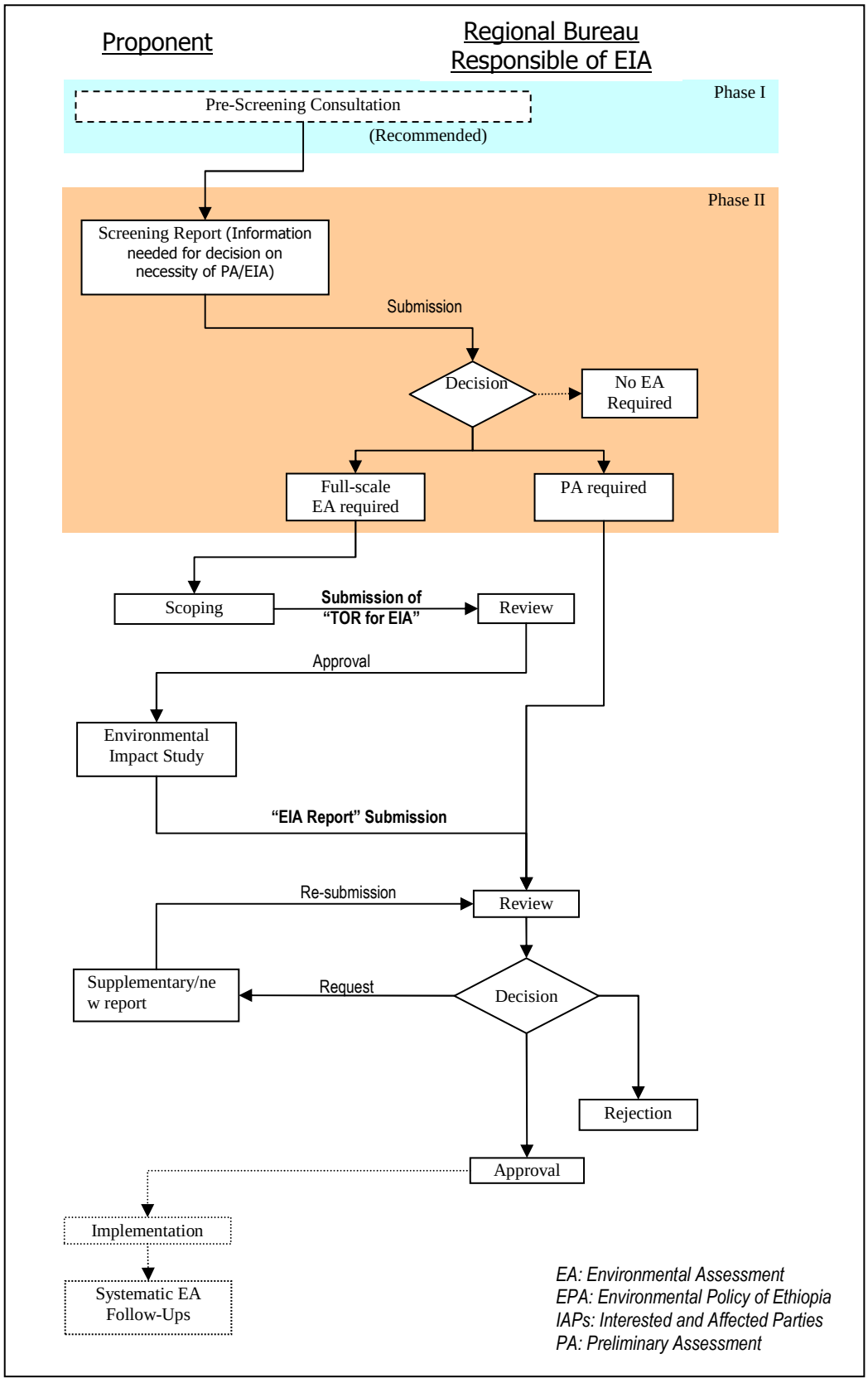


Figure 12.4: EIA Procedure in Ethiopia

* Further EIA not required

* Preliminary Assessment is required for projects of the nature listed below.

  - Not serious but some impacts are expected

  - It is unclear to make decision whether EIA would be required

  - Accessible information is not adequate

* Full EIA and TOR for EIA is required

It is expected that the facilities to be designed by the Study will require Preliminary Environmental Impact Study, according to Environmental Impact Assessment Procedural Guideline Series 1 (Environmental Protection Authority, Federal Democratic Republic of Ethiopia, Box below). In the Schedule II, rural water supply facilities are required to file Preliminary Environmental Impact Study Report.

SCHEDULE 1. Lists of Projects That Require Full Environmental Impact Assessment

20 . Water Supply

- canalization of water courses
- diversion of normal flow of water
- water transfers scheme
- abstraction or utilization of ground and surface water for bulk supply
- water treatment plants
- Construction of dams, impounding reservoirs with a surface area of 100 hectares
- Ground water development for industrial, agricultural or urban water supply of greater than 4000 m^3 /day
- Drainage Plans in towns close to water bodies

SCHEDULE. 2. List of Projects That Require A Preliminary Environmental Impact Study.

- Rural water supply and sanitation

SCHEDULE 3. Lists of Projects That May Not Require Environmental Impact Assessment

(Not applicable)

c. Scoping

If the project requires full EIA, the following procedures would be needed. First, scoping is to be conducted for determining specification of full EIA. As the results of scoping, TOR of EIA will be formulated by the project proponent. The TOR for EIA has to contain the

following items:

* A brief description of the project,
* All alternatives identified,
* Issues raised by Interested and Affected Parties (IAPs), and
* Description and records of the public participation.

Contents of the EIA are as follows:

* Background to the proposal,
* Setting the context of the problem,
* Consideration of alternatives,
* Institutional and public involvement,
* Required information regarding project and location, etc.,
* Analysis of impacts,
* Mitigation and monitoring, and
* Conclusions and recommendations.

d. Environmental impact study report

Minimum contents of Environmental Impact Study Repot, formulated after series of investigation, are listed below.

* Impact Prediction
* Impact analysis
* Consideration of alternatives
* Preparation of management plan (mitigation, monitoring activities)
* Preparation of contingency plan

e. Reviewing

This stage is to review if the impact assessment is properly carried out. Five EIA report and a digital data of EIA is to be submitted to the reviewing organization. The reviews take place at each steps listed below.

* Screening Report
* Scoping Report
* TOR for EIA
* EIA report
* Performance Reports of Monitoring Report and Evaluation Report

f. Decision making

There are 6 types of decisions.

* Approval of EIA report and performance report

* Approval of the project

* Approval of the project with conditions

* Approval of the project with continuous investigation

* Approval with additional or new EIA report

* Rejection

12.4 Initial environmental examination

12.4.1 Project description

(1) Purpose of this Study

This Study will contribute to Ethiopian Groundwater Resources Assessment Program (EGRAP+) and Universal Access Program (UAP) by evaluating groundwater potential of the Rift Valley Lakes Basin (RVB) systematically as creating hydrogeological maps of RVB, and by formulating of master plan level water supply plans.

The outputs are as follows.

1) Producing hydrogeological maps for RVB; and

2) Formulation of water-supply master plan for selected 28 towns in RVB.

(2) Location

The selected 28 towns are listed in Table 12.2, and indicated in Figure 12.5. Total of 9 (nine) towns from Oromia region and 19 (nineteen) are selected from SNNPR.

Table 12.2: Selected Towns

Region	Zone	Woreda	Town	(Town ID)	Population 2010	Population 2015 (Projected)
Oromia	Arsi	Hitosa	Boru Jawi	(O-12)	4,446	5,230
		Tiyo	Kulumsa	(O-11)	3,472	4,084
			Katar Genet	(O-29)	3,953	4,650
		Limana Bilbilo	Lemo Sirba	(O-30)	5,590	6,575
	West Arsi	Kofele	Kabate	(O-40)	4,146	4,877
			Kofele	(O-10)	14,401	16,939
		Sheshemane	Awasho-Dhanku	(O-41)	7,040	8,281
			Hursa	(O-42)	5,700	6,705
		Wondo	Bura (Busa)	(O-34)	5,112	6,013
SNNPR	Hadiya (Alaba SW)	Misrak Badawocho	Weyira Mazoria	(S-55)	8,346	9,817
		Shashago	Hirkofofo	(S-54)	2,590	3,047
			Dosha	(S-09)	1,881	2,213
	Kembata Timbaro	Kedia Gamela	Adilo	(S-14)	4,659	5,480
		Dayiboya	Daniboya	(S-15)	8,111	9,541
	Sidama	Dara	Kebado	(S-17)	8,365	9,839
	Gurage	Meskan	Hamus-Gabeya(Bamo)	(S-53)	4,152	4,884
	Wolayita	Humbo	Tabela (Humbo)	(S-30)	6,246	7,347
		Sodo Zuria	Dalbo Atowa	(S-59)	4,007	4,713
	Silite	Lanifaro (Lanfuro)	Tora	(S-46)	9,163	10,778
		Sankura	Mazoria	(S-51)	2,730	3,211
				Total	116,120	134,224

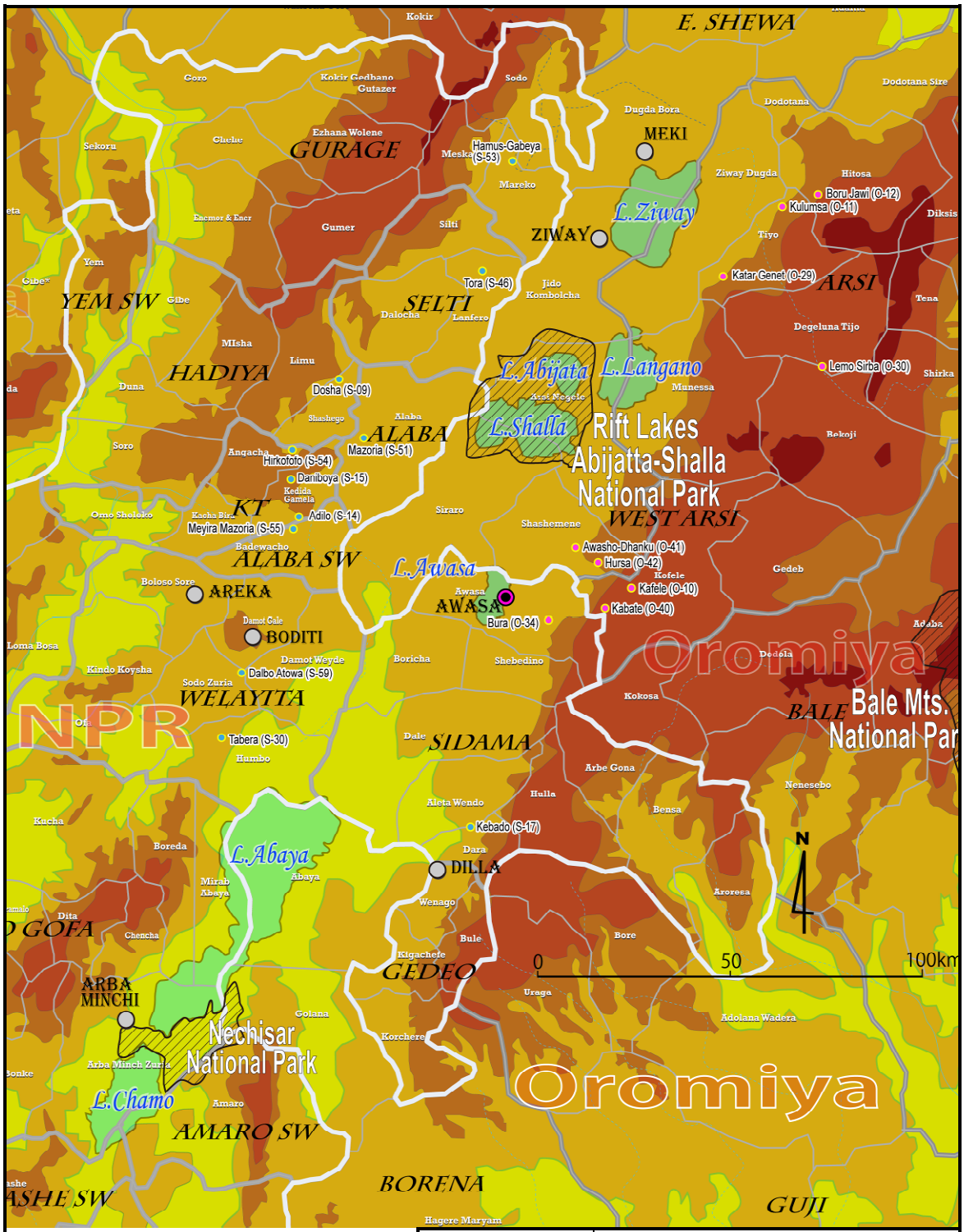


Figure 12.5	Location of Selected Towns
THE STUDY ON GROUNDWATER RESOURCES ASSESSMENT IN THE RIFT VALLEY LAKES BASIN	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	