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Water Resources Management in the Central Rift Valley of Ethiopia

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WATER RESOURCES MANAGEMENT IN THE CENTRAL RIFT VALLEY OF ETHIOPIA



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GRECDH



Intermón Oxfam

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Summary

The Ethiopian Central Rift Valley (CRV) is part of the Great African Rift and encompasses four major lakes on the rift floor. It is situated in the administrative regions Oromiya and the Southern Nations Nationalities and Peoples Region (SNNPR), and covers an area of approximately 10,000 km² [1]. The total population of the CRV is approximately 1.5 million. The natural resources of the area are under enormous pressure due to human influences. The lakes and their influent rivers are used for irrigation, soda abstraction, fish farming, recreation, and also support a wide variety of endemic birds and wild animals [2].

One of the developments in the past decades is the introduction and rapid expansion of irrigated agriculture. Smallholder farmer irrigation schemes as well as large scale private and state farms have been established during the last decades. A recent development is the introduction of foreign investment in closed vegetable and flower production systems [3].

In the pastoral areas, food insecurity is a major problem and a significant proportion of the population rely on relief assistance from external agencies. One of the main causes of poverty in the CRV is the low level of agricultural productivity. The condition of many smallholder irrigation schemes is poor which contributes to inefficient use of water and high irrigation costs [4]. Many irrigation schemes are constructed with governmental or non-governmental support, but operational and maintenance support is often lacking or only partly received [3].

Currently, water is used in the CRV without planning or regulation and without monitoring. The Government of Ethiopia has created policies, strategies, proclamations and development programme to achieve MDGs targets. Each document appears feasible on paper, but constraints in Ethiopia's water sector have restricted policy success.

While there are policies in place that promote efficient utilization of the available water resources, they are not being implemented because of financial and humanpower constraints and problems of stakeholder coordination and participation, among other reasons. The implementation of a Water Point Mapping (WPM) supported by NGOs in the CRV may help in this regard, because in the short term, WPM may serve as a valuable planning tool for the local level governments.

Títol: Gestió dels recursos hídrics de la Vall Central del Rift Etióp

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Paraules clau: gestió d'aigua, irrigació, abastament d'aigua, polítiques d'aigua, conca, Vall Central del Rift Etióp, Etiòpia.

Resum

La Vall Central del Rift Etióp (CRV) és una subconca caracteritzada per quatre llacs i els seus afluents. L'àrea comprèn part les regions d'Oromiya i de Southern Nations Nationalities and Peoples Region (SNNPR) i té una extensió d'uns 10.000 km² [1]. La població total de la zona és aproximadament de 1,5 milions d'habitants.

Els recursos naturals de la zona es troben sota una gran pressió a causa de les activitats productives que s'hi han desenvolupat. Els llacs i els afluents s'utilitzen per irrigació, indústria, ramaderia, pesca, recreació i ús domèstic, així com per suportar una àmplia varietat d'aus endèmiques i altres animals salvatges [2]. Un dels desenvolupaments recents a la zona ha estat la introducció d'empreses estrangeres de sistemes de producció de flors i vegetals [3].

En les zones de pasturatge, la inseguretats alimentària és un problema important, per això una proporció significativa de la població depèn de l'assistència d'agències externes. Una de les principals causes de la pobresa en el CRV és el baix nivell de productivitat agrícola, ja que la productivitat dels cultius tant de secà com de regadiu és molt baixa [4].

Les condicions dels sistemes d'irrigació de molts petits agricultors són deficientes, fet que contribueix a un ús ineficient de l'aigua. Molts sistemes de regadiu es construeixen amb suport governamental o no governamental, però el suport operatiu i de manteniment sovint no existeix o es rep només en part [3].

Actualment, els recursos hídrics del CRV s'utilitzen sense planificació o regulació i sense supervisió. El Govern d'Etiòpia ha creat polítiques i programes de desenvolupament per tal de promoure un ús eficient de l'aigua. Cada un d'aquests documents elaborats pel govern sembla factible sobre el paper, però les limitacions en el sector de l'aigua d'Etiòpia han impossibilitat el seu èxit.

Molts aspectes i principis de les polítiques existents no es poden dur a terme a causa de la falta de recursos econòmics del país, entre d'altres motius. La implementació d'un Water Point Mapping (WPM) per part d'una ONG en el CRV pot ajudar en aquest sentit, ja que a curt termini pot servir com una eina d'anàlisi i planificació per als governs locals.

Preface

This thesis contributes to the project “Promoting adequate environmental governance in the Ethiopian Central Rift Valley”, which is being undertaken by the Universitat Politècnica de Catalunya (UPC) and Intermon Oxfam (IO) and is financially supported by the Centre for Cooperation and Development (CCD) of the Universitat Politècnica de Catalunya (UPC) and the Col·legi d’Enginyers de Camins, Canals i Ports.

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Table of Contents

Summary	1
Preface	3
1. Introduction.....	13
1.1 Background	13
1.2 Project context.....	14
1.3 Goal of study	15
1.4 Expected results	15
1.5 Application of results.....	15
1.6 Research methodology	15
1.7 Structure of the report.....	16
2. Geography and climate of the Central Rift Valley.....	17
3. Water resources	20
3.1 Background: Ethiopia.....	20
3.2 Rift Valley Lakes Basin	21
3.2.1 Lake Ziway	22
3.2.2 Lake Abiyata.....	22
3.2.3 Lake Langano.....	23
3.2.4 Lake Shala	24
3.3 Groundwater resources of the CRV	24
4. Population.....	25
5. Economy, agriculture and food security	26
5.1 Poverty and food security	30
5.2 Health	32
6. Government structure	35
7. Water governance	36
7.1 Decentralization and water in Ethiopia.....	36
7.2 Federal Institutions	38
7.2.1 Ministry of Trade and Industry	38

7.2.2	Ethiopian Investment Agency	38
7.2.3	Ministry of Agriculture and Rural Development	39
7.2.4	Environmental Protection Agency	39
7.2.5	Ministry of Water Resources	40
7.2.6	River Basin Organizations	40
7.3	Conceptual Differences between River Basin and Regional Planning.....	42
7.4	Regional institutions.....	42
7.4.1	Regional Environmental Agencies	42
7.4.2	Water Resources Bureaus.....	43
7.5	Local Level Institutions	44
7.6	NGOs in the Central Rift Valley.....	45
7.7	Stakeholder interaction in Ethiopia’s water sector.....	48
7.8	Legislation	51
7.8.1	Ethiopian Federal Democratic Republic Constitution	51
7.8.2	Water Resources Management Policy.....	51
7.8.3	Ethiopian Water Sector Strategy.....	53
7.8.4	Water Resources Management Proclamation No.197/2000.....	53
7.8.5	Poverty Reduction Strategy Paper (PRSP) and Plan for Accelerated and Sustained Development to End Poverty (PASDEP)	54
7.8.6	Water Sector Development Program	55
7.8.7	Environmental Impact Assessment Guidelines	56
7.8.8	Rift Valley Lakes Basin Integrated Resources Development Master Plan Study Project	57
7.9	Water rights	57
7.10	Overview of water sector financing	58
7.11	Gender issues	59
8.	Land tenure system	61
8.1	Policy Texts: Federal & Regional Land Proclamations.....	62
9.	Water use in the Central Rift Valley	63
9.1	Water for irrigation	63
9.1.1	Water Users Associations and Cooperatives	64
9.2	Abijata Soda Ash Share Company.....	66
9.3	Water supply in the CRV.....	69

9.4	Synthesis water users.....	69
9.5	Impacts on water resources.....	70
9.5.1	Climate change.....	72
10.	Conclusions and recommendations	76
	References	81
	Annex 1. Stakeholders interviewed	85
	Annex 2. Questionnaire Investment Institutions	86
	Annex 3. Questionnaire Agricultural Institutions	88
	Annex 4. Questionnaire Water Institutions	92
	Annex 5. Questionnaire Environmental Institutions	95
	Annex 6. Questionnaire NGOs.....	98
	Annex 7. Questionnaire Private Investors	100
	Annex 8. Population Survey.....	101

List of Figures

Figure 1. Location map of Ethiopia [5].....	17
Figure 2. Woreda boundaries in SNNPR and Oromiya in the Central Rift Valley [16]..	18
Figure 3. Lake Ziway. Author: Ester Raventós	19
Figure 4. Bulbula River. Author: Ester Raventós	19
Figure 5. Major River Basins of Ethiopia [15]	20
Figure 6. Lakes and rivers of the Central Rift Valley [13].....	21
Figure 7. Lake Ziway. Author: Ester Raventós	22
Figure 8. Bulbula River. Author: Ester Raventós	22
Figure 9. Lake Abiyata. Author: Ester Raventós.....	23
Figure 10. Lake Langano. Author: Ester Raventós.....	23
Figure 11. Rural population of the Bite Dhabe kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero	25
Figure 12. Animal power cultivation in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero	26
Figure 13. Smallholder open-field vegetable production systems in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós	27
Figure 14. Sher complex in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós	27
Figure 15. Land use in the Central Rift Valley in 2006 [1].....	28
Figure 16. Donkeys transporting water in Dalota Mati kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero	29
Figure 17. Cattle in Lake Shala-Abyata National Park. Author: Ester Raventós	30
Figure 18. People fishing in Lake Ziway. Author: Ester Raventós	30
Figure 20. Scaffolding made of wood in Addis Ababa. Author: Ester Raventós.....	32
Figure 19. Typical houses of the rural area. Author: Ester Raventós.....	32
Figure 21. FLuoride concentration [19]	33
Figure 22. Dental fluorosis. Author: Ester Raventós.....	34
Figure 23. Administrative Regions of Ethiopia [15].....	35
Figure 24. Organizational Structure of the Rift Valley Lakes RBO [4].....	41
Figure 25. Institutional arrangement of water supply [5]	44
Figure 26. Chart: “seedling rising & distribution” on the wall of SEDA Office in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós.....	45
Figure 27. Chart: “Dugda Bora District sheep & goat distribution” on the wall of SEDA Office in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós.....	45
Figure 28. HOAREC Office in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós	46
Figure 29. Political context in Ethiopia’s water sector [30].....	48
Figure 30. PRSP and related programs [9]	54
Figure 31. Women and girls fetching water in Dalota Mati kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero	59

Figure 32. Woman and girl preparing a donkey to carry water containers in Dalota Mati kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero	60
Figure 33. Location of existing irrigation within the Central Rift Valley [4].....	63
Figure 34. Chart on the wall of Haleku Malka Teso Irrigation Cooperative office. Author: Ester Raventós	64
Figure 35. Organizational structure of a Water Users Association. Author: Ester Raventós	65
Figure 36. Organizational structure of the Haleku Malka Teso Irrigation Cooperative. Author: Ester Raventós.....	65
Figure 37. Pump of the Haleku Malka Teso Irrigation Cooperative in Bulbula River. Author: Ester Raventós.....	65
Figure 38. Chart: “summary of farm materials and inputs purchased and distributed” on the wall of the Irrigation Project of the Haleku Malka Teso Irrigation Cooperative office. Author: Ester Raventós.....	66
Figure 39. Evaporation ponds of the soda ash factory. Author: Ester Raventós.....	66
Figure 40. Soda ash factory. Author: Ester Raventós.....	67
Figure 41. Pumping station of the soda ash factory. Author: Ester Raventós.....	67
Figure 42. Shore of Lake Abiyata. Author: Ester Raventós	69
Figure 43. Livestock in Bulbula River. Author: Ester Raventós.....	70
Figure 44. Shoreline position of Lake Abiyata at different time [13].....	71
Figure 45. Lake Ziway modelled levels – response to climate change [4]	73
Figure 46. Lake Abiyata modelled levels – response to climate change [4].....	73
Figure 47. Lake Langano modelled levels – response to climate change [4].....	74
Figure 48. Lake Shala modelled levels – response to climate change [4].....	74
Figure 49. National Climate Change Hearing Event in Abijata-Shala National Park. Author: Ester Raventós.....	75

List of tables

Table 1. Woredas in the Central Rift Valley [1].....	18
Table 2. Characteristics of Central Rift Valley lakes [4]	21
Table 3. Problems in the Central Rift Valley according to the NGOs	47
Table 4. Political Actors in Ethiopia's Water Sector [30]	50
Table 5. Water Sector Reforms.....	51
Table 6. Requirement of a preliminary EIA [37].....	56
Table 7. Lake Abiyata (LTA) for soda ash production [4].....	68
Table 8. Water abstraction in the Central Rift Valley in 2006 [1].....	69
Table 9. Selected water quality parameters of the RVLB Lakes [4].....	70
Table 10. Changes of the size of Lake Abiyata [1]	72
Table 11. LTA lake level response to climate change [4]	72

List of abbreviations

ADLI	Agricultural Development Led Industrialization
AFD	Agence Française de Développement
BoARD	Bureau of Agriculture and Rural Development
BoFED	Bureau of Finance and Economic Development
BoWR	Bureau of Water Resources
CBO	Community Basin Organization
CCD	Centre for Cooperation and Development
CRV	Central Rift Valley
DLDP	District-level Decentralisation Programme
DWSS	Department of Water Supply and Sanitation
ECWP	Ethiopia Country Water Partnership
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Environmental Protection Council
ERSDF	Ethiopian Social Rehabilitation & Development Fund
EWNRA	Ethiopian Wetlands and Natural Resources Association
EWSSP	Ethiopian Water Supply and Sanitation Project
FDRE	Federal Democratic Republic of Ethiopia
FINIDA	Finnish Development Agency
FMS	Ethiopian Financial Management System
GCMs	Global Circulation Models
GDP	Gross Domestic Product
GNP	Gross National Product
GoE	Government of Ethiopia
GPD	Gross Domestic Product
GRECDH	Grup de Recerca en Cooperació i Desenvolupament humà
GTZ	German Technical Cooperation
HOAREC	Horn of Africa Regional Environmental Centre
IO	Intermon Oxfam
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
LTA	Long Term Average
MDGs	Millenium Development Goals
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development
MoTI	Ministry of Trade and Industry
MoWR	Ministry of Water Resources
NGO	Non Governmental Organization
NWRC	National Water Resources Commission
OIDA	Oromiya Irrigation Development Authority
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PRSP	Poverty Reduction Strategy Paper
REAs	Regional Environmental Agencies
RVCWDA	Rift Valley Children and Women Development Association
RVLB	Rift Valley Lakes basin
RVLBA	Rift Valley Lakes Basin Authority
RVLBHC	Rift Valley Lakes Basin High Council
SDPRP	Sustainable Development and Poverty Reduction Program

SEDA	Selam Environment and Development Association
SNNPR	Southern Nations, Nationalities and Peoples Region
STIs	Sexually transmitted infections
TGE	Transitional Government of Ethiopia
ToR	Terms of Reference
UMP	Urban Management Program
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Fund
UPC	Universitat Politècnica de Catalunya
WASH	Water supply, Sanitation and Hygiene
WHO	World Health Organization
WPM	Water Point Mapping
WRC	Water Resources Council
WSDP	Water Sector Development Program
WSSA	Water Supply and Sanitation Authority
WUA	Water Users Association

1. Introduction

1.1 Background

Ethiopia is an ancient country with rich diversity of peoples and cultures and a unique alphabet that has existed for more than 3000 years [5]. Since 1991 Ethiopia has a federal administrative structure, which constitutes the federal and regional government. Officially known as the Federal Democratic Republic of Ethiopia, it is the second most populous nation in Africa with over 79.2 million people and the tenth largest by area with its 1,100,000 km². The capital is Addis Ababa [6]. Ethiopia is Africa's oldest independent country and, with the exception of a five-year occupation by Mussolini's Italy, has never been colonized.

Rain fed smallholder agriculture is the backbone of the national economy providing 44% of the GDP and 85% of the employment. Droughts therefore have a strong impact on economic growth [7]. The spatial and temporal variability of water resources limits development and constrains management and equitable distribution.

Access to basic social services such as education, health, shelter, safe drinking water, and sanitation are among the lowest in the world. Over 90% of the rural population living in Ethiopia have no access to potable water [8]. Regarding energy, biomass appears to be the main source, in particular freely collected firewood, resulting in widespread environmental degradation [9].

In order to attain sustainable and equitable solutions to these problems due attention has been accorded by the Federal Democratic Republic of Ethiopia (FDRE) government to find policy options.

The Ethiopian Central Rift Valley (CRV) is part of the Great African Rift. It is situated in the administrative regions Oromiya and the Southern Nations Nationalities and Peoples Region (SNNPR), and covers an area of approximately 10,000 km² [1]. The total population of the CRV is approximately 1.5 million. The CRV consist of a chain of lakes, streams and wetlands. Being a closed basin, the CRV is one of the environmentally very vulnerable areas in Ethiopia [1].

The rapidly growing population has led to an increased claim on natural resources. The agricultural area has increased considerably, while changing agricultural practices have increased further the pressure on the natural resources. Irrigation, fertilizers and agrochemicals have been introduced in the last years. Water abstraction is often being done without the basic understanding of the complex hydrological and hydrogeological system and the fragile nature of the rift ecosystem [10].

Management of land and water resources in the CRV is complex due to increased competition for irrigation water, land and biomass. Moreover, climate change may affect the amount of rainfall and its distribution and requires policy development.

Several civil society organizations such as Rift Valley Children and Women Development Association (RCWDA) and Selam Environment and Development Association (SEDA) have projects to improve water use efficiency in irrigated smallholder schemes to reduce poverty [11].

Recently, policies of the Ethiopian government strongly support export-oriented irrigated horticulture and private large scale floriculture as a means to increase foreign exchange earnings and employment opportunities. The CRV is a region in Ethiopia where such policies have resulted in large scale investments in floriculture greenhouses and in a strong growth in smallholder irrigation schemes. The associated increase in irrigation water extraction from surface water and groundwater resources puts an increasing claim on scarce water resources in the area. However, poverty will remain a major driver for the exploitation of water resources by smallholders as long as no alternative livelihood strategies are available that rely less on irrigation water and no regulatory framework is in place to manage water extraction in the CRV.

1.2 Project context

This thesis is financially supported by Centre for Cooperation and Development (CCD) of the Universitat Politècnica de Catalunya (UPC) through one of its projects: “Promoting adequate environmental governance in the Ethiopian Central Rift Valley” led by the Research Group on Cooperation and Human Development (GRECDH). The project is being undertaken in collaboration with the UPC and Intermon Oxfam (IO), and it has been funded by the Col·legi d'Enginyers de Camins, Canals i Ports.

Through its Centre for Cooperation and Development (CCD), www.upc.edu/ccd, UPC has been actively promoting the involvement of its community in cooperation for development activities since the beginning of the 1990s (mainly through competitive budget allocations for small projects, mobility grants and awareness-raising activities).

The GRECDH is a multidisciplinary research group created on February 2006 at the Universitat Politècnica de Catalunya (UPC). It is formed by researches coming from very different knowledge areas but with common objectives with respect to the research applied to the cooperation and the human development.

Intermon Oxfam (IO) is Spanish based international NGO that has been working in developing projects since 1956. IO has been involved since the mid 90's in Ethiopia working together with its affiliates and allies on various issues affecting the lives of the poor people. The Central Rift Valley in Ethiopia is one of the study areas of the Livelihood Program of IO, which aims to turn the tide of environmental degradation and to ensure sustainability of livelihoods in the CRV.

In order to guarantee the sustainable development in the CRV, a proper management of the water resources is mandatory. Hence, the research “Water Resources Management in the Central Rift Valley” of Ethiopia was initiated in order to:

1. To clearly understand the optimal decision level where advocacy should be focused.
2. To identify stakeholders and involve them in natural resource conservation and protection activities.
3. To give advice for stakeholders on water resources management and sustainable development.

1.3 Goal of study

Overall Goal

To support water resources management at Central Rift Valley, by analysing the legal framework and assessing environmental impact of productive activities and fostering sustainable and equitable use of water resources.

Specific Goals

- To collect and analyze information to identify how water management is regulated in the Ethiopian Central Rift Valley and to know the social and environmental impacts of this management, so as to give appropriate recommendations, by analyzing the legal framework and surveying the stakeholders.
- Development of knowledge base to strengthen local authorities in the field of water management enabling a sustainable development of the CRV.

1.4 Expected results

Description on how Ethiopian policy defines Water Resources Management (which stakeholders should be incorporated, how it is taking place now, strengths and weaknesses of the nowadays implementation) and developing some proposals of action on how to improve water management.

1.5 Application of results

Results can be applied as a pertinent source of information which may help to improve water resources management at local and basin scale. Specially the results will help Intermon Oxfam to achieve the results of his Livelihood Program, which involves stakeholders like government offices, Community Based Organizations, private sectors and farmers involved in natural resources, conservation and protection activities in the CRV.

1.6 Research methodology

The research methodology consisted of three parts:

First, the study of the legal documents related with water management to understand the legal framework, prepare questionnaires and identify all the stakeholders related to water management.

The questionnaires were designed for collecting mainly qualitative information on:

- Formal and informal rules on water management.
- Implementation progress of the policies.
- Future law developments.
- Coordination among stakeholders.
- Collective action initiatives.
- Awareness of environmental and water problems.

Second, interview the stakeholders with the questionnaires (Annex 2, 3, 4, 5, 6, 7 and 8). Collection of information consisted of formal and informal approaches, in total 30 visits. Data has been collected in 22 administrative units, 2 private investors, 6 NGOs, 3 local people, and one Community Based Organization (Annex 1).

The third part consists of analysis of collected data comparing it with the legal framework studied in the first part of the research.

1.7 Structure of the report

This report starts with a description of the goals of the thesis and the research methodology used (Chapter 1). In Chapter 2 some general characteristics of the CRV are presented. The water resources of the study area are described in Chapter 3. Chapter 4 show the population characteristics, followed by the description of the economy and food security of the Central Rift Valley (Chapter 5).

The legal framework of water management is analyzed with the description of the government structure (Chapter 6), the government institutions and the legislation (Chapter 7). Chapter 7 also presents some aspects about gender issues.

Chapter 8 analyses the land tenure system. The various water uses and its impacts follow in Chapter 9. Finally, conclusions and recommendations are presented in Chapter 10.

2. Geography and climate of the Central Rift Valley

Ethiopia is part of the East African region commonly referred to as the “Horn of Africa.” Bordered by Somalia and Djibouti to the east, the Sudan on the west, Eritrea to the north, and Kenya to the south, Ethiopia is a land-locked country (*Figure 1*) [9].

Ethiopia’s landscape holds mountain chains, flat-topped plateau, deep canyons, river valleys, and rolling plains. Altitudes range from 110 m below sea level in the Dallol Depression to more than 4,600 m above sea level in the Semien Mountains. Extensive lowland areas with altitudes under 1,000 m abound on the western, eastern and southern margins of the country [9].

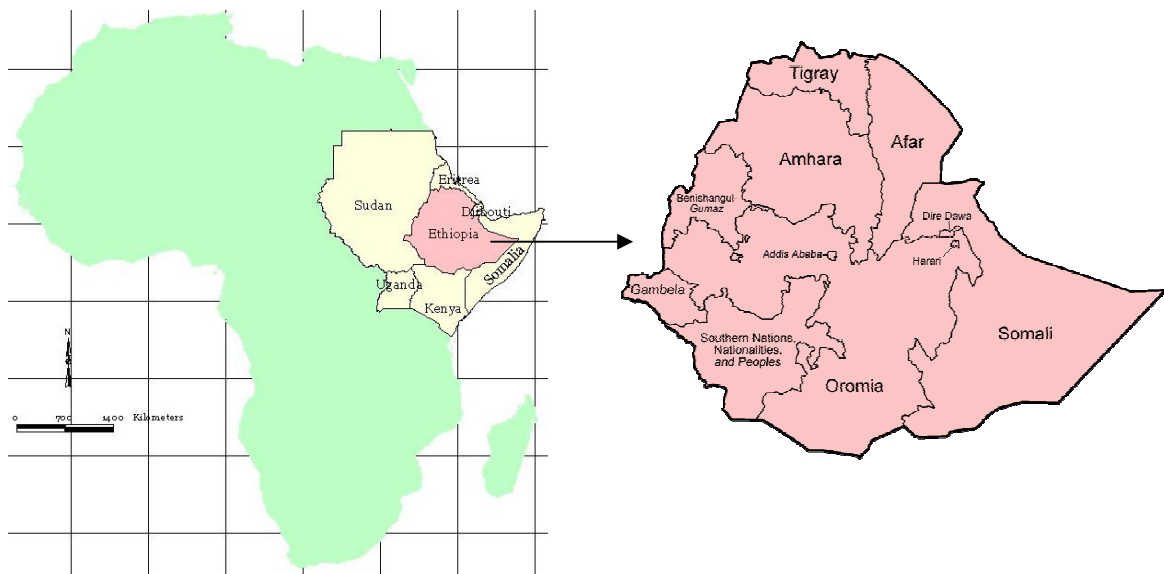


Figure 1. Location map of Ethiopia [5]

The Ethiopian Central Rift Valley (CRV) is part of the Great African Rift Valley and is located between 38°00'–39°30' east longitude and 7°00'–8°30' north latitude. It is a sub-basin of the Rift Valley Lakes Basin and encompasses Lake Ziway, Lake Abiyata, Lake Langano and Lake Shala. Lake Abiyata and Lake Shala form together a National Park.

The principal feature of the Rift Valley Lakes Basin is that it is a graben, a block fault geological structure in which the floor of the valley has become vertically displaced with respect to the valley sides, resulting in typical rift valley topography with a wide, steep sided valley and a broad, flat bottom [4].

The area is situated in the administrative regions Oromiya and the Southern Nations Nationalities and Peoples Region (SNNPR). The CRV encompasses various administrative areas (woredas), of which the most important ones are: Sodo, Meskana, Mareko, Dugda Bora, Ziway Dugda, Adami Tulu Jido Kombolcha, Arsi Negele, Munessa, Tiyo and Degeluna Tijo. The three first-mentioned woredas are part of the

Southern Nations Nationalities and Peoples Region (SNNPR), while the other woredas are situated in Oromiya [1].

Region	Woreda	Area (ha)
SNNPR	Sodo	83017
	Meskana	36615
	Mareko	50422
Oromiya	Dugda Bora	151423
	Adami Tulu jido Kombolcha	125049
	Tiyo	63336
	Degeluna Tijo	97233
	Ziway Dugda	126729
	Munessa	152061
	Arsi Negele	134000
Total		1019884

Table 1. Woredas in the Central Rift Valley [1]

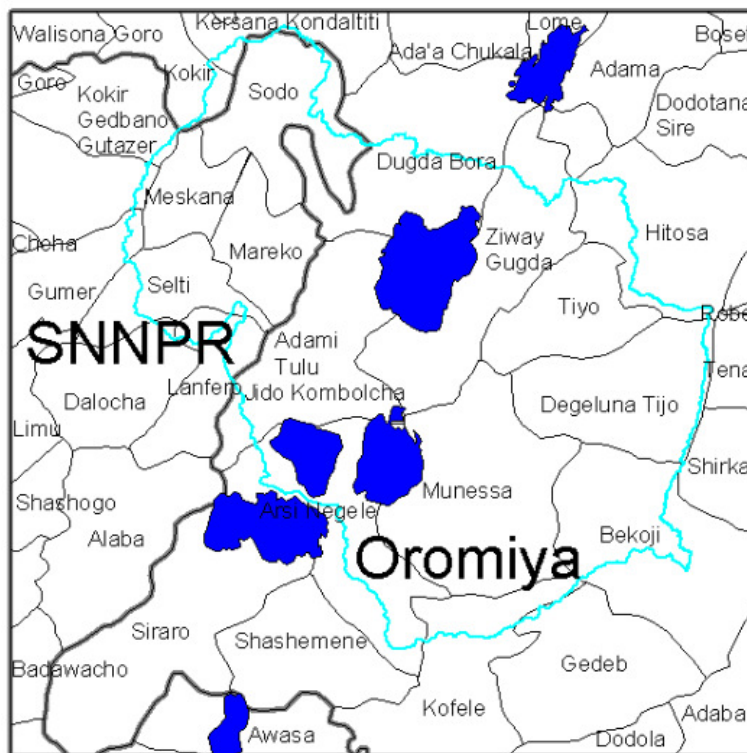


Figure 2. Woreda boundaries in SNNPR and Oromiya in the Central Rift Valley [16]

Ethiopia has a tropical monsoon climate with wide topographic-induced variation [12]. Latitude, altitude, winds and humidity with varying magnitude have significant impact on temperature conditions in Ethiopia [5].

The Central Rift Valley has three physiographic regions: the rift, escarpment and highland. The climate is humid to subhumid in the highlands and semiarid in the rift valley. The mean annual temperature is around 15°C in the highlands and 20°C in the rift valley [13].

Precipitation in the highland areas is higher than in the lowland areas. A dry period can be identified from the end of October till the beginning of March [3]. Rainfall in the CRV is highly erratic, and most rain falls intensively, often as convective storms, with very high rainfall intensity and extreme spatial and temporal variability [12]. The average annual rainfall ranges from 1150 mm in the highlands to 650 mm in the rift floor [13]. The irregular distribution of rainfall over the year is the biggest constraint for agriculture, because cumulative rainfall over the year is quite high [3].



Figure 3. Lake Ziway. Author: Ester Raventós



Figure 4. Bulbula River. Author: Ester Raventós

3. Water resources

3.1 Background: Ethiopia

The overall land mass of the country is hydrologically divided into twelve basins, eight of these are River Basins, one Lake Basin and three Dry Basins. Four of the River Basins, Abay, Baro-Akobo, Merab and Tekeze are part of Nile River System, flowing generally in the Western direction toward Sudan eventually terminating in the Mediterranean Sea. Five Basins namely, the Omo-Ghibe, Awash, Rift-valley Lakes, Denakil and Aysha can be categorized as the Rift-valley system as all of them drain their water in the Great East African Rift-valley. The remaining three, Genale-Dawa, Wabishebelle and Ogaden are part of the Eastern Ethiopian Basin that generally flows in the South-easterly direction toward the Somali - Republic and then to the Indian Ocean (*Figure 5*) [14].

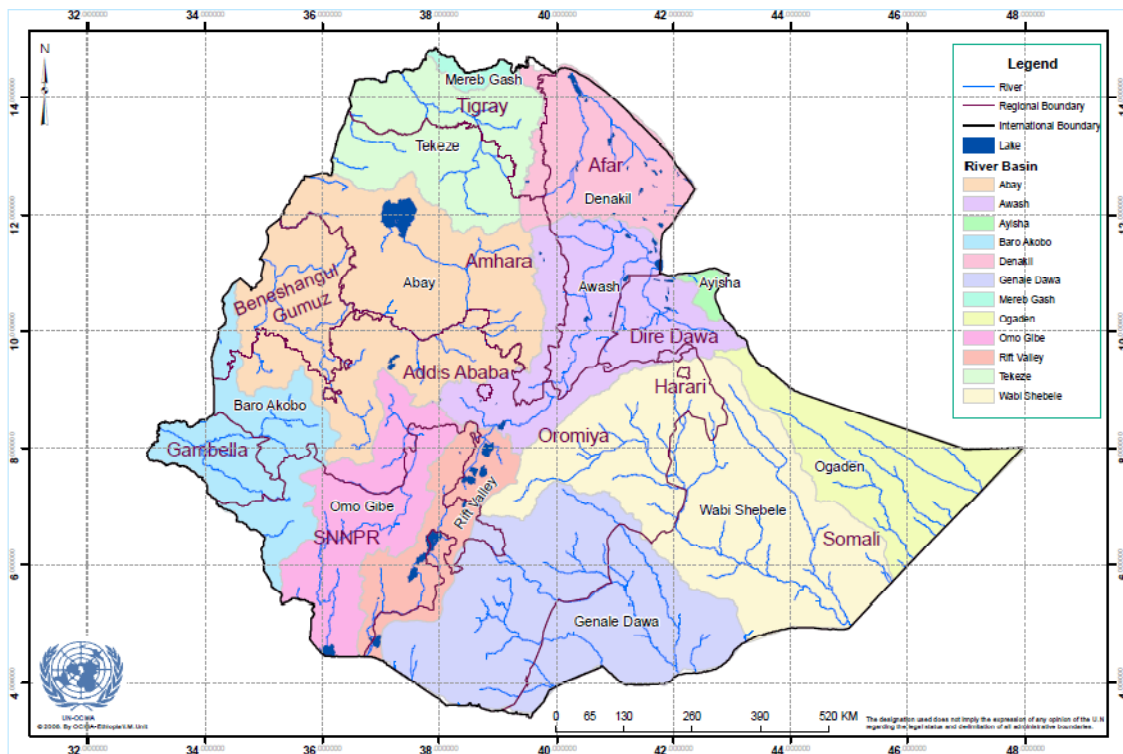


Figure 5. Major River Basins of Ethiopia [15]

Most of the rivers in Ethiopia are seasonal and about 70% of the total runoff is obtained during the period June-August [12]. The big and main water resources problem in Ethiopia is the uneven spatial and temporal occurrence and distribution. The groundwater potential of the country is not known with any certainty, but so far only a small fraction of the groundwater has been developed and this mainly for local water supply purposes [12].

3.2 Rift Valley Lakes Basin

The hydrology of the RVLB can be considered as four main surface water sub-basins:

- The Ziway-Shala sub-basin (14,477 km²).
- The Awasa sub-basin (1,403 km²).
- The Abaya-Chamo sub-basin (18,118 km²).
- Chew Bahir sub-basin (19,029 km²).

All these sub-basins, and the RVLB itself, are hydrologically closed, meaning there is no surface water outlet from the lakes except for evaporation. The lakes are therefore highly vulnerable to changes in water use regimes in the basin and to pollutants [4].

The Central Rift Valley covers the Ziway-Shala sub-basin which comprises the catchments of Lake Ziway, Lake Langano, Lake Abiyata and Lake Shala. Lake Shala is generally separate but under high flow conditions some water will transfer to Lake Abiyata.

Lake Ziway receives most of its water from two tributaries, being the Meki River and Ketar River. Lake Ziway is connected with Lake Abiyata through the Bulbula River. Lake Langano is connected with Lake Abiyata through the Horakela River. Both Lake Abiyata and Shala are terminal lakes (without surface water outflow) [16].

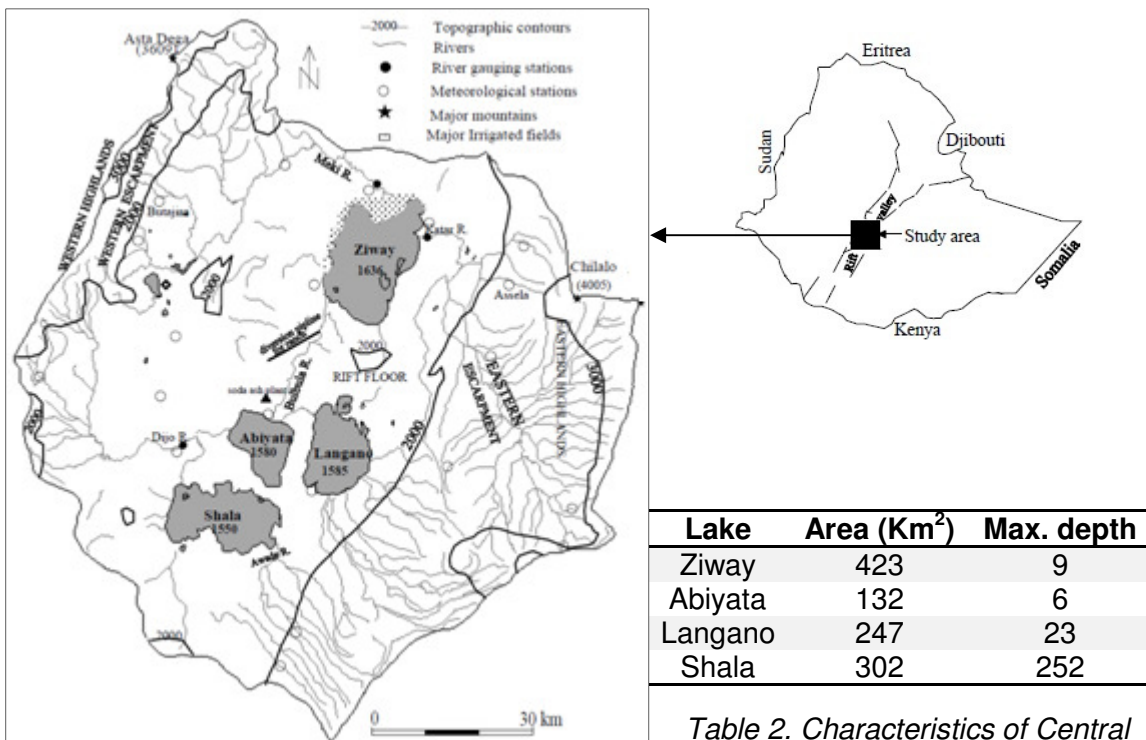


Figure 6. Lakes and rivers of the Central Rift Valley [13]

Table 2. Characteristics of Central Rift Valley lakes [4]

3.2.1 Lake Ziway

This is an open lake, connected to the terminal Lake Abiyata via the Bulbula River. It is the largest lake in the CRV. The Katar and Meki Rivers originate in the highlands and drain to the lake. The lake's water level has declined over the past few decades as a result of water diversion from the two main feeder rivers for irrigation, as well as direct pumping from the lake. The lake is home to many endemic birds and a wide variety of wild animals. It also is one of the main sources of commercial fish farming in Ethiopia [2].



Figure 7. Lake Ziway. Author: Ester Raventós

3.2.2 Lake Abiyata

Since Lake Abiyata is fed principally by spills of the upstream lakes of Ziway and Langano, and because of its terminal position in the drainage area, and its shallow depth, Lake Abiyata has a more pronounced sensitivity to changes in the basin and is especially susceptible to any diversion of feeder rivers for irrigation projects along the Meki and Katar Rivers and to water abstracted directly from Lake Ziway for irrigation and domestic consumption [4].

Owing to this, any reduction in levels in Lake Ziway will have a significant impact on the lake levels in Lake Abiyata because Lake Ziway is the main feeder, through the Bulbula River, for Lake Abiyata.



Figure 8. Bulbula River. Author: Ester Raventós

Since the mid 1980s Lake Abiyata water levels have been in almost constant decline, which is not explainable through the rainfall record, indicating that water abstractions are the main cause of the decline. Lake Abiyata is also sensitive to any reduction of flow in the Bulbula River, either through lake levels in Lake Ziway dropping or through direct pumping of water along the course of the Bulbula River to supply Ziway and Bulbula town water supplies, or diverted for small irrigation plots. The direct pumping of water from the Lake Abiyata for commercial exploitation of soda ash by evaporation of brine also impacts on lake levels [4].



Figure 9. Lake Abiyata. Author: Ester Raventós

3.2.3 Lake Langano

Lake Langano is fed by rivers from the highlands on eastern side of the Rift Valley. Lake Langano flows towards Lake Abiyata to the south through the Horakela River. The level of Lake Abiyata is only a few metres lower than that of Lake Langano, and the two lakes could unite and overflow to Lake Shala to the south if they were to rise by a few metres [4].



Figure 10. Lake Langano. Author: Ester Raventós

Lake Langano experiences only small seasonal water level variations of about 1 m, and lower inter-annual water level variations compared to other lakes in the basin. Lake Abiyata is less sensitive to reductions in flow in the Horakela River (as compared with the Bulbula River) from increased water use in the Lake Langano basin, as this river contributes only about 8% of the total inflows of Lake Abiyata [4].

3.2.4 Lake Shala

Lake Shala is the deepest lake (256 m), and is separated from Abiyata by a volcanic caldera rim. Lake Shala is a closed lake and is highly alkaline. The alkaline nature of this lake makes water abstraction directly from Lake Shala for irrigation not possible [4].

3.3 Groundwater resources of the CRV

The nature of the geological formations within RVLB and the intense tectonic disturbance that has affected them form a significant influence over the distribution and disposition of groundwater resources within the basin [4].

Groundwater is recharged by direct rainfall to permeable ground, (generally greatest in the basin margins where rainfall is relatively high), via river systems and lakes and from overlying or adjacent groundwater bodies. Groundwater discharge is from springs, either into surface waters (supporting base flow), directly into lakes, to the surface (e.g. wetlands, where evapotranspirative losses may be high) and into adjacent (or overlying) groundwater bodies [4].

The hydrogeological complexity is such that the groundwater contribution to the overall water resource balance varies considerably throughout the basin. There are complex relationships between groundwater recharge, flow, storage and discharge and the surface water system. The frequent occurrence of groundwater as discreet bodies, which may not be readily identified, makes evaluation of the available groundwater resource extremely difficult [4].

Given the nature of the area and the rainfall and evapotranspiration characteristics it is expected that the groundwater recharge is negligible in the subcatchments of Horakelo, Bulbula and Abiyata. Also in the subcatchment of Langano the groundwater recharge is expected to be very small compared to the other balance terms [1].

In the catchments of the Meki and Ketar River the average groundwater recharge is expected to range from 5 to 10% of the rainfall, thus representing a volume of approximately 300 to 600 million m³ per year [1].

4. Population

Ethiopia is among the least urbanised of African nations and the RVLB is the least urbanised area of Ethiopia, with less than 13% living in urban areas. Population density of the basin as a whole is 167 persons per km², which is three times the average for the country [4].

The growth of population is dependent on fertility, mortality and migration [4]. The population in the CRV has increased rapidly in the last decades due to natural population growth and migration to the CRV from other regions [3]. The corresponding average growth rate is 3.15%. This is a very high growth rate and is an obstacle to the economic development of the basin. According to the Rift Valley Lakes Master Plan Study Project, a priority for government must be to determine ways to limit population growth. As population increases, land pressures increase, farm employment opportunities decrease, and there will likely be more and more migration [4].

The age structure of the population is also an important feature. About 45% of the population of the basin is under 15 years, with a working population of 53% (note that this does not imply that they are actually working, only that they are in the working age group). Such a population distribution shows that now about half of the population must support the other half (the young and the old) [4].



Figure 11. Rural population of the Bite Dhabe kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero

5. Economy, agriculture and food security

Agriculture plays a significant and decisive role in the social and economic development of the country. However, owing to natural and man-made causes the country has not properly benefited from its abundant natural resources conducive to agricultural development, and consequently failed to register the desired economic development that would enable its people pull out of the quagmires of poverty.

The major impediments to agricultural development are the predominance of subsistence agriculture and lack and/or absence of more business/market-oriented agriculture, adverse climatic changes, failure to use agricultural land according to appropriate land use management plan and resource base, limitation in information base, lack of provision of supply and dissemination of appropriate technology, failure to integrate relevant activities and lack of adequate implementation capacity [17].



*Figure 12. Animal power cultivation in the Dugda Bora woreda of the Oromiya Region.
Author: Natalia Quero*

The vast majority of the population are dependent on subsistence farming. The rural areas of the CRV are characterized by low agricultural productivity and small landholding size. Population growth therefore places an ever-growing pressure on already inadequate farm sizes. Most farmers have only small plots of farmland producing food primarily for subsistence and are therefore not market oriented [4].

The predominant farming system in the CRV is the small mixed rain-fed production system consisting of grain crops and livestock. The major grain crops are wheat, maize, barley and teff [16]. This farming system is representative for poor farmers in the lowlands of the CRV and can be described as a production system with the following characteristics: low capital intensity, low input, high labour intensity, peasant farming, hoe and animal power cultivation (*Figure 12*), low management level, growing primarily subsistence annual and perennial crops with some sale of surplus [4].

In addition to the rain-fed production systems three types of irrigated production systems can be classified: closed vegetable and flower production systems, open field vegetable and fruit production on state and private farms and open field smallholder vegetable and fruit production systems (*Figure 13*).



Figure 13. Smallholder open-field vegetable production systems in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós

Presently only one closed production system is operational in the CRV, which is one of the major employers in the CRV with an average number of 30 up to 40 workers per ha in floriculture, currently about 500 ha are in production. The investor (Sher-Ethiopia) has constructed a greenhouse complex and leases greenhouses units to individual enterprises producing flowers or horticulture products for export (*Figure 14*) [1].



Figure 14. Sher complex in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós

Another important employer is the state farm namely Ziway Development Farm, with an open field vegetable and fruit productions system. With 186 permanent workers and 3000 seasonal workers they employ about 7 workers per ha [3]. This farm is located along the upstream part of Bulbula River. In the past this state farm irrigated over 1000 ha of land. Mid 2006 the irrigated area was about 680 ha. The size of the farm is expected to further decrease in the future, because of the expansion of closed production systems on its former land [16]. The cultivated crops are mainly beans,

tomatoes, onions and maize for seed production. A smaller area was grown with fruits, such as grapes, papaya and avocado [16].

Since the economical reforms, several open field private farms have been established in the CRV. An example is the Ethio-Flora, located along the Bulbula River south of the state farm Ziway Development. This private farm consists of 70 ha irrigated lands. Predominant crops are maize, green beans, papaya and banana. The farm also has a livestock unit, which uses, among others, maize residues as feedstuff [16].

The open field smallholder vegetable and fruit production systems differ from the previous category with respect to the irrigated area. They are much smaller, often less than 0.5 ha. The smallholders are often united in so-called Peasant Associations and they run irrigation schemes collaboratively [1]. The main crops in these systems are tomatoes and onions. These irrigated systems may combine with rain-fed cropping and/or livestock husbandry. The predominant irrigation method is furrow irrigation, where water is applied in a small trench between the crop rows [16].

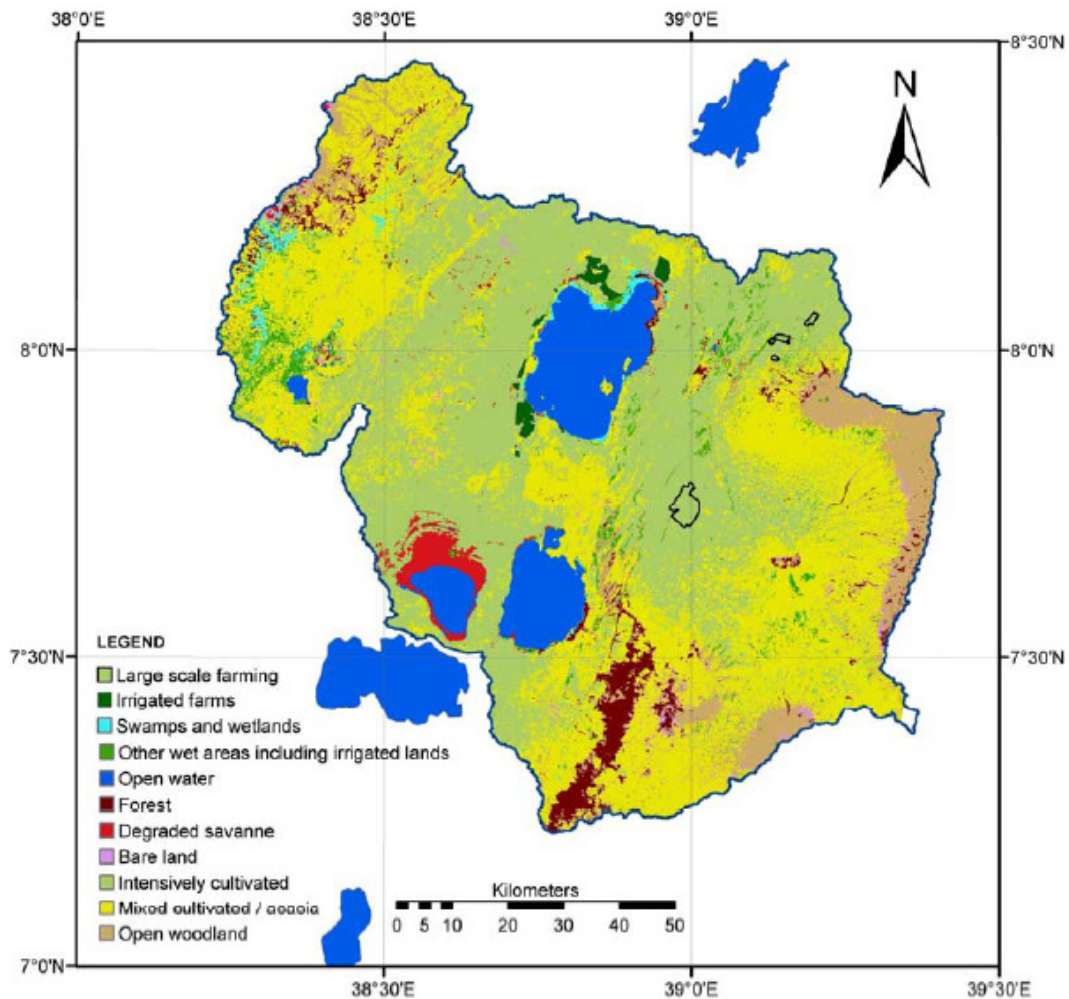


Figure 15. Land use in the Central Rift Valley in 2006 [1]

Other sources of employment include government, NGOs and cooperatives [4]. The situation with regard to access to alternative income opportunities is worse for pastoralists and, by virtue of their remoteness and physical isolation, most pastoralists have little, if any, access to non-farm sources of income. Livestock trading and petty trade in consumer goods are the most common alternative sources of income [4]. Additional income is obtained by charcoal production [3].

The predominant livestock is cattle, sheep and goat (in decreasing order). Most animals in the CRV are goats (in the lowland), sheep (in the highland) and cattle, mainly for meat production. Oxen are used as draft animals. In addition, chicken are kept for meat and egg production. For transportation donkeys (*Figure 16*), mules and horses are kept. The livestock population is large for a number of reasons. Traditionally, the number of animals, mainly cattle, gives farmers social status. For this reason farmers try to keep as many cattle as possible. Furthermore the increased human population has led to an increase in animals. This has resulted in overgrazing in many parts of the CRV [3].



Figure 16. Donkeys transporting water in Dalota Mati kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero

Although most livestock are well adapted to the local environment, their productivity with respect to milk, meat, eggs and reproduction is low. The prevalence of diseases and parasites is a significant issue in livestock production, causing large scale death of animals with consequent economic as well as social impact. Uncontrolled livestock slaughter outside of abattoirs encourages the transmission of livestock diseases. The animal health services are inadequately staffed and funded to counteract disease. The

cost of drugs is very high and diagnostic services are not readily available to livestock owners [4].

Feed sources are low in quantity and quality. Feed is sufficient only for maintenance (keeping the animal alive). Animal numbers are increasing at a rate far beyond growth in available feed.



Figure 17. Cattle in Lake Shala-Abyata National Park. Author: Ester Raventós

Lake Ziway supports the heaviest fish stock in the region. The highly productive rim of grassland close to the shore of lakes is the principal source of dry season grazing at high stocking densities and a wetland closer is a breeding site for birds and fishes. All these potential of the lake and the surroundings are being served as the pillar of the livelihood of the people around [18].



Figure 18. People fishing in Lake Ziway. Author: Ester Raventós

5.1 Poverty and food security

Poverty is widespread and multi-dimensional (low income, poor education and inadequate health services are typical of this). The causes of poverty are varied and complex, but according to the RVLB Master Plan Study Project the following interrelated factors contribute to the persistent poverty:

- Low levels of agricultural productivity and income (both crops and livestock).
- High dependence of rain-fed agriculture with only a very small proportion of irrigated land.
- Inadequate adoption of improved cropping practises and productive farming systems.
- Traditional (unproductive) livestock systems and livestock husbandry practices.
- Overabundance of livestock creating a conflict between food and feed.
- Lack of alternative income and employment opportunities in the non-farm sector resulting in widespread unemployment and underemployment.
- Small farm size, land tenure insecurity, fragmentation of holdings and landlessness.
- Overexploitation of forest resources and land degradation in the highlands.
- Unsustainable population growth rate leading to land degradation, reduction in farm size, underemployment and urban migration.
- Inadequate health facilities/services and poor health status.
- Inadequate education and vocational training.
- Poor water supply and sanitary facilities in the rural areas resulting in high incidence of disease and ill health.
- Inadequate road network and poor marketing facilities in the rural areas.
- Lack of financial resources and access to micro-credit.
- Periodic droughts in the pastoral areas resulting in the forced sale or loss of livestock.

In the pastoral areas, food insecurity is a major problem and a significant proportion of the population rely on relief assistance from external agencies. However, poverty in these areas is more than just food insecurity, as the population also suffers from poor access to health and education facilities and have few opportunities to engage in income generating activities [4].

Both the cultivators and pastoralists have developed several survival strategies to deal with seasonal and disaster period crises. Important strategies include the culture of sharing, seasonal out-migration in search of wage employment, and engagement in other off-farm activities. More short-term coping mechanisms employed during times of stress include:

- Leasing out of farmland.
- Selling assets, e.g. livestock and household items.
- Reducing consumption.
- Eating wild foods such as roots and leaves.
- Taking out loans to purchase food.
- Permanent migration of household members to urban centres.

In addition, charcoal trading, although illegal, has become an income for many local people. The demand for cooking fuel has increased as a result of population growth. Since liquid fuels are expensive, use of charcoal is often the only option for the local

poor to satisfy their energy demand. Charcoal is made of acacia trees and its production has caused large-scale deforestation in the last three decades [3]. The use of wood for construction also contributes to the deforestation (*Figures 19 and 20*).



Figure 19. Typical houses of the rural area. Author: Ester Raventós



Figure 20. Scaffolding made of wood in Addis Ababa. Author: Ester Raventós

5.2 Health

The most frequent diseases in Ethiopia are water-borne and water-related, and these are on the increase. After malaria, the most common are amoebas, giardia, typhoid fever and dysentery, all due to water contaminated by human waste. The main reason is that most people obtain their water from unprotected sources such as streams, ponds, wells, lakes etc. Poor water supply is the leading cause of diarrhoea, typhoid, cholera and related diseases [4].

The lack of proper sanitation contributes to this as it is the root cause of water contamination. Even the high density urban areas of the CRV do not have proper sanitation collection and disposal systems. Lack of health education has resulted in a very limited understanding of the link between hygiene and health among the majority

of the population, which further contributes to the poor health. There is a very low awareness in Ethiopia of the link between sanitation and health. Even where people do have a latrine, it is usually for convenience rather than hygiene. As a result, a very low priority is given to sanitation by communities and by town administrations. It is considered that there are other needs more pressing.

Basic sanitary facilities in the basin are essentially non-existent and those that are available are not properly used. Introduction of sanitation and sanitary facilities into the community is one of the major health-related problems to be solved. Action is needed to create awareness of and knowledge about the advantages of basic sanitation and hygiene in general [4]. But awareness and knowledge alone is insufficient and a behavioral change is necessary.

Sanitation is meant to be the joint responsibility of the municipality and the woreda health office, even though neither has sufficient means to execute their roles adequately. There are an insufficient number of trucks for waste collection and no sewerage systems. Officially, each household is responsible for its own waste, but there is no means of disposing of it [4].

Water supply, sanitation and hygiene are closely linked with malnutrition because of their direct impact on infectious diseases, especially diarrhoea, which are important risk factors in malnutrition. In turn, both are linked directly to poverty.

A particular environmental health issue in the CRV is fluorosis, caused by a high concentration of fluoride in water [4]. It is common in groundwater in many areas of the floor of the rift valley, in volcanic deposits.

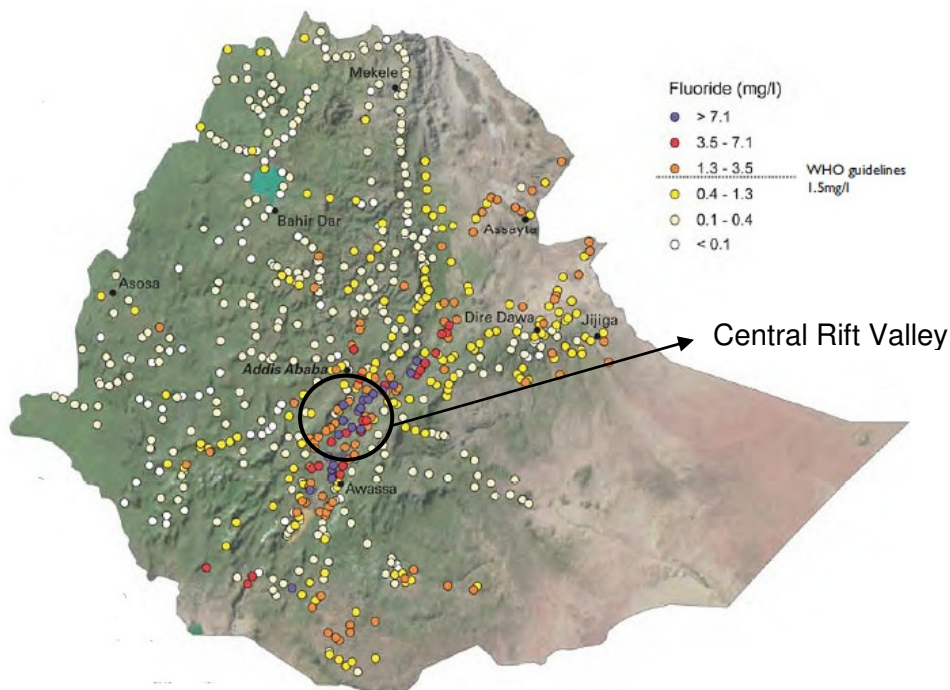


Figure 21. FLuoride concentration [19]

Figure 21 shows that the CRV has a very high fluoride concentration. Concentrations of fluoride above 1.5 mg/l in drinking water can cause dental and skeletal fluorosis. These clinical conditions are commonly encountered in the Rift Valley. The complications have no cure. With dental fluorosis, the teeth have brown discolouration (*Figure 22*).



Dental fluorosis is a life-long handicap. Skeletal fluorosis is caused by high concentrations of fluoride in drinking water consumed over many years. Symptoms include joint pains, progressive stiffness and limitation of mobility leading to severe invalidity. Disabling neurological complications (paralysis of limbs) occur in about 10% of skeletal fluorosis cases. In areas where children have poor nutrition, or lack calcium, high fluoride can lead to deformity of the lower limbs.

Figure 22. Dental fluorosis.

Author: Ester Raventós

Not all people exposed to high concentrations of fluoride in drinking water develop fluorosis. General health and nutrition and genetic factors can all play an important role. The most vulnerable people are those who are malnourished and with little calcium in their diet [19].

Sexually transmitted infections (STIs) are also a concern as they are fairly prevalent in Ethiopia and in the CRV, and can be sufficiently severe to impede employment, they can also affect fertility in women. Prevention of the transmission of STIs is considered a priority in Ethiopia [4].

6. Government structure

Ethiopia is an ancient country with rich diversity of peoples and cultures and a unique alphabet that has existed for more than 3000 years. The country has always maintained its independence, even during the colonial era in Africa [5].

Since 1991 Ethiopia has a federal administrative structure, which constitutes the federal and regional government. The country has got nine regional governments, (Tigray, Afar, Amhara, Oromya, Somalia, Benshangul-Gumuz, Southern Nations Nationalities and Peoples, Gambella, Harari) and two city states (Addis Ababa, Dire Dawa) (Figure 23). The National Regional States as well as the two cities administrative councils are further divided into five hundred eighty woredas and to around 15,000 Kebeles (5,000 urban and 10,000 rural) [5].

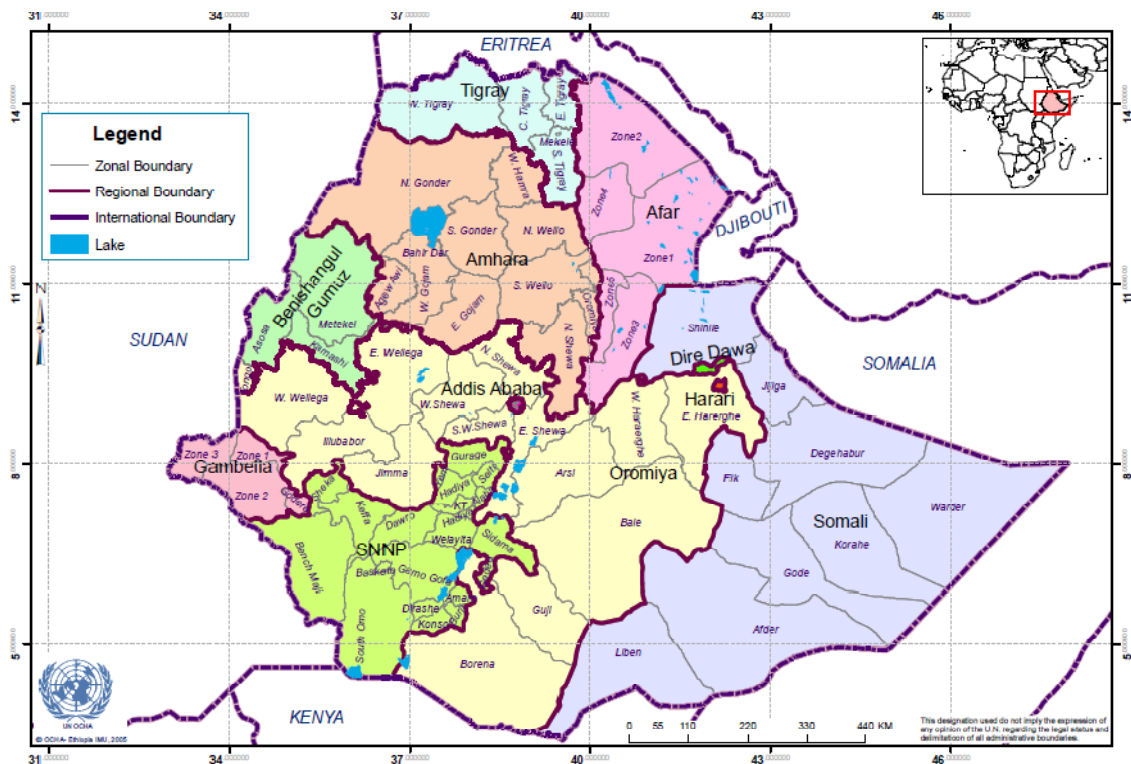


Figure 23. Administrative Regions of Ethiopia [15]

The parliament is the highest legislative body and the prime minister office with his cabinet is higher executive body in the country. The federal government is mainly responsible for foreign issues, defence, fiscal matters, interregional & international rivers and other macro level policies. The council of federation is constitutionally mandated to look after regional equity issues and other interregional disputes [5].

7. Water governance

Water governance generally refers to the wide range of social, economic, political, institutional, administrative systems and decision-making processes [5]. It stipulates who makes what kinds of decisions, when, and according to what criteria, norms and operational values. Such decisions range from those that are made at lower government institutions, which mainly deal with day-to-day operational and functional issues, to those that are made at higher levels.

Successful implementation of water policies, strategies, programmes and projects are dependent on all the stakeholders working at different levels. Effective governance can only be then realized through the existence and proper functions of relevant public, private, NGOs, international development partnering agencies and community based organizations [5].

7.1 Decentralization and water in Ethiopia

Prior to 1992, the coordination of water resources development activities in the country was carried out by the National Water Resources Commission (NWRC), which was established in 1981. The Commission had three authorities and one agency under its umbrella, which acted as the executive arms of the Commission. It also had a Water Resources Council (WRC) that comprised high-level representatives of Government Ministries that dealt with water and related activities [5].

However, with the coming into being of the Federal political system and a market oriented economic system in 1991 the organizations are either restructured to suit the new political and economic orientation or they are altogether dissolved or disbanded losing their functions and existence [5]. The 1991 change of government brought about a decentralized system of governance, the first wave of which (1991-2001) focused on creating and empowering national/regional governments, otherwise known as mid-level [20]. The national/regional governments were given legislative, executive and judicial powers in all matters within their area, except those falling under the jurisdiction of the federal government (defence, foreign affairs, economic policy, etc.) [20].

Proclamation No. 41/1993, dated 20 January 1993, delegated authority to the Regional Councils for planning, design, construction, operation and maintenance and management of the water supply and sanitation services [21]. The Regional Governments have taken over the management responsibility for water supply and sanitation operations for both rural and urban areas in the country. In each Region either Water Bureaus or Water, Mines and Energy Bureaus have been created to be responsible for water development and management activities.

Because of physical size of the regional states, and partly in recognition of the poor transportation network which hampers communication and for better administration works, each region was divided into a number of zones. Each zone was subdivided into woredas [5].

The Ministry of Water Resources (MoWR) was established in August 1995 [5]. Fiscal decentralization through transfer of budgets in the form of block grants was a key part of the decentralization process.

Pursuant to the Declaration of the Millennium Development Goals (MDGs) by the United Nations in 2000, the government of the Federal Democratic Republic of Ethiopia has continued to further devolve decision-making process, planning and implementation of social and economic activities down to the local levels [5].

In 2002, the second wave of decentralization focused on further devolution of power and responsibilities to the lowest level of governments, the woredas (districts). The District-level Decentralisation Programme (DLDP) and the Urban Management Programme (UMP) were the main vehicles for enhanced decentralization. The DLDP initially focused on four regions (Amhara, Oromia, Tigray and SNNPR). This has resulted in reforms in the administration/institutional arrangements, whereby the mandate of zonal administrations has been scaled down and more power has been given to the woredas [22].

Within the decentralized water sector arrangements, the federal government is in charge of policy and strategy development through MoWR and the regional and woreda governments are responsible for ensuring provision of services through delegation to water service providers. After decentralization, water service delivery activities were decentralized from the federal level to regional administrative bodies, BoWRs and woreda Water Desks. Woreda Water Desks were established with the responsibility of providing capacity support, in terms of technical assistance, planning and capital development, to communities, which will operate rural water systems through water committees [22].

In urban areas, municipalities were made legally responsible for the provision of water services within their jurisdiction, through autonomous town water boards. In bigger cities, separate water and sewerage authorities have been set up local-level utilities [22].

Budget allocated in water supply in each of the years of decentralization remained below 1% of total woreda budget. This small amount is also paid for salary of the staff and what is allocated as operation cost does not exceed cost for minor stationary items [20]. Furthermore, the trend in expenditure has shown an increase in salary expenditure than operation costs. Hence the bulk of the woreda budget goes for payment of salaries of civil servants in the woreda. Salary expenditure is between 83.5% and 92.2% while operation costs have been between 7.8% and 16% in the years of decentralization. After decentralization, increase in the number of schools and teachers and the opening of additional new offices and assignment of new employees for these offices are among the reasons for increase in salary expenditure in the woreda [20].

The financial resources at woreda level are insufficient to cover recurrent costs for operations, maintenance, etc. There is no link between collecting water tariffs and

finances for recurrent costs. Service providers are given a budget to work with that is also not related to actual costs of operation. Failure of water supply systems is common [4].

On the other hand, despite the proximity of the woreda to the zonal capital and its location on the main road, the woreda is facing humanpower problem, inhibiting efficient delivery of public services. This is mainly because of the lack of clearly institutionalized structure and scarcity of humanpower both in quantity and quality. In terms of availability of humanpower, from the total number of constraints which obliged the woreda to act almost in the same manner as before decentralization. This leads one to conclude that the woreda is not efficient in public service delivery as envisaged to be during the post-decentralization years [20].

Different constraints are responsible for the drawbacks. Financial and humanpower constraints and problems of coordination and participation have basically contributed to low performance of the woreda. Though the woreda was given autonomy in planning, administering, and managing public services, it has been restricted in terms of fully exercising its devolved powers particularly in personnel administration due to the actions of the regional and zonal bodies as well as the local challenges facing the woreda. Inconsistency of rules and regulations originating from regional and zonal bodies as regards planning and personnel administration are some of the impediments that inhibited the exercise of devolved power [20].

7.2 Federal Institutions

7.2.1 Ministry of Trade and Industry

The Ministry of Trade and Industry (MoTI) is a key stakeholder in all aspects of development in the country because is the government body responsible for the development of the private sector in Ethiopia.

According to the RVLB Master Plan Study Project, one of the main drivers of the development of the RVLB will be the growth of industry [4], making MoTI an important stakeholder. The MoTI is responsible for the development of the Floriculture industry in Ethiopia, which is currently the second largest in Africa [16].

7.2.2 Ethiopian Investment Agency

The Ethiopian Investment Agency is the government organ responsible for promoting, coordinating and facilitating foreign investment in the country [23].

The Ethiopian government is working progressively to improve the business climate and regulatory framework for foreign investment and the Ethiopian Investment Agency offers a streamlined service to encourage and facilitate investment in the country. The Ethiopian government is committed to the development of a free market economy and foreign investment has an important role to play in the continuing liberalization and development of the country [24].

According to the answers of the questionnaire that the Ethiopian Investment Agency filled during the field work, Environmental Impact Assessment (EIA) is not a requirement to get a license and the Agency has a shortage of skilled manpower, budget and better system of evaluating all projects to implement the policies at all levels.

7.2.3 Ministry of Agriculture and Rural Development

The Ministry of Agriculture (MoARD) prepares policy and strategies for land use, soils, landscape as well as conservation, utilization of forest, wildlife, and other natural resources. It also ensures quarantine control on plant, seeds, animal, and animal products brought into or taken out of the country [25].

In addition to rain-fed agriculture, the Ministry of Agriculture is also responsible for irrigated open field vegetable and fruit production and has developed a policy to stimulate this sector. MoARD identified so called “growth corridors” in Ethiopia with different priority crops based on agricultural potentials and market opportunities. Green bean is one of the priority crops within the CRV, while also a variety of fruit crops has been identified. Assessment of potentials and opportunities of various priority crops in the growth corridors appears to be qualitative and poorly supported by quantitative data, while investment, technical and marketing support of farmers is limited. The production of priority crops is stimulated by the MoARD mainly through the production of improved planting material [16].

The MoARD is promoting an efficient irrigation system by providing water use manuals for regional bureaus and giving trainings.

7.2.4 Environmental Protection Agency

At the federal level, environmental regulation lies principally with the Environmental Protection Authority (EPA). However, under the Establishment of Environmental Protection Organs Establishment Proclamation No. 295/2002, other Ministries which promote development projects likely to have adverse environmental effects were allowed to create their own Environmental Impact Assessment (EIA) Units [26]. MoWR is among the Ministries that have established such units.

The Proclamation also reestablished the Environmental Protection Council (EPC) [26], a cross-sectoral coordinating body with members from various Ministries, which was to advise the federal EPA, supervise its activities and approve directives, guidelines and environmental standards prepared by the Authority [26]. According to the Proclamation, The EPC shall hold its regular meetings once every six months. However, the EPC has only met once and effectively is not functioning.

The EPA is responsible, among other things, for formulating environmental policies, strategies, laws and standards and for implementing the Environmental Impact Assessment (EIA) process for projects that are of national importance, are funded by international donors, or affect two or more regional states. In practice the EPA has

successfully prepared a comprehensive set of documentation including general and sectoral guidance on EIA and Environmental Management Plans, environmental discharge standards and environmental quality standards.

However, the EPA has little regulatory control over decisions to approve important development projects or to stipulate appropriate environmental protection and mitigation conditions that should be applied to such projects. Once projects are approved, the EPA has few resources to monitor their construction to ensure compliance with the mitigation and monitoring plans.

7.2.5 Ministry of Water Resources

The Ministry of Water Resources of Ethiopia is a federal organization established in 1995 by the proclamation No. 4/1995 to undertake the management of water resources of Ethiopia. This involves development, planning and management of water resources, development of policies, strategies and programs, develop and implement water sector laws and regulations, conduct study and research activities, provide technical support to regional water bureaus and offices and sign international agreements [14].

The Ministry of Water Resources consists of 15-20 departments and services, having over 700 staff members [16]. The technical departments are engaged in data generation, analysis, retrieval and dissemination of information. The two leading departments in data generation are the Basin Development Studies and Hydrology departments. These two departments have large amounts of information that are related to the basins resources potential and development plans, as well as hydrological data. During the mission meeting with the Basin Development Studies Department was organized.

The Basin Development Studies Department is responsible for the preparation and implementation of integrated development master plans for all river basins in Ethiopia. The Basin Development Studies Department is also responsible for a Master Plan of the Rift Valley basin. It undertakes inventories of the water and other natural resources of the basins.

The Basin Development Studies Department reported that wetlands are degrading and that many developments around Lake Ziway take place without permission. There is no regulation. The government has started to develop 3000 ha of lands in the catchment of the Meki River. Pumps had already been installed, but the system was demolished by local people, who were not consulted (the central government had taken land from these farmers) [16].

7.2.6 River Basin Organizations

River Basin Organisations (RBOs) have been established in law in Ethiopia (2007) and can now be implemented. A department has been set up in the MoWR to facilitate the institution of RBOs and the process of creating the Abbay RBO is already underway. Work toward the Rift Valley Lakes Basin RBO began in 2006 [4].

Under the River Basin Councils and Authorities Proclamation No. 534/2007 all RBOs are expected to adopt the standard institutional and organizational arrangements established for the Abbay RBO [27].

The institutional proposals for the Rift Valley Lakes Basin were therefore prepared on the basis of Abbay Basin studies. The RVLB Master Plan Study Project proposed two levels of basin management for the Rift Valley Lakes RBO, namely: Rift Valley Lakes Basin High Council (RVLBHC) and River Valley Lakes Basin Authority (RVLBA).

Rift Valley Lakes Basin High Council (RVLBHC): This is a body that will direct, guide and supervise, as well as provide policy support, for the integrated management of the basin’s water resources. The council will include federal ministries, regional states and other concerned stakeholders. The RVLBHC will be supported the High Council Secretariat (HCS), under the supervision of the Director General of RVLBA, and the HCS will be located at the headquarters of the Authority. The HCS will generally provide administrative support to the High Council, sub-committees, working groups and others in relation to the business of the council [4].

Rift Valley Lakes Basin Authority (RVLBA): The RVLBA will be an autonomous organization entrusted with coordination and technical operation of integrated water resources management in the RVLB and will work in close collaboration with regional, zonal and woreda administrations in the basin as well as all other concerned stakeholders. The Authority will have highly qualified staff and adequate facilities necessary to undertake its duties. It is also proposed that the activities of the RVLBA are conducted from a headquarters and two branch offices located within the basin [4].

The organisational structure of the RVLBA headquarters and the links to the RVLB High Council, MoWR and relevant stakeholders is given in *Figure 24*.

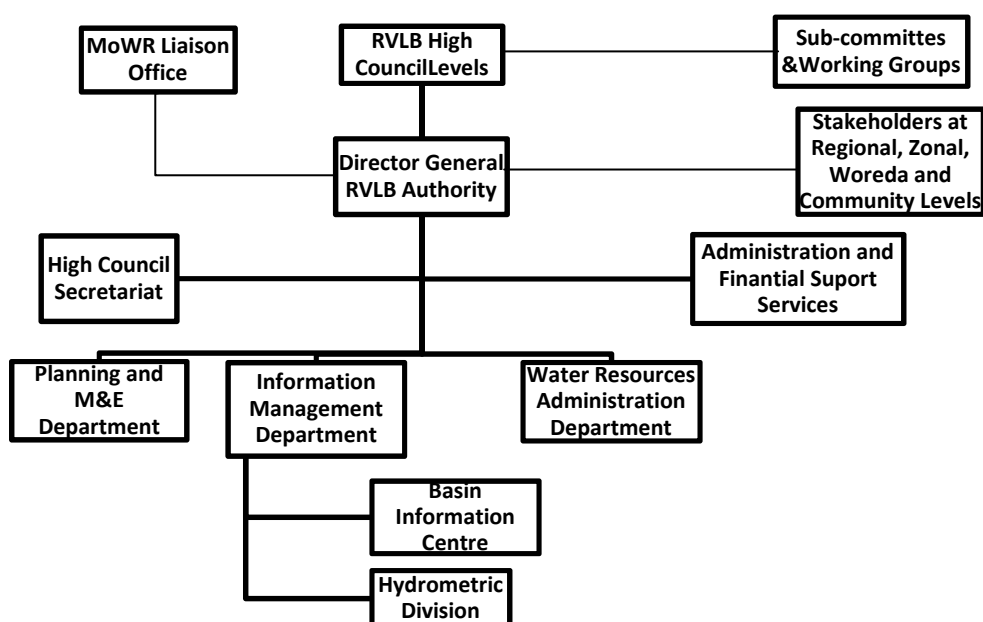


Figure 24. Organizational Structure of the Rift Valley Lakes RBO [4]

Awasa town is proposed as the location of the headquarters of RVLBA due to its strategic and central position within the basin [4]. The regional government offices of SNNPRS are located in Awassa and there is good access to the Oromiya regional offices. In addition, the RVLBA branch offices will be located at: Arba Minch to cover the southern part of the basin, and Ziway Town to cover the northern areas [4].

7.3 Conceptual Differences between River Basin and Regional Planning

River basin planning focuses on the development of water, land and associated resources within the hydrological boundaries of the Basin. In comparison, regional planning is geared towards the broader development of all physical and human resources within a specific area or region. For regional planning, hydrological boundaries are not meaningful as they have no administrative status and do not properly reflect the areas of economic growth and diversity needed for spatial planning [4].

The rationale for choosing a river basin as the unit for planning is primarily to optimize the use of the water resources within the basin where water is regarded as a major factor limiting development, as it is in the RVLB. River basin planning therefore focuses on water resources development, i.e. irrigation, and industrial/domestic water supply. Water use and allocation thus provides the basis of a river basin plan, but aspects of overall regional development are included where relevant economic sectors are directly linked to water resource development, e.g. agriculture, natural resources and energy. River basin plans are usually long term because the major investments often require a long implementation period [4].

Regional planning is usually based on administrative areas as it takes into account the political and administrative structures required for project implementation. Regional plans are a key element of the national planning hierarchy which comprises macro-economic planning, sectoral and regional planning. Regional planning does not necessarily consider water, or any other resource, as the major limiting factor for development. Its primary aim is to integrate all the economic and social sectors which are relevant to a particular region into a coherent spatial development framework. Identifying regional development opportunities and constraints for a wide range of sectors therefore provides the basis for an integrated regional development plan [4].

7.4 Regional institutions

7.4.1 Regional Environmental Agencies

Under Proclamation No. 295/2002, all regional states are expected to establish their own environmental organs [26]. The Regional Environmental Agencies (REAs) occupy relatively weak positions in the government hierarchy. In SNNPRS the REA is a unit within the Department of Natural Resources and Rural Land Administration, which is itself one of six departments within BoARD. In Oromiya the REA is the Environmental

Protection Office which reports directly to the Office of the Regional President. However, despite its autonomous position it is still a relatively weak office. The REAs are chronically understaffed, underfunded, and have little real authority in implementing the EIA system and industrial pollution control. They lack monitoring equipment and laboratory facilities, so any environmental monitoring has to be contracted out to external laboratories. As with the federal EPA, the REAs do not actively participate in the land leasing process, which is managed by the Regional Investment Offices. Consequently, REAs are often unaware of proposals for major developments located in environmentally sensitive sites or which by their size or nature may give rise to adverse environmental and social effects [4].

7.4.2 Water Resources Bureaus

Planning and implementing of water resources development and management, which are within the legal competence of the Regional States are further devolving down to the local administrative units. Regional bureaus and those that were at zonal level are giving way for some of their duties and responsibilities to the woredas. Some of the specialized institutions are getting restructured losing either their regulatory functions or operations related to their specific sector responsibilities [5].

In terms of the duties and responsibilities that had been entrusted upon the regional water bureaus and the other specialized agencies like Irrigation commissions/authorities, water construction enterprises and drilling enterprises, they have been actively working on developing small scale irrigation schemes, which includes study, design and construction. In addition water supply schemes have been constructed and maintained and operated using the competence of these organizations. In the regions that have relatively better capacity to plan and implement, the enterprises are organized to undertake construction activities and also give maintenance services using their crew established for such purposes. But with the advent of decentralization of planning, budgeting and implementing of projects/programmes at woreda (local) level a lot of institutional arrangements and reorganizations are still going on in the regions [5].

The Oromiya Irrigation Development Authority (OIDA) is a regional agency established in 1999 in charge of design and construction of, and technical advice on relatively small irrigation schemes (<400 ha). The Ministry of Water Resources is responsible for large scale irrigation schemes. In general, investors (such as in greenhouses) receive a license from the Oromiya investment office. Subsequently, the Oromiya Bureau of Water Resources checks the water-related issues of the investments. They may refuse licenses but this hardly occurs. OIDA is not involved in licensing of irrigation water permits, but is responsible for maintenance of smallholder irrigation schemes, advice and design of new schemes. Currently, new smallholder irrigation schemes are more frequently provided with subsidized drip irrigation schemes but old schemes remain relying on furrow irrigation [16].

7.5 Local Level Institutions

The woreda decentralization process has enabled the creation of Woreda water offices. These offices are responsible for planning, budgeting, implementing and monitoring and follow-up of water projects and programmes, in their respective localities [5].

Urban Water Supply Services are established by Government proclamation in many of the big cities and towns. They are autonomous to plan, develop and operate, within the legal and policy provisions that they are required to do so. Certain Urban Water Supply Services are under municipalities. In the rural areas, there are Water Boards and/or Water Committees responsible for the management of water systems in their respective constituency. These Water Committees are under the Woreda Water Desks.

In all the cases mentioned, the role of Government representatives is significantly high. Whichever of the management types mentioned above are taken, the various Management Boards are chaired either by Mayors or Town Administrators. The assumption is that majors and/or towns Administrator are elected people's representatives. But, members of the Water Boards Water Committees and the Management Board of the big public water utilities are also drawn from organizations that are considered to represent the general public and also representative from the social and economic entities that are believed to have a stake in the overall plan, development and management of the Water systems [5]. Institutional arrangement for developing, implementing, and managing of water supply and sanitation schemes are indicated in *Figure 25*.

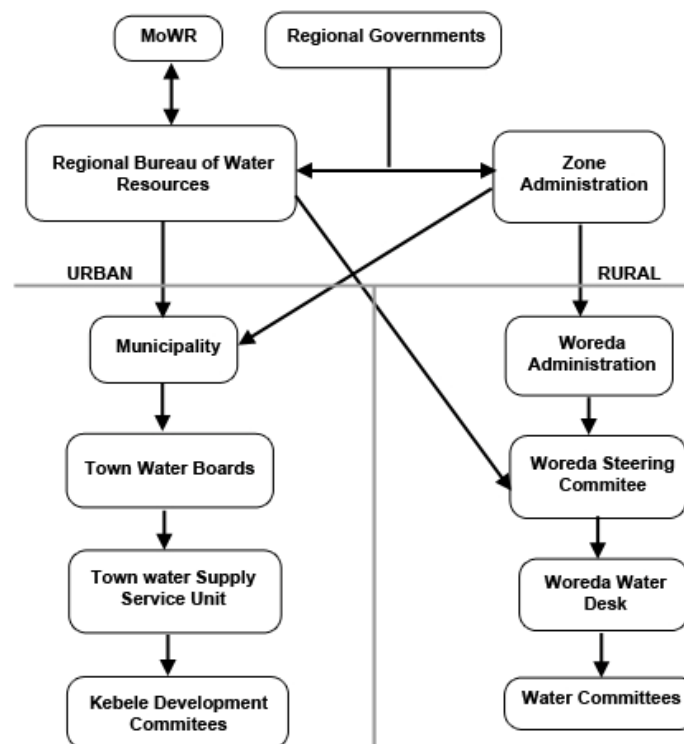


Figure 25. Institutional arrangement of water supply [5]

7.6 NGOs in the Central Rift Valley

Many NGOs (Non Governmental Organizations) are working in the CRV. Intermón Oxfam (IO) is a Spanish NGO that has been working in the developing projects since the mid 90's in Ethiopia. Through the "livelihood program" IO acts to improve livelihoods of different communities by financing and working with different local NGOs, like Selam Environmental Development Association (SEDA) and Rift Valley Children and Women Development Association (RVCWDA) to make projects in rural areas.

Selam Environmental Development Association (SEDA)
1. Seedling raising & distribution (2002-2007) fiscal year

S/N	Years of accomp	Seedling raised	No of nursery site	Seedling distributed	Seedling beneficiaries
1	2002	50,000	1	40,000	Local rural & urban community, GO's & private sectors & the like.
2	2003	70,000	1	55,000	Local rural & urban community, elem. school GO's & private sectors & the like.
3	2004	228,000	8	195,600	Local rural & urban community, elem. schools GO's & private sectors & the like.
4	2005	180,000	8	157,000	Local rural & urban community, elem. schools GO's & private sectors & the like.
5	2006	169,600	10	143,220	Local rural & urban community, elem. schools GO's & private sectors & the like.
6	2007	212,000	10	182,300	Local rural & urban community, elem. schools GO's & private sectors & the like.

Figure 26. Chart: "seedling rising & distribution" on the wall of SEDA Office in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region.

Author: Ester Raventós

Dugda Bora District Sheep & Goat distribution

PA	Sheep			Goat				
	No of beneficiaries	No of Sheep distributed			No of beneficiaries	No of goat distributed		
		M	F	T		M	F	T
Tuchi Dambel	-	-	-	-	5	25	30	60
Geraba Qorke	-	-	-	-	5	30	35	70
Sera wakene	-	-	-	-	7	23	30	60
walda Hafa	-	-	-	-	1	29	30	60
Xepho Coroqe	-	-	-	-	5	14	19	19
Dodota Dembel	-	-	-	-	7	8	15	15
Borqa debrebeg	-	17	17	17	-	-	-	-
Dara Daleca	-	17	17	17	-	-	-	-
Total		34	34	34	30	129	159	284

Figure 27. Chart: "Dugda Bora District sheep & goat distribution" on the wall of SEDA Office in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region.

Author: Ester Raventós

In addition, Horn of Africa Regional Environmental Centre (HOAREC) (*Figure 28*) is an international NGO working in the CRV that supports cooperation between member organizations and other environmental actors, including private sector and government [28].



Figure 28. HOAREC Office in Ziway Town, located in the Adami Tulu jido Kombolcha woreda of the Oromiya Region. Author: Ester Raventós

Ethiopia Country Water partnership (ECWP) was launched in December 2003 with the goal of promoting and implementing Integrated Water Resources Management (IWRM). Its members, among others, include institutions from Federal and Regional government offices, local and international NGOs, donors, research and academic institutions, Women and the private sector [29].

The Central Rift Valley Working Group is a multi-stakeholder platform to specially address the interrelated problems in the CRV in a public debate. This working group was formed in 2006 as a voluntary group of institutions and organizations, all professionally involved in the CRV and consisted of civil organizations, representatives of ministries and water-related institutes, the tourist sector and academia. The goal of the CRV Working Group is to “promote a basin wide integrated water resources management approach so as to make certain that adequate supplies of water of good quality are maintained for the people in the area, while preserving the hidrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature”. Although the CRV Working Group has no official mandate or authority in the CRV, it provides a first-of-its-kind platform of different stakeholders for policy dialogue on complex and interrelated issues in the CRV [1].

The problems that exist in the CRV according to the NGOs that are working in the area and the actions that they are doing to solve these problems are summarized in *Table 3*.

PLOBEM	REASON BEHIND	ACTIONS TO SOLVE/PREVENT NGOs ARE DOING
<i>Deforestation</i>	<ul style="list-style-type: none"> -To provide firewood and charcoal to generate income for food purchase (Use of wood as fuel). -Lack of awareness in the community in the area. -Increase of population. -Expansion of farms. -Use of wood for construction. 	<ul style="list-style-type: none"> -Creating awareness about the consequence of deforestation on climate. -Reforestation. -Promoting alternative energies. -Closing areas. -Mud blocks for construction.
<i>Poor law enforcement</i>	<ul style="list-style-type: none"> -Lack of capacity from the government. 	<ul style="list-style-type: none"> -Awareness raising and facilitating stakeholder participation.
<i>Reduction of water volume</i>	<ul style="list-style-type: none"> -Water is considerate free resource. -High competition for water by investors, smallholder farmers, private sectors. -Inflow water decrease. 	<ul style="list-style-type: none"> -Contributing to reduce water excess use and loss of water through improving the quality of irrigation infrastructure, and awareness of beneficiaries in water management.
<i>Water and soil pollution</i>	<ul style="list-style-type: none"> -Agrochemical use. -Losses of vegetation cover in the area. - Overexploitation and continuous utilization of the land. -Over utilization of water by irrigation. -Wind and water erosion. -Absence of town's waste disposal site. 	<ul style="list-style-type: none"> -Reduce use of agrochemicals speaking with farmers. -Promote organic inputs. -Training farmers.
<i>Soil erosion</i>	<ul style="list-style-type: none"> -Gradual diminishing of vegetation cover. -Poor soil management. 	<ul style="list-style-type: none"> - Planting trees. -Use of soil and water conservation techniques.
<i>Land shortage</i>	<ul style="list-style-type: none"> -Population pressure. 	<ul style="list-style-type: none"> -Family planning education. -Diversification of income. -Intensification of production (horticultural).

Table 3. Problems in the Central Rift Valley according to the NGOs

7.7 Stakeholder interaction in Ethiopia's water sector

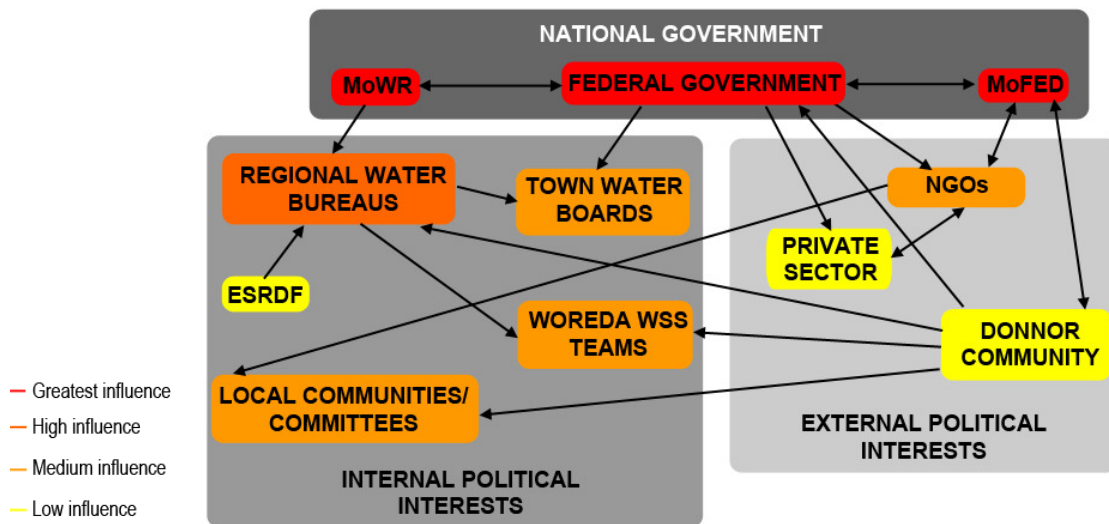


Figure 29. Political context in Ethiopia's water sector [30]

Figure 29 depicts the complex and multi-dimensional political climate of Ethiopia's water sector. The different priorities, reasons and resources for their involvement and the alliances among actors in water's sector are described in Table 4.

There are several stakeholders that are involved in the water sector. At the Federal level, the major ones are Ministries of Water Resources, Health, Agriculture, Finance and Economic Development and Capacity Building; at the Regional level there are Regional Councils, Bureaus of Water, Health, Finance and Economic Development, Mines and Energy and Agriculture; and at zonal level there are Zonal Administrations, Offices of Water, Health and Agriculture. At the woreda level there are Woreda Councils, Rural Development Offices, Woreda Water Desks, Health Desks, Water Users Associations, Agriculture Desks and Water Committees. At the community level, there are Water Boards, Water Committees, Municipalities and Urban Water Supply Service Offices. NGOs, external support agencies, donors and private sector are also involved in water resources activities.

However, despite repeated calls for effective stakeholder participation and decentralisation in water policy, central government still asserts the greatest influence in Ethiopia.

Actors in water policy area	Priority of water policy area for actor	Actor's resources for influencing water policy outcomes	Degree of influence in policy area	Actual & potential alliances among actors
Federal Government	HIGH: To ensure doing best for its people & potentially for profit.	Exercises executive power, ownership.	Most influential: responsible for water policy & strategy development.	Potential alliances with all stakeholders
Ministry of Water Resources (MoWR)	HIGH: To set national water policies	Water Resources Development Fund (to finance WSS schemes)	High influence: responsible for setting national policies & studying water distribution using scientific research tools.	<i>MoWR-central govt.</i> : MoWR sets national policies that govt. Develops. <i>MoWR-Regional Bureaus & woredas</i> : MoWR channels donor funds to local govt.
Regional Water Bureaus	HIGH: To ensure provision through delegation to water service providers.	Regional govt: most powerful player at regional scale.	Medium influence: responsible for planning investments & capacity building at regional level.	<i>Regional Water Bureaus- ERSDF</i> : ERSDF provide funds for regional water projects.
Town Water Boards (urban areas)	HIGH: enhance water service provision in towns & cities	Local govt.: most powerful player at local scale in cities & towns.	Medium influence: responsible for water service provision in towns & cities. Expected to contract out service provision to private operators.	<i>Town Water Boards-Private sector</i> : contracting out service provision to private operators.
Woreda (local govt. District) Water & Sanitation Teams (rural areas)	HIGH: To provide water services in rural areas.	Receive block grants from central govt. & decide how to use them autonomously in water sector.	Medium influence.	<i>Woreda WSS Teams-central govt.</i> : dissemination of block grants.
Private sector	MEDIUM: Profit.	Capital, trained professional engineers & experts.	Low influence: govt. Encourages private sector involvement, but remains more rhetoric than reality.	<i>Private sector-NGOs</i> : private sector providing financial assistance & NGO implementing.
NGOs	HIGH: To ensure best for civil society by non-profit means.	Expertise, knowledge, financial support & technical advice.	Currently small influence, but playing an increasingly growing role.	<i>NGOs-local committees</i> : NGOs help form committees.
Local community/ water committees	HIGH: They are the ones affected. They want to improve their access to safe drinking water	Their own voices on committees and though manual labour.	Low influence currently, but increasing. In some rural areas, water committees operate and manage water systems.	<i>Local committees-NGOs</i> : locals doing manual work, NGO provide financial/tech support. <i>Local committees-donors</i> : may receive aid directly from donors.
Donor community: World Bank, UNDP, UNICEF	Medium: Aiming to reduce global poverty living standards in Less Developed Countries.	Vital sources of financial & technical assistance.	Small influence: donor financing extremely low in Ethiopia.	<i>Donors-central govt.</i> : path of financing projects. <i>Donors-regions, towns & communities</i> : direct financing.

Actors in water policy area	Priority of water policy area for actor	Actor's resources for influencing water policy outcomes	Degree of influence in policy area	Actual & potential alliances among actors
Ministry of Finance & Economic Development (MoFED)	MEDIUM: Mainly to formulate development policies & plans that enable fundamental economic transformation. Automatic influence, as MoFED prepares federal gov't's budget. To initiate policy proposals that encourage & promote private sector involvement. To mobilize & negotiate foreign development aid.	Determining federal gov't's budget. Mobilising & negotiating foreign development aid.	Medium influence: prepares gov't. budget, thus has an input in determining expenditure on water sources/policy.	<i>MoFED-donors</i> : MoFED increasing type & inflow of donor aid. <i>MoFED-central gov't.</i> : MoFED prepare gov't's budget, some of which spent on water sector. <i>MoFED-private sector.</i> : MoFED initiates policy proposals with view to encouraging & promoting private sector. Assists private sector in investment decisions by identify potential investment areas.
Ethiopian Social Rehabilitation & Development Fund (ERSDF)	HIGH: To provide funding for rural water projects specifically.	Social Fund	Diminishing influence: been an important actor, has financed > 2000 rural water projects, serving > 2.5 people. But gov't. now phasing out ERSDF & re-deploying staff to other institutions.	<i>ERSDF-regional water bureaus</i> : ERSDF funding rural water projects.

Table 4. Political Actors in Ethiopia's Water Sector [30]

7.8 Legislation

Water Sector Reforms		
Year	Document	Prepared by:
1994	Ethiopian Federal Democratic Republic Constitution	FDRE
1999	Water Resources Management Policy	MoWR
2000	Water Resources Management Proclamation No. 197/2000	FDRE
2001	Ethiopian Water Sector Strategy	MoWR
2002-2005	Poverty Reduction Strategy Paper (PRSP)	MoFED
2002-2016	Water Sector Development Program	MoWR
2004	Environmental Impact Assessment (EIA) Guidelines	EPA
2005-2010	Plan for Accelerated and Sustained Development to End Poverty (PASDEP)	MoFED
2009-2034	Rift Valley Lakes Basin (RVLB) Integrated Resources Development Master Plan Study Project	MoWR

Table 5. Water Sector Reforms

7.8.1 Ethiopian Federal Democratic Republic Constitution

The election of Ethiopia's 547-member Constituent Assembly was held in June 1994. This Assembly adopted the Constitution of the Federal Democratic Republic of Ethiopia in December 1994 [6].

Article 43 defines the Right to Development: “*The Peoples of Ethiopia have the right to improved living standards and to sustainable development*” [31]. It also states that “*Nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community*” [31].

According to the Constitution, policies shall aim to provide all Ethiopians access to public health and education, clean water, housing, food and social security [31]. The Constitution states that everyone has the right to live in a clean and healthy environment and the Government will make every effort to provide such an environment [31]. The Constitution also holds the Government and the people of Ethiopia responsible for the preservation of natural resources and maintenance of ecological balances [31].

A number of proclamations and supporting regulations were made that contain provisions for the protection and management of the natural resources which reflect the principles of the Constitution [32].

7.8.2 Water Resources Management Policy

Within the framework of the Constitution, Ministry of Water Resources adopted the National Water Resources Management Policy in 1999 [8]. The overall goal of Water Resources Management Policy is to promote efforts towards efficient, effective, equitable and optimum utilization of the available water resources [5].

This document sets out management policy on water resources in general and those that relate to water supply and sewerage, irrigation and hydropower. It also describes policy on various crosscutting issues, among others, those dealing with groundwater resources, watershed management, water-rights allocation, trans-boundary concerns and technology.

The water policy has two main components:

- Sectoral policies: Water Supply and Sanitation policy, Irrigation policy and Hydropower policy.
- Policies on cross-cutting issues: which include among others, water allocation and apportionment, watershed management, water conservation and protection, technology and engineering, finance and economics, transboundary waters, water resources management information systems, stakeholders participation, water quality, disaster, emergency and public safety, R & D etc. [5].

The policy follows best international practice and promotes core policy principles, such as:

- **Water as an economic good:** The policy gives high priority to water supply and sanitation for human, livestock and industrial needs. It recognizes that allocation needs to be based on both economic and social benefits.
- **Promoting involvement of all stakeholders to improve efficiency:** The policy promotes effective coordination mechanisms for collaboration among different stakeholders.
- **Devolving ownership and management autonomy:** The institutional framework for management visualizes devolving ownership and management autonomy to the lowest possible level within the decentralization framework.
- **Financing, water pricing and cost recovery policies:** The policy envisions partial capital cost sharing and gradual full cost recovery for operation and maintenance for rural systems, and full cost recovery for urban water supply and promotion of domestic commercial and microfinance institutions in financing water investments.
- **Integrating planning for sanitation and hygiene with water supply:** This puts an emphasis on the need for an integrated approach to water and sanitation, and a clear identification of responsibilities of government and other stakeholders for sanitation and hygiene promotion.
- **Environment and natural resource management:** The policy aims to integrate effectively environmental protection and management matters into water resources administration, and to encourage the undertaking of impact assessments and conservation to be used as criteria in all projects.

According to the Ethiopian Water Resources Management Policy every citizen has the fundamental right to access safe water for his/her basic needs. The fundamental principle issued by government in relation to this issue states that "*As for as conditions*

permit, every Ethiopian citizen shall have access to sufficient water of acceptable quality to satisfy basic human needs” [8].

The policy provides a guiding framework within which more detailed sub-sector strategies and institutional reforms need to be developed.

7.8.3 Ethiopian Water Sector Strategy

Ministry of Water Resources prepared the National Water Sector Strategy in 2001. The principal objective of the Ethiopian Water Sector Strategy is to translate the National Water Resources Management Policy into action [33]. More specifically, this strategy sets the road map as how to make meaningful contributions towards:

- Improving the living standard and general socio-economic well being of the Ethiopian people.
- Realising food self-sufficiency and food security in the country.
- Extending water supply and sanitation coverage to large segments of the society, thus achieving improved environmental health conditions.
- Enhancing the contribution of water resources in attaining national development priorities.

The objective of the water supply and sanitation sub-sector strategy is to develop viable and implementable guidelines that promote the sustainable, efficient, effective, reliable, affordable and user-acceptable development of water supply and sanitation services, including livestock watering [33].

7.8.4 Water Resources Management Proclamation No.197/2000

The Water Resources Management Proclamation was issued in 2000 to provide legal ground for the implementation of the Water Resources Management Policy, issued in 1999.

The proclamation was issued with clear objectives and purpose to implement the fundamental principles, objectives, goal and the stipulated sectoral and crosscutting policy issues articulated in the Water Policy for Ethiopia.

The proclamation declares, "*All water resources of the country are the common property of the Ethiopian people and the state*" [34]. It gives MoWR in its capacity as supervisory body the authority to allocate and apportion water to all regions regardless of the origin and location of the resource.

The legal provision in the proclamation with regard to ownership of the resources and its allocation and apportionment clearly shows that the development, management, utilization and protection of all water resources in the country lines effectively in the hands of the Federal Government [5].

According to the Proclamation, the Integrated Basin Master Plan Studies shall serve as a point of reference and ensure that any water resource is put to the highest social and economic benefit of the people of Ethiopia [34].

In accordance with the Proclamation, use water for traditional irrigation is a type water use that not requires permit. "Traditional irrigation" means peasant managed irrigation that supplies water to land at a maximum rate of one liter per second or not more than one ha of land per peasant for his/her subsistence use [34].

7.8.5 Poverty Reduction Strategy Paper (PRSP) and Plan for Accelerated and Sustained Development to End Poverty (PASDEP)

The Plan for Accelerated and Sustained Development to End Poverty (PASDEP) has been prepared by Ministry of Finance and Economic Development (MoFED). The PASDEP is the Ethiopia's guiding strategic framework for the five-year period 2005-2010 and represents the second phase of the Poverty Reduction Strategy Paper (PRSP) process, which covered the past three years, 2002-2005 [17].

Recognizing pervasive poverty as Ethiopia's primary development challenge, the Government issued the Poverty Reduction Strategy Paper (PRSP) that conceptualizes the range of guiding strategies to address poverty in the country.

PRSP incorporates 4 building blocks: a strategy for economic growth based on agricultural and industrial development, judiciary and civil service reform, decentralization and empowerment and capacity building. *Figure 30* illustrates the linkages between the PRSP as the national development framework and the other national and sectoral programs including the Water Sector Development Program (WSDP).

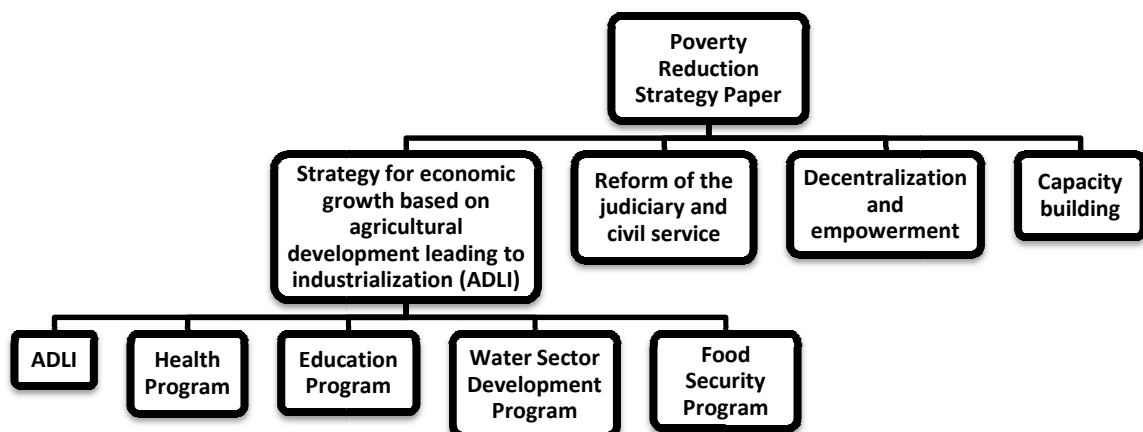


Figure 30. PRSP and related programs [9]

The first one, the Agricultural Development-Led Industrialized Strategy (ADLI), focuses on the basic needs of the rural population. The ADLI is complemented by other sectoral programs in Health, Education, and Roads aimed at improving the physical and social infrastructure and expanding access to basic goods and services [9].

The ADLI's distinctive features include:

- Commercialization of smallholder agriculture through product diversification.
- A shift to higher-valued crops.
- Promotion of niche high-value export crops.
- Support for the development of large-scale commercial agriculture.
- Effective integration of farmers with domestic and external markets.
- Tailoring interventions to address the specific needs of the country's varied agro-ecological zones.

The strategy promotes the use of labor-intensive methods to increase output and productivity by applying chemical inputs, diversifying production, utilizing improved agricultural technologies. ADLI also emphasizes the importance of distinguishing agro-ecological zones and tailors strategies as well as interventions for optimal development outcomes. This distinction guides the differentiated interventions needed to promote cross-sectoral and integrated growth [35].

One of the effects of the ADLI in the CRV is the increase of the area under irrigated horticulture and floriculture for export.

7.8.6 Water Sector Development Program

The Water Sector Development Program (WSDP) has been prepared by the Ministry of Water Resources. It defines concrete interventions in terms of projects and programs to achieve the water policy objectives, using the guidelines set under the national strategy [9].

The WSDP was developed with the purpose of meeting the MDGs and also in view of its additional contribution to the overall socio-economic transformation of the country [5]. The WSDP is a long-term plan that would guide the development and management of the country's water resources towards achieving the goals of poverty reduction and sustainable development [9]. It contributes to the achievement of the Plan for Accelerated and Sustained Development to End Poverty (2005-2010) (PASDEP).

The WSDP have a time horizon of 15 years (2002–2016). An important feature of WSDP is the inclusion of priority projects from river basins master plan studies, as well as those identified by various stakeholders, especially the regional governments. In summary, the WSDP provides an inventory of the projects to be implemented over the next 15 years with accompanied investments. Overall environmental and social impacts of WSDP are assessed to draw conclusions for future policy analysis, and guidelines provided as how to undertake such impact analysis at the project level. A comprehensive institutional and financial framework is proposed to secure successful implementation of the program [9].

The WSDP aims to translate these policy principles and strategy directions into an "Institutional Reform Package" that is not only essential for successful implementation of the WSDP, but also in order that Ethiopia have the continued growth in economic

productivity that is needed for sustainable development. The Institutional Reform Package has four components: reorganizing the Federal institutional structure, especially the MoWR; establishing new institutions (Basin Development Authorities); strengthening of the regional institutions and building partnerships [9].

In the WSDP it has been stated that the local communities, being the primary stakeholders, should be involved from the beginning for all water supply and sanitation activities. They should be empowered to make decisions and they should be made capable to do so by effective training. In the participatory approach, women have to play greater role and have to participate actively at all levels in the management, operation, maintenance and decision-making of water supply and sanitation schemes [9].

7.8.7 Environmental Impact Assessment Guidelines

In 2004, the Environmental Protection Authority issued the Environmental Impact Assessment (EIA) Guidelines. The purpose of the EIA guidelines is to ensure that any development projects and activities integrate environmental considerations in the planning process as a prerequisite for their approval.

These guidelines aim to assist in developing projects that can address the issues of sustainable development. They highlight major issues and potential impacts that should be taken into account during the preparation and assessment phases. According to these guidelines, the appropriate enhancement and mitigation measures should be integrated as early as possible, preferably in the project design [36].

The Environmental Impact Assessment Guidelines on Irrigation cover all types of irrigation projects and consider the various steps of the water cycle, including water harvesting, storage, conveyance, on-farm distribution and drainage [36]. The Integrated Environmental and Social Impact Assessment Guidelines on Water Supply focus on rural and urban water supply projects for human needs. They do not cover water supply for agriculture, livestock, forestry or fisheries.

The EIA Procedural Guideline defines the list of projects that require a preliminary Environmental Impact Study [37]. *Table 6* shows some of these projects.

Projects that require a preliminary EIA	Projects that may not require a preliminary EIA
Fish culture	Surface water fed irrigation projects covering less than 50 ha
Small animal husbandry and urban Horticulture and floriculture	Ground water fed irrigation projects covering less than 50 ha
Charcoal production	All small scale agricultural activities
Fuel wood harvesting	Rearing of cattle (<50 heads); pigs (<100 heads), or poultry (<500 heads)
Rain water harvesting	Livestock fattening projects (small scale)
Livestock stock routes	
Rural water supply and sanitation	

Table 6. Requirement of a preliminary EIA [37]

According to *Table 6*, the irrigation projects covering less than 50 ha and small scale agricultural activities don't require a preliminary EIA.

7.8.8 Rift Valley Lakes Basin Integrated Resources Development Master Plan Study Project

The Rift Valley Lakes Basin (RVLB) Integrated Resources Development Master Plan Study Project was commissioned by the Ministry of Water Resources (MoWR). The aims of the Master Plan Study are to:

- Promote sustainable development in the RVLB.
- Reduce poverty in the RVLB.

The Master Plan prepared for the Rift Valley Lakes Basin contains elements of both river basin planning and regional planning. However, certain adaptations had to be made to reconcile the conceptual differences between the two approaches, particularly with respect to the identification of development zones and the preparation of a structure plan for the Basin [4].

Water is one of the factors limiting development in the Rift Valley Lakes Basin area, so due attention is given to water resources and related issues in the Master Plan. However, the emphasis with regard to water resources is on conservation and sustainability, rather than development in itself. Also, other natural resources in the Basin are limited, for example, good agricultural land, forage and forest resources. The development of all resources is the basis for sound regional planning required to meet the objectives of poverty reduction and sustainable development. An integrated approach to basin planning is therefore necessary [4].

Therefore, water resources are mostly a constraint to development in the Master Plan, rather than a development target. There is some potential for irrigation development, but this is limited. Within the Master Plan, the regional planning framework facilitates wider socioeconomic development. Regional planning also permits a full understanding of the interaction between and the integration of the various sectors and puts forward other sector interventions supporting the growth of the Basin's economy [4].

7.9 Water rights

Water Rights issue in Ethiopia can be explained from two perspectives or from social equity and economic efficiency point of view. Consistent to underlying Government laws and international conventions, every Ethiopian citizen has the fundamental right to have access to sufficient water of acceptable quality, to satisfy basic human needs [8]. Citizens in Ethiopia, as conditions permit, shall not be left without safe water, no matter their capacity to afford for the services provided. The other aspect water right issue in Ethiopia is those related to persons, public or private organizations that have the desire and plan to involve themselves in the development and management of water resources. As long as these entities request or apply for water permits and certification

of their competence within the set legal framework and operational procedures, they are rightly entitled to involve in water resources development and management regardless of its origin or location within the territorial boundary of the Federal Democratic Republic of Ethiopia [5].

Under the Proclamation No. 197/2000, public and private agencies and persons applying for water use permit and certification of their technical and professional competence have the full right to use any water resources provided they fulfil requirements set by the Supervising Body [34].

The Ethiopian Water Policy and Water Proclamation clearly stipulate that all water resources (surface and Groundwater) are common property of the people of Ethiopia and the state [34]. Provided that irrigation water is not a private property but common property, no one is held responsible for the mismanagement.

7.10 Overview of water sector financing

Ethiopian government spending on water and sanitation is very low. In 2004, water sector expenditure as a share of the national budget amounted to only 0.7%, and only 0.2% of GNP (Gross National Product). Donor funding, both 'on-budget' and 'off-budget', is an important source of finance for the water and sanitation sector in Ethiopia. Other sources of finance come from user charges, the NGO sector and community contributions [22].

The Ethiopian Financial Management System (FMS) has two main channels for budgeting and transferring financial resources to regions, channel one and channel two funding. Channel One refers to direct budgeting and transfer from MoFED to regional BoFEDs and from there to woreda level. This funding channel is considered 'on-budget', as resources are part of the planning and budgeting process of public resources and are accounted for in the relevant budgets [22]. The Channel One system has advantages (it enables proper knowledge of and control over resources), and disadvantages (it can entail long bureaucratic procedures).

Channel Two involves budgeting and transfer through sector ministries, for instance MoWR, and transfer through their respective budget implementation units located at regional and woreda level. The World Bank EWSSP follows this system. Channel Two allocations target beneficiaries more exactly but such targeting may be donor targeting rather than nationally aligned, in addition, such support may risk leading to the establishment of a parallel system, given that it may not be captured within national systems [22].

A third way of channelling funds, otherwise known as Channel Three, involves transferring financial resources from the donor or NGO either directly to the regional sector bureau or through a project implementation unit. MoFED considers Channel Two and Channel Three 'off-budget', as donor and NGO support remains outside the planning and budgeting process of public resources [22].

There are many donors actively supporting government in water supply projects including UNDP, UNICEF, Agence Française de Développement (AFD), Finnish Development Agency (FINIDA), Japan International Cooperation Agency (JICA), GTZ, KfW, Development Cooperation Ireland, DfID, Government of the Netherlands, the European Union, The World Bank and The African Development Bank [4].

A larger proportion of funds for the WASH sector come from off-budget sources rather than on-budget [22]. During the field work, all the government institutions interviewed agreed that there are not enough funds to promote efficient use of water.

7.11 Gender issues

In general, rural water systems are decentralised and rarely include piped distribution systems. The predominant method for conveying water between the points of intake and consumption sites is using portable containers transported generally by girls and women or by animal traction (*Figure 32*) [38].

In most of the rural areas women are the primary water carriers and users. Women spend many hours each day fetching water (*Figure 31*). Often the sources of their water are unprotected springs, or polluted streams or ponds [39].

Starting from the year 1999, the Water Resources Management Policy gives the right of full involvement of women in the planning, implementation, decision-making and training, as well as empowers them to play a leading role in self-reliance initiatives [8].



Figure 31. Women and girls fetching water in Dalota Mati kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero

WSSA guidelines state that at least two women should be included in all water committees formed to manage water supply schemes. However, few women among many men will inhibit the women from playing an active role [39]. Due to social, economic and cultural reasons, women tend to be less active in water users groups,

and more reluctant to be drawn into them. In part this is because women have multiple responsibilities and have very little time to spare.

Access to safe water within easy reach of the household means women can save time, labour and effort, which they can employ in more productive agricultural and income generating activities [39].

In general, the overwhelming majority of women, regardless of background, have huge workloads, virtually no access to resources, no civil rights, no decision making capacity and no control over their own bodies and lives. In many cases they are the victims of direct and indirect social and physical violence simply because they are women. The imbalance of workloads, access to and control of resources, and social status between male and female is huge and endemic [4].

There is evidence of at least some positive change in the status of women. With the slow expansion of government presence at local level through the devolution process, health and family planning services and education as well as basic household improvements such as water supply and sanitation and energy, many women are beginning to understand that their status can be improved. Change may begin to come quickly as more girls have access to education and women have more time to devote to themselves and to community issues [4].



Figure 32. Woman and girl preparing a donkey to carry water containers in Dalota Mati kebele, located in the Dugda Bora woreda of the Oromiya Region. Author: Natalia Quero

8. Land tenure system

Ethiopia is one of several post-socialist countries undergoing an ambivalent transformation process towards some kind of capitalist economy. This applies in particular to land tenure regimes [40].

The dismissal of the *derg* regime on 28 May 1991 created a period of uncertainty about the future of land rights in Ethiopia. In this political void, both the option of privatization of land ownership and the continuation of some form of state ownership were discussed. However, already in its November 1991 declaration on economic policy, the Transitional Government of Ethiopia (TGE) announced the continuation of the land policy of the *derg* regime. In 1995, state ownership of land was instituted in Ethiopia's new constitution [31], but despite the passing of the constitution, the debate over land ownership continued until the 2000 elections. However, the debate was partly suppressed thereafter with the Prime Minister publicly declaring land policy a 'dead issue' in meetings with donor agencies [40].

The Ethiopian land policy debate focuses on the needs and economic pressures of the peasant economy of highland sedentary farming and is less concerned with the problems of pastoralist land tenure or the development of land markets in other parts of the country [40]. The government's position builds on a social equity paradigm and tenure security considerations. In this, state ownership is regarded as the most appropriate means to protect the rural peasantry from the negative side effects of market forces [40].

The government maintains that its policy is tailored to equally distribute land to all who claim rights to ensure access for the needy, to provide them with the means to make a living as farmers in rural areas, and to protect them from selling or mortgaging their land, thereby safeguarding them from the grabbing hand of an urban bourgeoisie and rural elites. The government also explains that this land policy is aimed at preventing political unrest [41].

But, according to the stakeholders interviewed, perhaps the single biggest barrier to overcome in agriculture is the small landholdings. They are currently averaging 0.5 ha per farm in the CRV as a whole, it is too small to support a family. Not being able to support a family means the farmers remain in the poverty cycle, which in turn means they cannot afford to make the investments needed to improve their productivity. Landholding size must increase if poverty reduction is to be achieved. The law does not allow farmers (and others) to own their land, and this prevents any increase in average farm size.

To increase productivity farmers need to invest. It has been proven time and again that they will not invest if the land they are investing in is not theirs. Farming is not very productive in Ethiopia, and anywhere farming is productive, farmers own their land [4].

8.1 Policy Texts: Federal & Regional Land Proclamations

Article 40 of the 1995 Ethiopian constitution states that:

The right to ownership of rural land and urban land, as well as of all natural resources is exclusively vested in the state and the peoples of Ethiopia. Land is a common property of the nations, nationalities and peoples of Ethiopia [31].

The article further specifies a “*right to obtain land without payment*” for “*Ethiopian peasants*” for grazing and cultivation purposes as well as a right to be “*protected against eviction from the possessions*”. The article further stipulates that any transfer of land is prohibited and “*shall not be subject to sale or other means of exchange*” [31].

The 1995 Constitution approved state ownership of land as the statutory framework [31]. Several regional governments have made use of the powers vested in them in the 1995 Constitution to formulate their land policies, among them Oromia Region (2002) and Southern Nations, Nationalities and Peoples Region (2003). Since, according to the Constitution, regional land policies need to be in accordance with federal law, all regional policies validate state ownership of land and farmers only receive usufruct rights to plots of land without transfer rights, such as sale or mortgage. All regional proclamations confirm the right to lease out land, although most regions restrict the period of lease. At the same time, there are also marked differences across the regional policies with regard to tenure security, lease and inheritance rights as well as the right of the regional government to redistribute land [40]. These differences in regional legislation imply that tenure security will markedly differ in the various regions of Ethiopia, in particular on the question of redistribution of land plots, on the definition of user rights and on certification.

9. Water use in the Central Rift Valley

9.1 Water for irrigation

Awareness regarding water scarcity is low among irrigation water users along Lake Ziway and from groundwater sources located in the northern part of this Lake. The perceived causes for those that are aware of water scarcity relate mainly to rainfall variability and much less to (irrigation) water users upstream along the Meki and Ketar. Domestic users downstream along the Bulbula River associate water scarcity to the floriculture greenhouses near Lake Ziway. For other urban water users, water quality is more important than water quantity maybe because of year round water supply [7].

The total irrigated area in the CRV is around 12000 ha, of which 500 ha are closed irrigated production systems and the rest are open irrigation systems. The irrigated areas are sustained by water coming from the following sources, in order of decreasing importance: Lake Ziway (31%), Ketar River (27%), groundwater (25%), Meki River (11%), Bulbula River (4%) and spring water (2%).

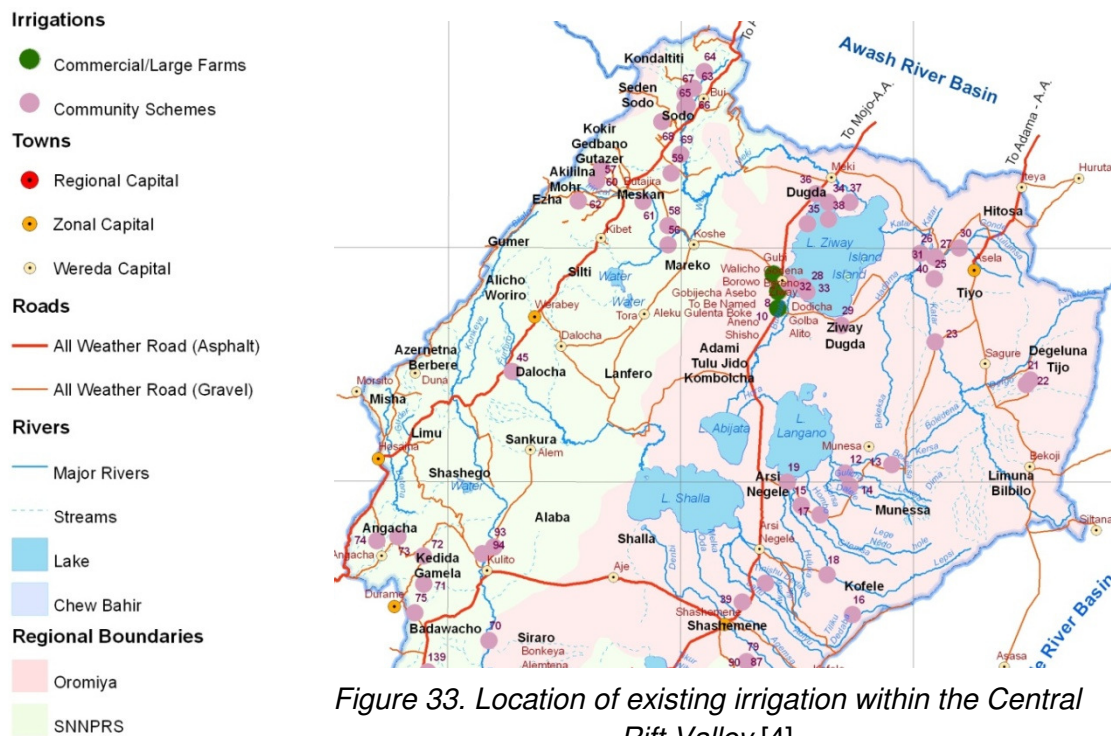


Figure 33. Location of existing irrigation within the Central Rift Valley [4]

The water use of closed irrigated production systems refers to the production of roses. All closed production systems use drip irrigation systems. Total gross water use by closed irrigation production is in the order of 2 million m³ per year [1]. With an average number of 10000 workers in floriculture, the Sher complex creates an important (and still growing) source of employment opportunities in the region. The farm is operational since September 2005 and it produces roses since December 2005.

The Sher complex is provided by surface water from Lake Ziway. Greenhouse drains and rainfall on the roof is drained directly to the nearby lake, which provides a possible emission pathway for nutrients and biocides [16].

Except for some pilot projects all open irrigation production systems use furrow irrigation. In this system water is collected in an elevated distribution canal or pond and from here it is distributed over the land by small ditches [3]. Total gross water use by open irrigation production is in the order of 150-200 million m³ per year. For these systems the irrigation water efficiencies are in the order of 20-40%. This means that in the order of 50-100 million m³ of the abstracted water is evaporated [1].

9.1.1 Water Users Associations and Cooperatives

In general, both traditional and modern irrigation schemes have some kind of cooperation and farmers have set up Water Users Associations (WUAs). When a WUA has a certain level of organization it reaches the status of cooperative. The structure of the cooperatives differs per woreda [3]. During the mission a meeting with the Haleku Malka Teso Irrigation Cooperative was organized. The extent of cooperation depends in particular on the support by (local) government and NGO's. *Figure 34* shows that the stakeholders involved with the cooperative visited are: the community, donors, the RCWDA (local NGO) and government line officers.

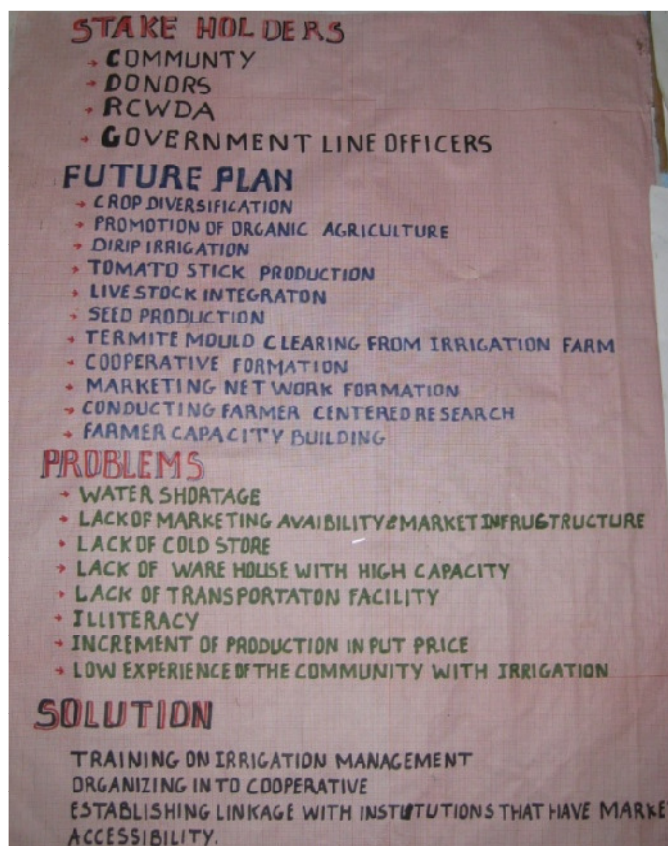


Figure 34. Chart on the wall of Haleku Malka Teso Irrigation Cooperative office. Author: Ester Raventós

Farmers within a WUA or cooperative collaborate in pump use and they share fuel costs.



Figure 37. Pump of the Haleku Malka Teso Irrigation Cooperative in Bulbula River.
Author: Ester Raventós

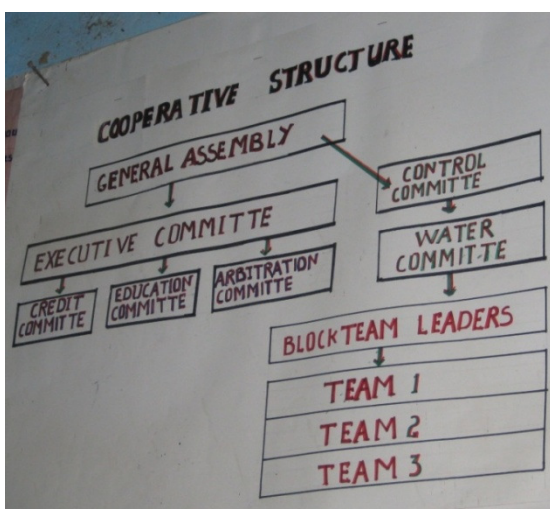


Figure 36. Organizational structure of the Haleku Malka Teso Irrigation Cooperative.
Author: Ester Raventós

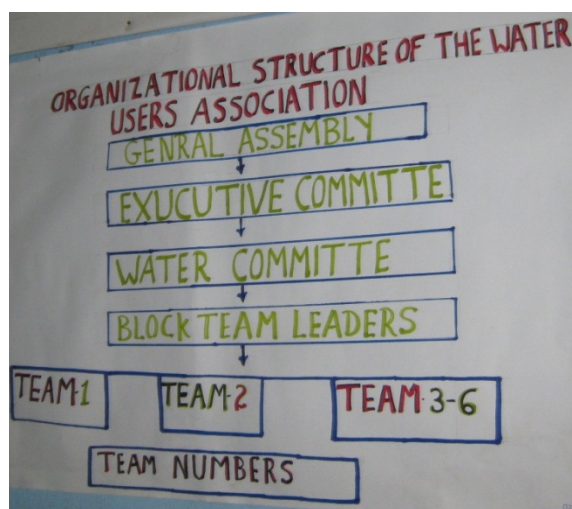


Figure 35. Organizational structure of a Water Users Association. Author: Ester Raventós

In general, cooperation at this level involves two major activities: providing service and marketing products. Service consists of purchasing inputs like (improved) seeds, fertilizers, chemicals, sprayers etc. At the output side cooperatives try to increase bargaining power of members at markets. Products are sold by the cooperative directly to the local market or to a union. Cooperatives also store non-perishable crops to sell them when market prices have increased. A third activity of cooperatives sometimes involves the management of savings, for example for maintenance and for insurance in

years with poor crop yields. Although farmers tend to organize, due to limited financial capabilities input supply to members is below desirable level and bargaining power is still very weak due to limited transportation possibilities [3].

Also water allocation is arranged within these organizations. Within the WUA or cooperative this is often not an issue. Between organizations in highland areas where farmers extract water from rivers however, allocation of the available water between upstream and downstream areas is often a problem. Cooperation between cooperatives in these areas in unions is often poor [3].

**HALEKU IRRIGATION PROJECT
SUMMARY OF FARM MATERIALS
AND INPUTS PURCHASED AND
DISTRIBUTED**

No	TYPE of materials	PURCHASED		Total Price Birr	cent	REMARK
		Amount kg/lit/m	Price			
1 Seed						
	Onion Seed	5kg	15225		00	
	Tomato Seed	5	1900		00	
	Pepper/green/	1			00	
	Cabbage seed	6	26		25	
	Maize Seed	350kg	111		00	
	Green Roast Seed	600kg	7000		00	
	Sub total			15600	00	
2-Farm tools						
	shovel	53	615		33	
	Hoe	55	592		00	
	Wateringcane	64			00	
	Large	54			00	
	Small	10	1800		00	
	Rake	4	270		00	
	Sprayer	56	487		00	
	Open barrel	4	1730		80	
	closed barrel	2	520		00	
	oil container	1	200		00	
	Sub total			6285	33	
3 Chemicals						
	Pencozem	63	7245		00	
	Riidomil	17	4590		00	
	Karete	15	3750		00	
	Selecron	22	7700		00	
	Decise	35	9800		00	
	Neron	11	3300		00	
	Malatation	13	1495		00	
	Register Book	6	210		00	
	Sub total			38090	00	
4. Fertilizer						
	DAP	58	52200		00	
	urea	30	17400		00	
	Sub total			69600	00	
	Grand total			153837	58	

Figure 38. Chart: “summary of farm materials and inputs purchased and distributed” on the wall of the Irrigation Project of the Haleku Malka Teso Irrigation Cooperative office. Author: Ester Raventós

9.2 Abijata Soda Ash Share Company

Since 1990 a soda ash factory is operational along the shore of Lake Abiyata. This factory produces soda ash (Na_2CO_3) from sodium bicarbonate (NaHCO_3) dissolved in lake water. The lake water is evaporated in large evaporation ponds (Figure 39), leaving sodium bicarbonate behind. Through heating the sodium bicarbonate is decomposed into sodium carbonate (soda ash), water and carbon dioxide [1].



Figure 39. Evaporation ponds of the soda ash factory. Author: Ester Raventós

Soda ash is used in the production of glass and of caustic soda. Both of these are currently used in industry in Ethiopia, but most of the country's requirements are met through imports from Kenya [4]. The most commonly stated reason for importing soda ash products is the inefficient production process at Lake Abiyata and the consequently higher costs over imports.



Figure 40. Soda ash factory. Author: Ester Raventós

The official production capacity of the plant is 20,000 tonnes per year of soda ash, but the most they have produced is about 7,500 tonnes in 2001. On average the factory produces 4,500 tonnes per year of soda ash with a water requirement of 150 m³/tonne of production. In the last three years production has declined to very low levels as the water level of Lake Abiyata has fallen and the lake shore has migrated to a distance of some 3 km from the pumping station (*Figure 41*) [4].



Figure 41. Pumping station of the soda ash factory. Author: Ester Raventós

Detail of changes in Lake Abiyata levels and lake area in response to soda ash production is given in *Table 7*.

Scenario no.	Soda ash production (tonnes/yr)	Change in lake level (m)	Change in mean lake area (%)
1	4,500	-0.03	0.0
2	10,000	-0.04	-0.5
3	20,000	-0.14	-1.9
4	1,000,000	-7.62	-89.0

Table 7. Lake Abiyata (LTA) for soda ash production [4]

For soda ash production between 4,500 tonnes and 10,000 tonnes per year there is some impact on lake levels ranging from a fall of 0.03 m and 0.04 m for the long term average (LTA), respectively, with compared to the baseline model and reducing lake area by 0.5%. Consequently, the present large decline in water level in Lake Abiyata is not related to soda ash production.

There is now a plan to rehabilitate the plant and get it working again. Production has slowed down because of the loss of water in Lake Abiyata [4]. There are considerations of increasing production to as much as 1 million tonnes per year, more than 100 times the current production. Such an increase is unrealistic and unsustainable as it would draw down Lake Abiyata to a dry bed within a few years. The plan is to pump water from Lake Shala. With a water requirement of 150 m³/tonne of production, the 1 million tonnes will result in a decline in lake levels of about 0.44 metres per year. Over the 30 year simulation period, this would be a decline of over 13 metres [4].

An assessment was also done in the RVLB Master Plan for expansion to 1 million tonnes of product per year using brines brought in from Lake Shala. This would require a pipeline and pumping to bring water from Lake Shala. With a water requirement of 150 m³/tonne of production, the 1 million tonnes will result in a decline in lake levels of about 0.44 metres per year.

For soda ash production between 4,500 tonnes and 10,000 tonnes per year there is a small impact on Lake Shala levels ranging between a decrease of 0.03 m and 0.07 m for the LTA water level, respectively. To maintain a safe or acceptable lake level decline soda ash production should be restricted to 10,000 tonnes per year and must not be expanded to 1 million tonnes per year on either Lake Abiyata or Shala.



Figure 42. Shore of Lake Abiyata. Author: Ester Raventós

Lake Abiyata is already badly damaged environmentally and if the soda ash expansion plans go ahead, the same damage will occur in Lake Shala. Serious consideration must be given to whether such a factory is an appropriate use of a National Park. Both Lakes Abiyata and Shala are in the Abiyata-Shala Lakes National Park and Lake Shala is a pristine lake, damage to these lakes and their habitats will result in loss of income from any tourism. Furthermore, if increased soda ash production coincides with further irrigation in the Lake Ziway and Shala Sub-basins, decreases in Lakes Abiyata and Shala levels will be exacerbated and further environmental and economic damage will occur [4].

9.3 Water supply in the CRV

In the RVLB, it is estimated that 74% of urban areas and 39% of the rural population have access to improved water supplies. In very few cases, even in urban areas, is the water actually potable [4].

There is no detailed information available on the domestic water use in the CRV. Since there is no data available, average national water use in Ethiopia (13.3 l/d per person) is assumed. This means that a population of about 1.5 million in the CRV consumes about 7.3 million m³ of water on annual basis [7].

9.4 Synthesis water users

Table 8 shows the distribution of existing water uses in the CRV.

Water User	Annual Water use (million m ³)
Open field irrigation systems	150-200
Livestock	8
Domestic	7.3
Closed irrigation systems	2
Soda ash factory	1

Table 8. Water abstraction in the Central Rift Valley in 2006 [1]

The open-field irrigated production systems are by far the largest user of the surface water. It can be concluded that the focus for quantitative water resources management should be on the water abstractions by the open field irrigation systems [1].



Figure 43. Livestock in Bulbula River. Author: Ester Raventós

9.5 Impacts on water resources

Table 9, presented in the RVLB Master Plan Study Project, shows selected water quality parameters from each of the lakes of the CRV.

Parameter	Ziway	Abiyata	Shala	Langano
pH	8.37	9.60	9.80	9.04
EC ($\mu\text{S}/\text{cm}$)	453	47,915	46,075	1,937
Na (mg/l)	61	7,520	6,475	390
F (mg/l)	1.6	220.0	188.0	9.1
SAR*	3.0	653	267	41.5

*SAR – Sodium Absorption Ratio - is an indicator based on several parameters specifically showing its suitability for irrigation. SAR of 10 is considered the maximum for irrigation.

Table 9. Selected water quality parameters of the RVLB Lakes [4]

Table 9 indicates clearly the differences between the lakes. According to the RVLB Master Plan Study Project, Lake Ziway is (currently) of reasonably good quality with respect to the other lakes. It is not saline or alkaline, fluoride concentration is within both Ethiopian and World Health Organization (WHO) standards and the SAR shows it is suitable for irrigation.

Lake Ziway has the water quality for use in drinking (with treatment) and irrigation but is already being overabstracted [4].

There is no control over effluent discharges into the lake Ziway. Several stakeholders have expressed concern about the effluent from the flower growing operations, as they are high users of agricultural chemicals. The rapidly growing town of Ziway and its environs, as well as other towns on the feeding rivers, have no means of waste water treatment or disposal. This pollution is undoubtedly entering Lake Ziway. There is no information available on their effluents but regular monitoring of Lake Ziway is becoming more important to identify the problem before it becomes serious [4].

Table 9 shows that Lakes Abiyata and Shala are highly saline-alkaline-sodic waters, containing high pH, high EC and sodium. SAR and fluoride values are extreme. Neither can support fisheries. Abiyata used to support one, but the decreasing water quality has killed them off and driven away the aquatic birds that once fed on them. Lake Shala has very low levels of ecological productivity, partly because of its great depth and the consequent very shallow productive photic layer in the upper waters coupled with lack of mixing of bottom sediments [4].

The water resources of the Lake Ziway basin are already likely overused and it is likely that current rates of abstraction are unsustainable. This is mainly shown in the fact that, since the mid 1980s, Lake Abiyata water levels (fed from Lake Ziway through the Bulbula River) have been in steady decline. The magnitude of the decline is not explainable through the rainfall record, which indicates that water abstractions are the main cause of the decline. Such abstractions are principally associated with irrigation [4].

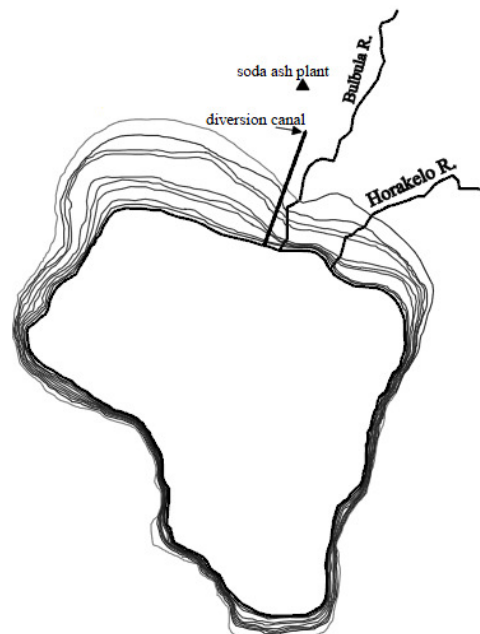


Figure 44. Shoreline position of Lake Abiyata at different time [13]

The outer boundary in *Figure 44* represents the 1940 shoreline and the inner thick shoreline is the average lake level in 2002. The lines between, from the outside,

represent the shoreline in 1967, 1971, 1976, 1983, 1984, 1985, 1995, 1996 and 1997 [13].

In 2006, Lake Abiyata had reduced to approximately 60% of its size in the nineteen eighties and nineteen nineties (*Table 10*). In 1973 (when there was no irrigation yet) the area of the lake was 20% more than in 1986 [1].

Year	Size of Lake Abiyata (km²)
1973	194
1986	162
1999	163
2006	95

Table 10. Changes of the size of Lake Abiyata [1]

9.5.1 Climate change

The impact of climate change on the water resources of the CRV has been assessed by the MoWR in the RVLB Master Plan using a climate change scenario based on output from the Global Circulation Models (GCMs) and scenarios used in other climate change studies for Ethiopia.

This study has used a hypothetical increase in temperature of +2°C resulting in a 10% increase of evapotranspiration, but a 10% decrease of rainfall over a period of 30 years; a relatively high impact scenario. For this climate change scenario the results from the regional flow model shows a reduction in total annual flow of 24% in rivers compared to present day runoff.

The modelled response of lakes Ziway, Abiyata, Langano and Shala to climate change is shown in *Figures 45, 46, 47 and 48*. In this scenario, water use for irrigation and water supply requirements are set for existing conditions to illustrate the impact of climate change alone.

All four lakes show a continual decline in lake levels over the future 30 year period. Lake Ziway shows a decline in LTA lake levels on average a reduction of 0.57 m and a loss of 11% in lake area (*Table 11*). Reduction in levels in Lake Ziway as a result of climate change also has an impact on the lake levels in Lake Abiyata.

Lake	LTA lake level change (m)	Change in area (%)
Ziway	-0.57	-10.7
Abiyata	-1.28	-17.0
Langano	-1.08	-3.1
Shala	-1.74	-0.6

Table 11. LTA lake level response to climate change [4]

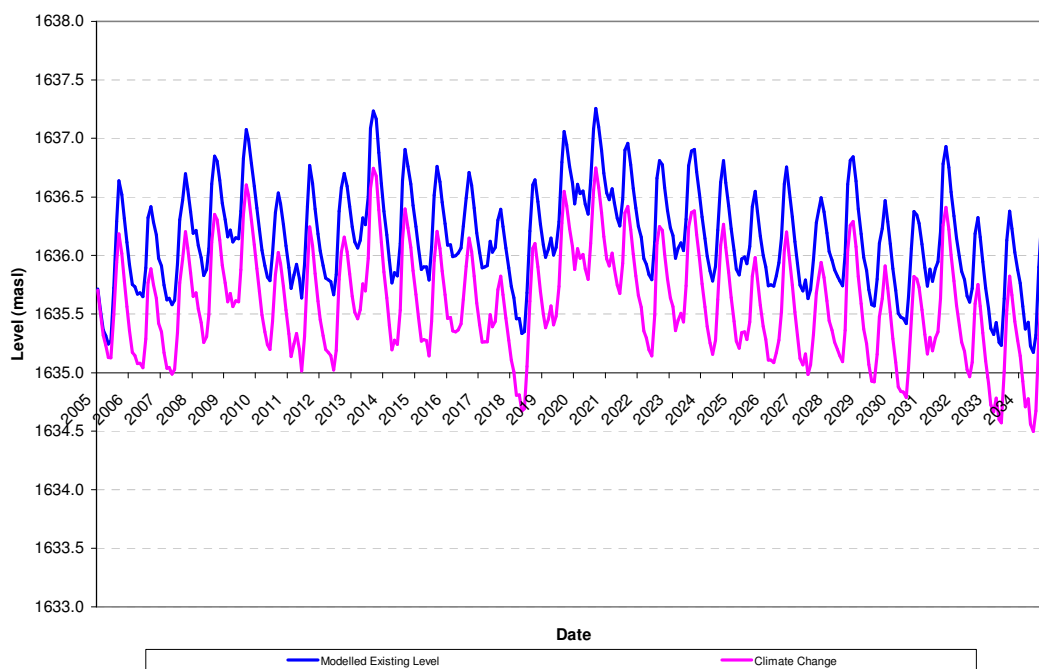


Figure 45. Lake Ziway modelled levels – response to climate change [4]

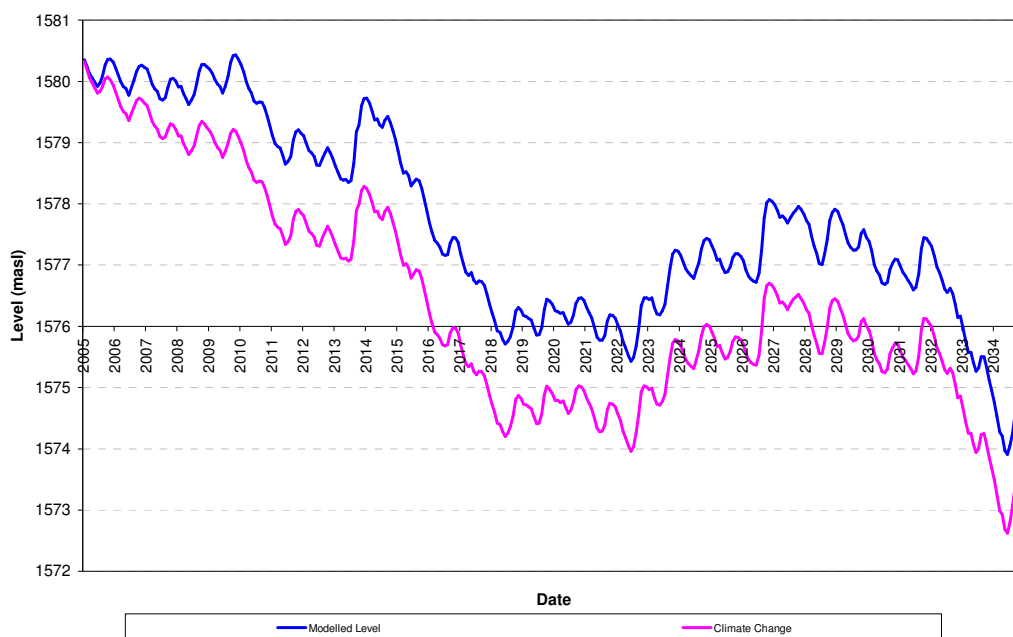


Figure 46. Lake Abiyata modelled levels – response to climate change [4]

Figure 46 shows the declining lake levels of Lake Abiyata in response to climate change and is the equivalent to a 25% reduction in flow in the Bulbula River. The changes in LTA lake levels due to climate change are show an overall fall by 1.3 m, a 17% decrease in lake area (Table 11).

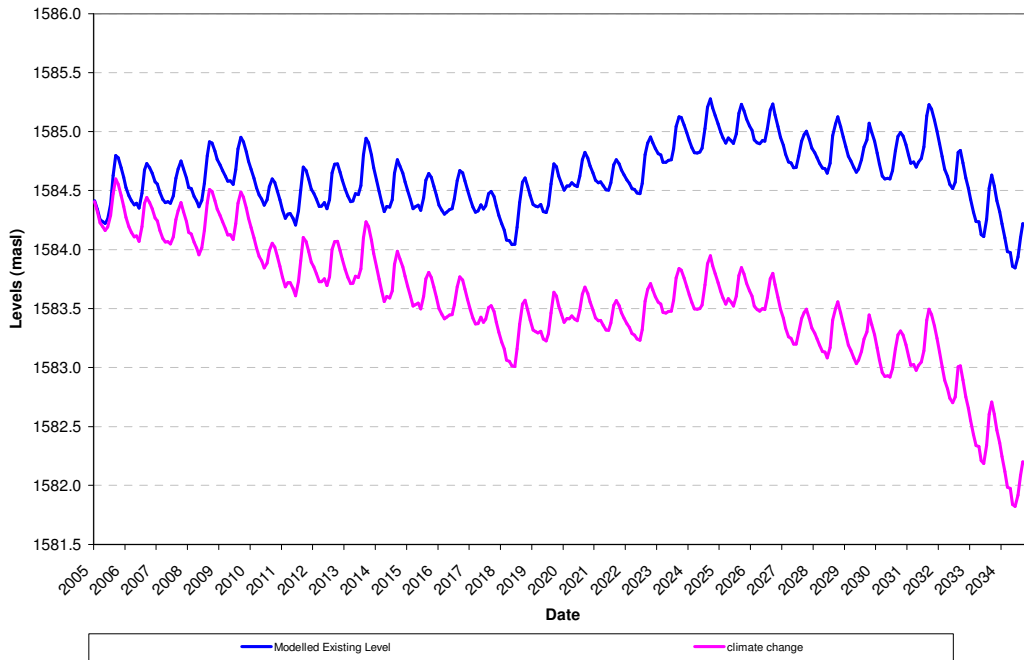


Figure 47. Lake Langano modelled levels – response to climate change [4]

For Lake Langanò there is a year on year continual decline in lake levels as shown in the future time series in Figure 47.

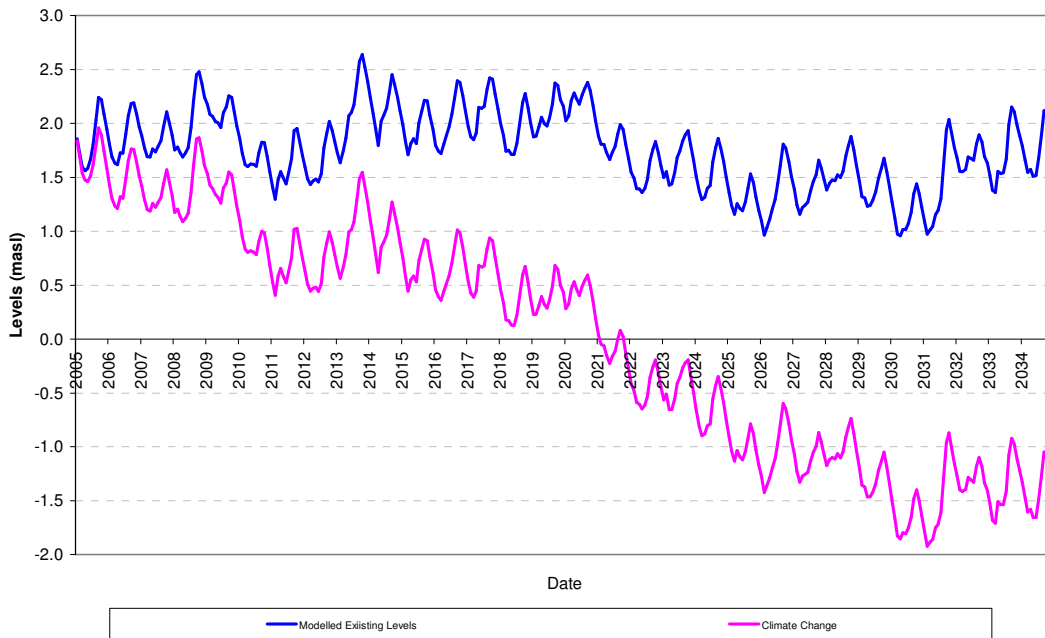


Figure 48. Lake Shala modelled levels – response to climate change [4]

The change in LTA lake level on Lake Shala caused by climate change show a decrease in lake levels of 1.74 m (Table 11).

Overall, the impact of climate change in the RVLB is high which is expected as most of the lakes are terminal in nature [4]. Furthermore, if climate change coincides with additional irrigation, decreases in all the lakes will be exacerbated and further environmental and economic damage will occur.

During the mission, in September 2009, the conference “National Climate Change Hearing Event” held in Abijata-Shala National Park was organized by the NGOs: Oxfam America, SEDA and EWNRA (*Figure 49*). The aims of the meeting were to create awareness of the consequence of climate change and promote climate change adaption and mitigation measures. It was also to support the Oxfam campaign that consisted in demanding urgent and decisive action on climate change from world leaders in the 2009 United Nations Climate Change Conference.



*Figure 49. National Climate Change Hearing Event in Abijata-Shala National Park.
Author: Ester Raventós*

The 2009 United Nations Climate Change Conference, commonly known as the Copenhagen Summit, was held in Copenhagen, between 7 December and 18 December. According to the Bali Road Map, a framework for climate change mitigation beyond 2012 was to be agreed there [42]. But, the Copenhagen Accord, reached between the US, China, India, Brazil and South Africa, contains no reference to a legally binding agreement and does not contain any legally binding commitments for reducing CO₂ emissions. The implementation of the Copenhagen Accord will be reviewed by 2015. This will take place about a year-and-a-half after the next scientific assessment of the global climate by the Intergovernmental Panel on Climate Change (IPCC) [43].

10. Conclusions and recommendations

Agriculture and poverty

Main livelihood of the rural population in the CRV is rain-fed agriculture and cattle breeding. Besides subsistence agriculture some other livelihoods are available for rural population. The most important employers are the Sher complex, the Ziway and Munessa State farm, some private farms and the soda ash factory.

One of the main causes of poverty in the CRV is the low level of rain-fed and irrigated agricultural productivity. Smallholder crop and livestock production is primarily subsistence based, with little commercial production. Agricultural intensification is urgently needed to break the vicious cycle of poverty that prevails in the CRV. However, agricultural development in the CRV faces a number of obstacles including:

- Unreliable rainfall.
- Inadequate availability of farm inputs and limited access to credit.
- Basic lack of knowledge and skills.
- Small farm size and competition for land.
- Poor transport and market infrastructure.
- Land tenure insecurity.

The small landholding are currently averaging 0.5 ha per farm in the CRV as a whole, it is too small to support a family. Not being able to support a family means the farmers remain in the poverty cycle, which in turn means they cannot afford to make the investments needed to improve their productivity. The law does not allow farmers (and others) to own their land, and this prevents any increase in average farm size. To increase productivity farmers need to invest.

The continuing conflict between pastoralist grazing and sedentary agriculture is also a consequence of the inability to own land. Once farmers own land they will have the right to not allow nomadic grazing on it. The livestock population in the CRV is eminent, which has resulted in overgrazing at large-scale. However, there are a few areas, notably around Asela (located in the Arsi Negele woreda of the Oromiya Region), where local administration is taking matters into their own hands and placing controls on livestock. These limited programmes have led to greater attention to feed sources and to breeding, as well as to ensuring animals are productive. They could be good models to follow in other areas.

Legal Framework

The Government of Ethiopia has implemented policies, strategies, proclamations and development programme to promote sustainable and equitable utilization of the available water resources. These include the National Water Resources Management Policy (1999) and Strategy (2001), providing guidance for investments in rural, town and urban water supply and sanitation; the 2002 Water Sector Development Program, promoting institutional reforms and most recently, the 2005 Plan for Accelerated

Sustained Development and to End Poverty (PASDEP), which sets ambitious targets over and above MDGs, and within a shorter time period (2005-2010). However, each document appears feasible on paper, but constraints in Ethiopia's water sector have restricted policy success and with it, sector development.

The RVLB Master Plan Study Project is not yet being implemented because its elaboration finished recently, in 2009.

The Ethiopian Water Policy and Water Proclamation clearly stipulate that all water resources are common property of the people of Ethiopia and the state [34]. Provided that irrigation water is not a private property but common property and no one is held responsible for the mismanagement, establish norms, rules and known laws that ensure the interest of all beneficiaries are required.

Are also required formal laws which specify appropriate management practices, the rights of Water Users Associations (WUAs) and individual users both in quantitative and qualitative terms and operational regulations.

Currently, there is a lack of policy awareness and limited knowledge and information about the policy at various public and private levels.

For policy success, each stakeholder needs well-defined roles and responsibilities and must cooperate with others, since all actors, from government, business and NGOs to donors have a role to play in addressing Ethiopia's water problem.

The involvement of the direct stakeholders in the planning, implementation, and governance and management of water resource projects should therefore be clearly spelt out in water policy. Special effort should be made to empower women and to ease their burden of work. Rural women have a much stronger interest in the sustainability of water supply schemes, and they should be provided all the necessary assistance, including technical training, to enable them to be involved in the management and maintenance of the schemes.

Water quantity

At present irrigation is the largest user of water in the basin. All the stakeholders interviewed states that there are little or economic or non economic incentives to use water efficiently or to protect the CRV watershed. Instead the existent incentives focus on expanding irrigated areas managed by community and private companies (mainly foreign). This together with low reinforcement and compliance with environmental regulations are threats to sustainable development of the region.

The condition of many smallholder irrigation schemes is poor which contributes to inefficient use of water and high irrigation costs. Many irrigation schemes are constructed with governmental or non-governmental support, but operational and maintenance support is often lacking or only partly received.

Currently, water is used in the CRV without planning or regulation and without monitoring. The current rates of abstraction in the CRV are unsustainable and therefore any greater abstraction will simply make the situation worse.

The impact of uncontrolled water use is already well illustrated by the decline in Lake Abiyata and the loss of its fish habitat and that of most aquatic birds. Since the mid 1980s Lake Abiyata water levels have been in almost constant decline, which cannot be explained through natural climatic variability and indicates that water abstractions in Lake Ziway basin are the main cause of the decline. To maintain a safe or acceptable lake level decline soda ash production should be restricted to 10,000 tonnes per year and must not be expanded to 1 million tonnes per year on either Lake Abiyata or Shala.

No further abstraction from direct pumping of water along the course of the Bulbula River to supply Ziway and Bulbula town water supplies is advised as this would result in further reductions in Lake Abiyata levels and a loss in lake area, with a further loss of habitat and wildlife, especially aquatic birds, in the Abiyata-Shala Lakes National Park.

Lake Ziway, Lake Langanano and Lake Abaya are not terminal in themselves, but flow into terminal lakes. Lake Shala is a terminal lake. Since Lake Ziway is shallow there is a real danger it be transformed into a terminal lake and become saline, like Lake Abiyata, over the next few decades. This would have major economic repercussions as such important developments as the floriculture farms would fail. There would also be a very negative impact on fisheries, on local communities who depend on water from Lake Ziway for domestic use and others.

All lakes in the CRV are already in some state of decline or at least a precarious balance. An increased level of abstraction for, for example, new irrigation development, would mean a faster rate of lake level decline. Careful consideration must be given to any further abstraction from any of the lakes or from the rivers that feed them.

Further development of both smallholder irrigation and large scale irrigation should be discouraged given the large impacts these have on the surface water resources, in particular the lakes. Instead emphasis should be on improving the economic and environment performance and efficiency of existing irrigation, and on improving economic return of rain-fed agriculture which dominates the agriculture sector.

Water quality

According to the environmental laws, the Environmental Protection Council (EPC) is the coordinating body that has to advise the federal Environmental Protection Agency (EPA), supervise its activities and approve directives, guidelines and environmental standards prepared by the Authority. However, the EPC has only met once and effectively is not functioning.

The EIA process and pollution control regimes are not being implemented in accordance with the legislation. The EPA receives few EIAs for review and approval and those that are issued are mainly required by International Funding Institutions such

as World Bank and the Ethiopian Development Bank. Those commissioned by other Ministries tend to be reviewed within the Ministry, with a small sample forwarded to the EPA. Very few private sector projects are subject to EIA, due to lack of awareness of the requirements and a loophole in the process of obtaining land leases through the Investment Offices, which by-passes the need for EIA.

As a result, the EPA has little regulatory control over decisions to approve important development projects or to stipulate appropriate environmental protection and mitigation conditions that should be applied to such projects.

As with the federal EPA, the Regional Environmental Agencies (REAs) do not actively participate in the land leasing process, which is managed by the Regional Investment Offices.

Consequently, water quality in the basin is deteriorating as ministries and regional bodies fail to manage and regulate water resources and water quality. Water quality monitoring is essentially nonexistent, so service providers have no information to work with for treatment and planning.

The implementation of the River Basin Organization (RBO) will help in this regard, if it is properly staffed and funded.

River Basin Organizations

To date there has been no organisation within the MoWR structure or within the regional bureaus of water resources which has the responsibility to control water use and manage water at a basin level according to the principles of Integrated Water Resources Management. However, through the establishment of the RVLB River Basin Organization (RBO), it could be change. With water as a constraint, an RBO is best placed to gather the interests of stakeholders on such a question and coordinate them to make decisions on water allocation.

A full understanding of the water resource availability in the CRV is essential to determining the right development interventions for the CRV. Such an understanding permits an equitable and sustainable allocation of water resources for both environmental and human demands throughout the basin.

The rationale for choosing a river basin as the unit for planning is primarily to optimize the use of the water resources within the basin where water is regarded as a major factor limiting development, as it is in the RVLB.

Water and sanitation services

The rural population with access to safe water is now small, and a concerted effort is needed to expand the service to a larger segment of the population within a reasonably short time. The involvement of government, NGOs and communities in this endeavour is essential.

One of the main constraints to water supply development has been capacity at regional and woreda level. Decentralisation has caused more autonomy to be devolved to the woreda, town and rural communities, who are increasingly responsible for planning and managing water supply systems, although often without the capacity to do so. The financial resources at woreda level are insufficient to cover recurrent costs for operations and maintenance. Donor funding is an important source of finance for the water and sanitation sector in Ethiopia.

Because of the direct link between access to safe water and health, investment in water supply is of the utmost importance and should be one of the main priorities for government investment.

Ethiopia's current Monitoring and Evaluation system is undeveloped, causing countless malfunctioning water sources to go unnoticed, reducing the water resources available to Ethiopians, so further increasing the water accessibility problem.

While there are good policies in place, they are not well understood and service providers are unclear as to their roles and responsibilities. The implementation of a Water Point Mapping (WPM) supported by NGOs in the CRV may help in this regard, because in the short term, WPM may serve as a valuable analysis and planning tool for the local level governments that improves efficiency and accountability.

Water point mapping is an exercise whereby the geographical positions of all water points in a district are gathered in addition to management, technical and demographical information. The data is entered into a geographical information system and then correlated with official demographic, administrative and physical data (population density, administrative boundaries, roads, etc). The information is displayed via digital maps. The strongest feature of these water point maps is that the distribution of water points within the district can be clearly visualized and inequities easily spotted [44]. WPM's main function is to simply and objectively demonstrate how water points are distributed within a territory, thus it serves as a valuable analysis and planning tool for local level governments. Moreover, it helps to define reliable indicators of access constructed from the lowest geographical level with the data available [45]. Socio-economic and technical information obtained from mapping can provide an entry point into discussions surrounding the lack of water point sustainability and reasons for non-functionality [44].

References

- [1] Jansen, H., Hengsdijk, H., Legesse, D., Ayenew, T., Hellegers, P. and Spliethoff, P. Land and water resources assessment in the Ethiopian Central Rift Valley. Alterra-rapport 1587. Wageningen University, 2007.
- [2] Ayenew, T. and Legesse, D. The changing face of the Ethiopian rift lakes and their environs: call of the time. Department of Earth Sciences, Addis Ababa University, 2007.
- [3] Scholten, W. Agricultural development and water use in the Central Rift Valley of Ethiopia: A rapid appraisal. Internship report. University of Twente, 2007.
- [4] Halcrow Group Limited and Generation Integrated Rural Development Consultants (GIRDC) and Ministry of Water Resources (MoWR). Rift Valley Lakes Basin Integrated Resources Development Master Plan Study Project, 2009.
- [5] Ministry of Water Resources (MoWR), United Nations Educational Scientific, Cultural Organization (UNESCO) and Generations Integrated Rural development Consultants (GIRDC). National Water Development Report for Ethiopia (Final), 2004.
- [6] Wikipedia: Ethiopia, <http://en.wikipedia.org/wiki/Ethiopia>, 2009 [Online].
- [7] Rodriguez, J.C. Preconditions for a Payment for Environmental Services establishment at Central Rift Valley, Ethiopia. MSc. Environmental Sciences Wageningen University, 2008.
- [8] Ministry of Water Resources (MoWR). Ethiopian Water Resources Management Policy, 1999.
- [9] Ministry of Water Resources (MoWR). Ethiopian Water Sector Development Program. Main Report, 2002.
- [10] Ayenew, T. Water management problems in the Ethiopian rift: Challenges for development. Journal of African Earth Sciences 48 (2007) 222–236, 2007.
- [11]. Assefa, M. Socio-economic assessment of two small-scale irrigation schemes in Adami Tullu Jido Kombolcha Woreda, Central Rift Valley of Ethiopia. MSc Thesis in Environmental Economics and Natural Resources Group, Department of Environmental Sciences, Wageningen University, 2008.
- [12] The encyclopedia of Earth, Water profile of Ethiopia, http://www.eoearth.org/article/Water_profile_of_Ethiopia, 2008 [Online].
- [13] Ayenew, T. Recent changes in the level of Lake Abiyata, central main Ethiopian Rift. Hydrological Sciences Journal des Sciences Hydrologiques Vol. 47, 2002.
- [14] Ministry of Water Resources of Ethiopia (MoWR), <http://www.mowr.gov.et>, 2009 [Online].

- [15] United Nations Office for the Coordination of Humanitarian Affairs, <http://ochaonline.un.org>, 2009 [Online].
- [16] Hengsdijk, H. and Jansen, H. Ecosystems for water, food and economic development in the Ethiopian central rift valley, BO-10-006-22. Report of inception mission to Ethiopia and Workplan. Plant Research International. Note 403, 2006.
- [17] Ministry of Finance and Economic Development (MoFED). Plan for Accelerated and Sustained Development to End Poverty (PASDEP), 2005.
- [18] Shimelis, S. Lake Ziway, sustainable development and climate change. Intermon Oxfam, 2008.
- [19] Research-inspired Policy and Practice Learning in Ethiopia and the Nile region (RIPPLE). Fluoride Problems in Ethiopian Drinking Water.
- [20] Berhanu, K. and Gebre-Egziabher, T. Decentralization in Ethiopia. Forum for Social Studies, ISBN 9789994450114, 2007.
- [21] Government of the Federal Democratic Republic of Ethiopia. Regional Government Establishment Proclamation No. 41/1993, 1993.
- [22] Wube, M., Alemu, E., Endeshaw, A. and Namera, G. Working Paper 10: Matching funds allocation in the Ethiopian Water Supply and Sanitation Project (EWSSP): A case from Benishangul-Gumuz, 2009.
- [23] Ethiopian Investment Agency, <http://www.ethiomarket.com/eic/>, 2009 [Online].
- [24] Organizing a Private Business Investment, <http://www.fdi.net/unctad/investmentguide/ethiopia/v.htm>, 2009 [Online].
- [25] Hailu, G. Environment law Ethiopia. International Encyclopaedia of laws. <http://www.dundee.ac.uk/cepmlp/journal/html/vol9/article9-12.pdf>, 2000.
- [26] Government of the Federal Democratic Republic of Ethiopia. Environmental Protection Organs Establishment Proclamation No.295/2002, 2002.
- [27] Government of the Federal Democratic Republic of Ethiopia. River Basin Councils and Authorities Proclamation No. 534/2007, 2007.
- [28] Horn of Africa Regional Environment Centre (HOAREC), <http://hoarec.org>, 2009 [Online].
- [29] Jembere, K. Participatory integrated water resources management (IWRM) planning: Lessons from Berki Catchment, Ethiopia. 34th Water, Engineering and Development Centre (WEDC) International Conference, Addis Ababa, 2009.
- [30] Norman, K. The Importance of Political Context in Achieving MDG7 in Ethiopia: An Essay. http://waterwiki.net/index.php/The_Importance_of_Political_Context_in_Achieving_MDG7_in_Ethiopia:_An_Essay, 2008.

- [31] Government of the Federal Democratic Republic of Ethiopia. Ethiopian Federal Democratic Republic Constitution, 1994.
- [32] Tekelemichael, Y. Current status of the environmental impact assessment system in Ethiopia. UNEP EIA Training Resource Manual, 2003.
- [33] Ministry of Water Resources (MoWR). Ethiopian Water Sector Strategy, 2001.
- [34] Government of the Federal Democratic Republic of Ethiopia. Ethiopian Water Resources Management Proclamation No.197/2000, 2000.
- [35] United Nations, <http://www.un.org/en/ecosoc>, 2009 [Online].
- [36] Environmental Protection Agency (EPA). Environmental impact assessment Guidelines on irrigation, 2004.
- [37] Environmental Protection Authority (EPA). Environmental Impact Assessment Procedural Guideline, 2003.
- [38] Environmental Protection Agency (EPA). Integrated Environmental and Social Impact Assessment Guidelines Water Supply, 2004.
- [39] Rahmato, D. Water Resources Development in Ethiopia: Issues of Sustainability and Participation. Forum For Social Studies, 1999.
- [40] Crewett, W. and Korf, B. Ethiopia: Reforming Land Tenure. Review of African Political Economy No. 116:203-220. ROAPE Publications Ltd., 2008.
- [41] Government of the Federal Democratic Republic of Ethiopia. Rural Development Policies, Strategies and Instruments, 2001.
- [42] Wikipedia: United Nations Climate Change Conference, http://en.wikipedia.org/wiki/2009_United_Nations_Climate_Change_Conference, 2009 [Online].
- [43] BBC News. Copenhagen deal: Key points, <http://news.bbc.co.uk/1/hi/sci/tech/8422307.stm>, 2009 [Online].
- [44] Welle, K. WaterAid learning for advocacy and good practice, WaterAid water point mapping in Malawi and Tanzania, 2005.
- [45] Jiménez, A., Pérez-Foguet, A. Improving water access indicators in developing countries: a proposal using water point mapping methodology. <http://www.iwaponline.com/ws/00803/ws008030279.htm>, /Water Science and Technology/: /Water Supply/, 8(3):279–287. ISSN: 1606-9749, 2008

Annex 1. Stakeholders interviewed

Level	Government offices
FEDERAL	Ethiopian Investment Agency Ministry of Trade and Industry Ministry of Agriculture and Rural Development Environmental Protection Authority Ministry of Water Resources
REGIONAL	Oromia Investment Office Oromia Trade and Industry Bureau Oromia Agricultural and Rural Development Bureau Oromia Agricultural and Rural Development Bureau (Small Scale Irrigation Department) Oromia Land and Environment Protection Bureau Oromia Water Resources Bureau SNNPR Trade and Industry Bureau SNNPR Agricultural and Rural Development Bureau SNNPR Agricultural and Rural Development Bureau SNNPR Water Resources Development Bureau SNNPR Water Resources Development Bureau (Irrigation Department)
WOREDA	Trade, Industry and Transport Office of Adami Tulu jido Kombolcha Adamitulu Agriculture and Rural Development Office of Adami Tulu jido Kombolcha Land and Environmental Protection Office of Adami Tulu jido Kombolcha Water Resources Office of Adami Tulu jido Kombolcha
TOWN	Trade and Industry Office in Ziway Town Water Supply Office in Ziway Town

Community Based Organization

Cooperative	Haleku Malka Teso Irrigation Cooperative
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NGOs

Rift Valley Children and Women Development Association (RCWDA)
SEDA (Selam Environment and Development Association)
Horn Of Africa Regional Environmental Center (HOAREC)
Central Rift Valley working Group
Ethiopia Country Water partnership (ECWP)

Private Investors

Sher Ethiopia
Abijata Soda Ash Share Company

Annex 2. Questionnaire Investment Institutions

Date:		Time:	
Name:			
Office:		Position:	
Contact mail:		Gender:	

GENERAL QUESTIONS:

1. Under your point of view, what does sustainable development means?

2. Do you think that different development interventions in CRV are respecting national environmental and water policies and proclamations?

NO, Which interventions? YES

ORGANIZATION AND PARTICIPATION:

3. Does your organization consult any other institutions before making decision about giving licenses?

NO YES

If yes, Which institutions do you contact with, and how often?

WATER MANAGEMENT AND ENVIRONMENTAL GOVERNANCE:

4. Do you think that there are favorable economic incentives that don't take into consideration environmental aspects in CRV?

NO YES

If yes, are they a threat to sustainable economic development? Why?

5. What is your organization's future strategy about economic development in the CRV?

6. Which are the main problems to implement the policies/law in your context?

LICENSES:

7. Which institution is giving the land in the CRV? Which criteria does he use?

8. Which are the main competences of your organization?

<p>9. Is your organization giving licenses? <input type="checkbox"/> NO <input type="checkbox"/> YES</p> <p>If yes, which <u>criteria</u> does your organization use to give licenses?</p>
<p>10. In which cases an Environmental Impact Assessment is required to get a license?</p>
<p>11. Does your organization have an environment unit? <input type="checkbox"/> NO <input type="checkbox"/> YES</p> <p>If yes, which are its competences?</p>

Annex 3. Questionnaire Agricultural Institutions

Date:		Time:	
Name:			
Office:		Position:	
Contact mail:		Gender:	

GENERAL QUESTIONS:	
1. Under your point of view, what does <u>sustainable development</u> means?	
2. Do you have complete and reliable information to make decisions regarding the development of the agricultural sector? Where do you obtain this information from?	
3. What is your organization's strategy to increase agricultural production based on?	
4. What is your organization's future strategy about land use in the CRV?	
5. Does your organization have a strategy to control the use of agrochemicals in farms? If yes, could you explain it?	<input type="checkbox"/> NO <input type="checkbox"/> YES
6. Does your organization have a strategy to prevent/control deforestation? If yes, could you explain it?	<input type="checkbox"/> NO <input type="checkbox"/> YES
7. Do you think that different development interventions in CRV are respecting national environmental and water policies and proclamations?	<input type="checkbox"/> YES <input type="checkbox"/> NO, Which interventions?
8. Which are the main competences of your organization?	
9. Does your organization have an environment unit? If yes, which are its competences?	<input type="checkbox"/> NO <input type="checkbox"/> YES
10. Please, complete the table about problems in the CRV. PROBLEMS: Do you think that there are problems in the Central Rift Valley? If yes, could you list them by importance? REASON BEHIND: From your point of view, which are the reasons of those problems? ACTIONS TO SOLVE/PREVENT YOU ARE DOING: What is your organization doing in order to prevent/solve those problems? ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE: From your point of view, which is the best solution for those problems?	

	PROBLEM	REASON BEHIND	ACTIONS TO SOLVE/PREVENT YOU ARE DOING	ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE
WATER AND ENVIRONMENTAL PROBLEMS				

ORGANIZATION AND PARTICIPATION:

11. How often does your organization meet with other stakeholders?

Institution's Name	Weekly	Monthly	Yearly	Less than y

12. Does your organization consult any other institutions before making decision about water management issues? NO YES

If yes, Which institutions do you contact with, and how often?

Institution's Name	How often?	Issue

13. Have your organization ever been consulted on water management issues by other institutions? NO YES

If yes, Which institutions do contact with you, and how often?

Institution's Name	How often?	Issue

14. Is your organization taking part on water management? NO YES, How?

WATER MANAGEMENT AND ENVIRONMENTAL GOVERNANCE:	
15.	What is your organization's future strategy about water management in the CRV?
16.	How are you promoting the "User pays" principle with the willingness and ability to pay for irrigation water supply?
17.	Do you think that the establishment of water fees for water users will avoid the unrestricted use of the water?
18.	Is your organization controlling the flow of waste water into fresh water bodies?
19.	Which are the main problems to implement the policies/law in your context?
20.	Who has the property rights over water and land resources?
21.	Do you think that the watershed management system protection is effective? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
22.	Are there enough funds to promote efficient use of water? <input type="checkbox"/> NO <input type="checkbox"/> YES
23.	Is the environment conservation an integral part of water resources management?
24.	Is there any incentive for efficient water use and watershed protection? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
25.	Is your organization promoting an efficient irrigation system? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES, How?
26.	Do you think that the quest for economic development is disregarding environmental issues? Why? <input type="checkbox"/> NO <input type="checkbox"/> YES
27.	Do you think that there are favorable economic incentives that don't take into consideration environmental aspects in CRV? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, are they a threat to sustainable economic development? Why?

LAND TENURE:	
45. Has your organization the competence to give land in the CRV?	<input type="checkbox"/> NO <input type="checkbox"/> YES
If yes, which criteria does your organization use to give land?	
46. Do you think that the current land tenure system stimulates the short term over-exploitation of land resources?	
47. Do you think that is possible to improve the agricultural sector without land ownership by the farmers? Why?	
<input type="checkbox"/> NO <input type="checkbox"/> YES	

Annex 4. Questionnaire Water Institutions

Date:		Time:	
Name:			
Office:		Position:	
Contact mail:		Gender:	

GENERAL QUESTIONS:

1. Under your point of view, what does sustainable development means?

2. Do you have complete and reliable information to make decisions regarding the development of the water sector? Where do you obtain this information from?

3. Do you think that different development interventions in CRV are respecting national environmental and water policies and proclamations?

YES NO, Which interventions?

4. Which are the main competences of your organization?

5. Does your organization have an environment unit?

NO YES

If yes, which are its competences?

6. Please, complete the table about problems in the CRV.

PROBLEMS: Do you think that there are problems in the Central Rift Valley? If yes, could you list them by importance?

REASON BEHIND: From your point of view, which are the reasons of those problems?

ACTIONS TO SOLVE/PREVENT YOU ARE DOING: What is your organization doing in order to prevent/solve those problems?

ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE: From your point of view, which is the best solution for those problems?

	PROBLEM	REASON BEHIND	ACTIONS TO SOLVE/PREVENT YOU ARE DOING	ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE
WATER AND ENVIRONMENTAL PROBLEMS				

ORGANIZATION AND PARTICIPATION:

7. How often does your organization meet with other stakeholders?

Institution's Name	Weekly	Monthly	Yearly	Less than y

8. Does your organization consult any other institutions before making decision about water management issues?

NO YES

If yes, Which institutions do you contact with, and how often?

Institution's Name	How often?	Issue

9. Have your organization ever been consulted on water management issues by other institutions?

NO YES

If yes, Which institutions do contact with you, and how often?

Institution's Name	How often?	Issue

WATER MANAGEMENT AND ENVIRONMENTAL GOVERNANCE:	
10.	Is your organization promoting waste minimization processes? <input type="checkbox"/> NO <input type="checkbox"/> YES, How?
11.	What is your organization's future strategy about water management in the CRV?
12.	How are you promoting the "User pays" principle with the willingness and ability to pay for irrigation water supply?
13.	Do you think that the establishment of water fees for water users will avoid the unrestricted use of the water?
14.	Is there a good coordination among decision makers at the federal and regional level regarding the establishment of water fees? <input type="checkbox"/> YES <input type="checkbox"/> NO, Why?
15.	Is your organization controlling the flow of waste water into fresh water bodies?
16.	Are you implementing the "polluter pays principle" in CRV, which are stated in the Pollution Control Proclamation? Are environmental taxes re-invested into conservation?
17.	Which are the main problems to implement the policies/law in your context?
18.	Who has the property rights over water and land resources?
19.	Do you think that the watershed management system protection is effective? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
20.	Are there enough funds to promote efficient use of water? <input type="checkbox"/> NO <input type="checkbox"/> YES
21.	Is the environment conservation an integral part of water resources management?
22.	Have basic human and livestock needs the highest priority in any water allocation plan? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
23.	Is there any incentive for efficient water use and watershed protection? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
24.	Do you think that there are favorable economic incentives that don't take into consideration environmental aspects in CRV? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, are they a threat to sustainable economic development? Why?

Annex 5. Questionnaire Environmental Institutions

Date:		Time:	
Name:			
Office:		Position:	
Contact mail:		Gender:	

GENERAL QUESTIONS:	
1.	Under your point of view, what does <u>sustainable development</u> means?
2.	Do you think that different development interventions in CRV are respecting national environmental and water policies and proclamations? <input type="checkbox"/> YES <input type="checkbox"/> NO, Which interventions?
3.	Which are the main competences of your organization?
4.	<p>Please, complete the table about problems in the CRV.</p> <p>PROBLEMS: Do you think that there are problems in the Central Rift Valley? If yes, could you list them by importance?</p> <p>REASON BEHIND: From your point of view, which are the reasons of those problems?</p> <p>ACTIONS TO SOLVE/PREVENT YOU ARE DOING: What is your organization doing in order to prevent/solve those problems?</p> <p>ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE: From your point of view, which is the best solution for those problems?</p>

	PROBLEM	REASON BEHIND	ACTIONS TO SOLVE/PREVENT YOU ARE DOING	ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE
WATER AND ENVIRONMENTAL PROBLEMS				

ORGANIZATION AND PARTICIPATION:				
5. How often does your organization meet with other stakeholders?				
Institution's Name	Weekly	Monthly	Yearly	Less than y
6. Does your organization consult any other institutions before making decision about environmental issues?				
<input type="checkbox"/> NO <input type="checkbox"/> YES				
If yes, Which institutions do you contact with, and how often?				
Institution's Name	How often?	Issue		
7. Have your organization ever been consulted on environmental issues by other institutions?				
<input type="checkbox"/> NO <input type="checkbox"/> YES				
If yes, Which institutions do contact with you, and how often?				
Institution's Name	How often?	Issue		
8. Is your organization taking part on water management? <input type="checkbox"/> NO <input type="checkbox"/> YES, How?				
9. Is your organization taking part on environmental governance? <input type="checkbox"/> NO <input type="checkbox"/> YES, How?				
ENVIRONMENTAL IMPACT ASSESSMENT:				
10. In which cases an Environmental Impact Assessment is required?				
11. Does your organization maintain regular environmental audits?				
<input type="checkbox"/> NO <input type="checkbox"/> YES				
If yes, Whom? Where? How Often?				
12. Are there enough funds to maintain these audits?				

WATER MANAGEMENT AND ENVIRONMENTAL GOVERNANCE:	
13.	Is your organization promoting waste minimization processes? <input type="checkbox"/> NO <input type="checkbox"/> YES, How?
14.	How are you promoting the "User pays" principle with the willingness and ability to pay for irrigation water supply?
15.	Is your organization controlling the flow of waste water into fresh water bodies?
16.	Are you implementing the "polluter pays principle" in CRV, which are stated in the Pollution Control Proclamation? Are environmental taxes re-invested into conservation?
17.	Which are the main problems to implement the policies/law in your context?
18.	Do you think that the watershed management system protection is effective? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
19.	Are there enough funds to promote efficient use of water? <input type="checkbox"/> NO <input type="checkbox"/> YES
20.	Is the environment conservation an integral part of water resources management?
21.	Is there any incentive for efficient water use and watershed protection? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
22.	Do you think that there are favorable economic incentives that don't take into consideration environmental aspects in CRV? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, are they a threat to sustainable economic development? Why?
BIODIVERSITY:	
23.	Does your organization manage protected areas? <input type="checkbox"/> NO <input type="checkbox"/> YES, How?
24.	Is the government going to create more protected areas?
LAND TENURE:	
46.	Do you think that the current land tenure system stimulates the short term over-exploitation of land resources?
47.	Do you think that is possible to improve the agricultural sector without land ownership by the farmers? Why? <input type="checkbox"/> NO <input type="checkbox"/> YES

Annex 6. Questionnaire NGOs

Date:		Time:	
Name:			
Office:		Position:	
Contact mail:		Gender:	

GENERAL QUESTIONS:

1. Under your point of view, what does sustainable development means?

2. Do you think that different development interventions in CRV are respecting national environmental and water policies and proclamations?

YES NO, Which interventions?

3. Are the current development interventions as per the proposed master plan for the basin?

4. Please, complete the table about problems in the CRV.

PROBLEMS: Do you think that there are problems in the Central Rift Valley? If yes, could you list them by importance?

REASON BEHIND: From your point of view, which are the reasons of those problems?

ACTIONS TO SOLVE/PREVENT YOU ARE DOING: What is your organization doing in order to prevent/solve those problems?

ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE: From your point of view, which is the best solution for those problems?

	PROBLEM	REASON BEHIND	ACTIONS TO SOLVE/PREVENT YOU ARE DOING	ACTIONS TO SOLVE/PREVENT THAT SHOULD BE DONE IN THE FUTURE
WATER AND ENVIRONMENTAL PROBLEMS				

ORGANIZATION AND PARTICIPATION:				
5. How often does your organization meet with other stakeholders?				
Institution's Name	Weekly	Monthly	Yearly	Less than y
6. Have your organization ever been consulted on water management issues by other institutions?				
If yes, Which institutions do contact with you, and how often?				
Institution's Name	How often?	Issue		
7. Have your organization ever been consulted on environmental issues by other institutions?				
If yes, Which institutions do contact with you, and how often?				
Institution's Name	How often?	Issue		

WATER MANAGEMENT AND ENVIRONMENTAL GOVERNANCE:
8. Do you think that the establishment of water fees for water users will avoid the unrestricted use of the water?
9. Do you think that the watershed management system protection is effective?
10. Do you think that there is low level of implementation of water and environmental law?
11. Do you think that the watershed management system protection is effective? <input type="checkbox"/> NO, Why? <input type="checkbox"/> YES
12. Is the environment conservation an integral part of water resources management?

Annex 7. Questionnaire Private Investors

Date:		Time:	
Name:			
Organization:		Position:	
Contact mail:		Gender:	

GENERAL QUESTIONS:

1. Under your point of view, what does sustainable development means?

USERS PARTICIPATION:

2. Have you ever been consulted on water management issues by institutions?

If yes, Which institutions do contact with you, and how often? NO YES

Institution's Name	Occasionally	Frequently	Comment

WATER MANAGEMENT AND ENVIRONMENTAL GOVERNANCE:

3. What is your organization's strategy to increase your production based on?

4. Is your organization using waste minimization processes? NO YES, How?

5. What do you think about paying a water fee for water usage? NO YES

USERS:

6. Which are your main sources of water?

7. Which amount of water are you abstracting from these sources?

8. Do you have any problem with your source of water? NO YES, Which?

9. Do you expect the need of more water in the future due an increase of production?
 NO YES

10. Do you think you will have problems with your source of water in the coming years?
 NO YES, Which?

11. Which regulations do you know about water utilization?

Annex 8. Population Survey

Date:		Time:	
Name:			
Interviewer:			

PERSONAL DATA:			
Name:			
Name of Household:		Gender:	<input type="checkbox"/> Male <input type="checkbox"/> Female
Role in the family:	<input type="checkbox"/> Head of Household <input type="checkbox"/> Wife <input type="checkbox"/> Son/Daughter <input type="checkbox"/> Grandparent		
Age:	<input type="checkbox"/> 10-20	<input type="checkbox"/> 20-30	<input type="checkbox"/> 30-50 <input type="checkbox"/> more than 50
Activity:	<input type="checkbox"/> Agriculture <input type="checkbox"/> Livestock <input type="checkbox"/> _____		
Kebele:		Woreda:	
Zone:		Region:	

QUESTIONS:	
1.	Are you member of any community based association? <input type="checkbox"/> NO <input type="checkbox"/> YES, Which one?
2.	Do you think that there are environmental problems in the Central Rift Valley? If yes, could you list three of them by importance?
3.	Do you think that there are water problems in the Central Rift Valley? If yes, could you list three of them by importance?
4.	From your point of view, which is the reason behind those problems?
5.	From your point of view, which are the impacts you suffer because of those problems?
6.	From your point of view, which is the solution for those problems?

PROBLEM	REASON	IMPACT	SOLUTION