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ABBREVIATIONS AND ACRONYMS

BPT	Break Pressure Tank
CWRM	Clear Water Rising Main
Dev	Development
d/s	downstream
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
EWTP	Existing Treatment Plant
FDRE	Federal Democratic Republic of Ethiopia
FEDO	Finance & Economic Development Office
GG	Gilgel Gibe
GGR	Gilgel Gibe River
mg/l	milligram per liter
IDA	International Development Agency
JCLEPO	Jimma City Land & Environmental Protection Office
JWSSE	Jimma Town Water Supply and Sewerage Enterprise
JWSSP	Jimma Water Supply and Sanitation Project
LEPB	Land and Environmental Protection Bureau (of Oromia)
LEPO	Land & Environmental Protection Office
$\mu\text{S/cm}$	Micro-Siemen per centimeter
MoWR	Ministry of Water Resources
NGO	Non-Governmental Organization
NRS	National Regional State
NWTP	New Water Treatment Plant
PAP	Project Affected Persons
RPF	Resettlement Policy Framework
RWRM	Raw Water Rising Main
SM	Sub-Main
WSSP	Water Supply and Sanitation Project
TOR	Terms of Reference
u/s	upstream
UWSSP	Urban Water Supply and Sanitation Program
WB	World Bank
WHO	World Health Organization
WWDSE	Water Works Design and Supervision Enterprise

EXECUTIVE SUMMARY

1. Introduction

The Urban Water Supply and Sanitation Program (UWSSP) is designed to implement the National Policy, Strategy and WSSP, and its development objective is increased access to sustainable water supply and sanitation services in Addis Ababa, Hawassa, Jimma, Gondar and Mekelle. The IDA will contribute to financing the Program. Participation in the Project also requires efficient environmental and social management of the infrastructure. To facilitate this process, an Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF) have been prepared during preparation of the parent project UWSSP. Since the exact locations and potential adverse localized environmental and social impacts of the planned investments could not be determined prior to the appraisal of the UWSSP, separate ESIA studies needed to be carried out and ESIA reports prepared as recommended in the ESMF. Therefore, the Ministry of Water Resources (MoWR) on behalf of the Jimma Town Water Supply and Sewerage Enterprise (JTWSSE) has entrusted the consultancy services for ESIA Study of the envisaged Jimma Town WSSP to Ato Arebo Sambi as an individual Consultant.

The main objective of the ESIA study as stated in the TOR is to identify, assess and mitigate the potential adverse and localized environmental and social impacts of urban water supply and sanitation project, and to recommend appropriate environmental and social management measures to be implemented during construction, operation and maintenance of the project.

2. Project Description

Of 10 secondary cities in Ethiopia, four cities including Hawassa, Jimma, Gondor and Mekele have been selected to participate in the Urban WSS Project. This ESIA study deals with the Jimma Town Water Supply and Sanitation Project. Jimma is situated in the southwestern part of Oromia National Regional State at 352km from Addis Ababa. The existing water supply system of the town depends on Gilgel Gibe river (GGR) as a source of raw water and has a weir intake structure, raw water pumping station, raw water rising main, conventional treatment plant, clear water collection and pumping system, three reservoirs, one booster station and distribution systems. Also the envisaged expansion project will depend on the GGR and it has been estimated that the flow of GGR is adequate to supply the water demand of the Jimma town till Year 2035 considering 50% of the minimum flow for downstream requirements.

The planned expansion and rehabilitation expansion project of the Jimma water supply system consists of the following main components:

Intake Structures: Rehabilitation of intake structures including de-sludging of silts accumulated in the sump, replacement of old pumps and worn-out gates and valves, maintenance of worn-out concrete, and riverbank protection works.

Raw Water Rising Main (RWRM): Installation of about 1.2km long new RWRM, which is aligned parallel to the existing RWRM along the access road to the Intake Site.

New Water Treatment Plant (NWTP): Installation of a NWTP, which would have a capacity of 21,048 m³/d and is sited adjacent to the existing Water Treatment Plant at Boye. The new treatment system would comprise Aeration Unit, Chemical Mixing and

Dosing, Flocculation and Clarification Units, Filtration using Rapid Gravity Sand Filters, Disinfection using chlorination and PH correction of Treated Water, and Clear Water Tank. In addition, the system would have a sludge drying bed for treating the sludge discharged from the treatment plant.

Clear Water Rising Main (CWRM) and Main Reservoir: There would be about 0.9km long CWRM that would convey treated water to two Main Reservoirs (MR) with 2000m³ each, located at Jiren Kella at an elevation of 1890 masl. The CWRM crosses the Addis-Jimma asphalt road and runs through the Jiren Plantation Forest. The Main Reservoirs feed the distribution sub-mains and booster station at Ginjo by gravity.

Distribution Systems and Service Reservoirs: The distribution system has four subsystems (SSs), which are connected to the Main Reservoirs. The subsystems are Boye, Ginjo, Hospital and Aba Jifar Subsystems, which cover an estimated service area of 12.62 km², 1.6 km², 4.15 km² and 0.49 km² respectively. The system has four-service reservoir, namely Ginjo, Hospital, Gabriel and Aba Jifar, which have a capacity of 500m³, 2500m³, 2500m³ and 200m³ respectively. In addition, due to high elevation difference within the Boye and Aba Jifar SSs, these SSs would be incorporated with Break Pressure Tanks that would have a capacity of 300m³ and 10m³ respectively.

Access Roads: The project would include rehabilitation of the existing access road connecting to the Intake Weir, the RWRM and WTP sites, and construction of about 900m long new access road that would connect the Jiren Main Reservoir. These access roads would be used during construction, operation and maintenance phases of the water system.

3. Policy and Legal Framework

The existing national environmental policies and legislations as well as the World Bank's Safeguard Policies that are most relevant for the ESIA study are described briefly below.

3.1 National Policy and Legal Framework

The Constitution of the Federal Republic of Ethiopia, adopted in August 1995, has a number of provisions, which have direct policy and legal relevance to environmental protection matters in connection with development projects. The concepts of sustainable development and environment rights are entrenched in the rights of the people of Ethiopia through Articles 43 and 44. Among the important principles stated in the Constitution are the citizens' right to development and to live in a clean and healthy environment, the duty to protect the environment, and the people's right to full consultation and expression of views in the planning and implementation of policies and projects that affect them directly.

The other important policy document is the Environmental Policy of Ethiopia (EPE), which has an overall policy goal to improve and enhance the health and quality of life of all Ethiopians, to promote sustainable social and economic development through sound management and use of natural, human-made and cultural resources and their environment as a whole. The EIA policies contained in the EPE emphasize the early recognition of environmental issues in project planning, public participation, mitigation and environmental management, and capacity building at all levels of administration.

In addition, the Ethiopian Government has issued a number of legislations that are aimed at advancing environmental protection and sustainable use of the Country's natural as

well as man-made resources. Among these laws, the most relevant ones include the Proclamation on Institutional Arrangement for Environmental Protection, Proclamation on EIA, Proclamation on Environmental Pollution Control, and Proclamation on Ethiopian Water Resources Management. The Institutional Arrangement Proclamation is aimed at ensuring sustainable use of environmental resources, by assigning responsibilities to separate organizations for environmental development and management activities on one hand, and environmental protection, regulations and monitoring on the other, thereby avoiding possible conflicts of interests and duplication of efforts.

The EIA Proclamation makes an EIA mandatory for specified categories of activities undertaken either by the public or private sectors and is the legal tool for environmental planning, management and monitoring. The planned Jimma Town WSSP has been assigned under the category of projects that are likely to bring some adverse impacts and thus, require further environmental assessment (EA). Therefore, in accordance to this legislation, EA has been conducted to determine the project's potential impacts and to develop appropriate mitigation measures to avoid or minimize the significant negative impacts to acceptable levels. The recommended mitigation measures are presented in an environmental management plan (EMP) which will be part of the project implementation plan (PIP).

The Pollution Control Proclamation is based on the right of each citizen to have a healthy environment, as well as on the obligation to protect the environment. Its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed, and to make the violation of these standards a punishable act. Proclamation No. 197/2000 provides legal requirements for Ethiopian water resources management, protection and utilization. Its main objective is to ensure that water resources of the country are protected and utilized for the highest social and economic benefits, to follow up and supervise that they are duly conserved, ensure that harmful effects of water use prevented, and that the management of water resources is carried out properly. Moreover, several other applicable legislations, EA Guidelines, and Environmental Institutions have been reviewed and incorporated into the ESIA Report.

3.2 ESMF and RPF Requirements

In order to ensure that the sub-projects financed under the UWSSP are implemented in an environmentally and socially acceptable manner, the Government of the Federal Republic of Ethiopia has prepared two safeguard policy documents that were agreed and disclosed as part of the borrower's legal commitment to the project. These policy documents are an Environmental and Social Management Framework (ESMF) and a Resettlement Policy Framework (RPF). These documents, in conjunction with the guidance provided in the Project Implementation Manual (PIM), need to be consulted directly during project implementation. The ESIA study for the Jimma Water Supply and Sanitation Project was carried out in accordance with the ESMF and RPF requirements and the guidance provided in the PIM.

3.3 World Bank's Safeguard Policies

The World Bank has 10 environmental, social, and legal Safeguard Policies, of which the following are triggered by the proposed JWSSP.

OP/BP 4.01 Environmental Assessment (EA): According to this Safeguard Policy, the Bank requires EA of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making through appropriate analysis of actions and of their likely environmental impacts. The Bank classifies a proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. The planned JWSSP falls under *Category B Project* [...its potential adverse impacts on human populations or environmentally important areas are less adverse than those of Category A projects] since it is likely to have some significant adverse environmental and social impacts, which can be controlled to acceptable levels by designing and implementing appropriate mitigatory measures. Hence, an ESIA has been conducted to identify the potential environmental and social impacts of the planned sub-project and to propose mitigation measures that are capable of reducing the potentially significant adverse impacts to acceptable levels. Finally, an environmental management plan (EMP) that encompasses the mitigation, monitoring and institutional measures to be implemented during the project construction and operation phases has been prepared and included in this ESIA Report.

Other World Bank Safeguard Policies triggered by the project include *OP/BP Natural Habitats*, *OP/BP 4.36 Forests*, *OP/BP 4.11 Physical Cultural Resources* and *OP/BP 4.12 Involuntary Resettlement*.

4. Methodology

This ESIA study has been carried out in accordance with the TOR provided in the Contract Agreement for the Consultancy Service. The methodology adopted to conduct the ESIA study includes review of relevant previous studies, national environmental policy, strategies, legislations and guidelines as well as the World Bank's Safeguard Policies, undertaking public and stakeholders consultations, and collection of important secondary data from relevant Government offices. It also comprised of detailed field investigations in the project influence areas to collect site specific baseline primary data and identify potential impacts, conducting impact analysis using relevant guidelines and standards, and development of feasible and cost-effective mitigation plan as well as environmental management and monitoring plan.

5. Baseline Description

5.1 Physical Environment

The major part of Jimma town, including the central, southern and western parts, is characterized by flat to gently sloping topography, while the northern and eastern parts of the town and its peripheries are characterized by hilly landscape. The elevation within the town boundary ranges from around 1700 masl in the south to over 2000 masl in the northern periphery of the town. The project area is characterized by temperate humid climate that has high precipitation, warm temperature and long wet period. The mean annual rainfall in the area is around 1500mm and annual potential evaporation is about 1465mm. The mean temperature is between around 12°C and 29°C with the mean daily temperature of 19.5°C. The geological formation of the Jimma area consists of various Tertiary Volcanic and younger Quaternary Sediments. Two major soil types, reddish brown residual soils and alluvial soils of brownish gray and grayish white clay soils are observed in Jimma area.

Jimma town is situated within the catchment of Gilgel Gibe river (GGR), which originates from highland areas in the west of Jimma and generally drains eastwards. At the intake weir site, the GGR has mean annual flows of about $12\text{m}^3/\text{s}$ with the highest mean flow of $46.2\text{m}^3/\text{s}$ in September and the lowest mean flow of $3.3\text{m}^3/\text{s}$ in April. The water quality of the GGR at the intake weir is very good for drinking water supply except some parameters which should be improved through appropriate conventional treatment.

5.2 Biological Environment

The project area has little undistributed natural vegetation or forestland. The original vegetation of the Jimma area has been totally modified by human activities and currently it is covered by some remnant trees, bushes and shrubs. The northern and eastern peripheries of the town have relatively important vegetation cover that comprises several species of indigenous trees and many species of shrubby and bushy plants, but more prominently plantation forest.

Since most part of the project area is highly disturbed and contains heavily degraded habitats, it contains very limited wildlife resources. Nevertheless, some parts of the periphery areas of the town particularly the Jiren Plantation Forest are important habitats for some wildlife species. The terrestrial wild animals inhabiting the area include Hyenas, Anubis baboon, Grivet monkey, Colobus monkey, Bush duiker and Common jackal. In addition, the project area contains a variety of birdlife. With regard to aquatic life, the Gilgel Gibe river supports some aquatic fauna, including Hippopotamus and two fish species.

5.3 Human Environment

According to the 2007 Population and Housing Census of Ethiopia, the total of population of Jimma in Year 2007 was only 120,600, out of which male and female were accounted 50.24% and 49.76% respectively. Jimma consists of heterogeneous population in terms of ethnic and religious composition, and major ethnic groups include Oromo, Amara, Dawro, Gurage and Kafficho, of which Oromo is the dominant one comprising about 36%. The main economic activities in the town are commerce and small scale manufacturing enterprises.

Concerning social services, the health facilities providing health services in Jimma town include 2 hospitals, 3 health centers, 20 clinics, 7 pharmacies, 22 drug stores, 4 rural drug vendors and 4 drug distributors. The existing educational facilities in the town include 17 primary schools (1-8), 3 secondary schools, 1 Government College, 1 University and 7 privately owned colleges. The current major water supply source of Jimma is the existing piped system in which raw water is abstracted from GGR and treated at a conventional treatment unit and distributed to the population through public fountains, and house and yard connection taps. However, there is a serious shortage of clean water supply in significant parts of the town, and this situation is inflicting significant impacts on public health and other socio-economic status of the population. Sanitation in the town is relatively poor as most of the existing excreta disposal facilities are pit latrines that are poorly constructed and poorly managed. The existing solid waste disposal system is also poor.

Jimma town has a number of historical monuments and relics that have both cultural and economic importance. The major cultural heritage sites in and around the town include

the 'Aba Jifar Palace', 'Mesgida Afurtema' (Mosque 40), a family cemetery of Aba Jifar II near the Mosque 40, and a one storey old building. In terms of road network, Jimma is connected with Addis Ababa by a 348km long asphalt road. It is also linked to all the districts of the Jimma Zone and to all the major towns and administrative regions in the west, southwest and southern parts of Ethiopia through major link roads. In addition, the town is connected to Addis Ababa, Gambela, Gore, Assosa and Tepi towns by air transport system. Jimma has a digital telephone service as well as a postal service, plus a 24 hours electric power supply, which is supplied from the national grid.

6. Potential Impacts and Mitigation measures

6.1 Beneficial Impacts

The significant positive impacts of the planned Jimma water supply system are associated with provision of safe and adequate potable water supply. The most positive effect of the project would be improvement of public health status through reduction of the prevalence of water-borne and water related diseases that ensue by drinking contaminated water and due to shortage of safe water for cleaning of eating utensils. Other important positive impacts include promotion of women's welfare, enhancement of investment and economic development, creation of employment opportunities, avoidance of extra expenditure for buying water and reduction of impacts on water quality.

6.2 Adverse Impacts on Physical Environment

Land Acquisition and Impacts on Land Use: Implementation of the envisaged water supply project will entail a permanent land acquisition of about 10ha for installing the new water treatment plant, storage reservoirs and break pressure tanks. In addition, it will cause temporary land taking mainly for installing transmission and distribution lines. This will result in loss of some farmland and grazing areas, natural vegetation, plantation trees, perennial crops, and some housing units. The impacts will be mitigated through reinstatement of lands affected due to temporary land uses, replanting of trees/forests affected, and payment of compensation for loss of properties or income benefits according to existing Government Laws and the RPF that was agreed as part of the borrower's legal commitment to the project.

Impacts on Soils: Installation of the various components of the project would involve cutting in soil and earthmoving works that will cause destruction of the soil structure and ultimately expose it to erosion by runoff water. The project area has climatic and topographic conditions that can intensify soil erosion. The potential impacts on soils can be minimized through execution of the construction works during the dry season, refilling the exposed soils soon, ploughing the compacted areas, reducing the time surface remains bare following completion of works, and preparing surface for re-vegetation and replanting appropriate grass, shrub and/or tree species as soon as possible.

Impacts on Downstream River Flows and Downstream Users: There would be reduction in downstream flows of the Gilgel Gibe river due to abstraction of water for the planned water supply system. Nevertheless, the extent of reduction in downstream flows would be very small, which is only about 3.3% and 4.8% of the annual mean flow of the GGR at the Intake Weir in year 2025 and 2035 respectively. Therefore, the predicted amount of reduction in the GGR flows is minimal and is not expected to cause any significant hydrological changes or impacts on downstream water uses.

Impacts on Water Quality: The major potential impact on water quality is related to pollution risks due to the discharge of sludge water released from the water treatment plants (WTPs). The main byproduct from the WTPs will be residual sludge that would comprise mainly sediments/mud, aluminum sulphate (alum) and water. On the basis of the expected dosage of Alum to be used in the WTPs, the concentration of Aluminum (Al) in the sludge water was estimated and it was found to be too high when compared to the acceptable limit. Therefore, disposal of the sludge to the natural water bodies like the GGR without treatment would be environmentally unacceptable. In order to deal with this significant impact, sludge drying bed/lagoons and disposal site for the solid waste are recommended to be included in the project plan and implemented at the right time.

Impacts due to Land Use in the Catchment: Most part of the Gilgel Gibe river catchment of the intake weir site is characterized by rolling, hilly and mountainous topography, dense population and intensive agricultural activities. With increased rate of deforestation, expansion of cultivation and increased intensity of farming and grazing practices, the rate of soil erosion has remarkably increased, and this situation has resulted in increased sediment loads of the Gilgel Gibe river water. In addition, there could be some risk of water pollution from agricultural chemicals mainly inorganic fertilizers due to leaching or runoff from agricultural fields along the Gilgel Gibe river around the intake site and at upstream. The high turbidity and total solids measurement of the river water during the wet season and the amount of Alum used to coagulate the sediment in the raw water substantiates the above statements. A sustainable and long-term solution to the sediment problem is implementing extensive soil and water conservation measures in the catchment. This would require the involvement of many stakeholders and a substantial amount of financial resource.

Impacts on Air Quality: During the construction phase, there will be short-term and localized impacts on air quality due to dust, exhaust emissions and noise generated by the construction activities. In order to minimize the extent of air and noise pollution and their effects, during construction the Contractor shall follow good site practices by incorporating appropriate mitigation measures to reduce dust production, nuisance noise and vehicle emissions.

6.3 Adverse Impacts on Biological Environment

Impacts on Vegetation and Protected Forestland: Activities related to construction of the various components of the project will cause some damages to natural vegetation, remnant indigenous trees and plantation forest. The relatively important impacts on plantation forest/trees and natural vegetation would be caused in the Jiren Plantation Forest area and along the Ginjo and Aba Jifar Sub-mains. The impacts on natural vegetation, remnant trees and plantation forest/trees can be reduced by restricting clearing or removal of trees to the imperative area needed for the project activities. In addition, a replanting program shall be implemented to compensate for the vegetation or trees lost due to the project activities. In the planting program priority shall be given to indigenous tree species.

Impacts on Wildlife: Of the areas affected by the project activities, the Jiren Protected Forest is an important wildlife habitat. Impacts on wildlife would be mainly related to loss of certain portion of the available habitat and disturbance by noise generated by the construction activities. The wild animals found in the impact areas would temporarily move away from the disturbed areas and are likely come back once the disturbance has

ceased. Recommended mitigation measures include minimization of habitat disturbance and loss, backfilling of trenches and grading to the natural topography to avoid the danger of animal trapping in such holes and to avoid obstruction to animal movements, and avoidance of wildlife poaching by the workforce.

Impacts on Aquatic Ecology: The important aquatic habitats in the project influence zone are Gilgel Gibe river, Aweytu river and Boye Swamp, which would be physically little affected. Nevertheless, Gilgel Gibe and Aweytu rivers are likely to be affected if the sludge water released from the WTPs is discharged to the rivers as the case with the existing treatment system due to changes in the physical and chemical quality of the river water. Potential impacts on aquatic ecology can be minimized through avoidance of discharging sludge water into the water bodies.

6.4 Adverse Impacts on Socio-Economic Environment

Impacts on Housing Units: Of the planned transmission lines, installation of the Ginjo and Aba Jifar Sub-mains may partially affect 3 and 8 residential housing units respectively. Proposed mitigation measures include payment of fair compensation for the affected households according to the relevant Government laws (Proclamation No. 455/2007 and Regulations No. 135/2007) and the RPF that was agreed as part of the borrower's legal commitment to the project. Also, adopting construction methods like use of manual labour and simple equipment instead of heavy-duty machinery for installing the transmission lines that would minimize impacts on properties.

Impacts on Tree Plantations and Perennial Crops: Installation of the Clear Water Rising Main and the Ginjo, Boye and Aba Jifar Sub-mains as well as construction of access road are likely to cause a loss of significant plantation trees, dominantly Eucalyptus species and Cypress. In addition, installation of the Ginjo and Aba Jifar SMs would affect perennial crops including 'Enset' (false banana), Coffee, 'Chat', and fruits such as banana, papaya, guava and orange. The recommended mitigation measures include conducting inventory and valuation of the affected properties and paying compensation according to the relevant Government regulations.

Impacts on Agricultural Lands: Installation of the Ginjo and Aba Jifar SMs would affect some plots of farmlands on temporary basis due to trenches excavation and compaction by heavy equipment used in the construction works. Recommended mitigation measures include reinstatement of the affected farmlands to productive state and effecting financial compensation according to the Regulations No. 135/2007.

Impacts on Cultural Heritage Sites: The Cemetery site found near the Mosque 40 may be affected if heavy duty machinery is applied during the installation of the Aba Jifar SM. In order to avoid potential risks to the Cemetery site, it is recommended that the Construction Contractor shall use manual labour and simple equipment instead of heavy equipment to install the portion of the Aba Jifar SM located near to the Cemetery site. In addition, for the section nearby the Aba Jifar Palace and the Mosque 40, the Contractor shall adopt suitable construction methods that will avoid any significant vibration.

Impacts on Infrastructures and Traffic Mobility and Safety: Installation of the new transmission lines and distribution systems would cause damages to road infrastructure since they would cross the Addis – Jimma asphalt road, other asphalt roads as well as gravel roads in the towns. In addition, the excavation works for pipe trenches and

mobilization of materials may cause interruption of vehicular traffic flows and pedestrian movements. Besides, the trench excavated and left open for sometimes could be a danger for local people especially children, women, elderly people and persons with disabilities, as well as for animals while it may cause obstruction to their mobility. Proposed mitigation measures include reinstatement of the damaged sections of the infrastructures to original state as soon as the works are completed, the excavation condition of the trench shall be in such a way that there would be minimum danger for the vehicular traffic, local people and animals, and placing appropriate signals at the excavation sites and prohibiting the sites for people and animals.

Interruption of Existing Water Supply System: There would be some interruptions to the existing water supply system particularly when connections with the existing distributions are made, and when rehabilitations and replacement of old pipes are executed. The impact can be minimized through proper planning of the installation works, and arranging other options of supplying water.

Impacts on Public Health: Potential impacts on public health during the construction phase are related to creation of breeding sites for vector mosquitoes that transmit malaria, and spreading of HIV/AIDS and other SIDs. During the operation phase, there would be some adverse impacts on public health, which is basically related to increased volume of wastewater that may attract disease vectors and consequently leaving people vulnerable to diseases. Mitigation measures include avoiding creation of pools of water where insect vectors of diseases may breed, provision of awareness raising and education programs about HIV/AIDS and other SIDs for construction workers and provision of adequate drainage facilities for disposal of the wastewater.

7. Project Alternatives

The alternatives considered in this ESIA include alternative water sources and location of abstraction, alternative construction method, alternative mitigation measures and the alternative “without project”. In the feasibility study of alternative water sources for the Jimma town water supply system, it was determined that surface water is the only feasible alternative to meet the project objective. No other technically and economically feasible alternatives have been found to achieve the functions of the planned water supply system. In terms of location of abstraction, the site of the existing intake weir was found to be the most technically and economically feasible.

In the consideration of alternatives construction methods for the project sections or components located in or nearby environmentally or socially sensitive areas, it was found that use of manual labour and simple equipment instead of heavy-duty machinery would avoid or minimize a number of potential environmental and social impacts. In the analysis of alternatives mitigation measures for disposal of residual sludge, consideration of both the environmental consequences of the sludge disposal and the cost implications related to the sludge treatment and disposal of the residual solid waste has been made and finally, the drying lagoons method recommended to be adopted for the project. In the alternative “without project” analysis, it was found that the “without project” option is not acceptable, and it is recommended that the envisaged project would be implemented in order to address the potable water shortage in Jimma.

8. Public and Stakeholders Consultations

The Constitution of Ethiopia through its Articles 43 and the Environmental Policy of the FDRE require the need to involve the interested and affected parties in the planning and

implementation of development policies, programs and projects. Also many donor agencies including the World Bank require different consultations with the concerned public and stakeholders and public comments on the ESIA Report before consideration by decision makers. In line with these policy and legal requirements, different consultations have been carried out with the key stakeholders including the project affected people, and the findings of these consultations are considered in the environmental and social impact analysis and development of mitigation and management plan.

9. Environmental Management and Monitoring Plan

The Environmental Management Plan (EMP) presented in this document links the impacts identified and mitigation measures proposed in the ESIA Report and the responsibilities for implementation and monitoring. Also, it indicates the time horizon over which the mitigation measures to be executed, and where necessary, cost estimates of the mitigation measures. Details of the recommended environmental management activities are synthesized in matrix which is presented in Table 9.1. Environmental monitoring will be required both during the construction and operation phases of the project in order to check whether the proposed mitigation measures are properly implemented and the performance of the implemented measures, as well as the occurrence of any unforeseen impacts. Details of the proposed monitoring program are provided in Table 9.2.

The proposed Environmental Management and Monitoring Plan also includes indication of the institutions and other bodies responsible for implementation of the proposed environmental and social management and monitoring actions. Further, it comprises the training requirements for the key institutions to strengthen their capacity in environmental management and monitoring activities. Moreover, the EMP included estimates of the costs necessary to implement the recommended environmental mitigation, management, monitoring and training programs, and this was found to be about 1.7 Million Ethiopian Birr.

10. Conclusions and Recommendations

Currently Jimma town has a significant shortage of safe drinking water supply and sanitation facilities. The existing water supply system is far from satisfactory particularly in terms of quantity and distribution. Sanitation in the town is also deficient as reflected by inadequate facilities for disposal of human excreta, refuse material and wastewater. There is therefore a pressing need to address the water shortage and sanitation problems in Jimma in order to improve the quality of life of the people, generate economic development, create employment and reduce poverty.

Implementation of the planned water supply project is expected to alleviate the scarcity of potable water supply in Jimma, improve public health and women's welfare, enhance investment and economic development, create employment, reduce poverty and ultimately improve the quality of life of the people.

On the contrary, implementation of the project will bring a number of adverse environmental and social impacts during the construction and operation phases. The important impacts during the construction phase include increased soil erosion, loss of plantation forest/trees, air and noise pollution, disruption of residential and business areas,

damages of physical infrastructures, obstruction of traffic mobility and safety hazards, increased risks of malaria and HIV/AIDS and other STIs, and interruptions of the existing water supply system during pipeline connections. Nevertheless, most of these and other identified potential problems are temporary and localized impacts that can be minimized to acceptable levels through good construction methods and adoption of appropriate mitigation measures that are specified in this document.

The significant environmental or social issues during the operation phase are water pollution hazards associated with disposal of the residual sludge released from the water treatment plant, increased risks of malaria transmission related to increased volume of wastewater and lack of drainage facilities for disposal of such wastewater, high sediment loading of the raw water during rainy season, and source water pollution potential from application of agricultural chemicals in the catchment. These potentials problems can be minimized by implementing corresponding mitigation measures including those specified in this ESIA Report.

Therefore, it can be concluded that there are no severe environmental or social impacts, or other grounds that will prevent the planned water supply project from not proceeding to its implementation provided that the mitigation measures shown in this document are strictly implemented and monitored.

In order to have minimal and acceptable residual environmental and social impacts, and enhance the potential benefits, it is recommended that the proposed mitigation measures are properly implemented at the right time, and necessary follow up of their effectiveness is made through well-planned monitoring program.

1 INTRODUCTION

1.1 Background to the Project

Improved access to safe water supply and sanitation is the core of Ethiopian Government's plan and the World Bank assistance to strengthen the urban agenda and improve the urban infrastructure coverage level. The Urban Water Supply and Sanitation Program (UWSSP) is designed to implement the National Policy, Strategy and WSSP. The International Development Agency (IDA)-financed UWSSP will contribute to financing the Program. The development objective of the UWSSP is increased access to sustainable water supply and sanitation services in Addis Ababa and four secondary cities - Hawassa, Jimma, Gondar and Mekelle, which have been selected to participate in the Urban WSS Project.

Participation in the Project is not limited to the provision of infrastructure, but also requires efficient environmental and social management of the infrastructure during construction and operation and maintenance on part of the responsible institutions at the town and project levels. To facilitate this process, an Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF) have been prepared during preparation of the parent project UWSSP. The ESMF and RPF were prepared by the Government of Ethiopia because the exact locations and potential adverse localized environmental and social impacts of the planned investments in the four towns could not be determined prior to the appraisal of the UWSSP. Thus, separate Environmental and Social Impact Assessment (ESIA) studies needed to be carried out and ESIA reports prepared as recommended in the ESMF.

Therefore, the Ministry of Water Resources (MoWR) on behalf of the Jimma Town Water Supply and Sewerage Enterprise (JTWSSE) has entrusted the consultancy services for ESIA Study of the envisaged Jimma Town Water Supply and Sanitation Project to Ato Arebo Sambu as an individual Consultant. The consultancy contract agreement between the Client and the Consultant was signed on March 01, 2010. This ESIA study has been carried out in conformity with the Ethiopia's Environmental Assessment (EA) procedures and the World Bank's OP 4.01 EA requirements.

1.2 Objectives of the Project

The main objectives of the Jimma town water supply and sanitation project are to:

- Increase access to sustainable water supply and sanitation services for the dwellers
- Improve the lives and health of the people living in the town
- Promote investment and economic development oriented interventions

This involves increasing water production, expand distribution network to un-served and low-income areas, provide public sanitation facilities and construction of wastewater treatment ponds and sewerage systems in higher density commercial areas.

1.3 Objectives and Scope of the ESIA Study

The main objective of the ESIA study as stated in the TOR is to identify, assess and mitigate the potential adverse and localized environmental and social impacts of urban water supply and sanitation project, and to recommend appropriate environmental and social management measures to be implemented during construction, operation and maintenance of the project. Thus, it is intended to ensure that the planned water supply and sanitation scheme is environmentally sustainable, socially acceptable and does not cause serious adverse environmental and social impacts.

The scope of the ESIA study includes:

- Review of Ethiopia's relevant environmental policies, legislations and procedures in conjunction with the World Bank's Safeguard Policies.
- Review of the Conventions and Protocols to which Ethiopia is a signatory.
- Identification and description of the current state of the biophysical and socio-economic environment of the project influence areas and highlight of issues that need to be taken into account during project preparation and implementation.
- Identification of the key stakeholders and carrying out stakeholders and public consultations and incorporation of the findings into the impact analysis and the ESIA Report.
- Identification and evaluation of the environmental and social impacts that are likely to arise during the construction, operation or maintenance of the designed WSSP;
- Consideration of alternative project designs and assessment of their potential environmental and social impacts, and provision of appropriate recommendations on the preferred option(s);
- Recommendation of suitable avoidance or mitigation measures to prevent or minimize the possible adverse environmental and social impacts to acceptable levels;
- As appropriate, review and adjustment of the Environmental Guidelines for Contractors for the UWSSP included in the ESMF;

- Assess the town's environmental assessment and management capacity, as well as the capacity to implement the proposed mitigation and monitoring measures, and make appropriate recommendations, including potential capacity building and training needs, and their costs; and
- Development of appropriate environmental and social management plan, which will ensure that mitigation measures are fully adopted and their effectiveness is properly monitored.

1.4 The ESIA Study Team

The Team in charge of the ESIA study comprises two senior professionals, including a Senior Environmentalist and a Senior Sociologist. These professionals have an extensive range of experience in environmental and social impact assessments of various development projects including urban water supply and sanitation projects.

The Environmentalist, Ato Arebo Sambi, has been responsible for the overall coordination of the team's tasks in the ESIA process, liaison with the Client, and carrying out most of the activities described under the scope of the Consultancy Service. In particular, he has been in charge of identifying and consulting most of the stakeholders, collation and review of project related documents and most of the policy and legal framework documents, activities related to the physical and biological components as well as several elements of the social component of the assessment, conducting the impact analysis and finally compiling this ESIA Report.

The Sociologist, Ato Aweke Gebre, has been particularly responsible for most of the socio-economic aspects/ components of the assessment. His professional knowledge and skill has been essential in order to make the assessment more comprehensive. His input has been indispensable to provide more appropriate recommendations with regard to the social components. In particular, he has been grateful in conducting stakeholders and public consultations including the discussions and interviews with the project-affected people, and in analyzing the output of these consultations in particular and the social issues in general.

1.5 Structure of the ESIA Report

This Report presents the findings of the ESIA study essentially following the report structure provided in the TOR of the consultancy assignment being organized in ten Chapters. Chapter 1 provides a background to the sub-project and the ESIA study and the scope of the services. Chapter 2 presents a brief description of the sub-project features including the main components and the activities to be involved, whereas Chapter 3 gives a brief review of the pertinent environmental policies, legislations and procedures. Chapter 4 describes in short the methodology adopted to carry out the ESIA study while Chapter 5 presents a description of the baseline environmental and social settings and constraints of the project area.

Chapter 6 deals with the core of the study, which is assessment of the potential environmental and social impacts of the envisaged project and recommendation of appropriate mitigation measures. Chapter 7 provides a brief account of the alternatives considered, whereas Chapter 8 presents the recommended environmental and social management and monitoring plans together with their cost estimates that are targeted to ensure the implementation of the proposed mitigating measures and follow up of

their effectiveness. Chapter 9 presents a concise description of the stakeholders and public consultations conducted during the course of the ESIA study and their main findings. Finally, Chapter 10 gives the conclusions drawn from the assessment and the key recommendations to be considered by the decision makers and project implementers.

2 PROJECT DESCRIPTION

2.1 Urban Water Supply and Sanitation Project

As elaborated in the Request for Technical and Financial Proposal for the ESIA Study, the Urban Water Supply and Sanitation Project (UWSSP) is designed to implement the National Policy, Strategy and Water Supply and Sanitation Project (WSSP). The IDA-financed UWSSP will contribute to financing the Program. Program design reflects the policy objectives of decentralization to the lowest possible level, involvement of all stakeholders in the process, integration of sanitation with improvements to water supply and recognition of water as an economic and social good. A demand responsive, performance based approach will be followed and cities will receive assistance to put in place institutions and develop capacity for implementation and will be able to access more resources for development of their water supply and sanitation systems as they demonstrate capacity for implementation. The stepped approach has been designed for urban water supply and sanitation to allow each city to move at its own pace and receive further assistance when prepared.

The Development Objective of the UWSSP is increased access to sustainable water supply and sanitation services, in Addis Ababa and four secondary cities. Up to 4 million urban residents in Addis and four other cities where the project is implemented will have increased access to potable water, and households in low-income areas will have improved access to water supply and sanitation facilities. The Project will also help to improve the efficiency and effectiveness of spending in the sector so that GOE can attract more resources to the sector. The project will support economic development in Ethiopia and improve the lives and health of the population. Reliable, safe and affordable water supply is key for the success of other commercial and economic reforms in the country. This objective will be addressed through the following three major components incorporating both capacity building and investment interventions.

Secondary city Water supply and Sanitation is to be provided (i) to increase water production, expand distribution network to un-served and low income areas, provide public sanitation facilities and construction of wastewater treatment ponds and sewerage in higher density commercial areas in the four secondary cities, (ii) Improve the operational efficiency of the participating water utilities by reducing non-revenue water and producing a better financial management and (iii) for project management.

In Ethiopia, there are 10 secondary cities with populations above 100,000, all of which are in a similar situation when it comes to water supply and sanitation. Of these, Hawassa in the Southern Region, Jimma in Oromia Region, Gondor in Amhara Region, and Mekele in Tigray Region with an average population of 200,000 have been selected to participate in the Urban WSS Project.

2.2 Jimma Water Supply and Sanitation Project

2.2.1 Project Location and General Description

The project area, which is Jimma town, is situated in the southwestern part of Oromia National Regional State at latitude of 7° 40' 00" N and longitude 36°50'00"E. at 348km from Addis Ababa along the Addis – Jimma road; the location of the project area is shown in Figure 2.1. The existing water supply system of the town depends on Gilgel Gibe river as a source of raw water and has a weir intake structure constructed across the river. In addition, the system has raw water pumping station, raw water rising main, conventional treatment plant, clear water collection and pumping system, three reservoirs (two with 2,500m³ capacity each and one with 500m³ capacity), one booster station and distribution systems.

Also the envisaged expansion project will depend on the Gilgel Gibe river by maintaining, rehabilitating or replacing several components of the existing system and installing new/additional components. It has been estimated that the flow of Gilgel Gibe river is adequate to supply the water demand of the Jimma town till Year 2035 considering 50% of the minimum/drought flow for downstream requirements.

2.2.2 Main Sub-Project Components

As described in the relevant project documents particularly in the Final Design Report (ARM Engineering, 2008), the planned expansion and rehabilitation of the Jimma water supply system consists of the following main sub-project components. The Key Project Components are shown in Figure 2.1 below while the full Project Layout is shown in Appendix 7:

(i) Intake Structures

Rehabilitation of intake structures including de-sludging of silts accumulated in the sump, replacement of old pumps and worn-out gates and valves, maintenance of worn-out concrete, and riverbank protection works. Photo 1 and 2 depict the existing intake weir during low river flow in Mach and during high river flow at end of June.

(ii) Raw Water Rising Main

Installation of Raw Water Rising Main (RWRM), which is about 1.2km long and aligned parallel to the existing RWRM along the access road to the Intake site.

(iii) New Water Treatment Plant

The New Water Treatment Plant would have a capacity of 21,048 m³/d and is sited adjacent to the existing Water Treatment Plant at Boye. The Treatment Plant would be installed over 10,000 m² land area. As informed by the Project Coordinator, this plot of land is already secured from the Jimma Town Municipality. The treatment system would comprise Aeration Unit, Chemical Mixing and Dosing, Flocculation and Clarification Units, Filtration using Rapid Gravity Sand Filters, Disinfection using chlorination and PH correction of Treated Water, and Clear Water Tank. In addition, the system would have a sludge drying bed for treating the sludge discharged from the treatment plant.

Figure 2.1: Location Map of Key Project Components



Photo1: A view of the Intake Weir Site during low flow in March



Photo 2: Intake Weir Site during high flow at end of June

(iv) Distribution Systems, Storage Reservoirs and Break Pressure Tanks

There would be a Clear Water Rising Main (CWRM), about 0.9km long, that would convey treated water to two Main Reservoirs (MR) with 2000m³ each, located at Jiren Kella at an elevation of 1890 masl. The CWRM crosses the Addis-Jimma asphalt road and runs through the Jiren Plantation Forest and bush land. The Main Reservoirs feed the distribution sub-mains and booster station at Ginjo by gravity.

The distribution system has four subsystems, which are connected to the Main Reservoirs at Jiren Kella. The subsystems are Boye, Ginjo, Hospital and Aba Jifar Subsystems. The Aba Jifar subsystem is connected to the Ginjo booster pumping station from which the water is pumped to the reservoir located nearby the Aba Jifar Palace to serve the Jiren area and the areas around Mosque 40. All other subsystems are fed by gravity except the area along the Agaro - Jimma road which is connected to the booster station of St. Gabriel Reservoir. The Subsystems are briefly described below.

Boye Subsystem: This subsystem will be mainly supplied from the MR and it comprises about 18.02km pipe length and approximately covers an area of 12.62 km². It comprises new residential areas such as Becho Bore, and the central part South and West of Saint Gabriel reservoir. About 67 % of the water will be used in this supply subsystem, and the altitude in the area ranges from 1710 masl to 1770 masl.

Hospital Subsystem: This subsystem supplies areas in nearby the Jimma Hospital and Kochie and Seto villages, and it encompasses about 4.15 km² in area. It will be supplied from Hospital Reservoirs located at 1779 masl. About 22% of the water will be used in this supply zone, and the altitude in this zone ranges from 1724 masl to 1770 masl.

(v) Ginjo Subsystem

This subsystem is approximately 1.6 km² in area and it covers about 8% of the water demand. The areas covered are the Jimma University, Teachers Training College (TTC), Ginjo Village and areas west of the TTC. The subsystem also comprises the

booster pumping station to Aba Jifar subsystem, and the altitude in this subsystem ranges from 1860 to 1785 m.

(vi) Aba Jifar Subsystem

The subsystem is approximately 0.49 km² in area and comprises the Jiren area and areas nearby Mosque 40 and Saint Giorgis Church. This subsystem will be supplied from the reservoir nearby Aba Jifar Palace located at 2020 masl. About 3% of the water will be used in this supply zone, and the altitude in this zone ranges from 1980 to 1865 masl.

(vii) Storage Reservoirs

Storage requirement in the distribution system has been sized based on balancing volume and emergency requirements. The size and location of Reservoirs is presented in Table 2.1 below.

(viii) Break Pressure Tanks (BPT)

Due to high elevation difference within the Boye and Aba Jifar Subsystems, it is necessary to incorporate BPTs so that the maximum pressure will be below 100m. Accordingly, two BPTs, BPT1 and BPT2, with 300m³ capacity and 10m³ capacity have been proposed in the Boye and Aba Jifar Subsystems respectively. BPT1 and BPT2 will be located at ground elevation of 1810 masl and 1960masl respectively.

Table 2.1 Service Reservoirs

Node	Description	Status	Supplied from	Capacity	Elevation, m		
				m ³	Bed Level	Min. Water L	Max. Water L
PR-01	Jiren Kella Main Reservoir	New	O-PS_01	4000	1,890	1,892	1,896.65
J-G12	Ginjo reservoir & booster station	Existing	PR-01	500	1,840	1842	1844.30
J-G09	Hospital Reservoir	Existing	J-G12	2500	1,779	1,937	1,942
ER-02	Gabriel Reservoir	Existing	J-B062	2500	1,779	1,781	1,786
PR-02	Aba Jifar Reservoir	New	O-PB-02	200	2020	2022	2024
	Total			9,750			

Access Roads: The existing access road connecting to the Intake Weir, the Raw Water Rising Main and Water Treatment Plant sites will be rehabilitated. On the other hand, a new access road of 900m long will be constructed to connect the Jiren Main Reservoir. These will allow easy access for maneuvering of heavy vehicles which will be used to deliver and off load construction materials and chemicals to the project sites. These access roads would also be used during the operation and maintenance phases.

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 National Policies and Strategies

3.1.1 The Constitution of FDRE

The Constitution of Ethiopia (Procl. No. 1/1995), adopted in August 1995, contains a number of articles, which are relevant to environmental matters in connection with development projects, as well as to the environment in general, and forms the fundamental basis for the development of specific environmental legislative instruments.

In the section, which deals with democratic rights, Article 43 gives the right to people to improved living standards and to sustainable development. Article 92 of Chapter 10 (which sets out national policy principles and objectives), includes the following significant environmental objectives:

- Government shall endeavor to ensure that all Ethiopians live in a clean and healthy environment (Article 44 states that all persons have the right to a clean and healthy environment)
- Development projects shall not damage or destroy the environment
- People have the right to full consultation and the expression of views in the planning and implementation of environmental policies and projects that affect them directly
- Government and citizens shall have the duty to protect the environment

Article 40 states that ownership of both urban and rural land is vested in the State and the people, and is common property, which is not subject to sale or other means of exchange. Peasants have the right to obtain land without payment, and are protected against eviction from land in their possession. Full right to immovable property and permanent improvements to land is vested in individuals who have built the property or made the improvements, but government may expropriate such property for public purposes, subject to the payment in advance of compensation commensurate to the value of the property or alternative means of compensation, including relocation with adequate State assistance.

3.1.2 Environmental Policy of Ethiopia

The Environmental Policy of Ethiopia (EPE) of the Federal Democratic Republic of Ethiopia (FDRE) was approved by the Council of Ministers in April 1997 (EPA/MEDAC 1997). It is based on the Conservation Strategy of Ethiopia (CSE), which was developed through a consultative process over the period 1989-1995. The policy has the broad aim of rectifying previous policy failures and deficiencies, which in the past, have led to serious environmental degradation. It is fully integrated and compatible with the overall long-term economic development strategy of the country, known as Agricultural Development-Led Industrialization (ADLI), and other key national policies.

The EPE's overall policy goal may be summarised in terms of the improvement and enhancement of the health and quality of life of all Ethiopians, and the promotion of sustainable social and economic development through the adoption of sound environmental management principles. Specific policy objectives and key guiding principles are set out clearly in the EPE, and expand on various aspects of the overall

goal. The policy contains sectoral and cross-sectoral policies and also has provisions required for the appropriate implementation of the policy itself.

The section of the EPE concerning EIA sets out a number of policies, key elements of which may be summarised as follows:

- Recognition of the need for EIA to address social, socio-economic, political and cultural impacts, in addition to physical and biological impacts, and for public consultation to be integrated within EIA procedures
- Incorporation of impact containment measures within the design process for both public and private sector development projects, and for mitigation measures and accident contingency plans to be incorporated within Environmental Impact Statements (EISs)
- Creation of a legal framework for the EIA process, together with a suitable and coordinated institutional framework for the execution and approval of EIAs and environmental audits
- Development of detailed technical sectoral guidelines for EIA and environmental auditing
- Development of EIA and environmental auditing capacity and capabilities within the Environmental Protection Authority, sectoral ministries and agencies, as well as in the regions

The thorough and holistic approach taken to development of the policy and, in particular, recognition of the importance of addressing cross-sectoral environmental issues, has led to a national approach to environmental management, which is not only comprehensive, but also provides a sound and rational basis for addressing the environmental problems faced by the country now and those which are anticipated over the next decade.

3.1.3 Sectoral policies

The Government of Ethiopia has issued several sectoral and cross sectoral policies that considers environmental issues for sustainable development. Among these, the ones which are most relevant are described below.

i) Water Resource Policy

The Ministry of Water Resources formulated the Federal Water Resource Policy in 1998 for comprehensive and integrated water resource management. The overall goal of the water resources policy is to enhance and promote all national efforts towards the efficient and optimum utilisation of the available water resources for socio-economic development on sustainable bases. The document includes policies to establish and institutionalise environment conservation and protection requirements as integral parts of water resources planning and project development.

ii) Wildlife Policy

The Wildlife Policy was developed in 2006 by the Ministry of Agriculture and Rural Development. The prime objective of the policy is to create conducive environment for the preservation, development and sustainable utilisation of Ethiopia's wildlife resources for social and economic development and for the integrity of the biosphere/biodiversity. It covers a wide range of policies and strategies relating, amongst others, to wildlife conservation and protected areas with four categories from the highest

protection ranking ‘*National Park*’, followed by ‘*Game Reserve*’ and ‘*Sanctuary*’ to ‘*Controlled Hunting Area*’.

iii) National Policy on Biodiversity Conservation, Research and Development

The policy contains policy directives with regard to the need to explore, collect, characterize, evaluate, conserve and utilize biodiversity. The need to regulate access to genetic resources through various measures, including legislation and building appropriate institutional structures and mechanisms is also mentioned. Strengthening capacity for information collection and documentation, encouraging networking and generally integration of biodiversity conservation, research and development elements in education and general awareness programmes are considered important. The policy directives emphasize the importance of community participation in the conservation and sustainable utilization of biodiversity resources together with the need to provide for access and benefit sharing for communities to and from biodiversity resources.

iv) National Population Policy

This Policy was issued in April 1993 and aims at closing the gap between high population growth and low economic productivity through a planned reduction in population growth combined with an increase in economic returns. With specific reference to natural resources, the main objectives of National Population Policy include making population and economic growth compatible and the over-exploitation of natural resources unnecessary; ensuring spatially balanced population distribution patterns, with a view to maintaining environmental security and extending the scope of development activities; and maintaining and improving the accommodating capacity of the environment by taking appropriate environmental protection and conservation measures.

v) Ethiopia’s Health Policy

Ethiopia’s health policy was issued in 1993, with the aim of giving special attention to women and children, to neglected regions and segments of the population, and to victims of man-made disasters. The priority areas of the policy are in the fields of Information, Education and Communication (IEC) of health to create awareness and behavioural change of the society towards health issues. Among others, the policy has placed emphasis on the control of communicable diseases, epidemics, and diseases that are related to malnutrition and poor living conditions; promotion of occupational health and safety; the development of environmental health; rehabilitation of health infrastructures; appropriate health service management systems; and provision of essential medicines.

vi) National HIV/AIDS Policy

Ethiopia is one of the countries in the world that is facing HIV/AIDS pandemics. Having understood the magnitude of the HIV/AIDS pandemic and its paramount impacts on the socio-economic development of the country, the FDRE issued a Policy on HIV/AIDS in 1998, which calls for an integrated effort of multi-sectoral response to control the epidemic. The National HIV/AIDS Policy urges communities at large, including government ministries, local governments and the civil society to assume responsibility for carrying out HIV/AIDS awareness and prevention campaigns. The general objective of the policy is to provide an enabling environment for the prevention and control of HIV/AIDS in the country. In order to address the problem

and coordinate the prevention and control activities at national level, in 2000 National AIDS Council was established under the Chairmanship of the country's President, and in 2002 HIV/AIDS Prevention and Control Office was established.

vii) National Policy on Women

This Policy was issued in March 1993 emphasizing that all economic and social programs and activities should ensure equal access of men and women to the country's resources and in the decision making process, so that they can benefit equally from all activities carried out by the Federal and Regional Institutions. Among the main policy objectives is that laws, regulations, systems, policies and development plans that are issued by the government should ensure the equality of men and women, and that special emphasis should be given to the participation of rural women.

3.1.4 Conservation Strategy of Ethiopia

Since the early 1990s, the Federal Government of Ethiopia has undertaken a number of initiatives to develop regional, national and sectoral strategies for environmental conservation and protection. Paramount amongst these was Conservation Strategy of Ethiopia (CSE), approved by the Council of Ministers, which provided a strategic framework for integrating environmental planning into new and existing policies, programs and projects. The CSE is approved by the Federal Government, and it is an important policy document. The CSE itself provides a comprehensive and rational approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross-sectoral policies, action plans and programmes, as well as providing the basis for development of appropriate institutional and legal frameworks for implementation.

The plan comprehensively presented the exiting situation within the country and gave priority actions plan on the short and medium term. In particular, it recognizes the importance of incorporating environmental factors into development activities from the outset, so that planners may take into account environmental protection as an essential component of economic, social and cultural development.

Regional States were given the responsibility to prepare regional conservation strategies, detailing with the specific conditions and environmental issues prevalent in their territory, and outlining the ways in which problems were to be addressed. Following CSE, the Regional States have prepared Conservation Strategy document for their respective Regions.

3.2 ESMF and RPF Requirements

In order to ensure that the sub-projects financed under the UWSSP are implemented in an environmentally and socially acceptable manner, the Government of the Federal Republic of Ethiopia has prepared two safeguard policy documents that were agreed and disclosed as part of the borrower's legal commitment to the project. These policy documents are an Environmental and Social Management Framework (ESMF) dated April 13, 2007, and a Resettlement Policy Framework (RPF) dated May 4, 2007. These documents, in conjunction with the guidance provided in the Project Implementation Manual (PIM), dated August 2007, need to be consulted directly during project implementation. The ESMF and RPF are briefly described below and

the ESIA study for the Jimma Water Supply and Sanitation Project (JWSSP) was carried out in accordance with the ESMF and RPF requirements and the guidance provided in the PIM.

3.2.1 ESMF Requirements

The ESMF outlines an environmental and social screening process, which should be carried out in parallel with other sub-project preparation activities such as technical, economic, and financial analyses. The ESMF has been prepared because the Ethiopian guidelines do not make provisions for the screening of small-scale sub-projects, which could have negative localized environmental and social impacts that would require mitigation. Therefore, the provisions of OP 4.01 Environmental Assessment for screening, assignment of environmental category, application of appropriate environmental mitigation measures and/or preparation of separate Environmental Impact Assessment (EIA) reports, review and clearance of screening results and/or separate EIA reports, consultations, and monitoring are applied to the sub-projects.

To facilitate the preparation and implementation of the sub-projects, the ESMF includes (a) an Environmental and Social Management Plan (ESMP); (b) a section on Capacity Building and Training, (c) Environmental Guidelines for Contractors; and (d) a Summary of the Bank's Safeguard Policies. The ESIA study of the Jimma WSSP has included all these requirements. Based on the findings of this ESIA study, a comprehensive ESMP has been prepared and provided in Chapter 9 of the ESIA Report. The ESMP comprises the outline of the potential environmental and social issues and their corresponding mitigation measures, the institutional responsibilities for the implementation and monitoring of mitigation measures, as well as monitoring indicators, time horizons and cost estimates. The ESMP also covers the Capacity Building and Training requirements to implement the ESMP. In addition, Environmental Guidelines for Construction Contractors are provided in Appendix 7. Moreover, a Summary of the World Bank's Safeguard Policies is presented in section 3.3 below.

3.2.2 RPF Requirements

According to the Bank's OP 4.12 Involuntary Resettlement, the development of a RPF is a requirement for projects that may entail involuntary resettlement, impacts on assets, or loss of livelihoods. Any impact of the UWSS Project on land and/or people (land acquisition, impact on assets, resettlement, livelihood restoration of affected people) will be addressed in compliance with the Constitution of Ethiopia, with other Ethiopian regulations, and with the World Bank safeguard policy in involuntary resettlement (OP 4.12). The RPF is a binding document for the UWSSP, and has been fully endorsed by the Government of the Federal Republic of Ethiopia.

Where gaps exist between Ethiopian laws and the Bank's OP 4.12, the UWSSP will follow the requirements of this Bank policy. There is a gap between the existing Ethiopian laws and the Bank's OP 4.12 related to eligibility for compensation. According to the Bank's OP 4.12 project affected people are considered legitimate for resettlement assistance regardless of the legality of land tenure. Whereas according to the Article 22 of the Ethiopian Regulations on Payment of Compensation for Property

Situated on Landholdings Expropriated for Public Purposes (Regulations No. 135/2007) any person who claims for payment of compensation in accordance with the Proclamation No. 455/2005 and the Regulations No. 135/2007 is required to produce proof of legitimate possession of the expropriated landholding and ownership of the property entitling compensation. Therefore, according to the RPF the UWSSP will follow the requirements of OP 4.12.

It would be appropriate and possible for the JWSSP to follow the agreed Resettlement Policy Framework as it is expected to be in conformity with the Bank's OP on Involuntary Resettlement. The policies or principles provided in the RPF including design procedures to minimize displacement, compensation principles and eligibility for compensation will be applied for the JWSSP. It is considered that the JWSSP would fully implement the resettlement and compensation procedures recommended in relevant sections of the ESIA Report, including sections 6.4.1, 6.4.2 and 6.4.3.

3.3 The World Bank Safeguard Policies

The World Bank has 10 environmental, social, and legal Safeguard Policies, of which the ones that are likely triggered by the proposed JWSSP are described concisely below.

3.3.1 OP/BP 4.01 Environmental Assessment (EA)

Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

As stated in the Bank's Safeguard Policies, Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

The Bank classifies a proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. The four categories are:

Category A: If a proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The

Category A designation may be equated to the *Schedule 1* designation in Ethiopian EIA guideline document (EPA, 2000).

Category B: A proposed project is classified as Category B if its potential adverse impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats - are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Category B Projects may be classified into two groups: **Category B1 or Category B2**. Projects in Category B1 are expected to have limited environmental and social impacts, and therefore, the application of simple mitigation measures are likely to suffice. Whereas Projects in Category B2 will require a separate EIA to get a better understanding of the potential environmental and social issues that have been identified in the screening process.

Based on the findings of environmental screening process carried out for the proposed JWSSP, this Sub-project would fall under *Category B2*. Implementation of the JWSSP is likely to cause a number negative environmental and social impacts, some of which are potentially significant but can be managed to acceptable levels. Hence, an ESIA has been conducted to identify the potential environmental and social impacts of the planned sub-project and to propose mitigation measures that are capable of reducing the potentially significant adverse impacts to acceptable levels. Finally, an Environmental and Social Management Plan (ESMP) that encompasses the mitigation, monitoring and institutional measures to be implemented during the project construction and operation phases has been prepared and included in Chapter 9 of this ESIA Report. It is expected that the ESMP would be part of the project implementation plan (PIP).

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

3.3.2 OP/BP 4.04 Natural Habitats

This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable

development. Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.

This policy may be triggered by the planned JWSSP because the Gilgel Gibe river (GGR), which is the source of water for the Jimma water supply system, is an important freshwater ecosystem that would be impacted by the project. The Gilgel Gibe river system may be considered as an important natural habitat since it is a habitat for a range of riverine flora and fauna including fish and hippopotamus. Furthermore, the reservoir created by the Gilgel Gibe I dam in downstream area is an important habitat where substantial reservoir fishery has already established. Protection of the riverine ecosystem would be imperative since it is an important habitat for flora and fauna. In addition, the Gilgel Gibe river has important socio-economic values including source of livelihood from riverine and reservoir fishery, as well as in terms of source of livestock water supply. Therefore, the extent and significance of potential impacts of the planned water supply scheme on the riverine habitat, its flora and fauna, and on water quantity and quality have been assessed and suitable mitigation measures recommended.

3.3.3 OP/BP 4.36 Forests

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

This policy may be triggered by the JWSSP since some of the sub-project components, including the Clear Water Rising Main, the Jiren Kella Main Reservoir, and the Boye and Ginjo Sub-mains, are situated in an area designated as State Plantation Forest. The forestland composes primarily plantation trees, but also remnants of some indigenous trees and patches of bush land areas. Because of the implementation of the above-indicated sub-project components, intrusion into the forestland and loss of a relatively small portion of it would be inevitable. Therefore, the possible impacts of the project on the forest resource have been evaluated and corresponding mitigation measures proposed in the EMP.

3.3.4 OP/BP 4.11 Physical Cultural Resources

The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, “physical cultural resources” are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest

may be at the local, provincial or national level, or within the international community.

This policy is triggered by the Sub-project because one of the subsystems, i.e. the Aba Jifar subsystem, is located in the vicinity of two important cultural heritage sites. The cultural sites are the well-known historical place of the Aba Jifar II Palace and a recognized mosque known as Mosque 40 and a Cemetery site nearby the mosque. The Sub-main connecting the Aba Jifar Reservoir runs very close to the Cemetery site and at some 100m from the Aba Jifar Palace and the Mosque 40, but very close to the fence of the Palace compound. Similarly, the Aba Jifar Reservoir is located at about 150m north of the Aba Jifar Palace but closer to its fence. The activities involved in the installation of these components of the sub-project may cause some impacts on the cultural sites unless due precautions and mitigations measures are taken. Hence, the possible impacts of the project activities have been examined and mitigation measures to be taken to avoid the impacts are recommended in the EMP.

3.3.5 OP/BP 4.12 Involuntary Resettlement

The objective of this policy is to either avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs, assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them, encourage community participation in planning and implementing resettlement, and provide assistance to affected people regardless of the legality of land tenure.

This policy may be triggered by the JWSSP since its implementation may displace some families residing along transmission lines mainly the Aba Jifar and Ginjo Sub-mains. To address this issue, the number of families that are likely to be affected by the Sub-project has been identified and mitigation measures recommended.

3.4 Environmental Framework Legislations

This section describes briefly the legislations that are aimed at advancing environmental protection and sustainable use of natural as well as man-made resources.

3.4.1 Proclamation on Institutional Arrangement for Environmental Protection

The FDRE Proclamation No. 295/2002, a Proclamation provided for the establishment of Environmental Protection Organs, came into effect in October 2002. Its objective was to assign responsibilities to separate organizations for environmental development and management activities on one hand, and environmental protection, regulations and monitoring on the other, in order to ensure sustainable use of environmental resources, thereby avoiding possible conflicts of interests and duplication of efforts. It was also intended to establish a system that fosters coordinated but differentiated responsibilities among environmental protection agencies at federal and regional levels.

The Proclamation re-established the EPA as an autonomous public institution of the FDRE. It also empowers every Sector Ministry or Agency to establish or designate an Environmental Unit (Sectoral Environmental Unit) that shall be responsible for coordination and follow-up so that the activities of the ministry or competent agency are in harmony with this Proclamation and with other environmental protection

requirements. Furthermore, the Proclamation stated that each regional state should establish an independent regional environmental agency or designates an existing agency that shall be responsible for environmental monitoring, protection and regulation in their respective regional states.

3.4.2 Proclamation on Environmental Impact Assessment

This Proclamation (Proc. No. 299/2002) was issued in December 2002 with the aim to make an EIA mandatory for specified categories of activities undertaken either by the public or private sectors and to ensure EIA as a legal tool for environmental planning, management and monitoring.

The Proclamation elaborates on considerations with respect to the assessment of positive and negative impacts and states that the impact of a project shall be assessed on the basis of the size, location, nature, cumulative effect with other concurrent impacts or phenomena, trans-regional context, duration, reversibility or irreversibility or other related effects of a project. Categories of projects that will require full EIA, not full EIA or no EIA are provided. To effect the requirements of this Proclamation, the EPA has issued a Procedural and Technical EIA Guidelines, which provide details of the EIA process and its requirements.

3.4.3 Proclamation on Environmental Pollution Control

This Proclamation, Proc. No. 300/2002, is mainly based on the right of each citizen to have a healthy environment, as well as on the obligation to protect the environment of the Country and its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed, and to make the violation of these standards a punishable act. The Proclamation states that the “polluter pays” principle will be applied to all persons. Under this proclamation, the EPA is given the mandate for the creation of the function of Environmental Inspectors. These inspectors (to be assigned by EPA or regional environmental agencies) are given the authority to ensure implementation and enforcement of environmental standards and related requirements.

3.4.4 Proclamation on Ethiopian Water Resources Management

Proclamation No. 197/2000, issued in March 2000, provides legal requirements for Ethiopian water resources management, protection and utilization. The aim of the Proclamation is to ensure that water resources of the country are protected and utilized for the highest social and economic benefits, to follow up and supervise that they are duly conserved, ensure that harmful effects of water use prevented, and that the management of water resources is carried out properly.

3.4.5 Proclamation on Research and Conservation of Cultural Heritage

Proclamation No. 209/2000 provides legal framework for Research and Conservation of Cultural Heritage. The Proclamation establishes the Authority for Research and Conservation of Cultural Heritage (ARCCH) as a government institution with a juridical personality. In addition, it has provisions for management, exploration, discovery and study of Cultural Heritage and miscellaneous provisions.

As defined in the Proclamation, the objectives of the Authority (ARCCH) are to carry out a scientific registration and supervision of Cultural Heritage; protect Cultural Heritage against man-made and natural disasters; enable the benefits of Cultural

Heritage assist in the economic and social development of the country; and discover and study Cultural Heritage.

Article 41 of the Proclamation is on Fortuitous Discovery of Cultural Heritage and Sub-Article (1) states that, any person who discovers any Cultural Heritage in the course of an excavation connected to mining explorations, building works, road construction or other similar activities or in the course of any other fortuitous event, shall forthwith report same to the Authority, and shall protect and keep same intact, until the Authority (ARCCCH) takes delivery thereof. Connected to this, Sub-Article (2) states that, the Authority shall, upon receipt of a report submitted pursuant to Sub-Article (1) hereof, take all appropriate measures to examine, take delivery of, and register the Cultural Heritage so discovered.

3.4.6 Proclamation on Expropriation of Land Holdings and Payment of Compensation

This Proclamation, Proc. No. 455/2005, issued in July 2005, deals with appropriation of land for development works carried out by the government and determination of compensation for a person whose landholding has been expropriated. It includes provisions on power to expropriate landholdings, notification of expropriation order, responsibility for the implementing agency, and procedures for removal of utility lines. According to the Proclamation, the power to expropriate landholdings mainly rests on wereda or urban administration authorities. Article 3 (1) of the Proclamation states that a wereda or an urban administration shall, upon payment in advance of compensation in accordance with this Proclamation, have the power to expropriate rural or urban landholdings for public purpose where it believes that it should be used for a better development project to be carried out by public entities, private investors, cooperative societies or other organs, or where such expropriation has been decided by the appropriate higher regional or federal government organ for the same purpose.

In addition, the Proclamation deals with determination of compensation having articles on the basis and amount of compensation, displacement compensation, valuation of property, property valuation committees, complaints and appeals in relation to compensation. As per this Proclamation, a land holder whose holding has been expropriated shall be entitled to payment for compensation for his property situated on the land for permanent improvements he made to such land, and the amount compensation for property situated on the expropriated land shall be determined on the basis of replacement cost of the property. For houses in urban areas, the amount of compensation should not be less than the current market value of construction. In addition to the amount of compensation for the property expropriated, the Proclamation also gives a provision for cost of removal, transportation and erection.

3.4.7 Proclamation on Rural Land Administration and Land Use

This Proclamation, Proc. No. 456/2005, came into effect in July 2005, and its objective was to conserve and develop natural resources in rural areas by promoting sustainable land use practices. In order to encourage farmers and pastoralists to implement measures to guard against soil erosion, the Proclamation introduces a Rural Land Holding Certificate, which provides a level of security of tenure.

The MoARD is charged with executing the Proclamation by providing support and coordinating the activities of the regional authorities. Regional governments have an

obligation to establish a competent organization to implement the rural land administration and land use law.

According to the Proclamation where land, which has already been registered, is to be acquired for public works, compensation commensurate with the improvements made to the land shall be paid to the land use holder or substitute land shall be offered. The Proclamation imposes restrictions on the use of various categories of land, for example wetland areas, steep slopes, land dissected by gullies, etc.

3.4.8 Proclamation on Development, Conservation and Utilization of Wildlife

This Proclamation (No. 541/2007) came into effect in August 2007 and its major objectives are to conserve, manage, develop and properly utilize the wildlife resources of Ethiopia; to create conditions necessary for discharging government obligations assumed under treaties regarding the conservation, development and utilization of wildlife; and to promote wildlife-based tourism and to encourage private investment. Under its Part two, the Proclamation provides the categories of Wildlife Conservation Areas to be designated and administered by the Federal Government, Regional States, Private Investors, and Local Communities.

Part three of the Proclamation contains provisions related to economic activities that may be undertaken within a wildlife conservation area, wildlife resource based tourism, and trading in wildlife and their products. Finally, Part four of the Proclamation comprises Miscellaneous Provisions that include Powers and Duties of the MoARD, Regional States and Wildlife Anti-Poaching Officers, Penalty, Repeal and Savings, and Inapplicable Laws.

3.4.9 Proclamation on Forest Development, Conservation and Utilization

Proclamation No. 542/2007, issued in September 2007, provides for the development, conservation and sustainable utilization of forests in satisfying the needs of the society for forest products and in the enhancement of national economy in general. It provides the basis for sustainable utilization of the country's forest resources. The Proclamation categorizes types of forest ownership as private forest and state forest. The Proclamation then goes on to give some specific direction for the development and utilization of private and state forests. Part two of the Proclamation contains provisions for the Promotion of the Utilization of Private Forest, while Part three gives provisions for Conservation, Development and Administration of State Forest. Lastly, Part four comprises Miscellaneous Provisions that, among others, include prevention of forest fire, production and movement of forest products, prohibitions, forest guards and inspectors of forest products movement, and powers and duties of the MoARD and Regional States.

3.4.10 Proclamation on Public Health

The Public Health Proclamation (No. 200/2000) entered into force as of March 9, 2000. Objectives of the Proclamation include enhancing popular participation in implementing the country's health sector policy, promoting attitudinal changes through primary health care approach and promoting healthy environment for the future generation.

The Proclamation has five parts. Part one is called 'General', and focuses on titles and definitions. Part two and three deal with establishment, powers and duties of an Advisory Board and Appointment of Inspectors respectively. Part four is very

comprehensive with 11 articles and other numerous sub-articles on public health. The major articles under part four of this Proclamation include: food quality control, food standard requirements, water quality control, occupational health control and use of machinery, waste handling and disposal, availability of toilet facilities, control of bathing places and pools, disposal of dead bodies, control at entrance and exit ports, communicable diseases and the requirement of health permit and registration before resumption and after completion of construction. Part five is on Miscellaneous Provisions – including obligation to cooperate, penalty, repealed and applicable laws, power to issue regulations, power to issue directives and effective date.

3.4.11 Proclamation on Oromia Rural Land Administration and Use

The Oromia NRS, in line with the powers given to regional governments, has issued Proclamation No. 55/2002, which has the main objectives to establish systems that promote a sustainable use of rural land and to create a conducive environment for rural land administration. Among others, the Proclamation defines the use right, security and obligation of the land users in accordance with the land use and administration policy, and institutional arrangement for implementation of the Proclamation.

The Proclamation states, among other matters, that:

- Any resident of the region aged eighteen years and above, whose life depends on agriculture, has the right to get rural land free of payment;
- Governmental and non-governmental organisations, private investors and social organisations have the right to use rural land through legal process;
- The customary right of access to land for communal use like grazing, ritual ceremonies and public uses shall be maintained for both peasants and pastoralists.

3.4.12 Regulations on Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes

Regulations No. 135/2007, came into force in July 2007, deal with payment of compensation for property situated on landholdings expropriated for public purposes. These Regulations were issued by the Council of Ministers pursuant to Article 5 of the Definition of Powers and Duties of the Executive Organs of the FDRE Proclamation No. 471/2005 and Article 14(1) of the Proclamation No. 455/2005 (discussed under 3.3.6) with an objective of not only paying compensation but also to assist displaced persons to restore their livelihood.

The Regulations contain provisions on assessment of compensation for various property types (including buildings, fences, crops, trees and protected grass), permanent improvement of rural land, relocation of property, mining license, burial ground, and formula for calculating the amount of compensation. In addition, it has provisions for replacement of urban land and rural land, displacement compensation for land used for crops, protected grass or grazing, and provisional expropriation of rural land. Further, the Regulations contain provisions that specify properties for which compensation is not payable and regarding furnishing of data to compensation committee, records of property, evidence of possession and ownership, and valuation costs.

3.4.13 International Conventions and Protocols

Environmental protection related International Conventions and Protocols to which Ethiopia is a signatory include the following:

- Vienna Convention for the Protection of the Ozone Layer, 1985
- Convention on International Trade in Endangered Species of Wild Fauna and Flora “CITES”, ratified by the government on 5/04/1989
- United Nations Framework Convention on Climate Change, ratified on 5/04/1994 through proclamation 92/1994
- Convention on Biological Diversity, ratified by the government on 5/04/1994 through proclamation 98/1994
- United Nations Convention to Combat Desertification, ratified by the government through proclamation No. 80/1992, signed on 15/10/1994
- Montreal Protocol on Ozone Depleting Substance, ratified by the government on 11/10/1994
- Convention on the Prohibition of the Development, Production, Stockpiling and use of Chemical Weapons and their Destruction, 1995
- Global Environmental Facility (GEF); the EPA has been officially designated as an Operational Focal Point for GEF projects in Ethiopia as of 11 October 1997
- Basel Convention on Trans-boundary Hazardous and Toxic Wastes, ratified by the government 2/10/2000

3.5 Environmental Assessment Guidelines

In order to facilitate the implementation of the environmental laws discussed above, EPA has issued a number of environmental guidelines. Among these are the technical and procedural EIA guidelines, which were issued in 2000 and 2003 respectively. They are intended to guide developers, competent agencies and other stakeholders in carrying out EIAs. The procedural guideline details the required procedures for conducting an EIA, the permit requirements, the stages and procedures involved in EIA process, and the roles and responsibilities of parties involved in the EIA process. It also includes the categories of projects (schedule of activities) concerning the requirement of EIA, and list of project types under each category.

The technical guideline specifies tools particularly standards and guidelines that may be considered when engaging in the EIA process, and details key issues for environmental assessment in specific development sectors. The Guideline provides the categories, the relevant requirements for an EIA and lists project types under each category. In accordance with this Guideline, projects are categorized into three schedules:

- Schedule 1: Projects which may have adverse and significant environmental impacts and therefore require a full Environmental Impact Assessment.
- Schedule 2: Projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but are not likely to warrant a full EIA study.
- Schedule 3: Projects which would have no impact and do not require an EIA.

In general, water supply and sanitation projects that are likely to have significant environmental and social effects would fall into Schedule 1. Urban water supply

schemes based on abstraction from surface water sources are not specified in the guideline. Therefore, expert's judgment based on the anticipated environmental and social impacts has been used to determine to which schedule the Sub-project would fall. Thus, the Jimma WSSP was assumed as Schedule 2 because its implementation is likely to cause some significant environmental impacts. Therefore, further assessment was considered to identify and evaluate the magnitude and significance of the potential impacts and to recommend corresponding mitigation measures.

In addition, the EIA laws and guidelines of Ethiopia require the preparation of environmental impact statement (EIS)/EIA report and its submission to the EPA or REA for projects requiring EIA. Further, the legal documents state that an EIS should contain sufficient information that enable the determination of whether or under what conditions the project should proceed, and provides a list of contents that should be in the EIS as a minimum requirement.

3.6 Administrative and Institutional Framework

3.6.1 Federal Democratic Republic of Ethiopia

The Federal Democratic Republic of Ethiopia (FDRE) comprises the Federal State and nine Regional State members. The power and duties of the government at the different levels (Federal, Regional and Local) in terms of power and duties, including on fiscal matters, have been defined by the Constitution, Proclamations Nos. 33 of 1992, 41 of 1993, and 4 of 1995. Under these proclamations, duties and responsibilities of Regional States include planning, directing and developing social and economic programs, as well as the administration, development and protection of natural resources of their respective regions.

3.6.2 Oromia National Regional Government

The Jimma WSSP is situated in the Oromia National Regional State (NRS), which is one of the regional states established by the Federal Government. Oromia is the largest regional state both in terms of surface area and population size, and its capital is Finfinne (Addis Ababa). For administrative purposes, the region is divided into zones, Woredas (districts) and kebeles (the grass-root administrative level). The basic administration unit is the Woreda and each Woreda is sub-divided into Kebeles. Each administrative unit has its own local government elected by the people. Based on the powers and responsibilities of the regional governments, the Regional Government has established Sectoral Bureaus, Commissions and Authorities.

3.6.3 Environmental Protection Authority

The National Environmental Protection Authority (EPA) was re-established under Proclamation No. 295/2002 as an autonomous public institution of the Federal Government of Ethiopia entrusted with the protection and conservation of natural resources in Ethiopia. The general role of the EPA is to provide for the protection and conservation of the broad environment, through formulation of policies, strategies, laws and standards, which foster social and economic development in a manner that enhance the welfare of humans and the safety of the environment sustainable.

One of the environmental policies of the EPA is to protect and rehabilitate the fundamental causes that lead to degradation, adverse effects and determine mitigation measures. The policy is usually integrated and compatible to fit to a long term economic development strategy known as agricultural development-led

industrialization (ADLI) and other key policies. As per sub-article 2 of article 6 of Proclamation No.9 of 1995, environmental development and management as well as protection in Ethiopia are designated. In this case the socio-environmental assessment needs to be reviewed and incorporated into different road project phases: at designing & planning, construction, monitoring, post-project evaluation and maintenance phases.

The EPA is the Competent Agency at the Federal level in Ethiopia. It is, therefore, the responsibility of this authority in the EIA process to:

- ensure that the proponent complies with requirements of the EIA process;
- maintain co-operation and consultation between the different sectoral agencies throughout the EIA process;
- maintain a close relationship with the proponent and to provide guidance on the process; and
- evaluate and take decisions on the documents that arise from the EIA process.

3.6.4 Sectoral Environmental Unit

The Proclamation No. 295/2002, which is briefly described in section 2.2.2, requires at the Federal level each sectoral ministry to establish in-house Environmental Protection Unit to ensure harmony with respect to implementation of the environmental proclamations and other environmental protection requirements. This Unit forms a lower level inter-sectoral co-ordination structure.

3.6.5 Regional Environmental Agencies

In accordance with the principles of government decentralization and the Proclamation no. 295/2002, each national regional state shall establish an independent Regional Environmental Agency or designate an existing agency that shall, based on the Ethiopian Environmental Policy and Conservation Strategy and ensuring public participation in the decision making process, be responsible for:

- coordinating the formulation, implementation, review and revision of regional conservation strategies; and
- Environmental monitoring, protection and regulation.

The Proclamation also states that regional environmental agencies shall ensure the implementation of federal environmental standards or, as may be appropriate, issue and implement their own no less stringent standards. Finally, the Proclamation states that regional environmental agencies shall prepare reports on the respective state of the environment and sustainable development of their respective states and submit them to the EPA.

For the Oromia NRS in which the Jimma WSSP is located, the *Oromia Bureau of Land and Environmental Protection (OBoLEP)* is responsible for environmental protection matters in the Region. The Bureau is responsible for the review and approval of EIA of development proposals under the mandate of the Regional Government and follow up of the implementation of EIA recommendations of such proposals. Therefore, project proponents in the Region should operate in close cooperation with the Bureau to ensure that the adverse environment effects of development proposals are properly identified and their mitigation or management actions incorporated in the project design or planning and implemented at the right time. Similar to the federal level, an Environmental Impact Study Report should be

prepared by the project proponents and examined, commented and approved by the *OBoLEP*.

3.6.6 Ministry of Water Resources

The Federal Ministry of Water Resources (MoWR) is charged with aspects of water sector policy, planning, water resources regulation, development and use. It has formulated the Federal Water Resource Management Policy and Water Sector Development Programmes.

The powers and duties of the MoWR are summarised below:

- Determine conditions and methods required for the optimum allocation and utilisation of water that flows across or lies within more than one Regional Governments and among various users and regions;
- Prepare draft laws concerning the protection and utilisation of water resources;
- Issue permits to conduct and operate water works;
- Undertake studies pertaining to the utilisation of waters of trans-boundary rivers and, upon approval, follow up their implementation;
- Prepare plans that help to utilise properly water resources for development purposes and supervise their implementation upon approval; and
- In co-operation with the appropriate organs, prescribe the quality standards for waters to be used for various purposes.

4 METHODOLOGY OF THE ESIA STUDY

4.1 General

This Environmental and Social Impact Assessment (ESIA) study has been carried out in accordance with the Terms of Reference (TOR) provided in Annex A of the Contract Agreement for the Consultancy Service. Based on the TOR and good EIA practice, the Consultant has adopted the following methodology to conduct the ESIA study:

- Review of national environmental policy, strategies, legislations and guidelines as well as the WB Safeguard Policies,
- Review of relevant previous studies in the town in particular and in the region in general,
- Undertaking consultations with the key stakeholders including the project affected people and conducting public consultations,
- Collection of relevant secondary data from relevant Government offices,
- Detailed field surveys in the project influence areas to collect site specific baseline primary data and identify potential impacts,
- Conducting impact analysis (identification, prediction and evaluation) using relevant guidelines and standards,
- Developing feasible and cost-effective mitigation plan as well as environmental management and monitoring plan.

4.2 Review of Policy and Legal Framework

In conducting ESIA study of any development proposal, it is essential to understand the national and regional environmental policies, strategies and legislations as well as the environmental policies or procedures of the project financing agency/agencies. Accordingly, after having a clear knowledge of the proposed project components or activities, Ethiopia's environmental policies, procedures/ guidelines and pertinent legislations as well as the World Bank's Safeguard Policies were thoroughly reviewed. This helped the Consultant to screen the envisaged WSS Project, establish which policies are triggered by the project and determine appropriate level of environmental assessment for the planned investments. It also assisted in recommending appropriate mitigation measures in compliance with the pertinent Bank's safeguard policies as well as the national and regional statutory requirements. Finally, a brief description of the relevant environmental policies and legislative framework within which the environmental assessment was undertaken is provided in Chapter 3 and their list is given in the list of references.

4.3 Review of Previous Studies

Relevant documents on previous studies for the envisaged JWSSP and other pertinent previous studies in the region were collected from the MoWR, the Project Office at JWSSE, the Consultant's Archive and other sources. These documents were exhaustively reviewed in order to have a clear understanding of the project features and the project area. In addition, all relevant data and information presented in the documentation was extracted and combined with the data collected from field surveys, relevant Government offices and consultations made with different

stakeholders, and used to describe the project features and the baseline environmental condition, as well as to identify the potential impacts of the project. The full list of the documents consulted is given in the list of references.

4.4 Field Surveys and Data Collection

The Consultant conducted a field visit to the project area to undertake three major tasks, including:

- To collect secondary data from the relevant Government offices and NGOs working in the project area,
- To carry out intensive investigations of the project sites and its neighboring areas or project impact zones in order to collect primary data and identify potential impacts and issues related to the implementation and operation of the planned sub-project, and
- To conduct consultations with the key stakeholders (the details on this activity are described in section 4.5 below).

Relevant secondary data was collected from the pertinent government offices operating in the Jimma town. Also, applicable data was gathered from concerned offices of the Kersa Woreda, which is located in the downstream of the project site particularly along the Gilgel Gibe river in order to assess downstream issues or possible impacts in the indirect impact zone.

In addition, the Consultant conducted intensive field surveys at all the major sub-project components including the intake weir on the Gilgel Gibe river, raw water rising main, new water treatment plant, pumping stations, clear water rising main, reservoir sites, and distribution sub-mains. This task, besides the acquisition of baseline data on environmental and social characteristics of the project area, enabled the Consultant to identify and register potentially affected resources located within the direct impact zone, and to have a clear understanding of the potential environmental impacts of the planned project activities. During the site investigations, special attention was paid to environmentally or socially sensitive areas or issues so that due emphasis was given during the significance analysis of the identified impacts and development of corresponding mitigation measures.

Furthermore, for the purpose of water quality analysis, water samples were collected from selected locations from GGR and its tributary (Aweytu R.) and sludge released from the existing water treatment plant. This task was performed at the end of the environmental field survey and the samples were brought to the WWDSE Laboratory in Addis Ababa. Then, the samples were analyzed for physical and chemical parameters and the laboratory test results were interpreted and compared with the WHO and Ethiopian drinking water quality guidelines in order to see the suitability of the water source for the intended purpose, i.e. for drinking and other domestic uses.

Those primary and secondary data gathered through the above indicated activities, combined with the information and data gained from the review of previous studies and stakeholders consultations, have been utilized to:

- describe the existing environmental and social conditions of the project area, categorizing as physical, biological and socio-economic environment (in Section 5), and
- identify and characterize possible environmental and social impacts of the planned water supply project (in Section 6).

4.5 Public and Stakeholders Consultations

Consultation with key stakeholders including the project-affected people (PAP) has been one of the essential elements of the ESIA process. The key stakeholders at different administrative levels as well as at the grass-root community level were identified before and during the environmental and social field survey. They identified stakeholders were informed about the envisaged project and consulted about the following measures issues:

- baseline environmental and socio-economic conditions including constraints of the study area,
- environmental and social impacts, both positive and negative impacts, likely to result due to the implementation or operation of the project,
- measures or actions that can be taken to avoid or minimize existing problems and potential adverse impacts of the envisaged project, and
- their perceptions and attitudes towards the proposed project.

Information related to existing environmental and socioeconomic features of the project influence areas, as well as the attitudes of the consulted parties towards the planned water supply project were obtained during the consultations and interviews. These information and opinions have been considered in the impact analysis and development of mitigation, management and monitoring plans. The details of the stakeholders consultation process and the key findings are described in Chapter 8. The list of persons and organizations consulted during this ESIA study is presented in Appendix 1 and the minutes of the meetings in Appendix 4 and 5.

4.6 Impact Prediction, Significance Analysis and Development of Mitigation Measures

Subsequent to the evaluation of the baseline conditions and analysis of stakeholders opinions, positive as well as negative environmental and social impacts likely to result from construction and operation of the planned water supply project have been identified, predicted and analyzed for significance. The possible impacts have been assessed being classified as impacts on physical, biological, and socio-economic environments.

The identified potential environmental and social impacts have also been analyzed for their status (beneficial/adverse), magnitude, geographical extent, duration in time, likelihood of occurrence, and potential for effective mitigation. The combination of these parameters have been summarized in an all-encompassing measure of “significance”, which is the basis for impact assessment and prioritization of mitigation. Corresponding to the significance of impacts, appropriate mitigation measures have been recommended to prevent or minimize the adverse impacts, and enhancement measures for the beneficial impacts. The details of the impact analysis are presented in Chapter 6.

In the impact prediction and evaluation of significance as well as synthesis of the ESIA Report, the following guidelines and standards have been consulted:

- The EPA EIA Guideline Document (issued in 2000) which provides the schedule of projects based on their expected environmental impacts - used to screen the project and determine the level of assessment required,
- The EPA's EIA Directive (issued in 2008) - served as above purpose,
- Regional Guideline Series Document for Reviewing Environmental Impact Report (issued in 2006) – used for establishing report structure and contents,
- The World Bank Safeguard Policies – used for project screening and determining the level of assessment required,
- WHO and Ethiopian Drinking Water Quality Guidelines – used for evaluating the permissible concentration of water quality parameters for human consumption,
- Relevant Standards such as the EPA's Industrial Pollution Control in Ethiopia (2003) – used for evaluating effluent (sludge) discharge requirements,
- The EPA's Guideline Ambient Environment Standards for Ethiopia (2003),
- The World Bank Environmental Guideline for Water Supply and Sanitation Projects,
- Effluent Discharge Requirements Proposed by the World Bank , and
- Regulations on Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes (Regulations No. 135/2007) – considered for impacts on properties and land uses.

5 DESCRIPTION OF BASELINE CONDITION

5.1 Physical Environment

5.1.1 Topography

The major part of Jimma town, including the central, southern and western parts, is characterized by flat to gently sloping/undulating topography, while the northern and eastern parts of the town and its peripheries are characterized by hilly/ sloping landscape. Most of the major sub-project components, including the Clear Water Rising Main, the Main Reservoir, the New Distribution Sub-mains, and Aba-Jifar Reservoir, are situated in the latter part of the City. The elevation within the town boundary and its peripheries ranges from around 1700 masl in the south/along Gilgel Gibe river to over 2000 masl in the northern periphery of the town, i.e. in the Jiren area.

5.1.2 Climate

The project area is characterized by temperate humid climate that has high precipitation, warm temperature and long wet period. The mean annual rainfall in the area is around 1500mm and annual potential evaporation is about 1465mm. The rainfall pattern shows major seasonal variation ranging from mean monthly rainfall of about 38mm in January to 229mm in August. The main rainy season extends from April to September.

The mean temperature is between around 12°C and 29°C with the mean daily temperature of 19.5°C. As described in the Jimma City Profile of 2008/2009, temperature variation is observed among seasons with the warmest season extending from February to April and the coldest season from July to September.

5.1.3 Geology and Soils

On the basis of information provided in the Jimma City Profile of 2008/2009, the geological formation of the Jimma area consists of various Tertiary Volcanic and younger Quaternary Sediments. Due to mostly thick soil formation and good vegetation cover, outcrops of the volcanic rocks are not common in the area. The volcanic rocks vary from basalt to rhyolites in lithology and include basaltic flows, acidic flows, ignimbrites and tuffs of the so-called Maqdala and Ashange groups.

Two major soil types are observed in Jimma area. These are reddish brown residual soils and alluvial soils of brownish gray and grayish white clay soils. The reddish brown soils are well-drained soils which are found in the hilly and rolling/sloping areas. Whereas the alluvial soils are found in the low-lying flatter or gently sloping plains and these soils are poorly drained.

5.1.4 Drainage and Water Resources

Jimma town is situated within the Gilgel Gibe river catchment. Gilgel Gibe river originates from highland areas in the west of Jimma and generally drains eastwards. Locally, the Jimma town is drained by two perennial rivers, namely Aweytu and Kitto, which join and pass through the Boye Swamp before they join the Gilgel Gibe river. It is worth-mentioning that almost the whole part of the town's catchments drain to Awetu and Kitto rivers, and the streams are highly polluted by domestic and urban wastes including uncontrolled discharge of sewage from residential as well as commercial areas. Nevertheless, the river water is assumed to undergo some self-

purification process while it passes through the Boye Swamp. The Swamp is an artificial water body created by a small dam, which is said to be constructed during the Italian occupation for the purpose of fishery development, and it is entirely covered by wetland plant communities predominantly sedges (see Photo 9). The Aweytu river after passing through the Swamp joins the Gilgel Gibe river just a few hundred meters below the dam. The intake weir for the Jimma town water supply is located at a few hundred meters upstream of the confluence of Aweytu and Gilgel Gibe rivers. This avoids pollution risks that could be posed by the Aweytu river water if the intake was located below the confluence.

At the intake weir site, the Gilgel Gibe river has mean annual flows of about $12\text{m}^3/\text{s}$ with the highest mean flow of $46.2\text{m}^3/\text{s}$ in September and the lowest mean flow of $3.3\text{m}^3/\text{s}$ in April. The minimum recorded flow of the river is around $1.4\text{m}^3/\text{s}$ which is in the month of March and is considered as the drought flow of the river.



Photo 3: A downstream view of the Gilgel Gibe River at the Intake Weir Site during low flow in March (LS) and during high flow in June (RS)



Photo 4: A view of Aweytu Rivert before confluence with GGR during low flow in March (LS) and during high flow in June (RS); highly polluted during the low flow though it passes through the Boye Swamp.

5.1.5 Water Quality

Water quality data is one of the important parameters that indicate the environmental quality of a given ecosystem. Therefore, water quality analysis was carried out with the following two main objectives:

- To assess the current water quality status of the Gilgel Gibe River (GGR) including any risk of water pollution in the catchment and determine its fitness for drinking water supply, and
- To establish baseline water quality data that would serve as the basis for future water quality monitoring.

In order to achieve these objectives, water samples were collected from selected sampling stations during low flow in March and during high flow in June and analyzed for physical and chemical parameters in the Laboratory of the WWDSE. The selected sampling sites are GGR at the intake weir site; GGR below the confluence of Aweytu river; Aweytu river at outflow of Boye Swamp or at upstream of the discharge of the sludge from EWTP; Aweytu river after the discharge of the sludge (i.e. Aweytu river water plus sludge water); and Sludge water released from the EWTP. The analytical results of the water samples are presented in Table 5.1 below. Concerning bacteriological parameters, the results of bacteriological analysis conducted by the Jimma Town Water Supply and Sewerage Enterprise (JWSSE) were used since it was not feasible to carry out this test during the present study. The results are evaluated in comparison with the WHO and Ethiopian Drinking Water Quality Guidelines.

According to the results of the water quality analysis, Gilgel Gibe River and the other water sources have low measurements for hardness, total solids, total dissolved solids and electrical conductivity that are far below the maximum allowable values shown in both the WHO and Ethiopian guidelines. Thus, the water sources have no limitation for drinking water supply in terms of these parameters. The average hardness of GGR water at the intake site is 50.4 mg/l (76 mg/l in March & 24.7 mg/l in June), and it will not cause any adverse effects such scale deposition in the distribution system and scum formation, which could be the case when hardness of the water is over 200 mg/l. Nevertheless, it may cause corrosive effect on pipelines and concrete works. The average measurement of total solids (TS) and total dissolved solids (TDS) of the GGR is 217 mg/l and 67.5 mg/l respectively, which is considered very good and potable. The mean electrical conductivity (EC) of the GGR is 105.5 $\mu\text{S}/\text{cm}$ indicating very low dissolved solids in the river water and it is very suitable for drinking and other domestic uses.

The mean pH value of Gilgel Gibe River and the other sources ranges between 6.4 and 6.9, which is nearly in the normal range for potable water. The optimum pH value for domestic water supply is usually in the range of 6.5 to 8.5; the Ethiopian drinking water guideline value is in the range of 6.5 to 9.2. The pH value of Aweytu river is relatively low/ lower than the value of GGR, which could be due to urban pollution and wetland effects, resulting in production of gases like hydrogen sulphide and methane, which can attribute for low pH value.

The average concentration of Sodium, Calcium, Magnesium and Chloride of the GGR is 5.6 mg/l, 12.2 mg/l, 4.8 mg/l and 0.95 mg/l respectively. These values are very low

compared to the permissible level indicated in the WHO and Ethiopian guidelines. Similarly the Fluoride concentration of GGR is low, which is only 0.5 mg/l, and this is far below the WHO guideline value, which is 1.5 mg/l. The mean sulphate content of the GGR, measured as 1.23 mg/l, is also very low, and this level of the constituent will not impose any damaging reactions with mortar pipes and concrete works.

The average iron concentration of GGR water at the intake site is 0.67 mg/l, which is below the Ethiopian guideline value (1.0 mg/l) but above the WHO guideline value (0.3 mg/l). This level of iron content is not expected to pose adverse effects such as colour changes to the water and deposition of a slimy coating on the pipelines that result from oxidation of ferrous iron to ferric iron by the bacteria that derive their energy through this process.

The mean ammonia concentration measured in the GGR at the intake weir is 1.27 mg/l, with 0.45 mg/l in March (during low river flow) and 2.09 mg/l in June (during high river flow). These values are above the usual range for surface water resources, which is below 0.2 mg/l, and these values exceed the drinking water guideline value of Ethiopia, i.e. 0.1 mg/l. The relatively higher concentration of ammonia may be partly attributed to livestock population in the catchment and partly to metabolic activities in the seasonally flooded areas along the GGR that may create anoxic condition.

Nitrate and nitrite are also important parameters that need to be considered in drinking water quality. The mean nitrate concentration of GGR is 3.15 mg/l whereas the concentration of nitrite is trace. These levels of the constituents are far below the maximum permissible concentration of the drinking water guideline values of the WHO and Ethiopian Standards. Nevertheless, regular monitoring of the elements is desirable since the use of inorganic fertilizers in the catchment may pose pollution risks as a result of leaching or runoff from agricultural fields. The concentration of phosphate in the GGR is also low, with mean value of about 0.2 mg/l (0.30 mg/l in March & 0.07 mg/l in June). Nitrate and Phosphate are often used as indicators of agricultural pollution and at present there is no indication of such problem in the project area.

In summary, the physical and chemical quality of the Gilgel Gibe river water at the intake weir is very good for drinking water supply. Nevertheless, the measurements of two parameters - turbidity and ammonia – exceeded the maximum permissible level indicated in the WHO and Ethiopian Standards. The turbidity of the river water in the wet season is very high (about 7 times the measurement of the dry season), which is attributed to intensive agricultural activities esp. cultivation in the catchment. In addition, based on visual observation, the colour appearance of the river water is not acceptable for drinking water. Regarding bacteriological parameters, the raw water of Gilgel Gibe river does not meet the quality standards of drinking water. Therefore, the river water can be used for the intended town water supply with appropriate conventional treatment.

Table 5.1: Results of Water Quality Analysis of Gilgel Gibe and Aweytu Rivers and Sludge Water

Source	Gilgel Gibe R. at Intake Weir		GGR at d/s of Aweytu R. Confluence		Aweytu R. at Outlet of Boye Swamp		Aweytu R. before GG R. Confluence	Sludge water released by EWTP	WHO maximum allowable concentration (mg/l)	Ethiopian maximum permissible level of drinking water quality
	14/3/10	26/6/10	14/3/10	26/6/10	14/3/10	26/6/10	14/3/10	26/6/10		
Date of Collection	14/3/10	26/6/10	14/3/10	26/6/10	14/3/10	26/6/10	14/3/10	26/6/10		
Date Received in Lab.	15/3/10	28/6/10	15/3/10	28/6/10	15/3/10	28/6/10	15/3/10	28/6/10		
Colour (app)	-	-	-	-	-	-	-	-		50
Turbidity (NTU)	26.0	184.0	16.0	165.0	16.0	134.0	15.0	1677.0	5.0	25
Total Solids 105°C (mg/l)	130.0	304.0	126.0	310.0	148.0	226.0	148.0	2630.0	-	1500.0
T. Dissolved Solid 105°C (mg/l)	90.0	45.0	96.0	47.0	116.0	58.0	118.0	60.0	1000.0	
Electrical Conductivity (µS/cm)	141.0	70.0	150.0	74.0	183.0	91.0	184.0	94.0	-	
p ^H	7.6	6.28	7.27	6.31	6.7	6.18	6.93	5.19	6.5 - 8.5	6.5 - 9.2
Ammonia (mg/l NH ₃)	0.45	2.09	0.22	2.21	0.26	1.79	0.22	0.19	-	0.10
Sodium (mg/l Na)	7.0	4.2	7.9	5.0	9.9	5.3	9.6	5.2	200.00	
Potassium (mg/l K)	3.1	2.1	3.2	2.6	4.4	3.8	4.3	1.9	-	
Total Hardness (mg/l CaCO ₃)	76.0	24.7	57.0	22.8	76.0	26.6	85.50	24.7	500.00	500.00
Calcium (mg/l Ca)	19.0	5.37	17.50	4.56	22.80	6.87	19.00	6.87	200.0	200.0
Magnesium (mg/l Mg)	6.9	2.76	3.22	2.76	4.60	2.30	9.20	1.84	150.0	150.0
Total Iron (mg/l Fe)	0.22	1.12	0.51	1.36	2.77	1.33	2.06	Trace	0.3	1.00
Manganese (mg/l Mn)	Trace	-	Trace	-	Trace	-	Trace	-	0.1	0.50
Fluoride (mg/l F)	0.6	0.38	0.22	0.16	0.36	0.26	0.28	0.18	1.5	
Chloride (mg/l Cl)	1.0	0.9	1.99	1.9	4.96	1.9	4.96	1.9	250.0	600.00
Nitrite (mg/l NO ₂)	Trace	0.125	Trace	0.29	Trace	0.125	Trace	0.01	Trace	
Nitrate (mg/l NO ₃)	3.3	2.99	3.41	4.2	1.40	4.73	1.63	2.96	45.0	Not specified*
Alkalinity (mg/l CO ₃)	79.8	33.6	73.5	31.5	84.0	42.0	90.0	10.5	-	
Carbonate (mg/l CO ₃)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	-	
Bicarbonate (mg/l HCO ₃)	97.36	40.99	89.67	38.43	102.50	51.24	110.20	12.81	-	
Sulphate (mg/l SO ₄)	0.86	1.6	0.95	1.7	2.26	1.5	1.71	24.6	400.0	400.0
Phosphate (mg/l PO ₄)	0.304	0.07	0.30	0.06	0.36	0.06	0.40	0.03	-	
Total Coliform per 100ml**	High	-	-	-	-	-	-	-	-	10
Faecal Coliform per 100ml**	High	-	-	-	-	-	-	-	-	Nil

Note: * For Nitrate the highest desirable level is 10mg/l; ** The results of bacteriological analysis made by the JWSSE

5.1.6 Land Use and Land Cover

According to the recently revised master plan of the Jimma, the town has a total area of 46.23km². Of the total land area of the town, about 25.7% is planned for residential buildings development, 2.65% for commercial activities, 4.01% for industrial developments, 10.6% for social & public services, 2.6% for administrative zone, 15.4% for road development, and the remaining 39.1% for other infrastructures.

The current land use/land cover of the areas at or around the major sub-project components is briefly described in Table 5.2 below. Photos 5, 6, 7 and 8 depict the land cover along the major project components.

Table 5.2 Land use and land cover patterns around the major sub-project components

	Project Components	Land use and land cover types	
		Dominant	Others
1	Intake Site and Raw Water Rising Main	Agricultural land used for maize cultivation & vegetables	Boye swamp, grazing land, road & some Acacia trees
2	New Treatment Plant Site	Grazing land	Some indigenous trees and bushes
3	Clear Water Rising Main	State plantation forest mixed with indigenous trees and bush-land	A few houses and asphalt road (Addis-Jimma road)
4	Main Reservoirs at Jiren Kella	Bush land with some indigenous trees & immature plantation trees	none
5	Sub-main connecting Ginjo & Hospital Reservoirs	State plantation forest mixed with indigenous trees and bush-land	Settlement areas, farmlands, grazing lands & plantation trees & remnant indigenous trees
6	Sub-main connecting Boye Subsystem	State plantation forest mixed bush-land & indigenous trees	Some houses, homestead plantations and asphalt road
7	Sub-main connecting Aba-Jifar Reservoir	Settlement/ built up areas and plantation trees	Farmland, perennial crops, remnant indigenous trees, bushes & shrubs, graveyard at Mosque 40, Aba-Jifar palace & gravel road
8	Aba-Jifar Reservoir	Grazing land & settlement	Aba-Jifar palace & road
9	Distribution Systems	Built up areas	Plantation trees, roads



Photo 5: A general view of the land cover along the corridor of the Aba Jifar Transmission Line.



Photo 6: A view of dense bush-land & plantation forest in the corridor of the CWRM, JK Main Reservoir and Boye Sub-main.

5.2 Biological Environment

5.2.1 Vegetation and Flora

(i) Vegetation Types and Their Floristic Composition

The Jimma town and its environs including the areas in which the major project components are situated have little undistributed natural vegetation or forestland. The vegetation and its floristic composition in the areas of the major project components are briefly described below.

(ii) Intake, RWRM and NWTP Sites

The original vegetation of these sites have been totally modified by human activities and currently they are covered by some scattered trees, bushes and shrubs, most of which are secondary vegetation. The Gilgel Gibe river banks including the intake site is covered by very narrow strip of bushy and shrubby vegetation, dominantly *Salix subserrata*, which is a riverine shrub or small tree, and others include *Senna*, *Sesbania* & *Solanum* species, which are shrubby plant communities. At most places these plant communities overhang or half-submerge the inshore zone of the river. Whereas the corridor of the Raw Water Rising Main (RWRM) and the New Water Treatment Plant (NWTP) site are covered by some remnant *Acacia* trees (*Acacia abyssinica* & *A. polystachya*) and other plant communities (see Photos 2 and 8).

In addition, the RWRM runs nearby the Boye Swamp, which is covered by plant species that are often characteristic of wetland habitat (see Photo 9). The dominant species in the wetland area are *Typha latifolia*, *Cyperus latifolius* and *Cyperus rotundus*. The RWRM runs along the crest of small dam/dyke that had formed the Swamp. The detailed list of plant species identified from the project sites is presented in Appendix 2.

(iii) CWRM, MR and Ginjo & Boye SMs

These project components are located mostly in areas that have relatively dense vegetation/forest cover. Of the total approximate length of 5.40km of the project

components, about 3.4km (63%) is located within the Jiren State Plantation Forest. More specifically, 80% of the CWRM, 70% of the Boye SM, 60% of Ginjo SM and the Main Reservoir lie within the boundary of the plantation forest. The remaining sections pass through settlement areas, farmlands and grazing areas, as well as areas covered by homestead plantation trees and remnant indigenous trees and bushes.

The Jiren Plantation Forest (JPF) comprises predominantly exotic tree species (mainly Eucalyptus and Cypress), which are in some parts interspersed or mixed with some indigenous trees and patches of bush lands. The JPF is a protected state forest, which is presently managed by the newly established Oromia Forest and Wildlife Development Enterprise. The tree species composition of the forestland is dominantly Eucalyptus spp. (mainly *E. camandulensis* & *E. grandis*) and Cypress (*Cupressus lusitanica*). The indigenous tree species include *Albizia schimperiana* ('Ambabeesa'), *Combretum molle* ('Rukeensaa'), *Croton macrostachys* ('Makaniisa'), *Olinia rochetiana* (Nolee) and *Syzygium guineense* ('Badeessa'), (the names in brackets are in Oromifa/local name); see Appendix 2 for the detailed list of plant species found in the area. Photos 6 and 7 show parts of the JPF and natural vegetation in the area.

(iv) Aba Jifar SM and Reservoir Areas

The corridor of the Sub-main connecting to the Aba-Jifar Reservoir has significant plantation trees dominantly Eucalyptus spp. and Cypress and some other exotic tree species like Graviella. Also several species of remnant indigenous trees and bushy and shrubby vegetation are significant in the corridor of the Sub-main. The major indigenous tree species commonly observed in the area include *Cordia africana* ('Woddeesa'), *Acacia abyssinica* ('Laftoo'), *Erythrina brucei* ('Wolensuu'), *Albizia schimperiana* ('Ambabeesa'), *Croton macrostachyus* ('Makaniisa'), *Millettia ferruginea* ('Askiraa'), *Sapium ellipticum* ('Bosooka') and *Vernonia amygdalina* ('Eebbicha'); see Appendix 2 for more detail list of plant communities identified from the area..

(v) Endemic and Threatened Species

Of the plant species identified from the project area, only two tree species, namely *Erythrina brucei* and *Millettia ferruginea*, are known to be endemic to Ethiopia. According to the IUCN conservation categories, these species are under the 'Least Concern' category and are common in the southwestern Ethiopia including the project area, as well as in many other places of the country.



Photo 7: A view of Jiren Forest area in which the JKMR, CWRM, and Boye & Ginjo SMs are located.



Photo 8: A view of some potentially affected Acacia trees along the Raw Water Rising Main.

5.2.2 Wildlife

Since most part of the project area is highly disturbed and contains heavily degraded habitats, it harbours very limited wildlife resources. Nevertheless, some parts of the periphery areas of the town particularly the Jiren Plantation Forest are important habitats for some wildlife species. As reported by the local people and the Jimma Zone Forestry and Wildlife Development Enterprise, Hyenas are the predominant mammal species inhabiting the area, and other prominent mammals include Anubis baboon, Grivet monkey, Colobus monkey, Bush duiker and Common jackal.

In addition, the project area contains a variety of birdlife though comprehensive study on their species composition has not been carried. The bird species observed during the field survey include Ducks, Eagles, Vultures, Doves, Pigeons, Egrets, Herons, Buzzards, Wattled ibis etc. More diverse bird species were observed in the Jiren Forest area, while several species were seen in the Boye Swamp area, along the Gilgel Gibe River, and other parts of the project area.

With regard to aquatic life, the Gilgel Gibe river supports some aquatic fauna. As indicated by local informants and local experts, Gilgel Gibe river is a perennial habitat for Hippopotamus, while the Boye Swamp is a seasonal habitat for the animal, i.e. during high water levels in the wet season. In addition, based on existing information obtained from previous surveys and local informants as well as observation made during the environmental field survey, the Gilgel Gibe river contains two fish species, namely Tilapia and Barbus fish in the stretch around the project site. These fish species belong to two families, namely Cichlidae and Cyprinidae for Tilapia and Barbus respectively. During the site visit it was observed that some individuals practicing fishing in the Gilgel Gibe river at upstream as well as at downstream of the intake weir site (see Photo 10). The local people interviewed and the Jimma Zone Animal Resources Development Agency indicated that fishing is practiced sometimes and at limited scale. The list of fauna found in the project area is presented in Appendix 3.

Endemic and Threatened Species

Of the faunal species identified from the project area, only a single bird species, i.e. Wattled ibis, is known to be endemic to Ethiopia. This bird species was observed in the Boye Swamp; the water supply project is not expected to cause any impacts on this wetland habitat. According to the IUCN Red List, none of the identified fauna are classified as threatened species.



Photo 9: A view of Boye Swamp – totally covered by sedges & other wetland plants.



Photo 10: Fish caught from the GGR.

5.3 Human Environment

5.3.1 Demographic Features

The 1994 Population and Housing Census of Ethiopia identified a total of 88,867 people living in Jimma town in 1994, out of whom 43,874 were males and 44,993 females accounting 49.4 and 50.6% respectively. Based on the 1994 Census result, the projected total population size of Jimma town in Year 2007 was 167,359. However, according to the 2007 Population and Housing Census of Ethiopia, the total of population of Jimma in Year 2007 was only 120,600, out of which male and female were accounted 50.24% and 49.76% respectively. This indicates that the population of Jimma has been growing at the rate of 2.3% per annum during the period between the two censuses.

Ethnic and Religious Composition

As is true for other urban centers of the country, Jimma consists of heterogeneous population in terms of ethnic and religious composition. In view of this, Oromo, Amara, Dawro, Gurage and Kafficho are the five major ethnic groups living in Jimma and their proportion is given in Table 5.3 below.

Table 5.3: Major ethnic groups in Jimma

S. No	Ethnic Groups	%	S. No	Ethnic Groups	%
1	Oromo	36	4	Gurage	7
2	Amara	23	5	Kefficho	7
3	Dawro	13	6	Other	14
				Total	100

Source: Projection based on 1994 Census Report

Similarly, the population of Jimma is heterogeneous in terms of religion. Thus, adherents of Orthodox Christian account 60%, Muslim 33%, Protestant 6% and Catholic 0.4%, others 0.4% and not stated 0.2%.

Population Structure

Population structure in terms of age-sex composition is very important in demographic studies. Age structure is very important variable in measuring potential school age population, voting population, and working age population. Population of Jimma town in broader age category is given in Table 5.4.

Table 5.4: Population of Jimma town in broader age category in 2007

Age Group	Population Size		Remark
	Number	%	
<15	51,858	43	
15-64	65,124	54	
65 and Plus	3,618	3	
Total	120,600	100	

Source: Computation based on 1994 and 2007 Census Results

As to the case of Jimma, 43% of the population is falling under less than 15 years age group, 54% falling in the working age group (15-64) and 3% are 65 years and plus age group.

Dependency Ratio

Large ratio of dependents in a population of an area indicates the burden put up on the active population. Although children are often engaged in productive activities as of age 7 particularly in rural Ethiopia, it is conventional to categorize children under 15 as dependents. On the other hand, old people above the age of 65 too are considered as dependents.

Based on the 1994 and 2007 Census Results, the youth and the old dependency ratio of the town identified to be 80 and 5 percent respectively. In sum, the total dependency ratio of the town found to be 85%, which means every 100 people in the working age group are identified to support 85 dependents.

5.3.2 Economy

The main economic activities in the town are commerce (trading and catering service) and small scale manufacturing enterprises. The local urban-rural exchange in the area

has contributed significant business activities in Jimma. The industries in the town are small scale and cottage industries like grain mills, wood and metal workshops, coffee hullers, hollow block manufacturing, bakeries and pastries. The dominant manufacturing activities that account 70% of the total number of manufacturing enterprises in the town are grain mills and wood works; the details are given in Table 5.5 below. There are no big industries in the town.

Table 5.5: Types and number of small-scale manufacturing industries in Jimma town

No	Type of Industries	Number	Percent
1	Grain mills	54	26.1
2	Coffee mills	11	5.2
3	Flour mills	5	2.3
4	Oil mills	1	1
5	Wood workshop	36	17.4
6	Metal workshop	65	31.5
7	Bakery	34	16.5
	Total	206	100

Source: Finance and Economic Development Office of Jimma Town, 2010

(i) Household Income Level

According to household income survey made by Jimma town Finance and Economic Development Office in 2003, monthly income of majority of respondents was extremely inadequate to meet food and non-food needs of household members. Most of the respondents do not practice saving due to low income earnings of households that leave them hand to mouth life.

As can be inferred from Table 5.6 below, monthly income of majority of both female and male HH heads (51.96%) falls between Birr 200-500, which is very low for full filling requirements for life. In addition, the study made during Jimma town development master plan revision on urban economy of Jimma in 2008, attested that the monthly income of 49.2 percent of the population is less than 500 Birr. Both surveys indicated closely similar income levels, which is too low to fulfill the requirements of life.

Table 5.6: Income distribution of male and female-headed households in Jimma

HH monthly income (Birr)	Sex				Cumulative	Total
	Male	%	Female	%		
Less than 200	75	5.8	111	8.59	14.39	188
201-300	248	19.19	122	9.49	28.6	371
301-400	108	8.36	53	4.10	12.46	161
401-500	98	7.58	43		10.9	142
501-600	46	3.56	18	3.34	4.96	64
601-700	47	3.64	23	1.78	5.42	70
>701	219	16.95	76	5.88	22.8	296
Total	841	65.09	44.6	34.52	99.61	1292

Source: Finance and Economic Development Office of Jimma Town, 2008

(ii) Structure of Unemployment

High prevalent rate of unemployment is one of the major social problems prevailing in most urban centers of Ethiopia in general and Jimma town in particular. Assessing the structure of unemployment is therefore useful to indicate the extent of available and unutilized human resources that must be absorbed by the local economy to ensure full employment.

As stated in the study made during Jimma town development master plan revision on urban economy of Jimma in 2008, there were 10280 registered unemployed persons in Jimma town, out of whom, 3317(32%) were males and 6963(68%) females. The total unemployment rate for Jimma reaches 29.2 percent, which is higher than the national average. This may imply that Jimma is lagging behind in development and solving unemployment problems than other similar urban centers of the country.

Unemployed rate in Jimma by type of training is shown in Table 5.7 below. As indicated in the Table, of the total number of unemployed people, the majority of the unemployed people. i.e. 8921(87%), are do not have training, while the rest 1359(13%) are trained in different professions and skills. The envisaged JWSSP is expected to render job opportunity for a certain proportion of unemployed persons of the town.

Table 5.7: Data on unemployment rate of Jimma town by type of training

Type of Training	Number of Unemployed People			
	Male	Female	Total	%
Not trained	2492	6429	8921	86.8
Agriculture	-	43	43	0.4
Pharmacy	36	-	36	0.4
Secretarial science	34	34	68	0.7
Computer application	90	170	260	2.5
Driving	108	-	108	1.1
Electrical work	89	-	89	1
Typing	-	215	215	2.1
Auto mechanics	43	-	43	0.4
Wood work	39	-	39	0.4
Tailoring	108	-	108	1.1
Computer science	-	34	34	0.4
Civil Engineering	37	-	37	0.4
Drafting Technology	36	-	36	0.4
Military	36	-	36	0.4
Metal work	34	-	34	0.4
Other skills	101	-	101	1.0
Not stated	34	38	72	0.7
Total Trained	825	534	1359	13
Total sum	3317	6963	10280	100.0

Source: Jimma Town Mayor's Office cited in Urban Economy of Jimma City, 2008

(iii) The socio-economic context of the project

A household socio-economic survey, which conducted by ARMA Engineers PLC in 2008, revealed that water scarcity is high in the newly developed areas and areas which are located at higher elevation than the reach of the existing water supply system. These areas include Jimma University campus, Ginjo Kebele, Jiren Kebele, Becho-Bore Kebele and Kito areas.

According to the survey output, of the total 63 HHs surveyed, 46% of them preferred to have improved water supply services, 35% preferred pipeline extension work to their residential areas while the remaining 19% preferred improved water tariff. Regarding service level, 79% of the respondents preferred to have yard connection, 16% to have house connection while the remaining 5% preferred to have public tap.

The socioeconomic survey has involved also discussion with the Town Water Supply Board and Municipal Officials and all groups of discussants unanimously reached consensus the envisaged project greatly enhance the overall socioeconomic development of the town and its dwellers.

5.3.3 Education

As per the data obtained from Finance and Economic Development Office of the town, there are 17 primary schools (1-8), 3 secondary schools, 1 Government College, 1 University and 7 privately owned colleges in Jimma town.

5.3.4 Public Health

(i) Prevalent Diseases

According to the morbidity statistics recorded by health centers and hospitals found in Jimma City, the leading public health in the town is malaria. Other prevalent diseases include upper respiratory tract infections, eye diseases, intestinal parasites, skin infections and genito-urinary system diseases. The ten top diseases affecting the public health are specified in Table 5.8 below in the order of their dominance.

Table 5.8 Ten Top Diseases recorded by H. Centers and Hospitals in Jimma City in 2007

S.N	Disease Types	Number of Cases	Percent
1	Malaria	38285	19.0
2	Upper respiratory tract infection except TB	23008	11.4
3	Disease of eye	123334	6.1
4	Helminthes	11984	5.9
5	Skin infection	11199	5.5
6	All other diseases of Genito-urinary system	9318	4.6
7	Gastritis and doedenits	8789	4.4
8	Acute Feverile Illness	5345	2.6
9	Gastro-Enteritis and colitis	5191	2.6
10	All other infective and parasitic diseases	5018	2.5
Total of ten top diseases		130471	64.6
Other cases		71436	35.4
Grand total		201907	100

Source: Jimma Town Heath Office, 2010

As can be inferred from the specified diseases, most of them are preventable by promoting primary health care program including provision of adequate clean water supply services and sanitation facilities.

(ii) Health Facilities

There are 2 hospitals, 2 health centers, 1 MCH Center, 20 clinics, 7 pharmacies, 22 drug stores, 4 rural drug vendors and 4 drug distributors which are providing health services in Jimma town. The details are given in Table 5.9 below.

Table 5.9 Health Institutions in Jimma City, 2008

Ser. No	Health Services	Ownership		
		Government	Private	Total
1	Hospital	2	-	2
2	Health Centre	2	-	2
3	Clinic	-	20	20
4	Pharmacy	2	5	7
5	Drug Store	2	20	22
6	Rural Drug Vendor	-	4	4
7	Drug Distributor	-	4	4

Source: Jimma City Health Office

5.3.5 Water Supply

The current major water supply source of Jimma is the existing piped system in which raw water is abstracted from Gilgal Gibe River and treated at the conventional treatment unit located Boye in Becho Bore Kebele and distributed to the population through public fountains, and house and yard connection taps. Treatment plant is situated at about 5km from the centre of the town in east direction and has a capacity of 552m³/hr.

According to the data obtained from the Jimma Town Water Supply and Sewerage Enterprise (JWSSE), the current average water production of the existing treatment unit is 6500m³/day while the current demand is estimated at around 10,000m³/day. This indicates a gap of or a shortage of 3500m³/day. Due to this, there is a serious shortage of clean water supply in significant parts of the town. As identified by key stakeholders, shortage of water supply is among the foremost current socio-economic problems of the town. Especially those Kebeles found at the periphery of the town and at higher ground such as Jiren, Ginjo, Setto, Becho Bore and Kitto Kebeles do not get water from the existing system either due to low pressure or due to lack of connections. Thus, shortage of safe drinking water is critical in these parts of the town and this situation is inflicting significant impacts on public health and other socio-economic status of the population. Photo 11 illustrates the problem of water shortage.

Based on the data provided by the JWSSE, the existing total number of pipeline connections in the town is 10,588. These include 10,074 connections to residential houses, 238 connections to commercial enterprises, 135 connections to industrial establishments, 98 connections to government organizations, and 43 connections to public fountains.

The prevailing shortage of water supply in Jimma has resulted in a number of socio-economic problems, amongst which the major ones are specified below:

(i) **Increased prevalence of water-borne diseases:** Shortage of clean water supply compelled some dwellers to consume water collected from unsafe sources such as hand-dug wells (*Berry*), streams and unprotected springs. The water obtained from these sources are contaminated by pathogenic organisms and pollutants, which have caused the users to suffer from water-borne diseases such as shigellosis, diarrhea, ameba etc. During the public and stakeholder consultations, the discussants reported that high morbidity rate of water-borne diseases urged the victims to spend considerable portion of their income for treatment and purchasing medicine.

(ii) **Wastage of labor and time in water collection:** With the exception of hand-dug wells, most of the unprotected water sources such as springs and streams are located at far distance from residential areas, which urged women to travel longer distances hauling water on their back. In addition, there are considerable numbers of people waste their time due to longer queuing time at water points. Due to this, women spend much time at water points, which has an impact on performing other daily chores at household level.

(iii) **Impacts on Income:** Shortage of clean water especially in those kebeles located at the periphery of the town urged dwellers to buy water fetched from unsafe sources or from the existing piped system but at longer distances at very expensive price like 2.20 Birr for 20 liters of water. This is a challenging situation considering the frequency of requirement and role of water for life.

(iv) **Impacts on Investments and Services:** In addition to the problems indicated above, shortage of water in the town restrained investment and business activities especially those engaged in the provision of services such as restaurants, bars and other households earning income by selling traditional drinks such as *Tej*, *Tella* and *Arekie*.

In general, the prevalence of various sorts of problems ensuing from shortage of water in Jimma town indicates that a great hope is vested on the envisaged water supply project to curb the situation.

5.3.6 Sanitation

Water supply and sanitation have many links and seen as necessary adjuncts of one another for several years particularly by those who promote them to improve public health. Any plan to provide water for domestic use, if it does not ensure that households also have adequate means of wastewater disposal system, it may compromise public health rather than improving it. This section of the study describes the existing sanitation situation of Jimma in reference to human excreta, domestic wastewater and solid waste collection and disposal system.

Based on previous surveys, interviews of relevant officials and experts, and observations made during the present field survey, sanitation in Jimma town is relatively poor. Most of the existing excreta disposal facilities comprise pit latrines that are poorly constructed, offensive and are over-filled due to lack sufficient

vacuum truck to de-sludge when a latrine is full or lack of space in the compound or funds to build a new one (ARMA, 2008).

Currently Jimma town does not have a sewerage system. Therefore, pit latrines and water dependent flush toilets that are based on septic tank system as well as open field are used for excreta disposal. The socio-economic survey conducted by ARMA Engineering in 2008 indicated that 55% of the sampled households use dry pit latrine, 10% use VIP, 12% use either private or shared water dependent toilet and 23% use open field.

The existing solid waste disposal system in the town is also poor. The town has a system of disposal through collection and final disposal based on open field dumping. Currently there are about 14 storage bins, which are sited at key locations in the town and wastes are disposed off elsewhere by the use of two lift trucks. Still a significant proportion of the solid wastes generated in the town end up in the streets, storm drainage systems, natural streams and open spaces in the town, which in turn causes nuisance to the community and public health hazards. According to the output of the study made by ARMA in 2008, among the total HHs surveyed, 67% used open fields, 21% burned the solid waste material at their backyard and 12% used garbage pits for solid waste disposal.

Similarly, the wastewater disposal system in the town is very poor. Aweyту and Kitto rivers and their tributaries drain the town naturally. Many of the households and other establishments found along these streams discharge the wastewater they generate into the two streams and other channels that ultimately drain into these natural water bodies. The street drainage also drains into the streams. According to the findings of the study made by ARMA in 2008, 57% of the HHs included in the survey used open field, 13% used pit, 25% used drainage ditches and 5% disposed into vegetable gardens. Thus, the two rivers are heavily polluted due to the uncontrolled disposal of sewage wastes, wastewaters and solid wastes.



Photo 11: The Problem of Water – an example where people collect water for domestic uses from unsafe sources like a stream passing through the town (Photo taken from Ginjo Kebele).



Photo 12: Ongoing drainage works and road construction activities in the business centre part of Jimma town.

5.3.7 Cultural Heritage and Religious Sites

The descriptions given in this section are mainly based on the information extracted from ‘The Historical Background of Jimma City’ prepared by Development Partners (Nov. 2008), and the information collected from the Jimma City Culture and Tourism Office as well as the observations made during the field survey. These sources indicate the existence of important historical monuments and relics in and around the town.

The major cultural heritage sites in the town include the palace, mosques and tombs of the kings and their relatives at Jiren and a one storey building in the town. The palace, named as ‘Aba Jifar Palace’, is located at higher ground in Jiren Kebele and the planned Aba Jifar Reservoir and the Ginjo-Aba Jifar Sub-main are located in the vicinity of the palace (see Photo 13). There are two mosques within the palace compound, which were constructed during the reign of Aba Jifar II. There are also household utensils and personal belongings of Aba Jifar II which are gathered in a building found in the centre of the town, which is being used as a museum.

‘Mesgida Afurtema’, which in Oromiffa means ‘mosque of the forty’ (Mosque 40), is another mosque constructed during the reign of Aba Jifar II (see Photo 14). It is located at about 500m south of the Aba Jifar Palace compound. It was built for forty Muslim Scholars (Ulamas) who came from Gonder to preach Islamic to the people. It was from their numbers (forty) that the name ‘Mesgida Afurtema’ was inherited. The Ginjo-Aba Jifar Sub-main runs at about 100m RHS of the Mosque 40.

There is also a family cemetery of Aba Jifar II near the Mosque 40. It had been the burial site of the kings of Jimma and their relatives since the mid-19th century until the downfall of the kingdom in the early 1930s. This site is important especially for there is a visible statue on the tomb of Aba Jifar II on which the date of his death inscribed in Arabic. The nearest cemetery is only about 3-4m from the route of the Aba Jifar Sub-main, while the cemetery of Aba Jifar II is over 50m far from the proposed pipeline route. Therefore, precautions need to be taken during the installation of the pipeline in order to safeguard the cemeteries.

Furthermore, there is an old one storey building, known as ‘Melessie Foq’, in the town along the road that leads to the Jimma Airport. It was designed by Indians and built a few years before the turn of the 19th century. The building is important because of its architectural resemblance with the Aba Jifar II palace and its construction around the same time. Its age is around 100 years and it is probably the oldest house in the town boundary.

The above indicated historical monuments and relics have both cultural and economic importance. They are the material evidences of the past history and culture of the people who lived in and around the town. They are important tourist attraction places in the Jimma area. In particular the Aba Jifar II palace and the Museum are visited by many tourists annually. The collections in the Museum include relics mainly of household utensils and personal belongings of Aba Jifar II, and ethnographic collections.



Photo 13: A view of the Palace of Aba-Jifar II at Jiren, one of the well-known historical places in Jimma.



Photo 14: A view of Part of Mosque 40, one of the known religious & historical places in Jimma.

5.3.8 Infrastructures

Infrastructure development is one of the prerequisite elements for economic and social development of a country. In terms of road network, Jimma is connected with Addis Ababa by a recently upgraded asphalted road, which is about 348km long. There are also several roads radiating from Jimma and linking all the districts of the Jimma Zone. In addition, Jimma is connected to all the major towns and administrative regions in the west, southwest and southern parts of Ethiopia through major link roads. The major roads include the Jimma-Bedele-Metu-Gambela Road and Jimma-Bedele-Nekemt Road in the west, the Jimma-Bonga-Mizan-Tepi Road in the southwest, and the Jimma-Chida-Wolayta Road in the south. Internally, Jimma town has a total length of about 53kms of all-weather roads until 2008. The length of asphalt roads in the town accounts for about 7.31% of the total length of asphalt roads in the Jimma Zone.

In addition, Jimma is connected to Addis by air transport system, which is five days per week. It is also connected to Gambela, Gore, Assosa and Tepi towns about three days in a week.

With regard to telecommunication services, Jimma has a digital telephone service as well as a postal service. Further, Jimma has 24 hours electric power supply, which is supplied from the national grid.

5.3.9 Gender Issues

The development of water supply, grain mills and other related projects are important investment sectors for addressing of women's practical problems. Especially the provision of clean water supply at reasonable distance relieves women from spending much time and labor for fetching water from unsafe sources found at distant places from residential areas. As is the case for most other areas, women are the main collectors, guardians and managers of water in Jimma. Women devote the greater share of their time in collecting water for home use. This has negative impact on nurturing their children and carrying out other gamut of household tasks.

Therefore, the envisaged water supply project has positive impacts on reducing this hardship by providing drinking water through house connections, or public fountains, which would be at reasonable distances from residential places. So, women will have more time to carry out other household tasks and exposure to training and education.

6 POTENTIAL IMPACTS AND MITIGATION MEASURES

The planning and design of a development project should consider the potential environmental and social issues/impacts in order to intensify the positive impacts and avoid or minimize the damages likely to be caused due to the project implementation and operation. It is, therefore, important to identify and evaluate the possible impacts of the project activities on the natural as well as human components of the environment. This would assist to propose appropriate avoidance or remedial measures in advance so that they would be considered in the project planning and design and would be executed during the implementation phase or operation phase as appropriate. With this basic principle in mind, the likely positive and negative impacts of the envisaged Jimma WSSP have been identified and described in the following sections together with their corresponding mitigation measures.

6.1 Beneficial Impacts

6.1.1 Improvement of Public Health and Sanitation

Provision of safe and adequate potable water supply has an obvious positive impact on public health and sanitation since it helps significantly reduce the spread of major infectious and parasitic diseases such as typhoid, dysentery and amoebiasis to mention a few of them. Implementation of the proposed water supply project is expected to enable the dwellers of the town to obtain safe and adequate water for drinking and other domestic uses. This in turn will reduce the prevalence of water-borne and water related diseases that ensue by drinking contaminated water and due to shortage of safe water for cleaning of eating utensils. With increased availability of good quality water, public health will improve since it will enable the public to keep clean kitchen and eating utensils. Personal hygiene will improve with increased availability of good quality water. Better personal hygiene coupled with the elimination of highly congested waiting lines around the water points will further reduce the spread of contagious diseases that are usually transmitted by physical contacts.

6.1.2 Promotion of Women's Welfare

As it is well known, fetching water is one of the burdens vested up on many women and their children, particularly of girls. One of the expected benefits of providing piped water supply at home or public fountains will be the significant reduction of time and energy spent in fetching water usually from either long distance or crowded water points with hours of waiting time.

During the field assessment, it was learned that women living in those kebeles where there is no adequate water supply are suffering from longer queuing time while waiting their turn at public fountains and traditional water points. In addition, these women are suffering from spending their labor and time hauling water on their back and traveling long distance.

Therefore, after the implementation of the envisaged project, it is expected that there will be shorter distance between the consumers' house and public taps and no long queuing time either. The provision of safe and adequate water supply will enable women to save much time and labor that can be utilized for nurturing their children and performing other daily chores. This condition will also allow school age girls to attend school.

6.1.3 Enhancement of Investment and Economic Development

During the discussions held with stakeholders, shortage of adequate water supply has restrained investments in various sectors in the town. Therefore, the provision of adequate clean water supply deemed to lure investors to Jimma and its environs, and promotes expansion of investment in different economic sectors including industry, agriculture and tourism, which may create substantial employment opportunities. In addition, with improved water supply, there will be better opportunities for commerce and trade to improve and provide better quality services.

6.1.4 Creation of Employment Opportunities

Implementation of the planned water supply project will provide job opportunities for the unemployed people, most of which would be during the construction phase. Local labour could be used providing revenue particularly to poor people and people trained in skills that could be used on other similar projects or works. In addition, some people will get permanent employment during the operation phase. The project components that will provide job opportunity include operation of the intake weir, water treatment plant, pumping stations, storage and service reservoirs, and environmental monitoring activities. Thus, it will create employment opportunities and income benefits for the local people especially the jobless people in the area, which may reduce poverty.

6.1.5 Avoidance of Extra Expenditure for Water

During stakeholders and public consultations, discussants identified that people living in the areas where there is a serious shortage of water were spending Birr 2.20 for 20 liters of water or for a jar-can of water (20 cents for buying water and 2 Birr for labor). This rate is too expensive compared with the income of the people living in the town. The expensiveness of the water has restrained the people to use water as per their demand. Therefore, provision of adequate clean water to the town's residents through the planned WSSP will avoid such extra expenses for buying water.

6.1.6 Reduction of Impacts on Water Quality

Currently the residual sludge water released from the existing water treatment plant is directly discharged to natural water bodies, i.e. the Boye and Gilgel Gibe Rivers, without any treatment. This situation has a considerable impact on water quality of the rivers. Implementation of the envisaged water supply project comprises sludge drying beds and properly located and controlled dumping site for the solid waste. Provision of this mitigation measure would avoid the water pollution problem being caused by the existing water treatment unit.

6.1.7 Political Benefits

Provision of essential social services to citizens is one of the major factors attesting the competence of a government in managing and administering of its subjects. It is also one of the major factors indicating the commitment and effort of the government for the attainment of social development in the country. Hence, the provision of adequate and safe water supply will have significant contribution for promoting rapport and trust relationship between the government and the dwellers.

6.2 Adverse Impacts on Physical Environment

6.2.1 Land Acquisition and Impacts on Land Use

Implementation of the envisaged water supply project will entail temporary or permanent land acquisition for locating the various components of the project. The components that will require permanent land taking include the New Water Treatment Plant at Boye (9ha), Jiren Kella Main Reservoir (0.4ha), Jiren Kella BPT (0.1ha), Aba Jifar Reservoir (0.25ha), Aba Jifar BPT (0.1ha), and Frustale Tank (0.1ha) all covering a total land area of about 10ha. According to the information obtained from the project office, all the mentioned project components are located on land areas that belong to the Jimma City Municipality and these plots of land are already secured for the project. Hence, installation of these components would not involve acquisition of land under private ownership. Currently the mentioned project sites are used for livestock grazing or covered by natural vegetation or plantation trees.

The remaining project components, i.e. transmission and distribution lines, which in total cover about 60km length, basically will require temporary land acquisition. Most of these lines run through land, which is under the Municipality and state plantation. Nevertheless, some portions of the pipelines particularly the Ginjo and Aba Jifar Sub-mains run through private landholdings. These lands are under various uses mainly annual or perennial crops cultivation, tree plantation or grazing lands, as well as some housing units. The impacts on these land uses are discussed separately elsewhere. The land losses due to the installation of the transmission and distribution lines would be temporary and the affected lands can be reinstated to productive state for agricultural uses particularly for growing annual crops or for livestock pastures.

In summary, the magnitude of land acquisition would be relatively small, and can be mitigated to acceptable levels through the mitigation measures discussed under sections 6.3.1 and 6.4.1 - 6.4.5.

6.2.2 Impacts on Soils

Construction or installation of the various components of the project would involve cutting in soil and earthmoving works. These activities will cause destruction of the soil structure and ultimately expose it to erosion by runoff water. Also, some of the activities like installation of the water transmission lines and construction of access roads may alter surface water flow patterns resulting in concentrated flows at certain points, which in turn may cause increased soil erosion. Further, the project activities may accelerate erosion through reduction of the protective ground cover. The rate of soil erosion will largely depend on climatic and topographic features of the area. The project area has climatic and topographic conditions that can intensify soil erosion. These are high intensity of rainfall and hilly/sloping topography in most part of the major project impact areas, coupled with erodibility of the soils. Increased soil erosion can lead to sediment loading of the receipt streams that ultimately drain to the Gilgel Gibe River.

On the other hand, due to the availability of sufficient moisture during most time of the year and good soil fertility, the project area has high potential for re-vegetation that would reduce the risk of soil erosion. Nevertheless, the rate of re-vegetation will

depend on the extent of replanting appropriate plant species and enhancement measures for natural regeneration like land leveling and spreading of topsoil.

Besides increased soil erosion, soils can be impacted as a result of compaction by heavy duty equipment applied in trench excavation and construction of access roads. The equipment operating zone is expected to be from 4m to 7m wide depending on the volume of work and local conditions like topography. Moreover, there could be some adverse impacts on soils resulting from contamination by hazardous substances. The likely sources of soil pollution would be spillages of oils and fuel from engines of vehicles and diesel operating machinery and improper disposal of used oils and lubricants.

The adverse impacts on soils will have local effects on areas under crop cultivation or grazing pasture in two ways: the land would be out of use during construction works, and after construction the land would be unusable for some time if not restored to the original condition. The restoration can be quicker for cultivation purposes than for grazing purposes.

In summary, the impacts on soils can be rated at moderate level, which can be reduced to acceptable levels with good construction methods and application of appropriate mitigation measures.

Mitigating measures

The potential impacts on soils can be minimized through execution of the construction works that involve excavation and other earthworks during the dry season, refilling the exposed soils soon, ploughing the compacted areas, reducing the time surface remains bare following completion of works, and preparing surface for re-vegetation and replanting appropriate grass, shrub and/or tree species as soon as possible. In addition, land clearing or vegetation removal and earthmoving activities should be restricted to the areas absolutely necessary for the works.

On slopes where intense erosion is expected a two phase planting approach, that is fast growing/high coverage perennial grass should be first planted or sowed to rapidly stabilize the land and prevent erosion immediately, and latter on shrubs or trees planted to consolidate coverage and prevent erosion. Ploughing the compacted areas would help to restore the affected land to productive state for growing crops or grasses for pasture, as well as to improve infiltration into the soil and reduce water runoff.

The plant species that would be used for the replanting program should be the ones that are adaptable to the agro-ecology of the area and have the abilities to reinforce the soil profile. The plant species that are proved to be appropriate for such purpose and available in the area are listed in Table 5.1 below. The recommended plant species have not only soil stabilization function but also have ecological and landscape values including replacement of the lost plant communities and habitats as well as improvement of the aesthetic value of the area. Additional or alternative plant species can be obtained from the Wereda Agriculture and Rural Development Office like Kersa W. and/or the Jimma Zone Forestry and Wildlife Development Enterprise.

Table 5.1: Plant Species (Grasses, Shrubs & Trees) Recommended for Planting Program

Type	Scientific Name	Local Name	Notes
Grasses	<i>Cynodon dactylon</i>	Chekorsa	On erosion vulnerable surfaces
	<i>Pennisetum sphacelatum</i>	Migira	
	<i>Vetiver Grass</i>		On erosion vulnerable surfaces and for gully treatment
	<i>Rhodes Grass</i>		On erosion vulnerable surfaces
Shrubs	<i>Sesbania sesban</i>		On the banks of Gilgel Gibe R. and along the RWRM.
	<i>Salix subserrata</i>	Alaltu	On the banks of Gilgel Gibe R. for riverbank stabilization.
Trees	<i>Acacia abyssinica</i>	Laftoo	Along the RWRM, CWRM and Sub-mains & near NWTP & MR
	<i>Acacia polyacantha</i>		Along the RWRM (near Aweytu river & Swamp)
	<i>Cordia africana</i>	Woddeesa	Along the Ginjo & Aba-Jifar SMs
	<i>Erythrina brucei</i>	Wolensuu	As above
	<i>Millettia ferruginea</i>	Askiraa	As above
	<i>Podocarpus gracilior</i>	<i>Birbirsaa</i>	Near the MR
	<i>Eucalyptus spp.</i>	<i>Baharzañi</i>	At the area to be allotted for replacement plantation
	<i>Cupressus lusitanica</i>		

6.2.3 Impacts on Downstream River Flows and Downstream Users

One of the possible impacts on water resources and on downstream users is related to reduction of downstream flows in the Gilgel Gibe River (GGR). This section attempts to assess the magnitude and significance of the changes in the hydrologic regime of the Gilgel Gibe river in downstream of the intake site for the Jimma water supply system (JWSS) and its effects on downstream development schemes and other users.

The extent of reduction in downstream flows has been estimated using the projected maximum water demand of the JWSS. According to the study made by ARMA Engineering PLC (2008), the amount of water withdrawal from the GGR in the year 2025 and 2035 was estimated at 0.4m³/s (34,297m³/d) and 0.57m³/s (49,2229m³/d) respectively. The indicated amount of abstraction would result in reduction of only about 3.3% and 4.8% of the annual mean flow of the GGR at the Intake Weir in year 2025 and 2035 respectively. At the Gilgel Gibe I Dam, which is located at about 80 - 85 km downstream of the intake site, the reduction in the river flows would be only about 0.8% and 1.1% of GGR flows in year 2025 and year 2035 respectively. Details of the water balance of Gilgel Gibe river at the Intake Weir and at the Gilgel Gibe I dam is given in Table 5.2 below.

Therefore, the predicted amount of reduction in the GGR flows is minimal and is not expected to cause any significant hydrological changes or impacts on downstream water uses. In terms of water resource development, Gilgel Gibe I and Gibe II

Hydroelectric Power Plants are the major schemes that depend on the Gilgel Gibe river flows for hydroelectric power generation. In addition, the river water is used for livestock water supply and small-scale supplementary irrigation schemes. This farming system is locally known as ‘Bone’, which is basically dependent on flood recession moisture on the flatter areas of the riverbanks. Some of the schemes use supplementary water abstracted from the GGR using small diesel operating motor pumps.

As per the information obtained from the Jimma Zone Water Resources Development Office and Kersa Wereda Agriculture and Rural Development Office, the land area currently developed under the ‘Bone’ cultivation along the GGR is relatively small and the amounts of water abstracted from the river for supplementary irrigation is minimal. As they indicated, the area currently under the ‘Bone’ farming system is estimated at about 379ha in Kersa Wereda on the left bank and only about 13ha in Omo Nada Wereda on the right bank. It has been confirmed that there is no any human water supply scheme that depends on the GGR water in downstream of the intake site. Thus, it can be concluded that the reduction in the downstream flows due to withdrawal of water from the GGR for the JWSS will not bring any appreciable impacts on the water demands of the downstream users or any detrimental effects on the downstream ecology.

Table 5.2: Water Balance of Gilgel Gibe River at Intake and Gilgel Gibe I Dam

	Water Source	Flow Condition	Flow (m ³ /s)	Reduction in flows after abstraction for JWSS (%)	
				Year 2025	Year 2035
1	Gilgel Gibe R. at Intake for JWSS	Annual Mean Flow	12.0	3.3	4.8
		Low Mean Flow	3.31	12.1	17.2
		Low Minimum Flow	1.36	29	42
2	Gilgel Gibe R. at Gilgel Gibe I Dam	Annual Mean Flow	50.4	0.8	1.1
		Low Mean Flow	8.2	4.9	7.0
3	Abstraction for Jimma water supply system (JWSS)	Yr 2025	0.40		
		Yr 2035	0.57		

Source: Consultant’s Calculation based on Hydrological Data given by ARMA Engineering (2008) and EEPCo (2004)

Mitigation Measures

Since the magnitude of hydrologic changes or reduction in downstream flows is very small and its effects on downstream users or on downstream ecology are anticipated to be insignificant, no mitigation measures deemed to be necessary.

6.2.4 Impacts on Water Quality

Impact on water quality is one of the major potential issues that must be assessed in detail. The possible impacts on water quality during the construction as well as operation phases are discussed below.

Construction Phase:

During the construction phase, there may be a potential risk of water pollution due to spillage of fuel or oil into a water course or improper disposal of used oils. In addition, water quality can be impacted due to increased turbidity resulting from increased soil erosion from surfaces disturbed during cutting in soil and earthmoving activities.

Operation Phase:

During the operation phase, the major possible impact on water quality is related to pollution risks due to the discharge of sludge water released from the water treatment plants. The main byproduct from the water treatment plant (WTP) will be residual sludge that would consist mainly of the sludge removed from the clarifier following chemical precipitation and the wash-water removed during backwashing of the filters. Aluminum sulphate, commonly called Alum, will be used to remove suspended solids and other impurities from the raw water through sedimentation and coagulation. Thus, the sludge will comprise mainly sediments/mud, alum and a considerable amount of water.

The amount of sludge from the clarifier is estimated to be on average 4% of the quantity of raw water to be treated, which has been estimated to be about 763m³/h, 2144m³/h and 3,077m³/h in year 2010, 2025 and 2035 respectively. Thus, the quantity of sludge to be produced would be about 30.5m³/h, 86m³/h and 123m³/h in year 2010, 2025 and 2035 respectively. With the assumed 16 hours per day operation time of the WTP, the amount of sludge to be generated from the clarifier is estimated to be about 488m³/d, 1376m³/d and 1968m³/d in year 2010, 2025 and 2035 respectively.

Data on the dosage of Alum to be used in the future WTP is not available. Therefore, it is assumed that the rate being used in the existing WTP is to be adopted for the future WTP. As per the data provided by the JWSSE, the dosage of Alum used in the existing WTP depends on the turbidity/sediment load of the raw water. Its ranges from about 200kg/d (12.5kg/h) in the dry season when turbidity is low to 400kg/d (25kg/h) in the wet season when turbidity is high to treat about 7000m³ of water per day. Based on this rate, the amount of Alum to be used in the future WTP (EWTP + NWTP) in year 2025 is estimated to be 60kg/h (28ppm) in the dry season to 120kg/h (56ppm) in the wet season and the amount of sludge produced would be 86m³/h.

One of the possible ways of dealing with the sludge is disposal to natural water course without any treatment. Assuming the sludge water would be released to Aweytu river then to Gilgel Gibe river, which is the case for the existing WTP, the GGR flow rate after sludge disposal (natural flow rate minus the abstraction for the JWSS plus sludge flow) is estimated to be about 4046m³/h in year 2025; note that an estimated low minimum flow rate of 1.1m³/s (3960m³/h) for GGR has been adopted, which is the minimum flow of GGR at the intake weir minus the abstraction for the JWSS plus the minimum flow of Aweytu R. With this flow rate, the Alum (chemical formula = Al₂(SO₄)₃) content of the GGR water is estimated to be about 15mg/l (15ppm) to 30mg/l (30ppm). The proportion of Aluminum (Al) content would be about 2.4mg/l (2.4ppm) to 4.7mg/l (4.7ppm). This concentration is too high when compared to the acceptable limit. According to EPA's *standards for effluent discharges to inland waters*, the emission limit value for Al is 0.2mg/l (0.2ppm). Based on the results of the water quality analysis conducted during the current ESIA study, the Aluminum

concentration in the sludge discharged from the existing water treatment plant is about 4.6 mg/l (4.6ppm), which is too high and much beyond the acceptable limit.

Similarly, in year 2035, the amount of Alum to be used in the WTP is estimated to be 88kg/h (28ppm) to 176kg/h (56ppm) and the amount of sludge produced would be 123m³/h. The Gilgel Gibe river flow rate after sludge disposal (natural flow rate minus the abstraction for the JWSS plus sludge flow) is estimated to be about 4083m³/h. With this flow rate, the Alum content of the GGR water is estimated to be about 22mg/l (22ppm) to 43mg/l (43ppm). The proportion of Aluminum (Al) content would be about 3.5mg/l (3.5ppm) to 6.7mg/l (6.7ppm). This concentration is too high when compared to the accepted limit.

Therefore, disposal of the sludge to the Gilgel Gibe river without treatment would be environmentally unacceptable. The sludge discharged to the natural river water particularly during the minimum flows may result in considerable increase in suspended sediment levels and chemical residuals that are attached to the solids in the water column and deposition at the riverbed. These may affect the physical and chemical quality of the river water. In addition, it may have detrimental effects on aquatic life including fish and other aquatic fauna, and may threaten the health of animals that depend on the river water in the downstream area. Disposal of the sludge water to a natural watercourse is economically the cheapest but environmentally and socially unacceptable.

Mitigation Measures

Potential impacts on water quality will be minimized through the following mitigation measures:

Construction Phase:

- Locating Contractor's site facilities (camps, fuel storage etc.) at sufficient distance (minimum of 1km) from water bodies,
- Provision of a secondary containment system for fuel storage facilities, such a berm capable of holding the 110% of the capacity of the largest container plus an appropriate volume to accommodate rainfall/runoff,
- Regular checking for leaks under all operating vehicles and equipment to avoid leakages by regular and effective maintenance,
- Implementing proper handling of oil and fuel to avoid pollution by spillages, and
- Avoiding disposal of used oils in the field, by strictly controlling and documenting waste disposal process.

Operation Phase:

The main mitigation measure for water quality control during the operation phase would be related to sludge treatment and disposal. In order to deal with this important issue, sludge drying bed/lagoons and disposal site for the solid waste shall be provided. The project plan has already included a sludge drying bed near the WTP and an abandoned quarry site selected for disposal of the cake.

In addition, periodic water quality monitoring shall be conducted for the GGR at the intake weir and downstream of Aweytu river confluence as well as for the Aweytu river in order to check for any major changes from the baseline condition.

6.2.5 Impacts due to Land Use in the Catchment

Most part of the Gilgel Gibe catchment of the intake weir site is characterized by rolling, hilly and mountainous topography, dense population and intensive agricultural activities. Although the catchment has been one of the regions with good vegetation cover including natural forests in the country in the past, this situation has greatly changed with rapid population growth and increasing demand for arable lands, grazing lands and settlement areas. This situation has resulted in increased deforestation and land degradation.

As per the discussions made with the officials and experts of the Jimma Zone Agriculture and Rural Development and Water Resources Development Offices, the rate of conversion of forestlands and other vegetation areas as well as grazing lands to cultivated lands in the catchment is very high. With increased rate of deforestation, expansion of cultivation and increased intensity of farming and grazing practices, the rate of soil erosion has remarkably increased, and this situation has resulted in increased sediment loads of the Gilgel Gibe river water.

The other situation observed in the catchment is that the drainage impeded or seasonally flooded low-lying flat areas along the Gilgel Gibe river used to be utilized for dry season livestock grazing. Nevertheless, since recently significant parts of these seasonally drainage impeded lands including the areas around the intake site have been converted to cultivated lands for growing mainly maize during the spring (*belg*) season and vegetables after flood recession using residual moisture. By virtue of flat topography, the risk of soil erosion from these areas and the rate of sediment transport to the river are likely to be low or minimal. However, there could be some risk of water pollution from agricultural chemicals mainly inorganic fertilizers due to leaching or runoff from agricultural fields.

The turbidity and total solids measurement of the river water and the amount of Alum used to coagulate the sediment in the raw water substantiates the above statements. The turbidity and total solids measurement of Gilgel Gibe river at the intake weir in March 2010 (dry season) was only 26 NTU and 130 mg/l respectively, while it was 184 NTU and 304 mg/l respectively during the end of June 2010 (main rainy season). Based on the data provided by the JWSSE, the amount of Alum used in the existing water treatment during the main rainy season, i.e. June to September, is over twice the amount used during the dry season. These data reflect high sediment loading of the river water during the rainy season, which is attributed mainly to intensive agricultural activities, topographic condition and high intensity of rainfall in the catchment. With increasing human and livestock population, the intensity of land use and rate of deforestation are expected to increase and consequently the rate of soil erosion and sedimentation of the river water is likely to increase. This situation calls for the need to implement adequate soil and water conservation measures including conservation based agronomic practices.

Regarding the risk of water pollution from agricultural chemicals, the current water quality data does not indicate a significant level of pollution of the river water.

Nevertheless, as the intensity of agricultural chemicals application is likely to increase in the future, this issue needs particular attention and regular monitoring of the trend of agricultural chemicals application in the catchment and regular testing of the water quality of the river.

Mitigation Measures

A sustainable and long-term solution to the sediment problem is implementing extensive soil and water conservation measures in the catchment. This measure would require the assessment of the current land use practices and land cover of the catchment area, the degree of soil loss from the catchment, and the types of interventions need to be implemented to reduce the problem. This activity in turn would require the input of appropriate specialists mainly soil and water conservation/watershed specialist, and sociologist, environmentalist and GIS Expert. And its implementation would necessitate the involvement of many stakeholders including the Zone, Wereda and Kebele Administrations, Zone and Wereda Agriculture and Rural Development Offices, NGOs specialized in SWC practices, and the local communities. In addition, it requires a substantial amount of financial resource. In order to support the financial requirement, the owners of development schemes that would benefit from the SWC activities should be considered as key stakeholders and involved from the beginning; these can include the JWSSE and EEPCo. It is recommended that as the main beneficiary of the SWC program, the JWSSE shall take the initiation of the program by discussing with the Jimma Zone and Jimma City Officials and the concerned institutions to create a task force that would work on the assignment.

As a short-term solution (impact reduction measure), it is recommended that the farming activities around the intake site like within about 1km stretch along the GGR shall be abandoned and a buffer zone along the river upstream of the intake site created and maintained well-protected by planting or allowing natural regeneration of shrubby vegetation or grasses; planting trees may not be feasible because of the effects of seasonal flooding.

6.2.6 Impacts on Air Quality

During the construction phase, there will be short-term and localized impacts on air quality due to dust, exhaust emissions and noise generated by the construction activities. Dust pollution will result from excavation works and earthmoving activities for construction of the different components of the project including the transmission lines, water treatment plant, reservoirs, distribution systems and access roads, operation of quarry and borrow sites, and vehicular movements on unpaved roads. In particular, the excavation works and movements of trucks hauling construction materials may generate significant dust emissions.

The other sources of air pollution will be fuel combustion in construction equipment and vehicles, and fugitive emissions from crushing plant. The major pollutant which gets emitted as a result of combustion of diesel is SO₂. The concentration of SO₂ is not expected to increase significantly, and thus, no significant impact on ambient air quality is expected as a result of operation of construction equipment. Fugitive emissions from stone crushing plant can cause localized air pollution that may have

some impacts on vegetation and human settlement found in close proximity of the plant site.

The effects of dust pollution will be largely to project personnel and the local population residing or working at nearby to the source. In addition, local water sources and the vegetation in the area can be affected. Dust can have some public health effects like asthma, cough and irritation to cardio-respiratory system.

During construction, temporary noise pollution can be significant at the major project sites (transmission lines, WTP, reservoirs), quarry and borrow sites, and crushing plant site. Depending on the intensity and duration of exposure, noise and the associated vibration effects can cause nuisance and adverse health effects like loss of hearing and hypertension.

Mitigation Measures

In order to minimize the extent of air and noise pollution and their effects, during construction the Contractor shall follow good site practices by incorporating appropriate mitigation measures to reduce dust production, nuisance noise and vehicle emissions. He shall implement the following mitigation measures:

- Limit traffic speeds to minimize dust levels and spray water regularly on the dusty roads.
- Use dust collectors or water spray systems as appropriate to prevent high dust emissions from stone crushing or batch plant operations.
- Service the exhaust systems of all vehicles and equipment on regular basis to ensure that noise and exhaust emissions are kept to appropriate levels.
- All machinery and plants should conform to the applicable noise standards, and plants should be provided with effective noise mufflers.
- Construction workers should adhere to health and safety standards pertaining to noise, such as wearing ear protection when operating plant or heavy machinery.

6.3 Adverse Impacts on Biological Environment

6.3.1 Impacts on Terrestrial Vegetation and Protected Forestland

Potential impacts of the different components of the proposed project on terrestrial vegetation and protected forest area are discussed below.

(i) Intake, RWRM and NWTP Sites

Implementation of these components of the project will have minor impacts on natural vegetation. The project activities will affect merely some remnant or secondary trees, bushes and shrubs, almost all of which are widely distributed in the area and elsewhere. Of the potentially affected plant communities, Acacia trees are prominent. It is estimated that about 10 medium and large size and 6 small size Acacia trees (*A. abyssinica* & *A. ployacantha*) are likely to be affected; of which 15 trees are found along the RWRM and one at the NWTP site. In addition, bushy and

shrubby plants as well as lower plants including herbaceous plants, sedges and grasses would be affected.

(ii) CWRM, MR and Ginjo & Boye SMs

Construction of these components of the project will have relatively important impacts on plantation forest and some impacts on natural vegetation. Approximately 80% of the CWRM, 70% of the Boye SM, 60% of the Ginjo SM and the whole Main Reservoir area are located in an area designated as a state plantation forest. Although this artificial forest area contains dominantly exotic tree species, in some parts it has a considerable number of indigenous trees and patches of bush-lands. Thus, installation of the above indicated sections of the project components certainly will cause damages to some indigenous trees, bushes and shrubs, plus losses of plantation trees, dominantly Eucalyptus and Cypress trees. The main potentially affected indigenous tree species include *Albizia schimperiana*, *Combretum molle*, *Croton macrostachys*, *Olinia rochetiana*, and *Syzygium guineense*. In addition, two medium size (immature) *Podocarpus gracilior*, located at the Main Reservoir site can be affected. Further, numerous smaller trees, shrubs and other plant communities such as herbs and grasses unavoidably would be affected.

In addition, construction of the remaining sections of the project components presumably will cause loss of some indigenous trees, bushes and shrubs as well as many plantation trees. The possibly affected indigenous tree species include *Erythrina brucei*, *Albizia schimperiana* and *Millettia ferruginea*.

In terms of area coverage, the forestland to be affected due to the construction of the project components siting within the boundary of the Jiren Plantation Forest is estimated at about 3.60ha. This is based on the estimated space requirement for trench excavation for laying the transmission lines, equipment operating zone and opening of access tracks (estimated at 10m width for these activities, equivalent to 3.0ha), for construction of the Main Reservoir and Buster Pumping Station (0.50ha) as well as for materials storage site (0.10ha). The area to be affected due to installation of the remaining sections of the project components, i.e. in the areas outside of the JPF, is estimated at about 2.0ha. This includes farmlands, grazing areas, and areas covered by plantation trees and some remnant or secondary vegetation.

(iii) Aba-Jifar SM and Reservoir Areas

Installation of the Sub-main connecting Ginjo Reservoir/Buster Pumping Station to the Aba-Jifar Reservoir, i.e. the Aba-Jifar SM, is expected to cause loss of plantation trees dominantly Eucalyptus and Cypress trees, as well as a considerable number of indigenous trees and other plant communities. The potentially affected indigenous tree species comprise *Cordia africana*, *Acacia abyssinica*, *Erythrina brucei*, *Albizia schimperiana*, *Croton macrostachyus*, *Millettia ferruginea*, *Sapium ellipticum* and *Vernonia amygdalina*. The number of exotic trees that must be removed is expected to be significant whereas the number of indigenous trees to be affected is likely to be less significant. In addition, several species of other plant communities, mainly smaller trees and shrubs would be affected. Since the route of this SM mostly follows an existing road, its implementation will not require construction of access road.

Construction of the Aba-Jifar Reservoir will affect some small size trees and shrubs, all of which are secondary plant communities. The potentially affected trees and shrubs include *Calpurnia aurea*, *Cordia africana*, *Croton macrostachyus*, *Erythrina brucei*, *Euphorbia tirucalli*, *Myrica salicifolia* and *Vernonia amygdalina*.

(iv) Distribution Systems

Most of the planned distribution systems are located within the densely built up parts of the town. Thus, installation of these components of the project will not cause major damages to vegetation resources. However, felling of some plantation trees (mainly Eucalyptus species) and clearing of some bushes and shrubs, most of which are secondary vegetation, are expected particularly in the expansion zones of the town.

In summary, the extent of both the natural vegetation and plantation trees affected by the planned project activities is relatively small compared to the area of same vegetation/forest resources available in the area. In addition, none of the affected plant species and habitats is considered rare or threatened at any status. Thus, the loss of both the natural vegetation and plantation trees can be considered less significant, and can be mitigated to acceptable levels.

Proposed Mitigation Measures

Potential impacts on natural vegetation, solitary indigenous trees and plantation forest/trees can be reduced by restricting clearing or removal of trees to the imperative area needed for the project activities. It is recommended that wherever technically feasible, indigenous trees found within the impact zone and its periphery shall be preserved. In addition, a replanting program shall be implemented to compensate for the vegetation/forest or trees lost due to the project activities. The planting program shall include both indigenous tree species (like *Acacia abyssinica*, *Cordia africana*, *Erythrina brucei*, etc.) and plantation trees (like Cypress, Eucalyptus, Gravillea).

6.3.2 Impacts on Wildlife

Of the areas affected by the project activities, the Jiren Plantation Forest (JPF) and the patches of natural forest in the JPF are habitats for some species of wild animals mainly Hyenas, monkeys, Anubis baboon and Bush duiker, as well as a variety of birdlife. A small portion of these habitats would be affected or disturbed by the construction activities of the Clear Water Rising Main, the Jiren Kella Main Reservoir and the Ginjo and Boye Sub-mains. The wild animals found in the impact areas would temporarily move away from the disturbed areas and are likely come back once the disturbance has ceased. The impacts will be mainly related to loss of habitats and disturbance by noise generated by the construction activities especially operation of heavy duty equipment and trucks hauling construction materials.

In addition, the Hippopotamus that may inhabit the Gilgel Gibe River near the intake weir site can be disturbed by the noise generated by the construction activities involved in the rehabilitation of the weir and installation of the Raw Water Rising Main. Presumably, the animals would temporarily move to the upstream or downstream stretch of the river and come back once the disturbance has ceased. Moreover, the construction activities will displace/disturb a variety of terrestrial as well as aquatic bird species inhabiting in the project impact areas.

Since most of the wildlife found in the area are those species adapted to disturbed habitats, they are not expected to be significantly affected by the temporary disturbances and loss of limited habitats caused by the project activities. Therefore, it can be concluded that implementation of the project will not bring any serious impacts on wildlife, and the potential impacts will be localized and less significant.

Mitigation Measures

Most of the mitigation measures proposed for the impacts on vegetation will also help to mitigate potential impacts on wildlife. Additional mitigation measures include backfilling of trenches and other excavated areas and grading to the natural topography as soon as works are completed to avoid the danger of animal trapping in such holes and to avoid obstruction to animal movements. In addition, poaching of wildlife by the workforce and deliberate killing of wild animals should be avoided. In order to realize this measure, training or awareness creation program shall be given for the project personnel prior to the commencement of the construction works.

6.3.3 Impact on Aquatic Ecology

The important aquatic habitats in the project influence zone are Gilgel Gibe river (GGR), Aweytu river and Boye Swamp. These habitats support a range of aquatic flora and fauna, prominently sedges and riverine plant communities, some fish species and hippopotamus. Implementation of the project components located nearby the indicated water bodies is not expected to cause any significant physical damages to these habitats. Nevertheless, the Gilgel Gibe and Aweytu rivers are likely to be affected if the sludge water released from the WTP is discharged to the rivers. In addition, the water bodies could be affected to some extent due to increased sediment loading resulting from increased soil erosion and sediment transport rate. The major possible impact is related to changes in the physical and chemical quality of the rivers water.

Mitigation Measures

Potential impacts on aquatic ecology can be minimized through avoidance of discharging sludge water into the rivers (GGR and Aweytu). This can be effected by providing drying bed for the treatment of the sludge water and disposal of the cake at a landfill; this mitigation measure is already included in the project plan. The potential sediment-loading problem can be minimized through implementation of soil stabilization and erosion control measures, which are already discussed in section 6.2.2.

6.4 Negative Impacts on Socio-Economic Environment

6.4.1 Impacts on Housing Units

Of the planned transmission lines, the Ginjo and Aba Jifar Sub-mains run at very close to several housing units (see Photo 15 as an example). Based on the data collected during the environmental field survey, about 8 housing units would be partially affected by the Aba Jifar SM. With regard to Ginjo SM, three housing units are possibly affected. A slight shift of the route of the Ginjo SM to left hand side would avoid the impact on the housing units while this would cause an impact on the fence of the Ginjo Mosque.

Mitigation Measures

After the Construction Contractor carry out a detailed site survey and determine the exact location of the project components, inventory and valuation of the affected properties shall be conducted and compensation paid to the owners in accordance with the existing Government Laws such as Proclamation No. 455/2007 and Regulations No. 135/2007 and the RPF that was agreed as part of the borrower's legal commitment to the project. In addition, the Contractor shall adopt construction methods that minimize impacts on properties like use of manual labour and simple equipment instead of heavy-duty machinery for installing the transmission lines that run at very close to fixed properties, valuable trees and cultural heritage sites.



Photo15: One of potentially affected houses along the Aba-Jifar SM, only 3m space between the house & the road where the pipeline is located.



Photo16: Potentially affected eucalyptus plantation along the Aba-Jifar SM – very narrow road & no space b/n the plantation & the road.

6.4.2 Impacts on Tree Plantations and Perennial Crops

As already described under section 6.3.1 above, installation of the Clear Water Rising Main and the Ginjo, Boye and Aba Jifar Sub-mains is likely to cause a loss of significant plantation trees, which are under both state and private ownership. The affected trees are dominantly Eucalyptus species (see Photo 16 as an example) and Cypress (*Cupressus lusitanica*), and some Graviillea trees. In addition, installation of the Ginjo and Aba Jifar Sub-mains would affect perennial crops including 'Enset' (false banana), Coffee, 'Chat' (stimulant plant), and fruits such as banana, papaya, guava and orange. The extent of the loss of the trees and crops should be determined after the detailed route survey and determination of the extent of land requirement for installing the pipelines, access roads and space for operating equipment.

Mitigation Measures

The mitigation measures for the impacts on plantation trees and perennial crops include conducting inventory and valuation of the affected properties and paying compensation according to the Regulations No. 135/2007. In addition, for the installation of the sections of transmission lines passing through dense trees and crops, the Contractor shall use manual labour instead of machinery in order to minimize the extent of damages to the properties.

6.4.3 Impact on Agricultural Lands

The Sub-main running from the Jiren Kella Main Reservoir to the Ginjo Reservoir (i.e. the Ginjo SM) and the Sub-main extending from Ginjo Buster Pumping Station to Aba Jifar Reservoir (i.e. the Aba Jifar SM) traverse some plots of farmland that are located in Ginjo and Jiren Kebeles (see Photo 17 as an example). Consequently, installation of the transmission lines will affect the farmlands on temporary basis due to trenches excavation and compaction by heavy equipment used in the construction works.

Mitigation Measures

Potential impacts on agricultural lands can be reduced by implementing the construction works during the dry season and unavoidable impacts mitigated through reinstatement of the affected areas to productive state. This can be realized by preserving topsoil during land clearing and excavation works, refilling the excavated soils and covering with topsoil immediately following completion of the installation works. In addition, the compacted areas shall be ploughed to prepare the surface for growing crops or pasture grasses. Furthermore, financial compensation shall be effected according to the Regulations No. 135/2007.



Photo 17: Potentially affected farmland plots, which are traversed by the Ginjo Sub-main in Ginjo Kebele.



Photo 18: Cemetery site at 4-5m from the route of the Aba Jifar Transmission Line.

6.4.4 Impacts on Cultural Heritage Sites

The cultural heritage sites located in the vicinity of some components of the project are the Aba Jifar Palace, 'Mesgida Afurtema' (Mosque 40), and the Cemetery site found near the Mosque 40. The former two sites are situated at a distance of not less than 100m from the transmission line that connects the Aba Jifar Reservoir, i.e. the Aba Jifar Sub-main, whereas the nearest cemeteries are found at about 3-4m distance from the pipeline route. Since this pipeline is relatively small in size (150mm in diameter) and PVC, which can be flexible, installation of the transmission line is expected to be carried out using manual labour and simple equipment instead of heavy equipment. Therefore, installation of the mentioned transmission line and Aba Jifar Reservoir is not likely to cause impacts on the above-indicated sites of cultural value.

Mitigation Measures

In order to avoid any potential adverse impacts on the cultural heritage sites, it is recommended that the Construction Contractor shall use manual labour and simple equipment instead of heavy equipment to install the Aba Jifar SM and Aba Jifar Reservoir at least for the stretches located nearby the cultural sites.

6.4.5 Impacts on Infrastructures and Traffic Mobility and Safety

The Clear Water Rising Main (CWM), the Boye and Aba Jifar Sub-mains, as well as the new distribution systems are designed to cross roads at several places. As a result installation of the transmission lines would cause damages to the road infrastructure. The CWM and the Boye SM would cross the Addis – Jimma asphalt road and the former transmission line is designed to cross under a culvert in order to avoid causing damage to the road whereas the latter transmission line would be installed by cutting across the road. In addition, the Aba Jifar SM will affect the gravel road linking the Jiren and Ginjo Kebeles. Further, the new distribution networks would cross asphalt roads as well as gravel roads at several places, and hence, their installation unavoidably would cause damages to the road network at the crossing points. Laying of the distribution networks would not only damage roads, but also likely to cause damages to roadside drainage facilities and pedestrian walkways of asphalt pavement and gravel surfaces.

The excavation works for pipe trenches and mobilization of materials may cause interruption of vehicular traffic flows and pedestrian movements especially in the town. Besides, the trench excavated and left open for sometimes could be a danger for local people especially children, women, elderly people and persons with disabilities, as well as for animals while it may cause obstruction to their mobility.

Mitigation Measures

The impacts on physical infrastructures (roads, drainage facilities and pedestrian walkways) can be reduced by restricting the damages to the area absolutely necessary for laying the pipelines and mitigating the unavoidable impacts by reinstating the damaged sections of the infrastructures to original state as soon as the works are completed.

For safety reasons the excavation condition of the trench should be in such a way that there will be minimum danger for the vehicular traffic, local people and animals. In addition, appropriate signals should be placed at the excavation sites and the sites ought to be prohibited for people and animals. Options to minimize obstruction of traffic mobility is scheduling construction for night, reserving a half-way for traffic mobility while working on the other half-way, and providing detour way where possible. Further, excess spoils should be quickly collected and dumped at the properly located spoil disposal site.

Moreover, to avoid unnecessary costs, inconveniences and delays in rehabilitation of the affected infrastructures and utilities, a plat form has to be established among the agencies responsible for road construction, water supply, telecommunication, power transmission and others to share ideas and understand the plans and working programs for each other.

6.4.6 Interruption of Existing Water Supply System

Inevitably, there would be some interruptions to the existing water supply system particularly when connections with the existing distributions are made, and when rehabilitations and replacement of old pipes are executed. This situation may result in shortage or lack of water in the zone serviced by the affected transmission lines or distribution systems. In particular, the impact could be significant if the interruption is extended for several days as the affected communities may tend to use water from unsafe sources or be forced to spend extra expenditure for buying water from vendors.

Mitigation Measures

The duration of the interruptions to the existing water supply can be minimized through proper planning of the installation works. In addition, other options of supplying water like temporary connections and providing water by arranging temporary tankers. Further, the affected community should be informed beforehand.

6.4.7 Impacts on Public Health

Construction Phase:

Trench excavations and other earthworks may modify the local topography and drainage system and create stagnant water points. These water pools may become favorable breeding sites for vector mosquitoes that transmit malaria to the communities living in the surrounding areas. This can be an important issue since malaria is the leading cause of morbidity in the town and its environs.

Large-scale construction works mostly have the potential for the spread of HIV/AIDS and other sexually transmitted diseases (STDs). This is mainly because construction workers are mostly young, sexually active group of the population, mobile and usually they tend to live in hotels or camps without their families. As per the information obtained from the Construction Contractor's Site Manager, the construction works of the planned JWSSP would involve approximately 120 skilled and semi-skilled workers and 100 – 140 daily laborers. All the daily laborers and most of the semi-skilled workers will be locals, and only the skilled and a small proportion of the semi-skilled workforce will be imported. Therefore, workers camps will not be established and the imported workers will live in rented houses. This situation has the advantage to reduce the risk of HIV/AIDS and other STDs.

Operation Phase:

During the operation phase, there would be some adverse impacts on public health, which is basically related to increased volume of wastewater. An increase in the volume of water supplied certainly will generate a proportional increase in the volume of wastewater produced. Currently most parts of the town has no properly constructed drainage systems including open ditches and closed conduits for disposal of storm-water and wastewater generated by the town. Unless such essential facilities are built to evacuate the wastewater, there will be no alternative to spilling of wastewater into streets, road surfaces and open drainage channels. As a result, more puddles that will attract disease vectors such as housefly and mosquitoes are expected and consequently leaving people vulnerable to diseases. In addition, leakages from distribution systems and operation of public fountains may generate significant

amounts of wastewater that could be potential breeding sites for malaria mosquitoes and other disease vectors.

Spilling of the increased wastewater into streets and access/internal roads may also result in destruction of the street and road pavement that in turn will have adverse effects on public activities.

Mitigation Measures

Construction Phase:

Construction works should not create pools of water where insect vectors of diseases especially mosquitoes may breed. Pipeline trenches and other excavated places should be refilled and graded to the surrounding topography immediately following completion of works in order to avoid formation of water points/pools that may become breeding sites for disease vectors. In case pools are formed, they should be drained as quickly as possible before they become ideal breeding places for disease vectors.

As preventive measures, construction workers must be informed through awareness raising and education programs about HIV/AIDS and other STDs. This has to be done by the Construction Contractor and the Jimma Town Health Office.

Operation Phase:

Provision of adequate drainage facilities for disposal of the wastewater is a fundamental solution to minimize potential problems related to increased wastewater. Not only provision of facilities, raising public awareness to promote proper disposal of wastewater using available facilities will also be essential. Moreover, the public fountain points should be well-constructed and provided with connections to drainage systems so that the wastewater would be safely drained away from the sites.

6.5 Summary of Potential Environmental and Social Impacts

Table 6.1 presents the main identified potential environmental and social impacts and their characterization in terms of impact type, duration and probability of occurrence, area extent and magnitude. In addition, the significance of the impacts is evaluated on the basis of this characterization.

Table 6.1: Summary of Prediction and Evaluation of Potential Environmental and Social Impacts

	Main Potential Impacts	Characterization											Evaluation			
		Type		Duration		Area Extent		Probability of Occurrence			Magnitude			Significance		
		Beneficial	Adverse	Short-term	Long-term	Localized	Extensive	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
1	Impacts on Physical Environment															
1.1	Land acquisition and impacts on land use		X	X	X	X				X	X					X
1.2	Soil erosion and compaction		X	X		X				X		X				X
1.3	Reduction of downstream river flows & effects on downstream users		X		X		X			X	X			X		
1.4	Impacts on water quality during CP		X	X	X		X			X	X					X
1.5	Impacts on water quality during OP		X		X		X			X			X			X
1.6	Air and noise pollution		X	X		X				X		X				X
2	Impacts on Biological Environment															
2.1	Impacts on terrestrial vegetation and protected forestland		X	X		X				X	X			X		
2.2	Impacts on terrestrial wildlife		X	X		X				X	X			X		
2.3	Impacts on aquatic ecology		X	X	X	X	X			X		X				X
3	Impacts on Social Environment															
3.1	Creation of employment opportunity	X		X	X	X				X	X					X
3.2	Impacts on housing units		X	X		X				X	X					X
3.3	Impact on agricultural lands		X	X		X				X	X			X		
3.4	Impacts on plantation trees & perennial crops		X	X		X				X		X		X		
3.5	Impacts on cultural heritage sites		X	X		X			X		X					X
3.6	Impacts on infrastructures and traffic mobility and safety		X	X		X				X		X				X
3.7	Interruption of existing water supply system		X	X		X				X	X					X
3.8	Impacts on public health	X	X	X	X	X	X			X	X	X				X
3.9	Impacts on investment & economic devt	X			X		X		X			X				X

6.6 Residual Environmental and Social Impacts

Prediction of the magnitude and significance of “after-mitigation” (or residual) environmental and social impacts is presented in Table 6.2 below. As it can be observed from the Table, it is expected that all the identified impacts can be mitigated to acceptable levels if the recommended mitigation measures are properly implemented.

Table 6.2: Prediction of Residual Environmental and Social Impacts

	Main Potential Impacts	Magnitude				Significance			
		Insignificant	Low	Moderate	High	Insignificant	Low	Moderate	High
1	Impacts on Physical Environment								
1.1	Land acquisition and impacts on land use		X				X		
1.2	Soil erosion and compaction		X			X			
1.3	Reduction of downstream river flows & effects on downstream users		X			X			
1.4	Impacts on water quality during CP		X			X			
1.5	Impacts on water quality during OP		X			X			
1.6	Air and noise pollution		X				X		
2	Impacts on Biological Environment								
2.1	Impacts on terrestrial vegetation and protected forestland		X			X			
2.2	Impacts on terrestrial wildlife		X			X			
2.3	Impacts on aquatic ecology		X			X			
3	Impacts on Social Environment								
3.1	Impacts on housing units		X				X		
3.2	Impact on agricultural lands		X			X			
3.3	Impacts on plantation trees & perennial crops		X			X			
3.4	Impacts on cultural heritage sites	X				X			
3.5	Impacts on infrastructures and traffic mobility and safety		X				X		
3.6	Interruption of existing water supply system		X				X		
3.7	Impacts on public health		X				X		

7 PROJECT ALTERNATIVES

The main objective of considering alternatives is to compare potential impacts of the possible project options as well as the options in mitigating project impacts. The alternatives considered in this ESIA include alternative water sources and location of abstraction, alternative mitigation measures and the alternative without project. These are briefly described below.

7.1 Alternative Water Sources and Location of Abstraction

In the feasibility study of alternative water sources for the Jimma town water supply system, it was determined that surface water is the only feasible alternative to meet the project objective. No other technically and economically feasible alternatives have been found to achieve the functions of the planned water supply system. There are no spring sources or groundwater aquifer in the Jimma area with adequate yields that can meet the town's water supply requirements. Therefore, abstraction of water from Gilgel Gibe River and treating it through conventional treatment units to meet the drinking water quality standards has been considered as the only option to achieve the project objective.

In terms of location of abstraction, the site of the existing intake weir was found to be the most technically and economically feasible. The intake site is located at upstream of the confluence of the Aweytu river in order to avoid pollution risks since this stream is highly polluted as it passes through Jimma and almost the whole catchment of the town drains into the stream.

7.2 Consideration of Alternative Construction Methods and Mitigation Measures

For the significant environmental and social impacts, alternative construction methods and mitigation measures have been considered and the most preferred one(s) are recommended for implementation.

7.2.1 Alternatives of Construction Methods

The extent and significance of a number of environmental and social impacts depend on the construction method applied to install the project facilities or components. In particular, for the project sections or components located in or nearby environmentally or socially sensitive areas, the possible construction methods and the environmentally or socially recommended method are given in Table 7.1 below.

As shown in the Table, use of manual labour and simple equipment instead of heavy-duty machinery would avoid or minimize a number of potential environmental and social impacts. Therefore, it is recommended that manual labour and simple equipment would be applied particularly for sections of the project components located nearby environmentally or socially sensitive sites as far as it is technically feasible. In case it is a must to apply heavy-duty equipment, maximum precautions or appropriate mitigations shall be adopted to avoid or minimize any possible impacts to acceptable levels.

Table 7.1 Comparison of Impact Significance of Possible Construction Methods

	Project Components	Main Potential Environmental & Social Impacts	Impact Significance by Construction Method		Recommendations
			CM-1	CM-2	
1	Clear Water Rising Main	Loss of plantation forest/ trees and indigenous trees	Low	Moderate	Use as required but apply appropriate mitigation measures to minimize impacts to acceptable levels.
2	Ginjo Sub-main	Loss of plantation forest/ trees, indigenous trees, perennial crops, farmland, & impacts on housing units & fence of Ginjo Mosque	Low	Moderate	Use CM1 for sections nearby housing units and valuable trees and crops to avoid or minimize impacts.
3	Aba Jifar SM	Loss of plantation trees, indigenous trees, perennial crops, farmland, & impacts on residential houses, cemetery site	Low	Moderate to High	Use CM1 for the whole section of the transmission line
4	Aba Jifar Reservoir	Loss of some trees and grazing land, noise pollution to nearby residents	Low	Low	Use CM1 as far as possible and apply mitigation measures to reduce noise pollution.
5	Boye Sub-main	Impacts on plantation forest, indigenous trees and asphalt road (Addis-Jimma Road)	Low	Moderate	Use as required but apply CM1 for sections nearby valuable trees and apply appropriate mitigation measures
6	Distribution Systems	Loss of plantation trees, indigenous trees, perennial crops; damages to asphalt roads, internal roads, drainage facilities, & pedestrian walkways; obstruction to traffic mobility & safety hazards	Low	Moderate	Use CM1 as far as technically feasible & apply appropriate mitigation measures

Note: CM = Construction Method; CM-1 = Manual Labour & Simple Equipment; CM-2 = Heavy Duty Machinery

7.2.2 Alternatives of Mitigation Measures

One of the significant environmental impacts of the envisaged project is related to residual sludge disposal. Therefore, the Consultant has considered three possible methods of sludge treatment and disposal. The three methods and their comparison are presented in Table 7.2 below. The option, which involves disposal of the sludge directly to the natural environment/river course without any treatment, is economically the cheapest, but environmentally unacceptable. If to comply with environmental standards, this option should not be adopted for the sludge disposal. The second alternative that involves sludge drying lagoons is likely to involve significant capital, operation and maintenance costs, but environmentally acceptable. The third option, which comprises mechanical treatment, seems to be economically prohibitive, but environmentally acceptable. Considering both the environmental consequences of the sludge disposal and the cost implications related to the sludge treatment and disposal of the residual solid waste, it is recommended that the drying lagoons method shall be adopted for the project.

Table 7.2: Comparison of Possible Alternatives for Sludge Treatment

Evaluation Criteria	Qualitative Evaluation of the Alternatives		
	Disposal of raw sludge to natural water body	Use of drying lagoons	Use of mechanical treatment
Equipment/facilities and chemicals requirement	Very low	Moderate	High
Energy consumption	Very low	Low	High
Land requirement	Very low	High	Low
Involvement of qualified operators	Very low	Moderate	High
Environmental & social impacts	High	Low	Low
Compliance to standards/ environmental acceptability	No (not acceptable)	Yes (acceptable)	Yes (acceptable)
Investment, operation & maintenance costs (as expected)	Very low	High	Very high
Overall acceptance level*	Low	High	Low

* The overall acceptance was determined based on the combination of environmental & social acceptance and cost implications of the alternative.

7.3 The Alternative “Without Project”

From an environmental point of view as well as some socio-economic aspects, the “without project” setup is preferable to project implementation, since it would avoid creation of any of the adverse impacts associated with the project. Nonetheless, the potential social and economic benefits to the envisaged water supply project would be foregone, and the existing social and economic problems associated with shortage of safe water supply would remain unrelieved. With such situation, the town’s economic and social development could be restrained and the standard of living of the town’s population may remain at a low level.

From an economic and social perspective, the “without project” option is not acceptable. At present, a significant proportion of the town’s population is not provided with safe drinking water from the existing water supply system and the remaining is supplied on ration basis. Hence, the majority of the town’s population is suffering from a number of social and economic problems including prevalence of water-borne diseases and poor hygiene, economic problems due to extra expenditure for buying water and impacts on service providers like restaurants, hotels etc. Moreover, shortage of potable water supply has significantly impacted on investment and other economic development activities. As it is revealed in this ESIA analysis, the implementation of the planned water supply project will not to bring any serious environmental or social impacts that cannot be mitigated to acceptable levels. Therefore, it is recommended that the envisaged project would be implemented in order to address the potable water shortage in Jimma, and thus, to improve the quality of life of the people, generate economic development, create employment and reduce poverty.

8 PUBLIC AND STAKEHOLDERS CONSULTATIONS

8.1 General

The Constitution of Ethiopia through its Articles 43 and the Environmental Policy of the FDRE require the need to involve the interested and affected parties in the planning and implementation of development policies, programs and projects. Also many donor agencies including the World Bank require different consultations with the concerned public and stakeholders and public comments on the ESIA Report before consideration by decision makers. Thus, public and stakeholders consultation and participation are considered as an integral part of the ESIA study and implementation of the ESIA recommendations.

In line with these policy and legal requirements, different consultations have been carried out with the key stakeholders including the project affected people in order to:

- Inform them about the envisaged project activities,
- Identify the major existing environmental and socio-economic problems of the project area with particular focus on potable water supply,
- Assess their perceptions and attitudes towards the proposed water supply and sanitation project,
- Identify the potential environmental and social impacts, both positive and negative impacts, of the envisaged sub-project,
- Seek possible mitigation measures that would help to avoid, minimize or offset the significant negative impacts and enhancement measures for positive beneficial impacts.

8.2 The Consultation Process

Initially, the different interested and affected parties at different administrative levels and at the grass-root community level were identified before and during the environmental and social field survey in the project influence area. The major identified stakeholders include the following:

- Relevant authority and experts of the Regional Land and Environmental Protection Bureau,
- Authorities and experts of the various sectoral offices of the Jimma Zone,
- Authorities of the Jimma City Administration,
- Authorities and experts of the various sectoral offices of the Jimma City Administration,
- Officials of the Kebeles in Jimma City, and
- The local community including the project affected people.

The consultations carried out with these stakeholders can be categorized into three groups or levels, which are briefly discussed below.

8.2.1 Consultations with the Administration and Sectoral Offices

Interviews and discussions were held with the authorities of the Jimma City Administration and the authorities of selected Kebeles, as well as with authorities and experts of the various sectoral offices operating in Jimma and its environs. The issues discussed and information gathered include the following:

- Baseline environmental and socio-economic conditions of Jimma and its environs,
- Major socio-economic and environmental problems of Jimma and its surroundings,
- Existing potable water supply situation and socio-economic problems related to shortage of clean water supply,
- Major environmental and social impacts (positive and negative) including downstream issues expected to result due to the implementation and operation of the envisaged sub-project,
- Possible mitigation measures for the identified negative impacts, and
- Their opinions and suggestions related to the proposed sub-project components or activities.

The main findings of these consultations are summarized in section 8.3 below and these are considered in the impact analysis and development of mitigation and management plan. The list of consulted authorities, professionals and organizations is presented in Appendix 1.



Photo 19: Consultation with Heads of Sector Offices



Photo 20: Consultation with Women Affairs Officials



Photo 21: Consultation with Vice Administrator of Jiren Kebele

8.2.2 Consultations with the Local Community

Interviews and discussions with members of the local community particularly the project affected people found near the major sub-project components were carried out during the field survey in the project influence areas. The main issues discussed with the interviewed PAPs include the following:

- The availability of safe drinking water supply in their village,
- Social and economic problems associated with shortage or lack of clean water supply, if the problem exists in their area,
- Potential benefits and negative effects expected to arise in relation with the project implementation and operation activities, and
- Their opinions towards the proposed water supply and sanitation project.

The main findings of the consultations made with the PAPs are included in section 8.3 below and the list of persons consulted is given in Appendix 1.



Photo 22: Interviews with local people along the Aba-Jifar Sub-main



Photo 23: Interviews with local people along the Ginjo Sub-main while they are on farming practices

8.2.3 Public Consultations

Three public consultations were carried out, two of them at Jimma Conference Hall (Gibe Hall) but at different times, and the third at Jiren Kebele. The first consultation held at the Gibe Hall was made with the authorities of the Jimma City Administration and heads or representatives of 16 sectoral offices operating in Jimma town (see Photo 24). The second consultation at the same place was conducted with representatives drawn from 10 Kebeles of the town and the participants included officials or representatives of the Kebele Administration, and representatives of the local community (see Photo 25). The third consultation was conducted at Jiren Kebele Office with the representatives of the local community and the kebele administration.

Prior to discussion on the agenda of the meetings, the Consultant presented a brief description of the sub-project components and the main activities involved in the implementation of the sub-project to the audience. Then the discussants were asked

whether they had fully understood the project features and after confirming that was the case, the agenda of the meetings was presented. These included the following:

- Key socio-economic and environmental problems of Jimma and its hinterlands,
- Existing potable water supply situation including the magnitude of water shortage in Jimma town,
- Social and economic problems related to shortage of clean water supply,
- Anticipated major environmental and social impacts (positive and negative) of the implementation and operation of the envisaged project,
- Possible mitigation measures for the identified negative impacts, and
- Their opinions and suggestions related to the proposed sub-project components or activities.

The participants discussed thoroughly on each of the above listed agenda and the main findings of these consultations are outlined in section 8.3 below, while the minutes of the meetings are attached in Appendix 6.



Photo 24: Consultation with Representative of the City Administration and Heads of Sector Offices at Gibe Hall



Photo 25: Consultation with Kebele Officials and Representatives at Gibe Hall



Photo 26: Consultation with Representatives of the Local Community at Jiren Kebele

8.3 Main Findings of the Different Consultations

8.3.1 Major Socio-economic and Environmental Problems of Jimma

As identified and discussed during the public and stakeholders consultations, the major socio-economic and environmental problems of Jimma City include the following:

- Population increase, which is putting increased pressure on social services, infrastructures, etc.
- Shortage of clean water supply resulting in significant social and economic problems
- Lack of proper and efficient solid and liquid waste disposal systems resulting in direct disposal of wastes in streams and open fields
- Increased environmental pollution especially water pollution mainly due to the reason indicated above
- Shortage of physical infrastructures such as roads, drainage facilities etc. and poor condition of the existing ones
- Illegal construction activities
- High rate of unemployment particularly the young people

8.3.2 The Magnitude of Clean Water Supply Problem

Shortage of clean water supply was identified as current number one problem of Jimma making the soundness of the project in relation with problem of the town. As stated earlier in the baseline description, *Jiren, Satto, Becho-Bore, Ginjo*, and other new settlement areas were identified as Kebeles or areas suffering more severely than other parts of the town. Thus, the people residing in these Kebeles are compelled to consume water drawn from unsafe/ polluted sources and thus, are suffering from its after effects such as water-borne diseases. In addition, the dwellers spend much

money to buy water from vendors. Further, women living where there is no clean water supply identified as the major victim of the problem, by spending much time and labor for longer queuing time and traveling longer distances hauling water on back loading.

8.3.3 Expected Positive Impacts of the Envisaged Project

The stakeholders also forwarded a list of positive impacts of the project. These include, among others:

- Improvement of public health since provision of adequate clean water would avoid or minimize water-borne diseases ensuing from consuming polluted water
- Availability of adequate potable water supply is expected to help the dwellers to lead healthy and happy life
- Women and children will save their time and energy to carry out other gamut of households tasks
- There will be a chance for unemployed people to get job during construction phase
- The project will pave a way for skill transfer and capacity building that would be used in operating the water supply facility and other similar projects
- Availability of adequate water supply will promote investments and other economic activities

8.3.4 Negative Impacts and Proposed Mitigation Measures

The major negative impacts of the project as identified by the stakeholders include the following:

- Demolishing of housing units in the town during construction phase,
- Damaging of infrastructures including asphalt and gravel roads, roadside drainage facilities and pedestrian walkways during the installation of transmission and distribution lines,
- Temporary or permanent acquisition of land under various uses due to land requirements for installation or construction of the different components of the project,
- Impacts on farmlands, annual crops as well as perennial crops in association with construction or installation of the project components including the transmission and distribution lines, water reservoirs, and public fountains,
- Loss of plantation trees as well as indigenous trees in relation to land taking and installation of the various project components including the transmission lines, distribution systems, reservoirs, and public fountains, and
- Impacts on cultural heritage sites such as the Aba Jifar II Palace, Mosque 40 & Cemetery site nearby the mosque, and Ginjo Mosque since these are located at nearby transmission lines and reservoirs.

Mitigation measures forwarded by the participants or stakeholders include the following:

- Effecting compensation for loss of private and public properties to enable the restoration of the affected assets,
- Refilling of pipeline trenches and other excavated sites as soon as the works are completed,
- Reconstruction of damaged infrastructures (roads, pedestrian walkways & drainage facilities) as soon as possible,
- Use of dust suppressants like spraying water on dusty gravel or earth roads to minimize dust pollution,
- Applying speed limit for construction traffic to reduce dust pollution and traffic accident risks,
- Utilization of mature trees affected by the project activities and implementing replacement tree planting,
- Allotting land for planting trees to replace the trees affected by the project, and
- Taking maximum precautions to avoid impacts on cultural heritage sites near some project components.

8.3.5 The Output of the Consultations

After considering the magnitude and significance of the positive and negative impacts of the planned sub-project, both groups of discussants of the consultations held at the Gibe Hall reached consensus that the positive impacts of the project would much outweigh the negative impacts. They highlighted that the implementation of the project would solve the Jimma town's water supply shortage problem while the potential negative impacts can be minimized by adopting the mitigation measures recommended during the consultations together with additional measures to be proposed by the ESIA Consultant.

The participants of both Public Consultations (PCs), officials of the administration and different sector offices and members of the local community consulted all supported the project with their full consent and pledged with great enthusiastic feeling to participate actively all along with the project implementing bodies in the subsequent phases of the project. Concerning downstream users, the consulted groups indicated that they fully accept the project assuming that the project would not cause significant reduction in downstream flows and the quality of river water would not be significantly impaired. Sample minutes of the meetings held with key stakeholders are presented in Appendix 5 while the minutes of the PCs conducted at the Gibe Hall and Jiren Kebele are attached in Appendix 6.

8.4 Public Disclosure of the ESIA Findings

The second step of consultation will include presentation or disclosure of the results of the ESIA study, i.e. the ESIA Report, to the public for review and comments on the report earlier to appraisal of the WSS project for implementation. Public disclosure of the ESIA Report would provide the project-affected people and other interested parties the opportunity to review and comment on the ESIA document and appropriate comments and suggestions will be considered in the Final ESIA Report. After public consultation results have been included, a final ESIA report will be publicly disclosed in Ethiopia and at the World Bank's Infoshop.

The MoWR in collaboration with the JWSSE has to publicly disclose this ESIA Report. They need to distribute copies of the Report with a letter accompanied to the Regional LEPB, Jimma Zone LEPO, and Jimma City LEPO. In addition, a summary of the ESIA Report in English and local language (Oromiffa) has to be disclosed to the key stakeholders including the Jimma Zone and Jimma City Administrations, Sector Offices of Jimma Zone and Jimma City, Kersa and Omo Nada Woredas Administrations, and local NGOs, as well as the project-affected people (PAP) through the Kebele Administrations and other available means. Further, the summary of the ESIA Report need to be made available to other interested parts by publishing it on regional newspaper and posting it in publicly accessible places like the Zonal, City and Kebele level administration offices.

Once disclosed in Ethiopia, the FDRE will authorize the World Bank to disclose this ESIA Report electronically at the Info-shop in Washington DC.

9 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

9.1 Environmental Management Plan

The potential adverse environmental and social impacts of the planned Jimma Water Supply and Sanitation Project have been identified, where possible quantified and their significance evaluated to the extent possible in Section 5 of this ESIA Report. In addition, the corresponding mitigation measures that should be implemented to avoid, lessen or offset the negative impacts are recommended in the same section.

This section presents an Environmental Management Plan (EMP) that links the impacts identified and mitigation measures proposed in the ESIA Report and the responsibilities for implementation and monitoring. Also, it indicates the time horizon over which the mitigation measures to be executed, and where necessary, cost estimates of the mitigation measures.

Prior to the commencement of the construction works and during construction, the Construction Contractor, the Supervisory Consultant and other responsible bodies should be aware of the environmental and social mitigation and management requirements and organized to perform the responsibilities vested upon them. During construction, the Construction Contractor would execute most of the mitigation measures recommended to control the possible impacts related to construction activities. The Supervisory Consultant and the City Land and Environmental Protection Office would monitor impacts and the proper implementation of the mitigation plan. In particular, the Supervisory Consultant would control the activities at the construction sites such as operation of equipment and vehicular traffic, operation of quarry and borrow sites, operation of materials processing sites like stone crushing & concrete batching plants, handling of hazardous substances like oils and fuel, disposal of spoil materials, etc. In addition, the Consultant has to approve the Contractor's Site Restoration Plan for the construction sites, construction material sources (quarries and borrow pits), materials processing and storage sites, and campsite, and make sure its proper implementation. When construction is completed, it is expected that those sites would be reinstated to their original state as closely as possible or to the state where the sites can be used for some productive uses like growing trees, crops, livestock pasture, etc.

The City Administration, JWSSE, and Jimma Town Land and Environmental Protection Office would implement most of the mitigation measures for the impacts associated with land acquisition and loss or damages of private or public properties. They would assign appropriate professionals and establish a committee that would carry out the inventory and valuation of the properties affected and effect the compensation to the property owners. In addition, the committee would handle the land acquisition process. These activities would be implemented immediately after the Contractor conducted the site survey and determined the exact location of the sub-project components and actual size of land required for laying them.

During the project operation phase, the JWSSE and JCLEPO would be responsible for implementing most of the mitigation and monitoring measures recommended in this ESIA study. Details of the proposed EMP is presented in Table 9.1 below. In order to ensure that the Contractor complies with the recommended environmental protection requirements, the provisions of the EMP and Environmental Guidelines for the Contractor should be part of the contract terms or agreements for the Contractor.

Table 9.1: Environmental Management Plan

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
1	Land acquisition and loss of land under various uses	<ul style="list-style-type: none"> • Payment of financial compensation for lost income from croplands or properties affected due to the project activities. 	JWSSE	Jimma City Administration	Prior to land acquisition	Given elsewhere
		<ul style="list-style-type: none"> • Restoration of productive lands affected by temporary activities. 	Construction Contractor	Supervisory Consultant, JCLEPO	Following completion of works	Part of the Engineering Cost
		<ul style="list-style-type: none"> • Scheduling the construction for dry season when the land is not in cultivation. 	JWSSE & Contractor	JCLEPO	Prior to start of construction	No cost
2	Impacts on soils (soil erosion, compaction & contamination)	<ul style="list-style-type: none"> • Execution of earthworks during the dry season and refilling the excavated soil soon. • Restricting land clearing to what is absolutely necessary. • Refilling the trenches and other excavated/exposed places soon, covering with topsoil, leveling to surrounding landscape and replanting with appropriate grass, shrub and/or tree species as soon as possible. • Ploughing the compacted areas to restore for crop growing and to improve infiltration into the soil and reduce water runoff. • Provision of well-designed and constructed culverts and side ditches for the access roads to minimize potential erosion. 	Construction Contractor	Supervisory Consultant	Throughout Construction phase	Part of the Engineering Cost
3	Impacts on landscape quality	<ul style="list-style-type: none"> • Restore quarry & borrow sites and campsite through back-filling, landscaping and re-establishing vegetation cover. • Replant vegetation to restore the natural appearance of construction areas mainly the transmission routes. 	Construction Contractor	Supervisory Consultant, Jimma City LEPO	Following completion of works	Part of the Contractor's Cost

Table 9.1: Environmental Management Plan, Continued

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
4	Increased sediment loading of water bodies	<ul style="list-style-type: none"> Minimize land clearance and earthworks to the imperative area necessary for the project works. Minimize soil erosion through refilling the trenches and other excavated/exposed places soon, and establishing protective cover such as appropriate grasses and other vegetation. 	Construction Contractor	Supervisory Consultant, Jimma City LEPO	Throughout construction phase and immediately after completion of works	Part of Contractor's Contract
5	Water pollution by hazardous substances (oils, fuel, used oils etc.) and sewage & other wastes generated by campsite	<ul style="list-style-type: none"> Locate site facilities (camps, fuel storage etc.) at sufficient distance (min. 1km) from water bodies, Provision of a secondary containment system for fuel storage facilities 	Construction Contractor	Supervisory Consultant, Jimma City LEPO	During site establishment	Part of Contractor's Contract
		<ul style="list-style-type: none"> Regularly check for leaks under all operating vehicles and equipment to avoid leakages by regular and effective maintenance, Implement proper handling of oil and fuel to avoid pollution by spillages, Avoid disposal of used oils in the field, by strictly controlling & documenting waste disposal process. 	Construction Contractor	Supervisory Consultant	Throughout construction phase	Precautionary measures & part of Contractor's Contract
6	Water pollution by sludge water released from water treatment plants	<ul style="list-style-type: none"> Construction of drying lagoons that will serve as thickeners for sludge water. 	Construction Contractor	Supervisory Consultant	During Construction phase	Included in the Engineering Cost
		<ul style="list-style-type: none"> Operation of the drying bed and disposal of the dewatered sludge at the properly located dumping site. 	JWSSE	JCLEPO	Throughout operation phase	Part of the Project Operation Cost

Table 9.1: Environmental Management Plan, Continued

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
7	Increased sedimentation & pollution risks due to land use in the catchment	<ul style="list-style-type: none"> Implement soil and water conservation measures in the catchment according to the study to be conducted by specialists as recommended under section 6.2.5. 	According to the recommendations of the catchment study	According to the recommendations of the catchment study	During the project operation phase	To be determined during the preparation for the interventions
		<ul style="list-style-type: none"> Create a buffer zone along the Gilgel Gibe river upstream of the intake weir site, and maintain it well-protected by shrubby vegetation or grasses. 	JWSSE in cooperation with ARDO	Zone LEPO	During the project operation phase	300,000.00 (Tentative)
8	Air & noise pollution due to dust, exhaust emissions and noise generated by the construction activities	<ul style="list-style-type: none"> Follow good site practices incorporating appropriate mitigation measures to reduce dust, nuisance noise and vehicle emissions. Limit traffic speeds to minimize dust and spray water regularly on the dusty roads. Use dust collectors or water spray systems as appropriate to prevent high dust emissions from stone crushing or batch plant operations. Service the exhaust systems of all vehicles and equipment on regular basis to ensure that noise and exhaust emissions are kept to appropriate levels. All machinery and plants should conform to the applicable noise standards, and plants should be provided with effective noise mufflers. Construction workers should adhere to health and safety standards pertaining to noise, such as wearing ear protection when operating plant or heavy machinery. 	Construction Contractor	Supervisory Consultant (SC)	Throughout construction phase	Included in the contract for the Contractor & SC

Table 9.1: Environmental Management Plan, Continued

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
9	Impacts on terrestrial vegetation and protected forestland	<ul style="list-style-type: none"> Restrict clearing or removal of trees to the imperative area needed for the project activities. Where feasible, preserve indigenous trees found within the impact zone and its periphery. Replant trees to compensate for the vegetation or trees lost due to the project activities. Restore quarry and borrow sites through back-filling and re-establishing vegetation 	Construction Contractor	Supervisory Consultant, Jimma City Land & Environmental Prot. Office	Throughout construction phase and following completion of works	Part of Contractor's Contract
		<ul style="list-style-type: none"> Arrangement of land for re-forestation program to replace the plantation forest lost due to land acquisition and project activities. 	Jimma City LEPO	Jimma Zone LEPO	As soon as possible during the construction phase	5,000.00
		<ul style="list-style-type: none"> Implement replanting program to compensate for trees or plantation forest lost due to land acquisition and project construction activities. 	Jimma Zone Forestry & wildlife Devt Enterprise	Jimma Zone LEPO	As soon as land & budget are made available	75,306.00 (see Appendix 6 for the details)
10	Impacts on wildlife	<ul style="list-style-type: none"> Back-filling of trenches and other excavated areas and grading to the natural topography to avoid the danger to animals and obstruction to their movements. 	Construction Contractor	Supervisory Consultant	As soon as works are completed	Part of Contractor's Contract
		<ul style="list-style-type: none"> Avoid poaching of wildlife by the workforce and deliberate killing of wild animals by vehicles. 	Construction Contractor	Supervisory Consultant	Throughout construction phase	As above
		<ul style="list-style-type: none"> Provide training or awareness creation program for the project personnel. 	Construction Contractor	Supervisory Consultant, JCLEPO	Prior to start of construction works	As above

Table 9.1: Environmental Management Plan, Continued

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
11	Impacts on aquatic ecology	<ul style="list-style-type: none"> Minimize soil erosion and sediment transport by implementing the measures indicated under item no. 2 above. 	Construction Contractor	Supervisory Consultant, JCLEPO	Throughout construction phase	Part of Contractor's Contract
		Avoid discharging of sludge water into water bodies (GGR, Aweytu river and Boye Swamp) by treating it at drying bed & dumping the cake at a landfill.	JWSSE	JCLEPO	Throughout the project phase	Part of the Project Operation Cost
12	Impacts on housing units	<ul style="list-style-type: none"> Pay compensation according to the Regulations No. 135/2007. The Compensation Committee shall conduct valuation of the affected houses and effect the payment to the owners. About 8 low standard houses have been identified along the Aba Jifar Sub-main. Based on the norms obtained from the Jimma City Municipality, the average cost of each house is estimated at 30,000 Birr. 	Committee comprising representatives of City & Kebele Administrations, Municipality, LEPO, JWSSE	Jimma Zone LEPO	Prior to commencement of construction works	240,000.00 (based on average cost of a house, which is about 30,000 Birr)
		<ul style="list-style-type: none"> Use manual labour and simple equipment instead of heavy-duty machinery for installing the pipelines that run near vulnerable properties 	Construction Contractor	Supervisory Consultant, JCLEPO	During pipeline installation	Part of the Contractor's Cost
13	Loss of tree plantations and perennial crops	<ul style="list-style-type: none"> Conduct the inventory and valuation of the affected trees and crops and pay compensation according to the Regulations No. 135/2007. 	Compensation Committee	Jimma Zone LEPO	Prior to commencement of construction works	150,000.00 (Tentative)
		<ul style="list-style-type: none"> Use manual labour and simple equipment instead of heavy-duty machinery for installing the pipelines that run near vulnerable properties 	Construction Contractor	Supervisory Consultant, JCLEPO	During pipeline installation	Part of the Contractor's Cost

Table 9.1: Environmental Management Plan, Continued

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
14	Impact on agricultural lands	<ul style="list-style-type: none"> Implement the construction works during the dry season, Reinstate the affected areas to productive state. Plough the compacted areas to prepare the surface for growing crops or pasture grasses. 	Construction Contractor	Supervisory Consultant, JCLEPO	During construction works & after completion of works	Part of Contractor's Contract
		<ul style="list-style-type: none"> Pay financial compensation according to the Regulations No. 135/2007. 	Committee & the Project			30,000.00 (Tentative)
15	Impacts on cultural heritage sites	<ul style="list-style-type: none"> Use manual labour and simple equipment to install the portion of the Aba Jifar SM located along the Cemetery site found near the Mosque 40. Construction works nearby the Aba Jifar II Palace & the Mosque 40 shall avoid any significant vibration or fly rocks. 	Construction Contractor	Supervisory Consultant	During the installation of the Aba Jifar SM & Reservoir	Part of Contractor's Contract
16	Damages of roads, drainage facilities & pedestrian walkways	<ul style="list-style-type: none"> Restrict damages to the area absolutely necessary for laying the pipelines, 	Construction Contractor	Supervisory Consultant	During construction works	Has no cost
		<ul style="list-style-type: none"> Reinstate the damaged sections of the infrastructures to original state as soon as the works are completed 	ERA District (Jimma Branch) & Municipality	Municipality	Following completion of works	700,000.00 (Tentative)
17	Obstruction of traffic mobility and safety hazards	<ul style="list-style-type: none"> Provide appropriate signals at the excavation sites, Prohibit the construction sites for the people and animals. For sections with critical space limitation, schedule construction for night and reserve a half-way for traffic mobility while working on the other half-way, Provide detours where possible. Collect and dump excess spoils as quickly as possible. 	Construction Contractor	Supervisory Consultant	Throughout the construction period	Part of Contractor's Contract

Table 9.1: Environmental Management Plan, Continued

Ser. No	Main Impacts	Main Mitigation Measures	Responsibility for Implementation	Responsibility for Monitoring	Timing of Execution	Cost Estimate (Eth. Birr)
18	Interruption of existing water supply system	<ul style="list-style-type: none"> • Proper planning for connections with the existing distributions, rehabilitations & replacement of old pipes. • Consider other options of supplying water like temporary connections and providing water by arranging temporary tankers, and inform the affected community beforehand. 	Construction Contractor, JWSSE	Supervisory Consultant, Jimma Zone Water Office	Prior to & during pipeline connection works	Part of Contractor's Contract, and routine activities of JWSSE
19	Impacts on public health	<ul style="list-style-type: none"> • Avoid creating pools of water where insect vectors of diseases especially mosquitoes may breed. Refill pipeline trenches and other excavated places and level to the surrounding topography. In case pools are formed, drain them as quickly as possible. 	Construction Contractor	Supervisory Consultant, Jimma Town Health Office	Throughout construction period	Included in the Contractor's contract
		<ul style="list-style-type: none"> • Inform construction workers through awareness raising and education campaigns about HIV/AIDS. 	Contractor & JHO and health institutions	Jimma Zone Health Office	Prior to start & during construction	Part of the Contractor's contract
		<ul style="list-style-type: none"> • Provision of adequate drainage facilities for disposal of the wastewater. • Raising public awareness to promote proper disposal of wastewater using available facilities. 	Municipality	Jimma Town LEPO	Prior to start of the new water supply system	Separate project is under planning
		<ul style="list-style-type: none"> • Regular monitoring of vector breeding sites and taking necessary actions depending on the monitoring results. 	Jimma Town Health Office	Jimma Zone Health Office	Throughout operation period	Included in monitoring program
				Total Cost		1,500,306.00

9.2 Environmental Monitoring Plan and Reporting

Environmental monitoring will be required both during the construction and operation phases of the project in order to check whether the proposed mitigation measures are properly implemented and the performance of the implemented measures, as well as the occurrence of any unforeseen impacts. Environmental monitoring helps to detect the extent and significance of the environmental and social impacts caused by the project over time or the impacts of environmental or human factors on the project itself and to assess whether mitigation actions have been properly and timely implemented and are working as expected. Monitoring of environmental parameters will identify potential problems from the project activities or potential problems on the project and will allow for timely implementation of effective corrective measures. It will also allow for validation of the assessment made in this study.

The major environmental and social issues that would be covered in the monitoring program include the following, but not limited to:

- land acquisition and reinstatement measures after completion of works,
- Impacts on soils (soil erosion, compaction, pollution) and mitigation measures implemented,
- Impacts on water quality and measures taken,
- Impacts on flora and fauna,
- Impacts on properties, land use and restoration measures,
- Impacts on cultural heritage sites,
- location and operation of material sources and hauling condition,
- establishment and operation of contractor's site facilities, and waste management or disposal,
- Impacts on existing water supply system,
- Impacts on infrastructures and traffic mobility and safety issues,
- Water pollution risks from fertilizers and pesticides use in the catchment,
- Sludge treatment and disposal systems,

Details of the proposed monitoring program is provided in Table 9.2 below.

During the construction phase, the Supervisory Consultant (SC) and agencies/institutions assigned for monitoring of various components or issues should report the monitoring results quarterly to the Jimma Town Land & Environmental Protection Office (JLEPO). The JLEPO shall compile the reports, together with the results of the issues monitored by itself, and develop a concise annual Environmental Monitoring Report, concerning environmental mitigation and management activities. This Monitoring Report will be submitted to and reviewed by the Ministry of Water Resources (MoWR) and the Federal Environmental Protection Authority (EPA). Thus, the JLEPO shall work closely with the Supervisory Consultant and agencies/institutions assigned for environmental management and monitoring activities in order ensure that the construction works are according to the contract obligations and any environmental accident or outstanding/unforeseen issues are resolved in consultation with the Contractor, the SC and other stakeholders.

The Environmental Monitoring Report may comprise the following issues, but not limited to:

- Status on implementation of the planned environmental management actions by the Construction Contractor and other assigned bodies in the specific period;
- A description of any environmental accident or developments which could potentially develop into a non-conformance event by the Contractor;
- A description of exceptional conditions on site whether they be climatic, machinery related, or otherwise stipulated;
- Minutes of meetings, if any, with stakeholders on any outstanding issues related to the project construction works; and
- Proposed solutions for any outstanding/unforeseen issues detected during the monitoring period.

During the operation and maintenance phase, the institutions or bodies assigned for monitoring should report the results to the JLEPO as per the monitoring requirements together with proposed solutions for any outstanding issues. Then, JLEPO reports to MoWR and Oromia Land & Environmental Protection Bureau, who would review the monitoring report and approve the solutions proposed by the monitoring organizations or propose other suitable solutions for any outstanding/unforeseen issues.

Table 9.2: Environmental and Social Monitoring Plan

S/ N	Environmental Issue/Impact	Indicators to be Monitored	Responsible Body/ Organization	Timing of Monitoring	Frequency of Monitoring	Method of Measurement	Cost Estimate (Eth. Birr)
I	Construction Phase						
1	Land acquisition and impacts on land use	Area of land under various uses expropriated for the project activities categorizing as temporary or permanent land acquisition. Number of households affected due to land expropriation or damages of properties and no. of HHs paid commensurate compensation. Area of land reinstated to productive state after completion of works, i.e. land area affected due to temporary activities.	Supervisory Consultant (SC) & Jimma Town Land & Environmental Protection Office (JLEPO)	During construction & after completion of works	As required	Cadastral survey/ measurement, registration of HHs during inventory of properties affected	Included in SC's contract & 10,000.00 for the JLEPO
2	Impacts on soils and landscape quality	Evolution of erosion signs (sheet erosion, gully formation, siltation in nearby water courses or drains). Length/ area of trenches and other exposed surfaces properly refilled, leveled to surrounding landscape and replanted with appropriate plant species following completion of works to minimize soil erosion, slope failures or to improve the quality of the affected landscape. Area of land affected due to exploitation of quarries and borrow sites and area reinstated after exploitation has ceased. Incidence of soil pollution by spillage of hazardous substances.	As above	Throughout construction period and after completion of construction	Minimum twice per month during the construction contract period	Visual observation, area measurement	Included in SC's contract & 30,000.00 for the JLEPO

Table 9.2: Environmental Monitoring Plan, Continued.

S/ N	Environmental Issue/Impact	Indicators to be Monitored	Responsible Body/ Organization	Timing of Monitoring	Frequency of Monitoring	Method of Measurement	Cost Estimate (Eth. Birr)
3	Impacts on water quality – sedimentation, pollution by hazardous substances and wastes generated by the project	Location/distance of the contractor’s site facilities (camps, storage site, workshop/garage) from water bodies (min. of 1km is recommended). Provision of a secondary containment system for fuel storage facilities. Proper handling of hazardous substances (oil, fuel) and disposal system used oils. Incidence of water pollution by spillage of hazardous substances. Sediment load/turbidity of nearby streams & rivers.	SC & JWSSE	During site establishment & throughout construction period	As required	Visual observations, water quality analysis in laboratory or using field kits	Included in the contract for SC & 6,000.00 for JWSSE/ water quality testing
4	Impacts on air quality	Dust levels or incidence of dust pollution in the construction areas & rate of application of dust suppressants (spraying water) on dusty areas. Use of dust collectors or water spray systems in stone crushing or batch plant operations. Noise and exhaust emission levels generated by construction vehicles and equipment. No. of complaints due to nuisance noise or dust pollution.	Supervisory Consultant (SC)	Throughout construction phase	As required	Visual observations & recording of cases	Included in the contract for SC
5	Impacts on flora and fauna	<ul style="list-style-type: none"> Area of forestland cleared for the project within the boundary of the Jiren State Plantation Number of matured indigenous trees affected/ removed due to the project activities. Number of trees/land area replanted and survived to replace the trees removed and the plantation forestland affected. Number of wild animals killed during the construction works. 	SC, Jimma Zone Forest & Wildlife Enterprise, JLEPO	During the construction period and after completion of works / contract period of construction	As required during the contract period	Visual observations, surface area measurement & recording of trees affected & animal fatalities	15,000.00

Table 9.2: Environmental Monitoring Plan, Continued.

S/ N	Environmental Issue/Impact	Indicators to be Monitored	Responsible Body	Timing of Monitoring	Frequency of Monitoring	Method of Measurement	Cost Estimate (Eth. Birr)
6	Impacts on properties (housing units, perennial crops, trees)	<ul style="list-style-type: none"> Number of housing units, perennial crops, trees affected due to the project activities. Number of households paid compensation for loss of their properties. 	SC, JLEPO	During the construction period	As required	Inventory & recording during land acquisition & construction works	15,000.00
7	Impact on agricultural lands	<ul style="list-style-type: none"> Area of agricultural land affected. Area of affected agricultural land reinstated after completion of works. Number of households paid compensation for loss of their farmlands. 	SC, JLEPO	During the construction period and after completion of works	As required	Surface area measurement & recordings of compensation committee	6,000.00
8	Impacts on cultural heritage sites	<ul style="list-style-type: none"> Construction methods used for works nearby the Cemetery site found near the Mosque 40 & Aba Jifar II Palace. Any impacts or potential risks to the sensitive sites. 	Supervisory Consultant, Jimma Town Culture & Tourism Office (JCTO)	During the construction works near the cultural sites	During land acquisition & every day during the works nearby the cultural sites	Visual observations	Included in the contract for SC & 2,000.00 for the JCTO
9	Impacts on physical infrastructures	<ul style="list-style-type: none"> Length or area of infrastructures (roads, drainage facilities & pedestrian walkways) damaged due to the project activities, Length or area of damaged infrastructures reinstated to original state after completion of the works. 	Supervisory Consultant, Municipality	During construction & after works are completed	As required	Visual observations & measurement	Included in the contract for SC & 10,000.00 for Municipality
10	Impacts on traffic mobility and safety issues	<ul style="list-style-type: none"> Number of construction sites provided with appropriate signals to minimize obstruction to traffic mobility & safety hazards. Number of risky construction sites prohibited for the people and animals or fenced to minimize safety risks. Timely collection and disposal of excess spoil materials. 	Supervisory Consultant, Municipality	Throughout the construction period	Once per day or as required construction works are on-going at road crossings or pedestrian access	Visual observations	Included in the contract for SC & 3,000.00 for Municipality

Table 9.2: Environmental Monitoring Plan, Continued.

S/ N	Environmental Issue/Impact	Indicators to be Monitored	Responsible Body/ Organization	Timing of Monitoring	Frequency of Monitoring	Method of Measurement	Cost Estimate (Eth. Birr)
11	Interruption of existing water supply system	<ul style="list-style-type: none"> Number of existing distribution lines interrupted during connections with the existing distributions, rehabilitations & replacement of old pipes. Number of existing systems with temporary connections to allow uninterrupted supply of water, or what other options considered to supply water to the users during the interruption in the existing system. 	Supervisory Consultant, Jimma Zone Water Office	During pipeline connection works	As required during pipeline connection works	Visual observations & recording number of complaints	Included in the contract for SC & 3,000.00 for Water Office
12	Impacts on public health	<ul style="list-style-type: none"> Number of construction sites creating pools of water that are favourable for disease vectors like malaria mosquitoes. 	SC, Jimma Town Health Office	Throughout construction period	As required	Visual observations & assessment of mosquito larvae	Included in SC's contract & 5,000.00 for Health Office
		Number of awareness raising and education campaigns about HIV/AIDS given for project workers and vulnerable local population.	Jimma Zone Health Office	Prior to start & during construction	As required	Communication with the implementers & interviewing the vulnerable groups	5,000.00
13	Handling of disinfection chemicals	<ul style="list-style-type: none"> Construction of proper storage facilities for the disinfection chemicals. Distance between the storage facilities of disinfection chemicals & the nearby human settlement; a minimum of 200m distance is recommended. 	SC, JWSSE & Jimma City Health Office	During construction phase	As required	Design review & inspection of its proper construction; & observation.	Included in SC's contract & 3,000.00 for JWSSE & Health Office
						Total Cost for Construction Phase	113,000.00

Table 9.2: Environmental Monitoring Plan, Continued.

S/N	Environmental Issue/Impact	Indicators to be Monitored	Responsible Body	Timing of Monitoring	Frequency of Monitoring	Method of measurement	Cost Estimate (Eth. Birr)
II	Operation Phase						
1	Downstream water flows	Measurement of downstream flows in GGR and changes from baseline data Any impacts on downstream water demands & checking whether water availability is above the minimum required levels.	JWSSE	Throughout operation period	Twice/yr during critical dry season	Hydrological flow measurement techniques	5,000.00 per year
2	Water quality monitoring	Physical-chemical indicators such as P ^H , turbidity, total dissolved solids, electrical conductivity, nutrients (nitrate, phosphate), residual chlorine, etc. Bacteriological indicators such as Escherchia coli (E. coli) – an indicator of fecal contamination	JWSSE	Throughout operation period	Twice/yr for source water (GGR at intake), once per month for treated water at WTP & distribution systems	Sampling & testing in laboratory or using field kits with portable incubators for microbiological testing	20,000.00 per year
3	Sludge water treatment & disposal of the cake	Proper functioning of the installed drying lagoons as thickeners for sludge water. Proper disposal & control of the dewatered sludge at the properly located dumping/landfill site.	JLEPO	Throughout operation phase	As required	Visual observation	5,000.00 per year
4	Public health & environmental sanitation issues	Number or availability of adequate drainage facilities for disposal of wastewater. Wastewater disposal situation by the local people using available facilities.	Municipality (Cleanness and Beauty Process)	Prior to start of the new WSS & during operation	As required	Visual observations, review of drainage plans & documents	10,000.00 per year
		• Number of vector breeding sites created and presence of mosquito larvae.	Jimma Town Health Office	Throughout operation period	As required	Visual inspection & survey of mosquito larvae	10,000.00 per year
5	Handling of disinfection chemicals	• Safety measures including proper storage of the disinfection chemicals, wearing of safety equipment by the technicians involved in the handling of the chemicals.	Jimma City Health Office	Throughout operation phase	Once per month	Visual observations	5,000.00 per year
					Total Cost for Operation Phase		50,000.00 per year

9.3 Institutional Responsibilities and Capacity Building Requirements

The proposed environmental and social management and monitoring actions would be implemented by several institutions and other bodies each with specific executive responsibilities for particular aspects. These include the following:

- Ministry of Water Resources,
- Oromia Water, Mines and Energy Bureau,
- Oromia Land & Environmental Protection Bureau,
- Jimma Zone Water, Mines and Energy Office,
- Jimma Zone Land & Environmental Protection Office,
- Jimma Zone Forest and Wildlife Resources Devt & Utilization Enterprise,
- Jimma City Administration,
- Jimma Town Land and Environmental Protection Office,
- Jimma Town Water Supply and Sewage Enterprise,
- Jimma Town Health Office,
- Construction Contractor of the JWSSP, and
- Construction Supervision Consultant.

Most of these stakeholders have some trained personnel and facilities to implement the environmental management activities. However, they will require some practical training on specific issues of the environmental and social management program. The proposed training requirements and provision of necessary facilities or resources for the key implementers of the EMP are discussed briefly in the following sections.

9.3.1 Training Program for Land and Environmental Protection Bureau Staff

The objective of this training program is to raise the capacity of the relevant staff of the Land and Environmental Protection Bureau and respective offices at Zone and City levels in environmental management and monitoring activities of the planned sub-project and future water sector investments. The training program may focus on ESIA, environmental management and monitoring. The training could be given by an International Consultant or qualified National Consultant who would be arranged under the WSSP.

9.3.2 Training Program for Water Bureau Staff

The aim of this training program is to upgrade the capacity of the relevant staff of the Water, Mines and Energy Bureau and respective offices at Zone and City levels in water quantity and quality monitoring and pollution control activities of the planned sub-project and future water-sector investments. The training program may focus on the following issues:

- monitoring of the quantity and quality of the water source (raw water) for the town water supply system and the treated water,
- monitoring of sludge water treatment and disposal system, and
- handling of chemicals used in the water treatment unit, including occupational safety measures.

The training could be given by an International Consultant or qualified National Consultant who would be arranged under the WSSP. It is suggested that this training would be given at the Regional Water Laboratory in order to supplement it with some practical aspects.

More specific training requirements at the sub-project level is given in the following Table.

Training Requirements for the Sub-project Staff

Institution	Staff Type	No. of Staff	Type of Training	Possible Place of Training/ Trainer
JWSSE	Chemist	2	Water Quality Monitoring	Regional Water Laboratory
JWSSE	Technicians	2	Handling of Chemicals used in Water Treatment	As above
JCLEPO	Environmental mentalist	2	Environmental Management & Monitoring	International Consultant/ National Consultant

Table 9.3: Training Cost Estimates

No.	Item	Quantity	Unit Rate	No. of days	Amount in Birr
I	Training for Chemists & Technicians				
1	Fee for Trainers	2	2000	7	28,000.00
2	Per diem for trainees	4	300	7	8,400.00
3	Transport cost (hiring vehicle & fuel cost)	1	1300	7	9100.00
4	Training course materials	Lump sum			3000.00
			Sub-total		48,500
II	Training for Environmentalists				
1	Fee for Trainers	1	4000	5	20,000.00
2	Per diem for trainees	2	300	5	3000.00
3	Transport cost (hiring vehicle & fuel cost)	1	1300	5	6500.00
4	Arrangement of training place & course materials	Lump sum			6000.00
			Sub-total		35,500.00
			Total		84,000.00
			Contingency (20%)		16,800.00
			Grand Total		100,800.00

9.4 Environmental Mitigation, Management, Monitoring and Training Costs

The environmental mitigation, management, monitoring and training costs are estimated based on the following assumptions:

- Most of the mitigation measures proposed to be implemented by the Construction Contractor are engineering/physical features, which are considered to be part of the construction items for the Contractor. It is assumed that these mitigation measures would be part of the construction contract for the Contractor and they also would be included in the Guidelines for the Contractor. Hence, the costs of these mitigation measures are not included in this Environmental Cost Estimate.
- As the case for the Construction Contractor, the costs of monitoring activities to be carried out by the Construction Supervision Consultant (CSC) is assumed to be included in the contract for the CSC.
- Accurate costs estimates for compensation of potentially affected properties such as housing units, planted trees and perennial crops, and for farmlands should be worked out after the Contractor conducts detailed site survey and determine the exact location of the project components. Thus, a tentative cost estimate is provided for the mentioned items.
- Tentative provisions are also included in the environmental cost estimates for the bodies or organizations that have responsibilities in the proposed environmental management and monitoring plans.

The total costs of the recommended environmental and social mitigation, management, monitoring and training programs for the construction phase are estimated to be about 1.7 Million Ethiopian Birr. In addition, the costs of the monitoring program proposed for the project operation phase are estimated at about 50,000 Ethiopian Birr per annum. These cost estimates are summarized in Table 9.4 below.

Table 9.4: Summary of Environmental Mitigation, Management, Monitoring and Training Cost Estimates

No.	Description	Quantity	Unit Cost (Eth. Birr)	Total Cost (Eth. Birr)
1	Environmental and Social Mitigation and Management Costs			
1.1	Buffer zone protection for intake site (for compensation of land acquisition & protection measures)		Lump sum	300,000.00
1.2	Implementation of replanting program to compensate for trees or plantation forest lost (see Appendix 6 for the details)	5 Ha	Lump sum	80,306.00
1.3	Compensation for impacts on housing units	8 Houses	30,000	240,000.00
1.4	Compensation for loss of plantation trees and perennial crops		Lump sum	150,000.00
1.5	Compensation for impact on agricultural lands		Lump sum	30,000.00
1.6	Reinstatement of damaged roads, drainage facilities and pedestrian walkways		Lump sum	700,000.00
2	Environmental and Social Monitoring Costs for Construction Phase (see Table 9.2 for the details)			113,000.00
3	Training Costs (see Table 9.3 for the details)			100,800.00
	Total Construction Phase Costs			1,714,106.00
4	Environmental and Social Monitoring Costs for Operation Phase (see Table 9.2 for the details)			50,000.00 per year

10 CONCLUSIONS AND RECOMMENDATIONS

Currently Jimma town has a significant shortage of safe drinking water supply and sanitation facilities. The existing water supply system is far from satisfactory particularly in terms of quantity and distribution. Sanitation in the town is also deficient as reflected by inadequate facilities for disposal of human excreta, refuse material and wastewater. There is therefore a pressing need to address the water shortage and sanitation problems in Jimma in order to improve the quality of life of the people, generate economic development, create employment and reduce poverty.

Implementation of the planned water supply project is expected to alleviate the scarcity of potable water supply in Jimma, improve public health and women's welfare, enhance investment and economic development, create employment, reduce poverty and ultimately improve the quality of life of the people.

On the contrary, implementation of the project will bring a number of adverse environmental and social impacts during the construction and operation phases. The important impacts during the construction phase include increased soil erosion, loss of plantation forest/trees, air and noise pollution, disruption of residential and business areas, damages of physical infrastructures, obstruction of traffic mobility and safety hazards, increased risks of malaria and HIV/AIDS and other STIs, and interruptions of the existing water supply system during pipeline connections. Nevertheless, most of these and other identified potential problems are temporary and localized impacts that can be minimized to acceptable levels through good construction methods and adoption of appropriate mitigation measures that are specified in this document.

The significant environmental or social issues during the operation phase are water pollution hazards associated with disposal of the residual sludge released from the water treatment plant, increased risks of malaria transmission related to increased volume of wastewater and lack of drainage facilities for disposal of such wastewater, high sediment loading of the raw water during rainy season, and source water pollution potential from application of agricultural chemicals in the catchment. These potentials problems can be minimized by implementing corresponding mitigation measures including those specified in this ESIA Report.

Therefore, it can be concluded that there are no severe environmental or social impacts, or other grounds that will prevent the planned water supply project from not proceeding to its implementation provided that the mitigation measures shown in this document are strictly implemented and monitored.

In order to have minimal and acceptable residual environmental and social impacts, and enhance the potential benefits, it is recommended that the proposed mitigation measures are properly implemented at the right time, and necessary follow up of their effectiveness is made through well-planned monitoring program.

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APPENDICES

Appendix 1: List of Consulted Persons and Organizations

No	Name	Position and Organization	Date
1	Ato Shimelis Kebede	Deputy Mayor, Jimma City Administration	10/03/2010
2	Dr. Bultuma Kemo	Head, Jimma Z. Animal Resources Devt Agency	09/03/2010
3	Ato Abdu Mohammed	Head, Jimma Town Water Supply & Sewerage Enterprise (JWSSE).	06/03/2010
4	" Daniel Girma	Head, Operation Department, JWSSE	08/03/2010
5	" Seid Siraj	Head, Customers Services Department, JWSSE	08/03/2010
6	" Tadele Gezahegn	Consultant, JWSSP.	06/03/2010 & 24/06/2010
7	" Ahmed Kedir	Chemist, JWSSE.	08/03/2010
8	" Tolesaa Gulilat	Chemist, JWSSE.	08/03/2010
9	" Tilahun Eshetu	Technician, Existing WTP, JWSSE.	08/03/2010
10	" Alemayehu Galata	Ecologist, Oromia Land & Environmental Protection Bureau (OLEPB)	04/03/2010
11	" Nuur-Alem Kinnise	Aquatic Ecologist, OLEPB.	04/03/2010
12	" Zerihun Asmelash	Head, Jimma City Land Environmental Protection Office (JCLEPO).	08/03/2010
13	" Awel Jemal	Environmental Protection Process Owner, JCLEPO.	08/03/2010
14	" Solomon Alemu	Head, Irrigation Water Supply & Drainage Core Process, Jimma Zone Water Office	09/03/2010
15	" Numeri Nura Aba-Fitta	Head, Drinking Water Supply Construction Core Process, Jimma Zone Water Office	09/03/2010
16	" Mohammed	Surveyor, Jimma Zone Water Office	09/03/2010
17	" Tesfaye Mulugeta	Representative Head, Jimma Z. Forest & Wildlife Resources Development & Utilization Enterprise	09/03/2010
18	" Tesfaye Tulcha	Team Leader, Jimma Z. Forest Res. Development & Utilization Team	09/03/2010 & 24/06/2010
19	" Terefe Fifte	Agronomist, Jimma Zone ARDO.	09/03/2010 & 25/06/2010
20	" Abdulakber Jemal	Representative Process Owner & Project Coordinator, Infrastructure Construction Process, Jimma City Municipality	10/03/2010 & 25/06/2010
21	" Muktar Ali	Procurement Management Expert, Infrastructure Construction Process, Jimma City Municipality	11/03/2010
22	" Ahamed Kemal	Procurement Management Expert, Infrastructure Construction Process, Jimma City Municipality	25/06/2010
23	" Ahamed Muhedin	Cleanness and Beauty Process Owner, Jimma City Municipality	10/03/2010
24	Aba Temam Aba Bor	Health Officer, Jimma City Health Office (JCHO)	10/03/2010
25	Ato Habtamu Kifle	Environmental Health Specialist, JCHO	10/03/2010

26	Ato Tewdros Getachew	Sanitarian, Jimma City Health Office	10/03/2010
27	W/o Marema Adem	Gender Expert, Jimma Town Women and Children Affairs Office	11/03/2010
28	W/o Sadiya Mohamad	Women Affairs Expert, Jimma Town Women and Children Affairs Office	11/03/2010
29	Aba Beya Isaa	Head, Jimma Town Tourism and Culture Office	12/03/2010
30	W/o Meselech Simegn	Planning & Program Expert, Jimma Town Finance & Economic Devt Office	11/03/2010
31	Ato Eshetu Alemayehu	Statistics Expert, JT Finance & Economy Office	11/03/2010
32	Ato Takele Adugna	Head, Kersa Woreda ARDO	12/03/2010
33	Ato Mulatu Terefe	Irrigation Agronomist, Kersa Woreda ARDO	12/03/2010
34	Ato Tesfaye Tenee	Chief Administrator , Ginjo Kebele	12/03/2010
35	Ato Mohamed Aba Mecha	Chief Administrator , Becho Bore Kebele	12/03/2010
36	Ato Fuad Aba Fitta	Chief Administrator , Jiren Kebele	12/03/2010
37	W/rt Amina Ahmed	Vice Administrator , Jiren Kebele	24/06/2010
38	W/o Dashure	Resident of Jiren Kebele	13/03/2010
39	Ato Umar Aba Milki	Resident of Jiren Kebele	13/03/2010
40	Ato Sherif Aba Jihad	Resident of Jiren Kebele	13/03/2010
41	Ato Mohamad Kadir	Resident of Ginjo Kebele	13/03/2010
42	W/o Segad Amade	Resident of Ginjo Kebele	13/03/2010
43	Henoke Abamoga	Resident of Ginjo Kebele	13/03/2010

Appendix 2: Main Plant Species found in the Project Area

No.	Scientific Name	Local Name (Oromifa)	Type	Family Name	Project Components*			Notes
					1	2	3	
1	<i>Acacia abyssinica</i>	Laftoo	Tree	Fabaceae	X	X	X	Along RWRM & NWTP
2	<i>Acacia sp.</i>		Tree	Fabaceae	X			Along RWRM
3	<i>Acanthus arboreus</i>	Shokkoruu	Shrub	Acanthaceae	X			Along RWRM, MR
4	<i>Albizia schimperiana</i>	Ambabeesa	Tree	Fabaceae		X	X	Common
5	<i>Asplenium sp.</i>		Fern	<i>Aspleniaceae</i>		X		Along CWRM, SM & at RM
6	<i>Bersama abyssinica</i>	Lolchiissa	Tree	Melanthaceae		X	X	
7	<i>Buddleja polystachya</i>	Anfarii	Shrub/S. tree	Loganiaceae	X			Some along the Aba Jifar SM
8	<i>Brucea antidysenterica</i>	Komegnoo	S. tree	Simaoubaceae			X	
9	<i>Calpurnia aurea</i>	Cekaa	Shrub/S. tree	Fabaceae		X	X	
10	<i>Capparis tomentosa</i>	Gumaroo	Shrub	Capparidaceae	X	X	X	
11	<i>Carissa edulis</i>	Agamsa	Shrub	Apocynaceae	X	X	X	Common
12	<i>Casuarina angustifolia</i>	Shewshewe	Tree			X	X	Planted exotic tree
13	<i>Combretum molle</i>	Rukeensa	Tree	Combretaceae		X		Along CWRM, SM & at RM
14	<i>Combretum aculeata</i>		Pseudoliana	Combretaceae	X			Near RWRM
15	<i>Cordia africana</i>	Woddeesa	Tree	Boraginaceae	X	X	X	Common
16	<i>Croton macrostachyus</i>	Makaniisa	Tree	Euphorbiaceae	X	X	X	Common
17	<i>Cupressus lusitanica</i>		Tree	Cupressaceae		X	X	Major in the Jiren Plantation
18	<i>Dracaena sp.</i>	Afarfatu/Serte	Pachycaul	Agavaceae	X			Some near RWRM
19	<i>Ehretia cymosa</i>	Uulagaa	Tree	Boraginaceae	X	X	X	Common
20	<i>Embelia scimperi</i>	Hankuu	Pseudoliana	Myrsinaceae		X		
21	<i>Erythrina brucei</i>	Wolensuu	Tree	Papilionoideae		X	X	Endemic, Common
22	<i>Eucalyptus camandulensis</i>	Akakilti, Barzafi Dima	Tee	Myrtaceae	X	X	X	Dominant plantation tree
23	<i>Eucalyptus grandis</i>		Tee	Myrtaceae		X		Found in Jiren State plantation
24	<i>Euphorbia tirucalli</i>	Cedaa	Shrub	Euphorbiaceae		X	X	Used for live fencing
25	<i>Euphorbia abyssinica</i>	Adamii	Tree	Euphorbiaceae			X	

No.	Scientific Name	Local Name (Oromifa)	Type	Family Name	Project Components*			Notes
					1	2	3	
26	<i>Ficus vasta</i>	Qilxuu	Big Tree	Moraceae		X	X	Some big canopy tree
27	<i>Gravillea robusta</i>		Tree	Proteaceae	X	X	X	Planted exotic tree
28	<i>Galiniera coffeoides</i>	Miixoo	S. tree	Rubiaceae		X	X	
29	<i>Hypericum revoltum</i>	Garamba	Shrub	Hypericaceae	X	X		
30	<i>Lantana salvifolia</i>	Kasee	Shrub	Verbenaceae		X	X	
31	<i>Maesa laceolata</i>	Abeyii	S. tree	Myrsinaceae		X	X	
32	<i>Maytenus arbutifolius</i>	Kombolchaa	Shrub	Celastraceae		X	X	
33	<i>Millettia ferruginea</i>	Askiraa/Sootaloo	Tree	Papilionoideae		X	X	Endemic
34	<i>Myrica salicifolia</i>	Reejiii	S. tree	Myricaceae	X	X	X	Common
35	<i>Olinia rochetiana</i>	Nolee	S. tree	Oliniaceae		X		
36	<i>Phoenix reclinata</i>	Meexii	Pachycaul	Palmae	X			Some
37	<i>Phytolacca dodecandra</i>	Endod	Pseudoliana	Phytolaccaceae	X	X	X	Some
38	<i>Podocarpus falcatus</i>	Birbirsaa	Tree	Podocarpaceae		X		Some around MR
39	<i>Pittosporum viridiflorum</i>	Amshika	Tree	Pittosporaceae		X		Around MR & along CWRM & SMs
40	<i>Premna schimperi</i>	Urggeessaa	S. Tree	Verbenaceae		X		
41	<i>Psidium guajava</i>	Zeyitun	S. tree	Myrtaceae		X	X	
42	<i>Pterolobium stellatum</i>	Gora	Shrub	Fabaceae		X		
43	<i>Rhamnus prinoides</i>	Geshoo	Shrub	Rhamnaceae			X	
44	<i>Rhus spp.</i>	Xaaxeessaa	Shrub	Anacardiaceae		X		
45	<i>Ricinus communis</i>	Koboo	S. tree	Euphorbiaceae	X	X	X	
46	<i>Rubus steudneri</i>	Goraa	Pseudoliana	Rubiaceae		X		
47	<i>Salix subserrata</i>	Alaltu	Shrub/s. tree	Salicaceae	X			Riverine along Gilgel Gibe R.
48	<i>Sapium ellipticum</i>	Bosooka	Tree	Euphorbiaceae	X	X	X	Some
49	<i>Senna didymobotrya</i>	Semamaki	Shrub	Caesalpiniodeae	X	X	X	Common
50	<i>Sesbania sesban</i>	Sesbania	Shrub	Papilionoideae	X	X		On banks of Gilgel Gibe R.
51	<i>Solanum incanum</i>	Hiddii	Shrub	Solanaceae	X	X		In highly disturbed areas
52	<i>Spathodea campulata</i>		Tree	Bignoniaceae	X			Planted decorative tree

No.	Scientific Name	Local Name (Oromifa)	Type	Family Name	Project Components*			Notes
					1	2	3	
53	<i>Syzygium guineense</i>	Badeessa	Tree	Myrtaceae		X		Along CWRM & around MR
54	<i>Trema guineensis</i>	Alelee	Tree	Ulmaceae		X		
55	<i>Vernonia amygdalina</i>	Eebbicha	S. tree	Compositae		X	X	
56	<i>Cynodon dactylon</i>	Chekorsa	Grass	Poaceae	X	X	X	Dominant
57	<i>Digitaria abyssinica</i>	Warit	Grass	Poaceae	X	X	X	Common
58	<i>Eragrostis spp.</i>		Grass	Poaceae	X			
59	<i>Hyparrhenia anthistriodes</i>	Bilaa	Grass	Poaceae		X		
60	<i>Pennisetum sphacelatum</i>	Migira	Grass	Poaceae	X	X		
63	<i>Sporobolus pyramidalis</i>	Murii	Grass	Poaceae	X	X		
64	<i>Sorghum sp.</i>		Grass	Poaceae	X			
65	<i>Cyperus latifolius</i>	Caafee	Sedge	Cyperaceae	X			In Boye Swamp
66	<i>Cyperus rotundus</i>		Sedge	Cyperaceae	X			Around Boye Swamp
67	<i>Cyperus sp.</i>		Sedge	Cyperaceae	X			Around Boye Swamp
68	<i>Typha latifolia</i>	Filaa	Reed	Typhaceae	X			In Boye Swamp
69	<i>Persicaria senegalensis</i>		Macrophyte		X			In Boye Swamp

Note: * Presence of the species in the area of the Project Component; 1 = Intake Weir, RWRM & NWTP; 2 = CWRM, Main Reservoir & Sub-Mains (Boye & Ginjo); 3 = Aba Jifar SM & Reservoir

Appendix 3: Main Wildlife Present in the Project Area

No	Scientific Name	Common Name	Local Name (Oromifa)	Proj. Component*			IUCN Red List ¹	Source
				1	2	3		
I	Terrestrial Mammals							
1	<i>Cercopithecus aethiops</i>	Grivet Monkey	Qalamee		X	X	LR/lc	a, b, c
2	<i>Papio anubis</i>	Anubis Baboon	Daljeesa		X		LR/nt	a, b, c
3	<i>Colobus guereza</i>	Colobus Monkey	Weenii		X	X		a, b, c
4	<i>Crocuta crocuta</i>	Spotted Hyena	Waraabesa				LR/cd	a, b
5	<i>Hyaena hyaena</i>	Stripped Hyena	Waraabesa					a, b
6	<i>Hystrix cristata</i>	Crested Porcupine	Dhadee		X	X	LC	b
7	<i>Potamochoerus larvatus</i>	Bush Pig	Booyyee	X	X			b
8	<i>Sylvicapra grimmia</i>	Bush Duiker	Quruphee		X			a, b
9	<i>Lepus habessinicus</i>	Abyssinian Hare	Wakele		X	X	LC/lc	b
10	<i>Canis aureus</i>	Common jackal	Wangoo				LC	a, b
11	<i>Orycteropus afer</i>	Aardvark	Waldigesa		X		LC	b
12	<i>Genetta abyssinica</i>	Abyssinian Genet					DD	b
II	Aquatic Fauna							
13	<i>Hippopotamus amphibicus</i>	Hippopotamus	Roobii					a, b
14	<i>Oreochomis niloticus</i>	Tilapia fish	Kurtumii	X				b, c, d
15	<i>Barbus intermedius</i>	Barbus fish		X				b, d
III	Bird Species							
16	<i>Bucorvus abyssinicus</i>	Abyssinian Ground-hornbill	Humoo	X	X			
17	<i>Francolinus sp.</i>	Francolin	Gogorii		X			b
18	<i>Numida meleagris</i>	Helmeted Guineafowl	Sololiyaa		X			b
19	<i>Campethera nubica</i>	Nubican Woodpecker		X	X	X		b
20	<i>Quelea quelea</i>	Red-billed Quelea		X	X	X		b, c
21	<i>Bostrychia carunculata</i>	Wattled ibis		X			Endemic	b
22	<i>Corvus albus</i>	Pied Crow	Araagesa	X	X			b, c
23	<i>Circaetus pectoralis</i>	Black-chested Eagle	Culuulee	X	X	X		b
24	<i>Buphages eythrorhynchus</i>	Red-billed Oxpecker		X	X	X		c
25		Bat	SimbirooHalkaniii	X	X	X		b, c
26	<i>Alopochen aegyptiaca</i>	Egyptian Goose		X				c
27	<i>Anas undulata</i>	Yellow-billed Duck	Daakiyee	X				c
28	<i>Necrosyrtes monachus</i>	Hooded Vulture		X	X	X		b, c
29	<i>Gyps uiepellii</i>	Rüppell's Vulture	Gobocoroo	X	X	X		b, c
30	<i>Columba albitorques</i>	White-collared Pigeon		X	X	X		b, c
31	<i>Columba guinea</i>	Speckled Pigeon		X	X	X		b, c
32	<i>Egretta spp.</i>	Little & Great Egrets		X	X	X		c
33	<i>Butorides striata</i>	Striated Heron		X				c

Note: * Presence of the species in the area of the Project Component; 1 = Intake Weir, RWRM & NWTP; 2 = CWRM, Main Reservoir & Sub-Mains (Boye & Ginjo); 3 = Aba Jifar SM & Reservoir.

Sources of Information: a = JZFWDE, b = Local People, c = Observation by Consultant, d = Previous surveys

Legend for IUCN Red List

LR/cd = Lower risk/conservation dependent

LR/lc = Lower risk/least concern

LC = Least concern

LR/nt = (Lower risk/near threatened)

Vu = (Vulnerable)

EN = Endangered

CR = Critically endangered

DD = Data deficient

¹ The Category of the Red List is based on 2006 IUCN Red List of Threatened Species.

Appendix 4: Cost Estimate for Tree Planting Program

Note: It is recommended that the replanting program would cover 5ha of land. Of this, 4ha is proposed to replace the plantation trees/forest, which is part of the Jiren State Plantation, and the remaining 1ha is intended to compensate for the loss of indigenous trees elsewhere. Thus, the 4ha would cover plantation trees/exotic tree species like *Cuppressus lusitanica*, *Eucalyptus* spp. and *Gravillea*, whereas the 1ha would cover indigenous tree species like *Acacia abyssinica*, *Cordia africana*, *Erythrina brucei* etc. The unit cost is based on the norm provided by the Jimma Zone Forestry and Wildlife Enterprise.

	Activity Description	Quantity	Unit Cost (Birr/Ha)	Total Cost (Birr)	Remarks
1	Seedlings raising	5Ha	750	3750	
2	Land clearing	5Ha	700	3500	
3	Pitting	5Ha	377	1885	
4	Loading & unloading	5Ha	250	1250	
5	Planting	5Ha	377	1885	
6	Management like weeding	5Ha	377	1885	
7	Guarding*	36months	600	21600	12 months at nursery site & 24 months after planting
8	Salary for Supervisor	36months	750	27000	
	Total			62755	
	Contingency (20%)			12551	
	Grand Total			75306	

* 2 Guards for 3 years (1 year at nursery site & 2 years after planting) at the rate of 300 Birr/month/person salary.

Appendix 5: Minutes of Key Stakeholders Consultations

Minutes of Meeting No. 1

Sub-Project:	Jimma Town Water Supply and Sanitation Project
Date:	6 March 2010
Place:	Jimma Town Water Supply and Sewerage Services Office
Participants:	Ato Tadele Gezahegn, Consultant at Project Coordination Office Ato Arebo Sambu, Environmental Consultant
Meeting Agenda:	Briefing of Sub-Project Components, Stakeholders Identification and Arrangement for Public Consultation, and Arrangement for Site Visit

Agenda:

Agenda 1: Briefing of Sub-Project Components

In order to clearly understand the features of the planned Sub-Project, Ato Arebo requested Ato Tadele to give a brief description of the sub-project components and provide him relevant project documents for further review. Accordingly, Ato Tadele briefly discussed the sub-project components as follows:

- **Intake Structures:** Rehabilitation of intake structures including de-sludging of silts accumulated in the sump, replacement of old pumps and worn-out gates and valves, maintenance of worn-out concrete, and riverbank protection works.
- **Raw Water Main:** Installation of Raw Water Rising Main, which is about 1.2km long and aligned parallel to the existing Raw Water Rising Main along the access road to the Intake site.
- **New Water Treatment Plant:** The New Water Treatment Plant would have a capacity of 21,048 m³/d and is sited adjacent to the existing Water Treatment Plant at Boye. The Treatment Plant would be installed over 10,000 m² land area, which is already secured from the Jimma Town Municipality. The treatment system would comprise Aeration Unit, Chemical Mixing and Dosing, Flocculation and Clarification Units, Filtration using Rapid Gravity Sand Filters, Disinfection using chlorination and PH correction of Treated Water, and Clear Water Tank. In addition, the system would have a sludge drying bed for treating the sludge discharged from the treatment plant.
- **Distribution System and Storage Reservoirs:** There would be a Clear Water Rising Main, about 0.9km long, that would convey treated water to two Main Reservoirs with 2000m³ each, located at Jiren Kella to feed the distribution sub-mains and booster station at Ginjo by gravity. The distribution has four subsystems, namely Boye, Ginjo, Hospital and Abajifar Subsystems, which are connected with the main reservoir at Jiren Kella.

Finally, Ato Tadele provided the Consultant with the Final Detail Civil Design Report for review and understanding of the detail project features.

Agenda 2: Stakeholders Identification and Arrangement for Public Consultation

Discussion was made in order to identify the key Stakeholders and fix a date for Public Consultation. The key stakeholders were identified to include the following:

- (i) Jimma Town Administration Level: Jimma Town Administration Office, Town Municipality, Water Supply and Sewerage Service, Land & Environmental Protection Office, Health Office, Education Office, Culture and Tourism Office, Finance and Economic Development Office, and Women Affairs.

- (ii) Jimma Zone Administration Level: Water, Mines and Energy Office, Land and Environmental Protection Office, and Agriculture and Rural Development Office.
- (iii) Research and Training Institutions: Jimma University.
- (iv) Kebele and Community Level: Kebele Administrators, Managers or their representatives, and representatives of the local community.

It was agreed that Ato Tadele would contact the Jimma Town Chief Administrator in order to arrange Public Consultation for 11 March 2010 at convenient time.

Agenda 2: Arrangement for Site Visit

It was agreed that Ato Tadele would arrange the Surveyor who carried out the project sites surveying works since he knows the project sites very well and capable to guide the ESIA Team for site observation, data collection and consultation with the community adjacent to the project sites.

The Minutes of the Meeting Prepared by: Arebo Sambu

Minutes of Meeting No. 2

Sub-Project:	Jimma Town Water Supply and Sanitation Project
Date:	9 March 2010
Place:	Jimma Zone Forest and Wildlife Development Enterprise
Participants:	Ato Tesfaye Mulugeta, Forest Devt Expert & Repr. Head, Enterprise Ato Tesfaye Tulcha, Forest Devt & Utilization Core Process Owner Ato Arebo Sambu, Environmental Consultant
Meeting Agenda:	Forest and Wildlife Resources of the Jimma Town Water Supply Project Impact Areas and Project Impacts on the Resources

Agenda:

Prior to start discussing on the Agenda, Ato Arebo gave a brief description of the main features of the envisaged Jimma Water Supply Project (JWSP). Then a brief discussion was made on the following important topics.

Agenda 1: Forest and Wildlife Resources of the Project Impact Areas

The officials of the Jimma Zone Forest and Wildlife Development Enterprise (JZFWE) indicated that some components of the planned JWSP would traverse or be located within the Jirena State Plantation Forest (JPF). The JPF contains mainly plantation trees dominantly Eucalyptus species and Cypress, but also several species of indigenous trees and patches of bush lands. This protected forest area is currently under the control of the newly established Oromia Forest and Wildlife Development Enterprise. They also highlighted that the JPF is an important habitat for some wild animals including Hyenas, Anubis baboon, Grivet monkey and Colobus monkey. Besides, the forestland harbours a variety of birdlife.

Further, the participants identified that the major project components located within the JPF are transmission lines including the Clear Water Rising Main, and Ginjo and Boye Sub-Mains, and the Main Reservoir.

Agenda 2: Potential Impacts of the Project on Forest and Wildlife Resources

The officials anticipated that installation of the above indicated project components surely would cause damages to certain parts of the JPF resulting in mainly losses of plantation trees, some indigenous trees and other vegetation types. In addition, it would cause disturbance of the wildlife found in such currently less disturbed habitat. Further, the earthworks involved in the construction activities may result in soil erosion as the area is characterized by hilly terrain and high intensity of rainfall.

Agenda 2: Proposed Mitigation Measures

The authorities emphasized the need to mitigate the potential impacts on the JPF and the wildlife of the area. They indicated that the loss of certain parts of the JPF can be mitigated or compensated for by implementing a replanting/re-afforestation program and by limiting damages to the area absolutely necessary for the project activities. They also recommended that the replanting program would be implemented by the Jimma Zone Forest and Wildlife Enterprise and the necessary cost covered by the project, i.e. the JWSP. In addition, the land required for replanting should be allocated by the Jimma City Administration/ the City Land and Environmental Protection Office or the Jimma Zone Land and Environmental Protection Office. Finally, the officials pointed out that the JZFWE has the necessary technical capacity including trained manpower, equipment, nursery sites etc. to implement the proposed mitigation plan.

The Minutes of the Meeting Prepared by: Arebo Sambu

Minutes of Meeting No. 3

Meeting with Women Affairs Office

Meeting with heads and experts of Women Affairs of Jimma town held on 11/03/2010. During the meeting, the participants being introduced about the objective and processes of the project. They were also invited to express their positive and negative expectation of the project. Plus, they also urged to forward recommendations for mitigating the negative impacts of the project.

During introduction phase of the project, participants of the meeting accepted the project with great enthusiastic feeling, as water supply is the major practical problem of women in Jimma town.

1. Positive Impacts

They have identified a long list of positive expectation about the project with particular reference to women. The following are the chives among the varied:

- Reduces women's burden deployed for hauling water from longer distance
- Women will save time spent for longer queuing waiting their turn at water points and will have adequate time for nurturing their children and carrying out other routine gamut of Household tasks
- Enables people to keep their personal hygiene
- There are many women who are unemployed currently and will have the opportunity to get job in the project.
- Income generating schemes for women by providing food, tea and coffee for construction workers will be created in association with the project.

2. Negative Impacts

The project will create closer physical proximity between male and female construction workers during construction phase and this might expose women of the project area to:

- HIV/AIDS Infection
- Rape
- Unwanted pregnancy

Besides to problems above, the participants of the meeting identified one unique anticipated problem after completion of envisaged project. That is, the current Jimma Town Water Supply Service lacks capacity in the future to render efficient service with its current man power and organizational structure.

3. Proposed Mitigation Measures

The participants of the meeting also forwarded the following solutions as mitigation measures of the negative impacts.

- Train women to be prudent while working with male construction workers
- Train women on cares to be taken from HIV/AIDS and other STDs
- Urging the contractor to make special consideration for women construction workers
- Building the over all capacity of Jimma Town Water Supply Services before it took over the out puts of the envisaged project
- Decentralizing the current Jimma town Water Supply Services to Kebele level after completion of the envisaged project to render effective and efficient service

The Minutes of the Meeting Prepared by: Aweke Gebre

Minutes of Meeting No. 4

Meeting with Heads and Experts of Jimma Town, Municipality, Health, Culture and Tourism Offices

Meeting with heads and experts of jimma town Municipality, Health, Culture and Tourism offices held on 10/03/2010, 10/03/2010 and 12/03/2010 respectively. The objectives, processes and points of the meeting as well as views suggested by the participants of the meetings were similar with that of held with head and experts of Women Affaire Office and summarized under.

Summary of Meeting Held with the Stakeholders is given below.

Offices where Meeting Conducted	Participants of the Meeting	Date of the Meeting	Agendas Entertained in the Meeting and Out Puts				
			Introducing the Project	Attitude About the Project	Positive Expectation About the Project	Negative Expectation About the Project	Suggested Mitigation Measures
Jimma Town Municipality	Mayor & Experts	10/3/2010	Have got full information about the project	Positive	Avoids water borne diseases	<ul style="list-style-type: none"> Affects housing units, 	<ul style="list-style-type: none"> Realizing Compensation
						<ul style="list-style-type: none"> Affects trees, perennial crops, fruits and farmland, 	<ul style="list-style-type: none"> Realizing Compensation
						<ul style="list-style-type: none"> HIV /AIDS expansion, 	Promotion of training and distributing condoms free of charge
						<ul style="list-style-type: none"> Expose women to be vulnerable to various sorts of social problems such as rape and unwanted pregnancy, 	Training women to be prudent while working with male construction workers
Jimma Town Health Office	Head & Experts	10/3/2010			The dwellers will lead happy & healthy life	<ul style="list-style-type: none"> Hinders mobility during construction phase, 	Filling on time the trench & putting signals for protecting the people from danger

Jimma Town Women Affaire Office	Head & Experts	11/3/2010			Mothers save time and energy that can be deployed to nurturing children and carrying out other household tasks	<i>Increases Sewages</i>	
Jimma Town Culture and Tourism Office	Head & Experts	12/3/2010			Job opportunity to unemployed youth		Designing proper sewage disposal mechanism
					Skill transfer		

The Minutes of the Meeting Prepared by: Aweke Gebre

Appendix 6: Minutes of Public Consultations

Appendix 7: Environmental Guidelines for Construction Contractors

Environmental Guidelines for Construction Contractors

I. General: Applicability of These Environmental Guidelines and ESMP

1. These general environmental guidelines apply to any work to be undertaken under the UWSS Project. For certain work sites entailing specific environmental and/or social issues, a specific Environmental and Social Impact Assessment, including an Environmental and Social Management Plan (ESMP), has been prepared to address the above-mentioned specific issues in addition to these general environmental guidelines. In addition to these general Environmental Guidelines, the Contractor shall therefore comply with any specific ESMP for the works he is responsible for. The Contractor shall be informed by the Client about such an ESMP for certain work sites, and prepare his work strategy and plan to fully take into account relevant provisions of that ESMP. If the Contractor fails to implement the approved ESMP after written instruction by the works supervisor to fulfill his obligation within the requested time, the Client reserves the right to arrange for execution of the missing action by a third party on account of the Contractor.
2. Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an ESMP where such an ESMP applies.
3. These Environmental Guidelines, as well as any specific ESMP, apply to the Contractor. They also apply to any sub-contractors present on Project work sites at the request of the Contractor with permission from the Client.

II. General Environmental Protection Measures

4. In general, environmental protection measures to be taken at any work site shall include but not be limited to:
 - (a) Minimize the effect of dust on the environment resulting from earth mixing sites, vibrating equipment, construction related traffic on temporary or existing access roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity of work sites and access roads.
 - (b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) comply with Ethiopian standards and are generally kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
 - (c) Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels are maintained and/or re-established where they are disrupted due to works being carried out.
 - (d) Prevent any construction-generated substance, including bitumen, oils, lubricants and wastewater used or produced during the execution of works, from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs.

- (e) Avoid or minimize the occurrence of standing water in holes, trenches, borrow areas, etc.
- (f) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands, local communities and their settlements. Restore/rehabilitate all sites to acceptable standards.
- (g) Upon discovery of graves, cemeteries, cultural sites of any kind, including ancient heritage, relics or anything that might or believed to be of archeological or historical importance during the execution of works, immediately report such findings to the Supervision Consultant or the Client so that the Ministry in charge of Culture may be expeditiously contacted for fulfillment of the measures aimed at protecting such historical or archaeological resources.

In the event that the Contractor encounters chance finds during construction and/or rehabilitation activities, he will contact (a) the Jimma City, Jimma Zone or Oromia Regional Bureau of Culture and Tourism for chance finds encountered at the regional level.

- (h) Prohibit construction workers from engaging in the exploitation of natural resources such as hunting, fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities. Prohibit explicitly the transport of any bush meat in Contractor's vehicles.
- (i) Prohibit the transport of firearms in Project-related vehicles.
- (j) Prohibit the transport of third parties in Project-related vehicles.
- (k) Implement soil erosion control measures in order to minimize surface run off erosion and minimize siltation, etc.
- (l) Ensure that garbage, sanitation and drinking water facilities are provided in construction workers camps.
- (m) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
- (n) Ensure public safety, and meet Ethiopian traffic safety requirements for the operation of work to avoid accidents.
- (o) Ensure that any trench, pit, excavation, hole or other hazardous feature is appropriately demarcated and signposted to prevent third-party intrusion and any safety hazard to third parties.
- (p) Comply with Ethiopian speed limits, and for any traffic related with construction at UWSS Project sites, comply with the following speed limits unless Ethiopian speed limits are lower:
 - Inhabited areas: 50 km/h
 - Open road: 90 km/h.

- (q) Ensure that, where unskilled daily-hired workforce is necessary, such workers are hired from neighboring communities.
 - (r) Generally comply with any requirements of Ethiopian law and regulations.
5. Besides the regular inspection of the sites by the supervisor appointed by the Client for adherence to the Contract conditions and specifications, the Client may appoint an environmental inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State or Regional Environmental Authorities may carry out similar inspection duties. In all cases, as directed by the Client's supervisor, the Contractor shall comply with directives from such inspectors.

III. Pipelines

- 6. No trench shall be left open for more than 7 days, unless duly authorized by the supervisor upon Contractor's request. Trenches and other excavation works shall be demarcated and/or signposted to avoid third party intrusion.
- 7. General conditions related with topsoil stripping, storage and restoration apply.
- 8. The Contractor will take measures to dispose of water used for pressure tests in a manner that does not affect neighboring settlements.

IV. Waste Management

- 9. All drums, containers, bags, etc. containing oil/fuel/surfacing materials and other hazardous chemicals shall be stored at construction sites on a sealed and/or bonded area in order to contain potential spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable Ethiopian government waste management regulations.
- 10. All drainage and effluent from storage areas, workshops, housing quarters and generally from camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.
- 11. Used oil from maintenance shall be collected, properly stored in sealed containers, and either disposed of appropriately at designated sites or be re-cycled.
- 12. Entry of runoff into construction sites, staging areas, camp sites, shall be restricted by constructing diversion channels or holding structures such as berms, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
- 13. Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.
- 14. Where temporary dump sites for clean excavated material are necessary, they shall be located in areas, approved by the Client's supervisor, where they will not result in supplemental erosion. Any compensation related with the use of such sites shall be settled prior to their use.

15. Areas for temporary storage of hazardous materials such as contaminated liquid and solid materials shall be approved by the supervisor and appropriate local and/or relevant national or local authorities before the commencement of work. Disposal of such waste shall be in existing, approved sites.

V. *Quarries and Borrow Areas*

16. The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas. The location of quarries and borrow areas shall be subject to review and approval by relevant local and national authorities.
17. New extraction sites:
 - a) Shall not be located less than 1km from settlement areas, archaeological areas, cultural sites – including churches and cemeteries, wetlands or any other valued ecosystem component, or on high or steep ground.
 - b) Shall not be located in water bodies, or adjacent to them, as well as to springs, wells, well fields.
 - c) Shall not be located in or near forest reserves, natural habitats or national parks.
 - d) Shall be designed and operated in the perspective of an easy and effective rehabilitation. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.
 - e) Shall have clearly demarcated and marked boundaries to minimize vegetation clearing and safety hazards for third parties.
18. Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.
19. Stockpile areas shall be located in areas where trees or other natural obstacles can act as buffers to prevent dust pollution, and generally at a distance from human settlements. Wind shall be taken into consideration when siting stockpile areas. Perimeter drains shall be built around stockpile areas.
20. The Contractor shall deposit any excess material in accordance with the principles of these guidelines, and any applicable ESMP, in areas approved by local authorities and/or the supervisor.

VI. *Rehabilitation of Work and Camp Sites*

20. Topsoil shall be stripped, removed and stored for subsequent rehabilitation. Soils shall not be stripped when they are wet. Topsoil shall not be stored in large or high heaps. Low mounds of no more than 1 to 2m high are recommended.
21. Generally, rehabilitation of work and camp sites shall follow the following principles:
 - To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.

- Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.
- Ensure reshaped land is formed so as to be stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.
- Minimize erosion by wind and water both during and after the process of reinstatement.
- Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.

VII. Management of Water Needed for Construction Purposes

22. The Contractor shall at all costs avoid conflicting with water needs of local communities. To this effect, any temporary water abstraction for construction needs from either ground or surface water shall be submitted to the following community consultation process:
- Identification of water uses that may be affected by the planned water abstraction,
 - Consultation with all identified groups of users about the planned water abstraction,
 - In the event that a potential conflict is identified, report to the supervising authority.

This consultation process shall be documented by the Contractor (minutes of meeting) for review and eventual authorization of the water withdrawal by the Client's supervisor.

23. Abstraction of both surface and underground water shall only be done with the consultation of the local community as mentioned and after obtaining a permit from the relevant authority.
24. Abstraction of water from wetlands is prohibited.
25. Temporary damming of streams and rivers is submitted to approval by the supervisor. It shall be done in such a way as to avoid disrupting water supplies to communities downstream, and to maintain the ecological balance of the river system.
26. No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses. Similarly, wash water from washing out of equipment shall not be discharged into water courses or road drains. Washing bays shall be sited accordingly. Unless site conditions are not favorable, it will generally be infiltrated through soak pits or similar.
27. Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

VIII. Traffic Management and Community Safety

28. Location of temporary access roads shall be done in consultation with the local community and based on the screening results, especially in important or sensitive environments. Temporary access roads shall not traverse wetland areas or other ecologically sensitive areas. The construction of any access roads shall be submitted to a prior consultation process with potentially affected communities that will have to be documented (minutes of meetings) for supervisor's review and approval.
29. Upon the completion of civil works, all temporary access roads shall be ripped and rehabilitated.
30. Measures shall be taken to suppress dust emissions generated by Project traffic.

31. Maximum speed limits for any traffic related with construction at UWSS Project sites shall be the following, unless Ethiopian speed limits are locally lower:
- Inhabited areas: 50 km/h
 - Open road: 90 km/h.

IX. Salvaging and Disposal of Obsolete Components Found by Rehabilitation Works

32. Obsolete materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures shall be salvaged and disposed of in a manner approved by the supervisor. The Contractor has to agree with the supervisor which elements are to be surrendered to the Client's premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.
33. Any asbestos cement material that might be uncovered when performing rehabilitation works will be considered as hazardous material and disposed of in a designated facility.

X. Compensation of Damage to Property

34. Compensation of land acquired permanently for Project purposes will be handled under Client responsibility based on the provisions of the RPF. However, in the event that the Contractor, deliberately or accidentally, damages property, he shall repair the property to the owner's satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner/user a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.
35. In any case where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the supervisor.

XI. Contractor's Health, Safety and Environment Management Plan (HSE-MP)

36. Within 6 weeks of signing the Contract, the Contractor shall prepare an HSE-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an ESMP for the works. The Contractor's EHS-MP will serve two main purposes:
36. The Contractor's HSE-MP shall provide at least:
- a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an ESMP;
 - a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
 - a description of all planned monitoring activities and the reporting thereof; and
 - the internal organizational, management and reporting mechanisms put in place for such.
37. The Contractor's HSE-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor's HSE-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

XII. HSE Reporting

38. The Contractor shall prepare bi-monthly progress reports to the Client on compliance with these general conditions, the sub-project ESMP if any, and his own HSE-MP. The Contractor's reports will include information on:
- HSE management actions/measures taken, including approvals sought from local or national authorities;
 - Problems encountered in relation to HSE aspects (incidents, including delays, cost consequences, etc. as a result thereof);
 - Non-compliance with contract requirements on the part of the Contractor;
 - Changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects; and
 - Observations, concerns raised and/or decisions taken with regard to HSE management during site meetings.
39. The reporting of any significant HSE incidents shall be done as soon as practicable. Such incident reporting shall therefore be done individually. The Contractor should keep his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-monthly reports. Details of HSE performance will be reported to the Client.

XIII. Training of Contractor's Personnel

40. The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project ESMP, and his own HSE-MP, and are able to fulfill their expected roles and functions. Specific training will be provided to those employees that have particular responsibilities associated with the implementation of the HSE-MP. Training activities will be documented for potential review by the Client.
41. Amongst other issues, training will include an awareness session for all employees on HIV-AIDS addressing the following topics:
- What is HIV/AIDS?
 - How is HIV/AIDS contracted?
 - HIV/AIDS prevention.

Appendix 8: Response to the Comments Given by the World Bank

Response to the Comments Given by the World Bank

The responses to the comments given by the World Bank are provided in the following Table.

	Comments	Response
	<p>General: The report has to explicitly acknowledge existence of two safeguard related documents that were agreed and disclosed as part of the borrower's legal commitment to the project. Procedures followed in conducting the assessment and recommending mitigation measures have to adhere to the provisions agreed upon in these two documents. Please refer to the Environmental and Social Management Framework (ESMF) for the Urban Water Supply and Sanitation Project.</p> <p>The report should also apply the procedures and arrangements specified in the project implementation manual to the UWSSP where the various operational policies that need to be addressed have been indicated and details provided on actions contractors will need to take in undertaking the construction activities. Please refer to section 5 and annex 3 of the Project Implementation Manual with all the attachments to it.</p> <p>The report emphasizes the need for a close monitoring of activities during the construction and operation phases. The environment section of the MWE should ensure that the recommended actions are implemented and a mechanism to monitor progress under each mitigation measure has to be in place. The report needs to be checked for consistency of identified impacts and recommended actions between the executive summary and the main body.</p> <p>The report needs to be checked for consistency of identified impacts and recommended actions between the executive summary and the main body.</p>	<p>The comment is very relevant and accordingly considered in the Final ESIA Report. The ESMF and RPF requirements are briefly described under section 3.2 (which is part of the Policy and Legal Framework) of the Final ESIA Report. In addition, the requirements have been followed in conducting the ESIA study and in preparing the ESIA Report, including the ESMP.</p> <p>The procedures and arrangements specified in the Project Implementation Manual (PIM) to the UWSSP have been followed in conducting the ESIA study and in preparing the ESIA Report. How and where these are addressed is described in section 3.2.1.</p> <p>It is expected that the Project Implementing Agency, i.e. the JWSSE would facilitate the implementation of the recommended Environmental and Social Management Plan by allocating the necessary budget and coordinating the activities of other stakeholders.</p> <p>It is checked and confirmed that identified impacts and recommended actions between the executive summary and the main body are consistent.</p>
	<p>Comments on Environmental aspects of the ESIA for Jimma WSS Project:</p>	
I	<p>Impacts on soils: It is important that the likely negative impacts on soils including through erosion are addressed as effectively as possible by taking up works in the dry season, refilling exposed soils as soon as possible, ploughing compacted areas, reducing the time period for which lands are left bare after completion of works, by taking up plantation of grasses and other vegetation that can minimize soil erosion.</p>	<p>The indicated mitigation measures were already described in section 6.2.2 (under mitigation measures) and in section 9.1 (Table 9.1 EMP) including the responsibility for implementation and monitoring as well as the timing of implementation. The Project Implementing Agency will take necessary measures to facilitate the implementation of the mitigation plan.</p>

II	Impact on downstream flows: While the impact on downstream flows is likely to be minimal if one goes by the current level of abstraction of water for the new water supply and sanitation system. It is important to closely monitor downstream flows to ensure that these are adequate and far above the minimum required levels.	The comment is accepted and the recommended monitoring measure is included in the Monitoring Plan (Section 9.2, Table 9.2, item no.1). It is recommended that the JWSSE would implement the monitoring action.
III	Water Quality: The major impact on water quality is expected from possible pollution from sludge water released from the water treatment plant through residual sludge that is likely to consist mainly of sediments/mud, Aluminum Sulphate (alum) and water. The expected dosage of Alum for water treatment indicates that the concentration of Aluminum in the sludge water is likely to be much higher than acceptable limits. Therefore, it is essential that treatment of the sludge before disposal to bring it to Gilgel Gibe River is done on a regular basis. The sludge drying bed/lagoons and disposal sites for the solid waste need to be necessarily included to ensure that the impact is within acceptable limits.	The recommended mitigation measures were already provided in Section 6.2.4 (under mitigation measures for the operation phase). It is recommended that the Project Implementing Agency (JWSSE) will take necessary measures to effectively implement the mitigation measures.
IV	Impact on vegetation, wildlife and aquatic ecology: The report documents the likely negative impacts on vegetation, wildlife and aquatic ecology that deserve attention during project implementation. The OP/BP 4.04 on Natural Habitats and OP/BP 4.36 on Forests have therefore been triggered and would need to be carefully addressed as required in the ESIA document.	The potential impacts of the planned project on Natural Habitats and Forests were identified and described together with appropriate mitigation measures in section 6.3.1, 6.3.2 and 6.3.3. It is believed that the recommended mitigation measures will be implemented and monitored according to the detailed Environmental Management Plan provided in Chapter 9, Table 9.1.
V	Impact on Cultural Heritage Sites: The likely impacts on cultural heritage sites such as the cemetery, Aba Jifar Palace, Mosque etc. have also been documented in the report and would need to be taken care of by having the contractor minimize use of machinery and prioritize manual labour use for the construction activity. The OP/BP 4.11 on Physical Cultural Resources has therefore been triggered and would need to be addressed as required in the ESIA document.	It is believed that the recommended mitigation measures for the possible impacts on cultural heritage sites will be implemented and monitored according to the Environmental Management Plan provided in Chapter 9, Table 9.1. It is the Project Implementing Agency's responsibility to ensure that the recommended mitigation measures are effectively implemented to avoid any potential risks to the cultural heritage sites.
	Comments on ESIA Study Report of Jimma WSS Project:	
I	11.1.1 While the report has been prepared quite comprehensively, the sections related to Social Safeguard on Involuntary Resettlement OP4.12 requires some review. First and foremost the report needs to explicitly acknowledge the existence of the Resettlement Policy Framework (RFP – see attached) for the UWSSP that is the agreed framework for implementation of all actions	It is a good comment, and the Consultant has addressed it under section 3.2.2 of the Final ESIA Report.

	<p>related to Involuntary Resettlement, Rehabilitation and related compensation. This will ensure that references to OP 4.12 on Involuntary Resettlement on page 16 of the report, Proclamation on Expropriation of Land Holdings and Payment of Compensation in section 3.3.6 on page 18, Proclamation on Rural Land Administration and Land Use in section 3.3.7 on page 19, Proclamation on Oromia Rural Land Administration and Use in section 3.3.11 on page 20, and Regulations on Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes in section 3.3.12 on page 21, and related descriptions are in light of a full understanding of the contents of the agreed Resettlement Policy Framework for the project. The Consultant would confirm that it would be appropriate and possible for the project to follow the agreed Resettlement Policy Framework as it is expected to be in conformity with the Bank's OP on Involuntary Resettlement. [Note: Section 3.3... in the draft ESIA Report is section 3.4... in the Final ESIA Report].</p>	
II	<p>The observations in 6.2.1 on Land Acquisition and Impacts on Land Use summarizes the temporary and permanent land acquisition for locating various components of the project requiring permanent land acquisition covering a total land area of around 10ha as being lands that belong to the Jimma City Municipality (according to project office sources) and that these lands are already secured by the project. In order to confirm this fact, it would be essential to have the specific details of these plots including their location on a cadaster map as well as a certificate from the EPLAUA that these lands indeed have been allotted to the Project.</p>	<p>The Consultant has contacted the Project Coordinator (Ato Tadele Gezahegn) at the JWSSE to obtain the requested documentation. He has confirmed that necessary land acquisition procedures are completed and the project construction is well advancing. Finally, he agreed to obtain the requested documents from the concerned authorities or offices so that it would be attached to the Final ESIA Report.</p>
III	<p>Section 6.4.1 on page 63 details the impacts of Housing Units and specifies that Ginjo and Aba Jifar sub-mains run very close to several housing units and about 8 housing units would be partially affected by the Aba Jifar sub-main. With regard to Ginjo sub-main, 3 housing units are expected to be affected even though a slight shift in the route of this main could possibly avoid this. In terms of mitigation, the report leaves the identification of the affected households to the stage after the Construction Contractor has finalized location of each of these items of project infrastructure. It is recommended that, following the Resettlement Policy Framework for the project, once the affected families are identified the extent of their loss be assessed and valued and they be compensated and relocated (if required) prior to the beginning of any work under the project.</p>	<p>It is a very relevant comment that reinforces the recommendations of the ESIA study. The impacts on housing units should be mitigated according to the Resettlement Policy Framework agreed for the Project by identifying and valuing the affected housing units as per the recommendation given in the ESIA Report (see section 6.4.2 and Table 9.1, item 12). It is recommended that the Project Implementing Agency would take a leading role in coordinating the compensation process by facilitating the establishment of Compensation Committee and allocating necessary budget.</p>
	<p>It is important that the feedback received, commitments</p>	<p>It is recommended that the highlighted</p>

	made and conclusions dawn as a result of the community and other stakeholders consultations are taken into consideration while finalizing the project design and feedback be provided to the communities on actual action taken as a result of these inputs.	task would be implemented by the Project Implementing Agency.
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Appendix 9: Project Layout