

# EEPCO

ETHIOPIAN ELECTRIC POWER CORPORATION

## GIBE III Hydroelectric Project



**EXECUTIVE SUMMARY**  
**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT**

March 2009

## Table of Contents

<b>0</b>	<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
0.1	Introduction .....	1
0.2	Project Description .....	1
0.2.1	Project Location .....	1
0.2.2	Gibe III Hydropower Scheme .....	2
0.2.3	Transmission Line .....	4
0.2.4	Access Roads.....	4
0.3	Policy, Legal, and Administrative Framework .....	i
0.3.1	Regulatory Framework of FDRE .....	i
0.3.2	African Development Bank Guidelines.....	i
0.3.3	World Bank .....	ii
0.3.4	International Conventions .....	ii
0.4	Description of the Project Environment.....	ii
0.4.1	Dam and Reservoir/upstream .....	ii
0.4.2	Baseline Information: Downstream Area.....	vii
0.4.3	Baseline Information: Gibe III-Sodo Transmission Line.....	ix
0.5	Project Alternatives.....	ix
0.6	Potential Impacts and Benefit Enhancement and Mitigation Measures .....	xi
0.6.1	Beneficial/ Positive Impacts .....	xi
0.6.2	Adverse Impacts and Mitigation Measures: Dam and Reservoir .....	xii
0.6.3	Impacts on Downstream Environment Lower Omo and Mitigation Measures.....	xv
0.6.4	Adverse Impacts and Mitigation Measures: Gibe III-Sodo Transmission Line .....	xvii
0.6.5	Adverse Impacts and Mitigation Measures: Chida-Sodo Road Realignment .....	xvii
0.6.6	Cumulative Impact Assessment .....	xviii
0.7	Environmental Management and Monitoring Program.....	xviii
0.7.1	Environmental Management .....	xviii
0.7.2	Environmental Monitoring .....	xix
0.7.3	Monitoring Framework .....	xx
0.8	Public Consultations and Disclosure Plan.....	xx
0.9	Environmental Mitigation, Management, Monitoring and Training Costs .....	xxii
0.10	Contacts.....	xxiv

## List of Tables

Table 1:	Summary of Project Impact on Household Assets by Wereda and Project Component .....	xiii
Table 2:	Summary of estimated environmental mitigation, monitoring and training costs.....	xxiii

## List of Figures

Figure 1:	Location Map of the Project Area .....	2
Figure 2:	Administration Map around the Reservoir Area .....	3
Figure 3:	General Layout of the Site Installations .....	5
Figure 4:	Chida - Sodo Road Realignment Change .....	6

# EXECUTIVE SUMMARY

## 1.0 Introduction

Ethiopian Electric Power Corporation (EEPCO) is currently focusing on developing the country's hydroelectric potential and the Gibe III scheme provides generating capacity to meet domestic demand and increase exports of electricity and make the sector a major foreign currency earner for the country. The direct benefits of this project will be 1,870 MW of electrical power and 6,400 GWh of firm energy per year.

The Environmental and Social Impact Assessment (ESIA) has been prepared in compliance with Ethiopian ESIA procedures and in accordance with international standards, as reflected in the policies, safeguard procedures, and guidelines of the African Development Bank.

This executive summary includes information drawn from associated reports prepared within the same study framework, namely:

- i) Environmental and social Impact assessment: Dam and Reservoir
- ii) Environmental and Social Impact Assessment: Downstream
- iii) Environmental and Social Management Plan
- iv) Resettlement Action Plan
- v) Environmental and Social Impact Assessment: Gibe III-Sodo Transmission Line
- vi) Environmental and Social Impact Assessment: Chida-Sodo Road Realignment

Full reports can be accessed at <http://www.eepco.gov.et/>

CESI of Italy, in association with MDI Consulting Engineers of Ethiopia, was charged with the responsibility of preparing the ESIA and AGRICONSULTING of Italy in association with MDI carried out the additional study on downstream impact assessment. EEPCO's EMU prepared the ESIA and the RAP for the Transmission line project.

## 2.0 Project Description

### 2.1 Project Location

The Gibe III scheme is located within the Gibe - Omo River Basin, in the middle reach of the Omo River around 450 km by road south of Addis Ababa. The scheme, from the root of its reservoir to its tailrace outfall, extends over a corridor some 155km long. Administratively, the reservoir stretches over five zones and twelve weredas. The downstream area extends from the dam site upto Lake Turkana. Omo River below the Gibe III dam traverses through the four weredas of South Omo Zone.

The approximate centroid of the project area lies at 757,225 North and 312,293 East. Figure 1 and 2 show the locations of the project area for the dam and reservoir and administration map around the reservoir respectively. The works concerning the construction of the Gibe III scheme (diversion tunnels, cofferdams, main dam, Power House, switchyard, etc.) are concentrated in a small area of about 1.6 km<sup>2</sup>.

### 2.1.1 Gibe III Hydropower Scheme

The Gibe III Hydropower Project will be the third development in a cascade of water resource schemes (Gilgel Gibe/ Gibe I, in operation and Gibe II under completion) on the main Gibe/Omo River. One further hydropower scheme – known as Gibe IV is foreseen downstream on the Omo River.

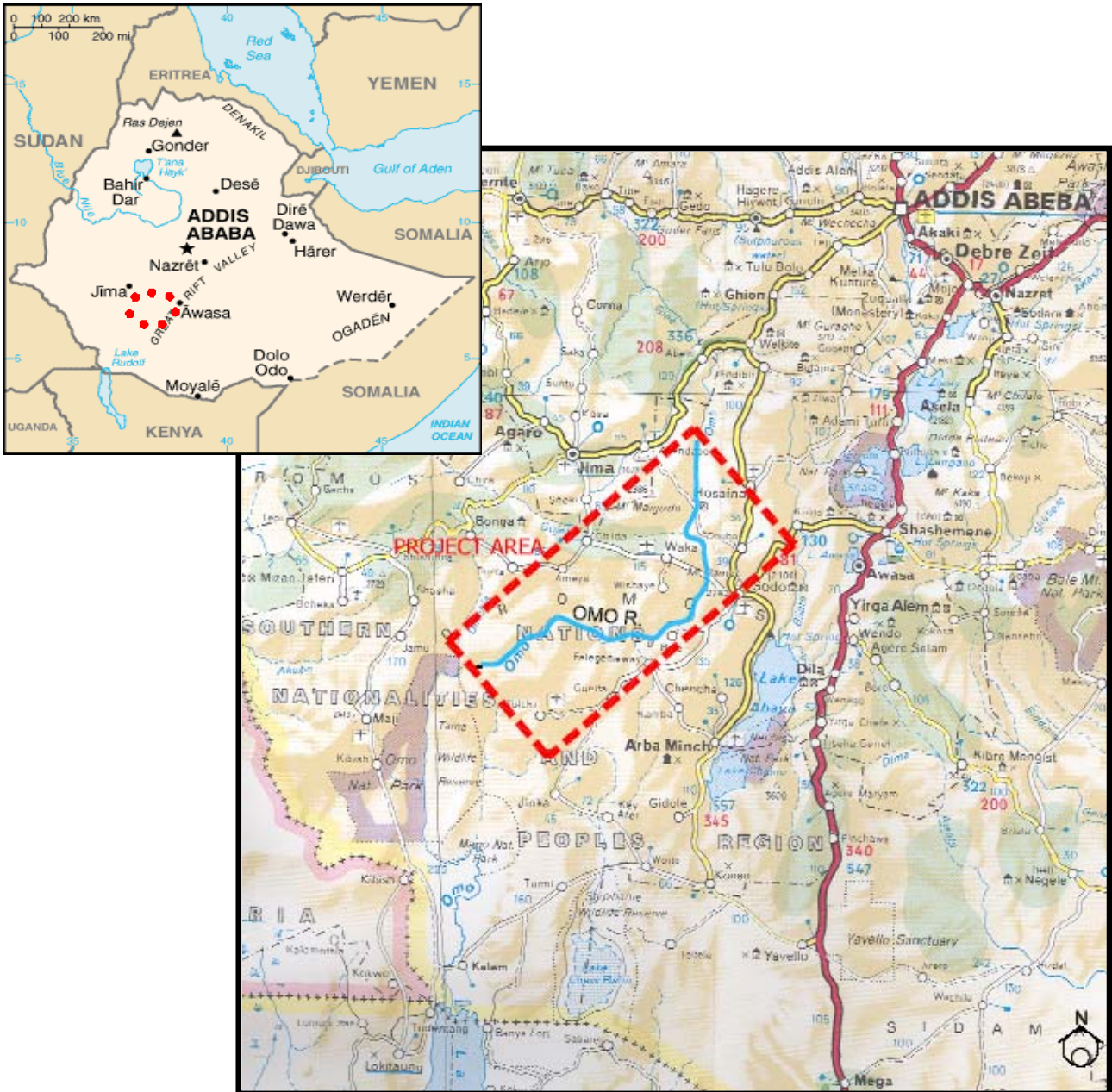


Figure 1: Location Map of the Project Area

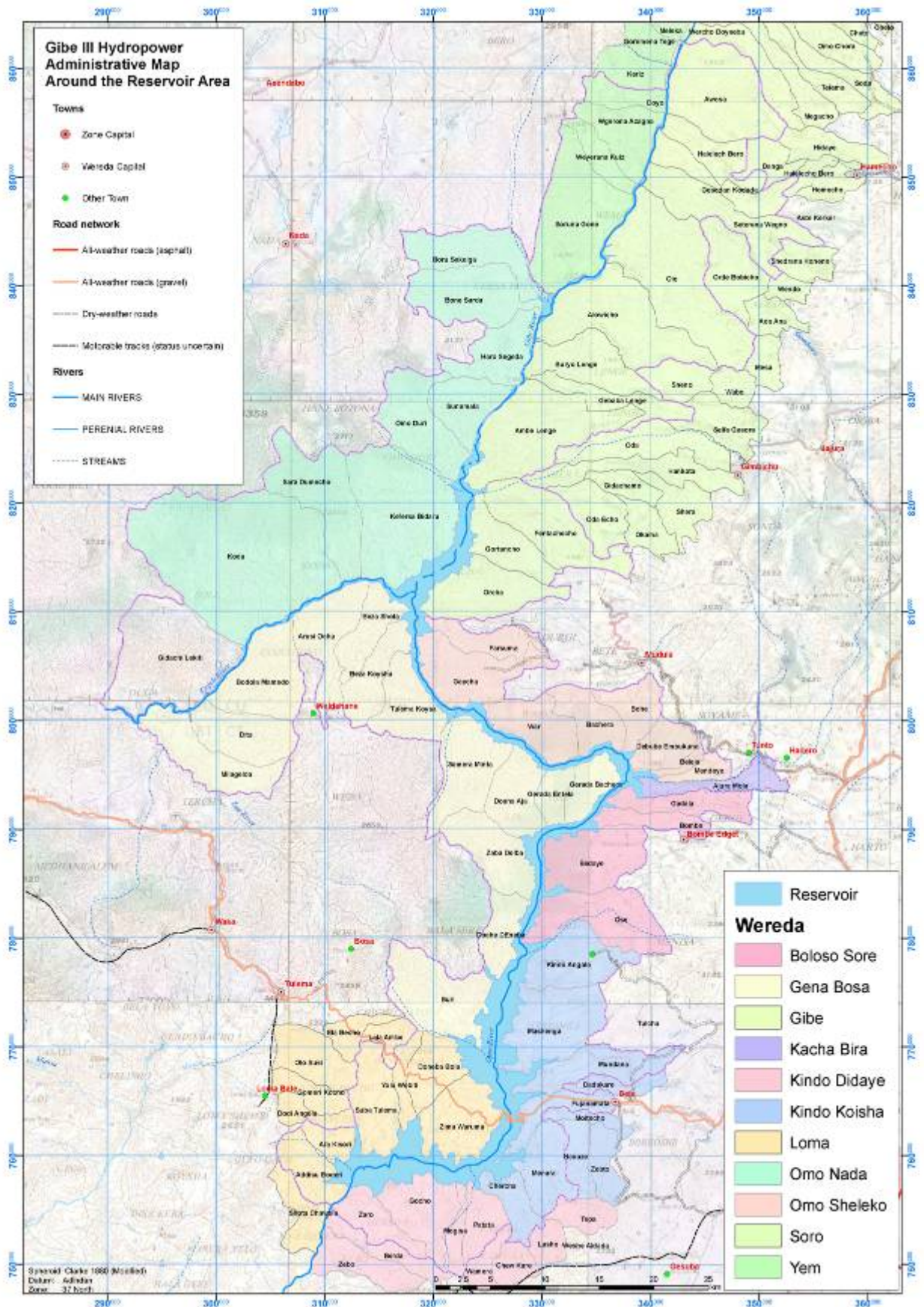


Figure 2: Administration Map around the Reservoir Area

Figure 3 shows the overall layout of the Gibe III, Hydropower scheme and comprises a 240m high dam which will create a huge reservoir with a surface area of some 200 km<sup>2</sup> and a live storage of some 11,750 million m<sup>3</sup>. It has an underground and inclined penstocks, a surface Power House equipped with ten power generating units and switchyards, with the following characteristics:

- Vertical axis Francis N. 10 turbines, 187 MW, 211 m Hn, 95 m<sup>3</sup>/s Q
- 0.46 Plant load factor (0.46 Gibe I; 0.44 Gibe II)
- 6,500 GWh Energy produced annually

The electrical power will be available at any time of the day or night to cover both peak and off-peak demand in the Ethiopian interconnected power systems or exported. The so-called specific unit cost of the Gibe III scheme, based on the generation component (excluding the transmission component), is some 2.86 Euro cents per kWh indicative of a very attractive hydropower generation scheme.

### *2.1.2 Transmission Line*

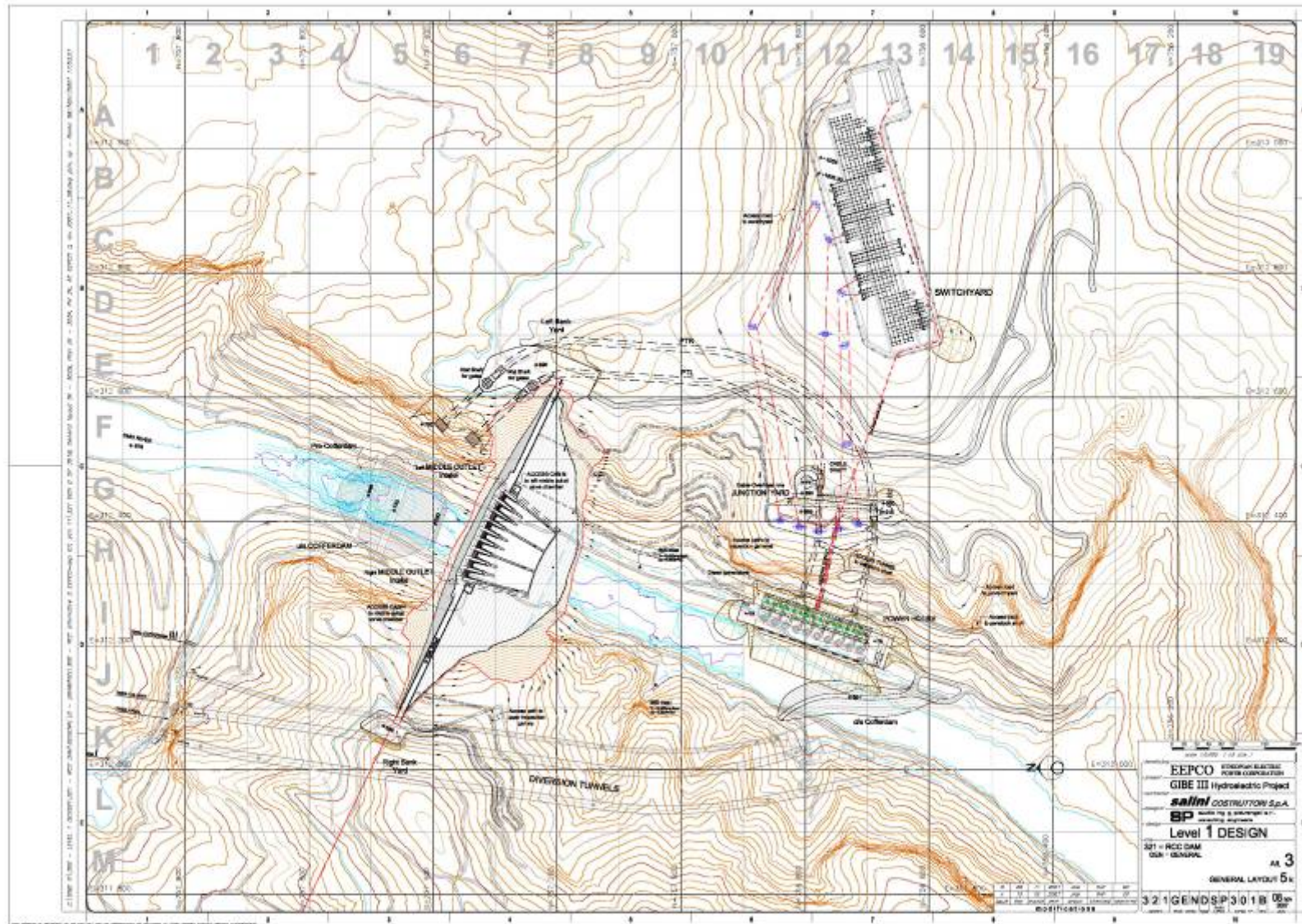
The power produced by the 1,870 MW Power House at Gibe III will be delivered to Interconnected System (ICS) through a 65 km long four double circuit 400 kV overhead transmission line that connects the Gibe III to a new substation at Sodo. This line will be 65 km long.

The transmission line towers will be constructed as self-supporting steel lattice structures. The normal spacing between consecutive towers will be approximately 350m. The footprint of the towers will be approximately 12m by 12m. A right-of-way, 50m in width and approximately in the centre of the wayleave, is to be kept clear of both vegetation and structures. The right-of-way will be used for the footings of the transmission towers and as an access track for construction and maintenance of the transmission line. This land will also remain under the ownership of its present owners. As much as possible the route where practical, has avoided houses or settlements and agricultural areas.

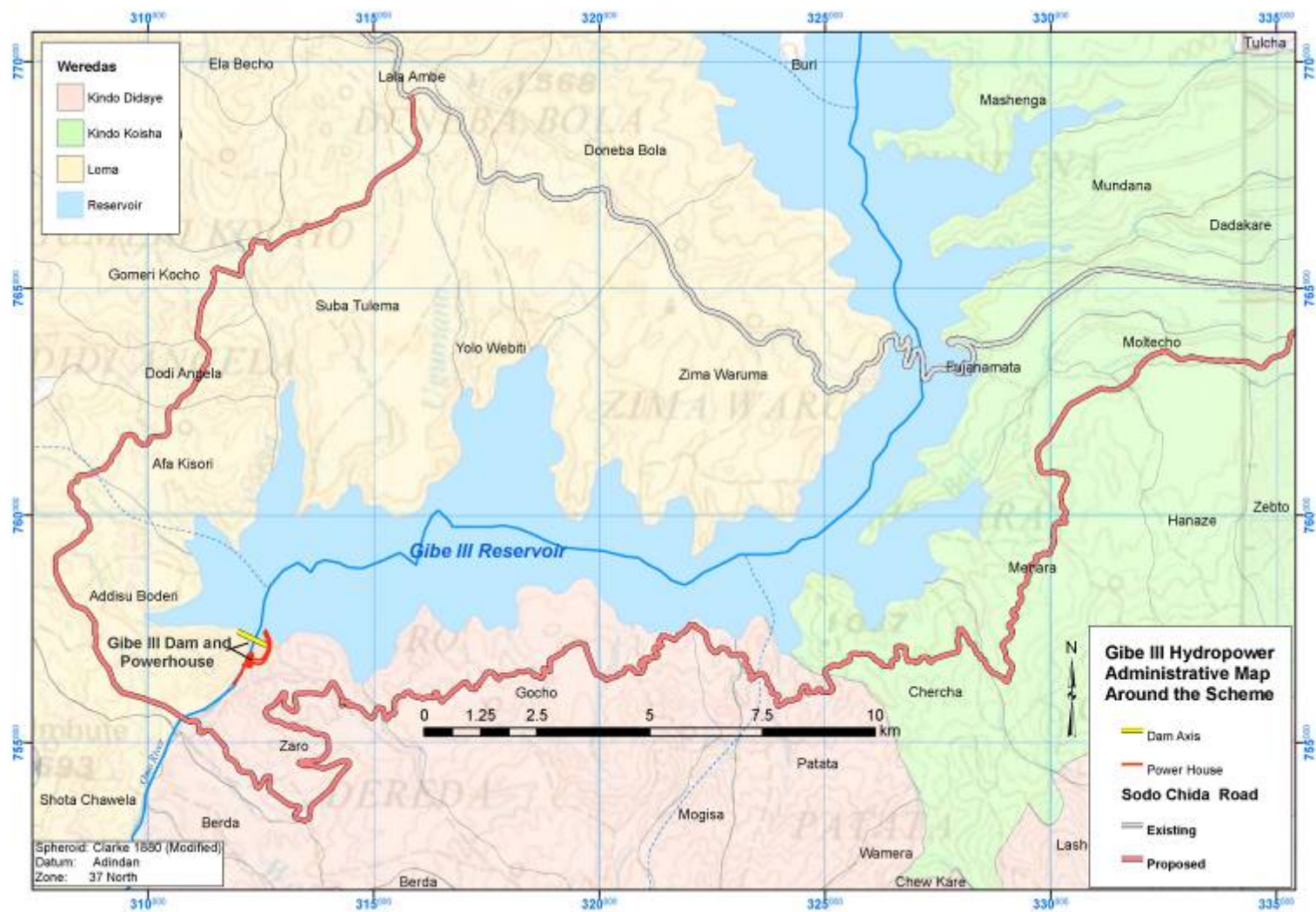
### *2.1.3 Access Roads*

The existing bridge across the Omo River (on the Chida-Sodo Road) will be submerged by the future Gibe III reservoir and a new road bridge will be built downstream of the dam. After reservoir impounding, the permanent link between the Omo River left and right banks will be possible utilising Road (on the right bank plateau) to the dam site, passage over the d/s toe of the dam and a new road on the left plateau from the dam site to the existing road (or to Kindo Halale).

The proposed relocation road still lies in Wolayita and Dawro Zones of SNNPRS and serves the same community. Both the existing road and the relocation road are shown in Figure 4. The total length of the road along the selected alignment is approximately 72 km. The EPC contractor has studied a 47 km road alignment on the left bank and a 24.5 km on the right (see Figure 4). The surfacing will be about 7 m wide carriage way gravel road. A new bridge will be constructed across the Omo downstream of the Gibe III dam. The detailed design of the road is illustrated in the relevant report.



**Figure 3: General Layout of the Site Installations**



**Figure 4: Chida - Sodo Road Realignment Change**

In terms of function, the road is classified as a link road. The suggested formation width for the road is 10 m and it includes 1.5 m wide shoulders on either side. The road has a gravel surfacing. Based on the field investigations and the cross profile, requirement for roadside drainage and other protection measures required are identified. Hence, the proposals include roadside drains (furrow and lined), scour checks, retaining walls, etc. Other provisions mainly include sign, markings and road furniture.

## **2.2 Policy, Legal, and Administrative Framework**

The ESIA study for the proposed Gibe III Hydroelectric project has been carried out within the framework of local, national and international environmental regulations. The legislative framework applicable to the proposed project is governed by the Federal Democratic Republic of Ethiopia (FDRE), Africa Development Bank (AfDB), World Bank, and European Investment Bank (EIB).

### ***2.2.1 Regulatory Framework of FDRE***

The Federal Democratic Republic of Ethiopia adopted its Constitution in 1995, which provides the basic and comprehensive principles and guidelines for environmental protection, and management in the country.

Federal Environmental Protection Authorities (EPA) administers the EIA process in Ethiopia, as set out in its establishment proclamation. EEPCO has complied with the EIA and procedural and documentation requirements of EPA, with submission of the ESIA, ESMP and Resettlement Action Plan reports.

EEPCO and the EPC contractor will be responsible for implementing the recommended environmental mitigation measures and management plans in coordination with the Federal EPA and the Regional Environmental Protection Offices. The environmental performance of the project will be monitored on a regular basis through EEPCO's own set up and through external/ third party audits.

### ***2.2.2 African Development Bank Guidelines***

According to AfDB screening criteria, Gibe III project is a category "1" project, for which a full-scale environmental impact assessment is required. This ESIA report was prepared to fulfil the requirements of AfDB involved in financing of the project investment.

The following key AfDB policies and guidelines dealing with environmental and social issues related to the project were taken into consideration for preparation of the ESIA and ESMP reports and the Gibe III project is in compliance with the AfDB polices:

- Environment and Social Assessment Procedures
- Policy on Involuntary Resettlement

### **2.2.3 World Bank**

The WB provides detailed guidelines for the EA process. The Gibe III hydropower project falls under Category A as per WB Performance Standards and its procedures for project appraisals. The WB policies and guidelines dealing with environmental and social issues related to the project were taken into consideration for preparation of this ESIA.

### **2.2.4 International Conventions**

The Federal Democratic Republic of Ethiopia has ratified several international conventions and protocols, and some of these have relevance to Gibe III Hydroelectric Project and these include:

Convention on Biodiversity (Rio convention);

Frameone convention of UN on climate change;

African convention on the conservation of Nature and natural Resources;

Convention on Wetlands of International importance Especially as waterfowl Habitat (Ramsar);

Convention concerning the protection of world cultural and Natural Heritage.

## **2.3 Description of the Project Environment**

Information on existing natural and socio-economic resources is of fundamental importance for evaluation of environmental impacts. The baseline data on the current status of the physical, biological and socio-cultural environments of the project area have been assembled, evaluated and presented.

### **2.3.1 Dam and Reservoir/upstream**

#### **2.3.1.1 Physical Environment**

##### *Climate*

The amount of rainfall decreases throughout the Omo-Gibe catchments with a decrease in elevation and varies from a minimum of 1,200 mm to a maximum of about 1,900 mm. The average annual rainfall calculated over the whole Gibe III basin where the dam is located is 1,426 mm. 75 to 80% of the annual rainfall occurs during a five months period from May to September. The mean annual temperature is 20.4°C.

##### *Geology*

The regional geology of southern Ethiopia consists mostly of metamorphic rocks of green schist, amphibolite and granulite facies that represent the southern margins of the Arabian-Nubian shield.

The dam site area is characterized by a deep gorge with sub-vertical walls. The river alluvium is constituted by fine sands and gravel of variable thickness, with a maximum depth up to about 15 meters. From the river banks start the 30-50 m slopes of a coarse angular colluvium in silty-sandy matrices. The slightly weathered trachyte walls, outcropping are mainly characterized by two sub-

vertical joint families, being parallel and orthogonal to the river. The walls are affected also by a relevant transverse fault system with NW-SE orientation.

The left bank is about 200 m high and appears almost intact, while the right bank is affected by a NNW-SSE fault system. The trachyte flow appears in some parts weathered and altered by fractures and hydrothermal fluids. At the top of the right bank a main NNW-SSE fault has caused a vertical displacement and put basalt and trachyte structures into contact. Near the contact with the colluvium, the rock assumes a more plutonic look. The ends of the walls are sometimes characterized by basalt columnar flows (two at least) upset by a structural movement.

#### *Seismology*

While the Gibe III dam is located in Ethiopia, in the vicinity (about 70 km) of the eastern branch of the east African rift system the entire area interested by the project, according to the LEVEL 1 DESIGN Geological Report, doesn't show any evidences of present existing seismic activity.

#### *Hydrogeology*

Available data concerning the reservoir were collected from boreholes drilled at the dam site, from documents of the Gibe II project, and from remote sensing. The stratigraphy and structural geology of the reservoir banks were defined on the basis of the interpretation of ASTER scenes and other remote sensing data. Local permeability values were acquired from boreholes drilled at the dam site. According to the geological report no relevant filtration couloirs from the reservoir have been observed along the river basin. Permeability would be of secondary type (i.e. related to fracturing of the rock mass) while primary permeability (i.e. related to porosity) would be limited to the pyroclastic units interbedded in basalt flows

#### *Hydrology*

The Omo River Basin is drained by two major rivers from the highlands, the Gibe River flowing southwards and Gibe River flowing eastwards. Downstream of their confluence only minor tributaries join, as the river continues southwards and enters the deep gorge where the Gibe III dam site has been identified. At the dam site, the catchment area is some 34,150 km<sup>2</sup> that represents 45% of the total catchment area at Lake Turkana and contributes 80.5 % of the basin flow. The Omo River has an average slope of 3.1 m/km. The long term mean flow at Gibe III site is estimated to be 435 m<sup>3</sup>/s or 13.5 Billion m<sup>3</sup> per annum. Seasonal variations are extreme, with monthly mean flow ranging from around 60 m<sup>3</sup>/s in March to more than 1,500 m<sup>3</sup>/s in August.

#### *Water quality*

In order to describe water chemical characteristics upstream and downstream the dam site, a water sampling campaign has been done to define the abundance of defined chemical parameters in three stations (downstream Gibe II Power House, at Bele Bridge and near the Gibe III dam site). Considering very low salinity levels on the usual mineral water scale, the Omo River water can be classified as earthy-brackish, alkaline, and with bicarbonate.

### *2.3.1.2 Biological Environment*

#### *Land Use and Land Cover*

Land cover assessment was carried out for the Gibe III reservoir area and it was based on satellite images interpretation, field observations, field data collection and analysis. The classification resulted into the following four classes: The riparian vegetation in the reservoir area was observed along the river sides and it occupied 1,839 ha of land (8.8 %), and deciduous woodland covers about 17,158 ha (82.2%) and it is characterized by approximately 2% tree cover and 98% grass at the time when the field survey was carried out. The exposed surface and silt/gravel land covers 4.7 % of the reservoir area and it mainly occurs along the lower parts of the river, on steep sides of rivers and degraded hillsides and rock outcrops. River/ water body covers 4.3 % of the reservoir area. Farming practices and settlement are concentrated in areas (outside the valley on the highland) which are not affected by the future reservoir.

#### *Natural Vegetation and Forest Resources*

The vegetation on the hill slopes of the valley is characterized by deciduous phenology of the woodland species which shed their leaves during the dry season and regain them during the wet season as an adaptive mechanism for the prolonged dry season. The plant species of the Omo Valley have over time developed adaptive mechanisms and traits that allow them either to survive fire, germinating after the heat shock or to regenerate after a fire episode. In general, the vegetation which has evolved (around the reservoir area) as response to the frequent fires is poor in species composition. There is a narrow band of riparian vegetation of almost similar species composition as the woodland on the hill slopes. Due to ample moisture, trees found at the edge of the riverbank are not affected by fire as the rest of trees in the upper parts of the study area.

The altitudinal ranges, temperature, humidity and the floristic and physiognomy composition of the vegetation in the Omo river basin and Gibe Basin provide ideal conditions for Tsetse fly infestation.

#### *Wildlife Resources*

Based on the assessment, the number of wildlife species in the project area is low and does not rate well with areas in downstream of Gibe III dam (the Mago and Omo National Parks) and harbours only limited number of wildlife. However, the local residents and professionals from the offices of Agriculture interviewed during the field studies reported the presence of wildlife within the project area. The wildlife that have been recorded for the reservoir area are very common in many parts of the country and none of these species are endangered or threatened.

The vegetations provide good habitat to support diverse wildlife species. However, the wildlife habitats have always been under threat due to wildfires that are practiced during the dry season and it is greatly affecting the overall ecology and resource base. The woodlands, in particular are under high threat from fire.

### *Fishery Resources*

The Omo-Gibe river basin is known to contain high diversity of fish species with over 70 species listed. The fishery in the study area includes: the riverine fishery along the mainstream Omo River, flood plain fishery (and Dipa Hayk), and the lacustrine fishery at Lake Turkana (Bubua and Toltale).

Studies on the biology of the different fish species have shown that they have different seasonal and spatial distribution for optimal growth – feeding, reproduction and survival. The large variety of species found in the river system is distributed in all sorts of habitat like in the deep open river channel or in pools (*Hetrobranchus longifilis*), in the floodplains, in rocky habitats like *Labeo cylindricus*, demersal areas (*Hyperpius bebe*), etc. Similarly their feeding habit varies enormously among the species covering all available niches. Some species undergo seasonal migration from the lake feeding grounds to spawn in the River Omo – like *Distichodus niloticus*, *Labeo horie*. Others prepare their own spawning sites (nests) close to the vegetated shore areas in the lake and complete the life cycle (*Oreochromis niloticus*). There are also fish species that spawn in the lake and also some of the population in the river systems (*Hydrocynus forskalii*).

There are few species which are endemic to the Lake Turkana and lower delta of the Omo River. However, none of the reports referred in the studies indicate the occurrence of endangered or threatened fish species in the Omo-Turkana system. The endemic fish species breed in different locations in or close to the lake - like in the estuarine, littoral and pelagic habitats of the lake. These fish species have apparently evolved in the lake from the riverine ancestors to fill up the niche created in the lacustrine system.

Riverine fishery is not developed partly due to lack of access to suitable fishing grounds and also the food habit or culture of most of the rural community does not favour fish consumption. Fishing is done mainly with hooks and some gill net. Commercial fishing is mainly reported in the lower course of the river far below the proposed dam site, at Omorate and at the Lake Turkana.

### *Protected Areas*

Ethiopia issued a number of regulations aimed to conserve and protect the remaining natural ecosystems of the country in National Parks, Wildlife Sanctuaries, National Priority Forest Areas and Controlled Hunting Areas. However, the reservoir area is neither contiguous with nor in close proximity with any of these nationally protected areas.

#### **2.3.1.3 Socio-Economic Environment**

The socio-economic assessment has been carried out with the objective to provide a comprehensive analysis of the existing socio-economic conditions of the population in the future reservoir area.

### *Population and Settlement*

In 2006, an estimated 253,412 people were living in the 67 Peasant Associations located around the Gibe III reservoir area of which 49.9% were males and 50.1% were females. This population represents 10.8% of the Wereda population. However, as a result of steep slope and Tsetse fly

infestation, there is no settlement in the future reservoir area and settlements are concentrated on the highland in areas outside the valley. Settlement around the project area is also fully rural, and the residents are organized into small villages. The average population density within the Peasant Associations located around the reservoir area is 127.8 persons/km<sup>2</sup>.

More than 13 different ethnic groups live around the future reservoir area and the major ethnic groups are - Hadiya (25.3%), Wolayita (23.0%), Oromo (20.4%), Dawro (6.9%), Kembata (6.7%), Tembaro (5.0%), and less than one percent of Amhara, Keffa and Sodo Gurage, Silte and Sebatbet gurage. The rest of the ethnic groups constitute less than 3.3 in total.

Major religions practiced in the project Wereda are Christianity (67.7%) and Muslims (24.6%). Traditional religions are practiced by about 5.3% of the population.

#### *Agriculture and livestock populations*

The main areas of farming are confined to the middle or upper slopes of the hills where the settlements are situated. The farmers in the project area (mainly on the high land) produce small quantities of a wide range of crops (15-20 different crops), including cereals, roots, tubers, pulses, spices, coffee and fruits. Such use of the land is very sound, allowing the land to be converted with vegetation throughout most of the year, which helps to reduce the erosion effects of the heavy rain occurring in July and August.

As the result of the less favourable rainfall, Tsetse fly infestation and the consequent occurrence of cattle disease, trypanosomiasis, there is very little farming activity around the Omo valley bottom lands only near the dam site. The steepness of the slope on either side of the valley appears to be another important factor which has discouraged the use of the valley for agricultural purposes.

The main livestock populations in the project area are cattle, sheep, goats, poultry and equines. Few farmers own oxen, although this varies throughout the project area.

#### *Public Health*

The major health problems of the project area are reported to be infectious diseases and malnutrition. Most illnesses are communicable and are related, either directly or indirectly, to lack of adequate and safe drinking water supplies and sanitation, low living standards and poor nutrition. Waterborne and vector borne diseases are also prevalent in the area. The project areas are highly endemic for malaria with continuous transmission and malaria is by far the most important of the diseases. The presence of several rivers (tributaries to Omo River) provides ideal breeding habitats for mosquitoes. The health coverage in the affected Weredas ranges from 34.6% to 83.6% (that is the population living within 10km radius of a health station).

#### *Cultural, Religious, Historical and Archaeological Sites*

The importance of the Gibe III reservoir area and the immediate surrounding has been investigated in terms of religious and cultural site relics and archaeological importance. Based on this investigation the historical sites known as King Ijajo Kella and King Halala Walls were found on both sides of the Omo River. An additional archaeological impact assessment as well as the

elongated stone ramparts in Wolayita and Dawro has been initiated with the Authority for the Research and Conservation of Cultural Heritage (ARCCH).

The UNESCO designated heritage site is not in close proximity to the proposed Gibe III dam and reservoir areas. The lower valley of the Omo River which is designated as a UNESCO World Heritage site is located far downstream and will not be affected by this scheme.

No visible archaeological remains, which have scientific, cultural, public, economic, ethnic and historic significances, have been observed in the area and dam sites. The sites have no archaeological importance. However, a Chance Find protocol has nevertheless been prepared to cover any unexpected finds.

### ***2.3.2 Baseline Information: Downstream Area***

#### *Population and Settlement*

The Lower Omo stretches over Salamago, Hamer, Nyangatom and Dasenech weredas and is well endowed with both cultural diversity and natural resources. The population within these four weredas of the lower Omo is estimated to be about 131,831 of which 50.3% were males and 49.7% were females in the year 2007. There are 28,713 households with an average of 4.6 people per household. Of the total population, an estimated 50% are economically active (age 14-64), 45% are youth (ages 0-14) and 2% are elders. The population is predominantly rural based with nearly 94.8% living in rural areas. The urban population is estimated to be only about 5.2%.

#### *Agriculture*

There are different farming systems in the Lower Omo, which are influenced by agro-climatic and socioeconomic constraint, and these include cereal-based mixed farming system and retreat flood cultivation.

**Rainfed agriculture:** Rainfed crops are cultivated in three out of the four weredas where flood recession cropping is also important; Hamer, Salamago and Nyangatom, at higher altitudes towards the west and eastern margins of the Omo valley. Rainfall at lower altitudes (e.g. in Dasenech Wereda) is insufficient to support any rainfed cropping. Labour for hoe cultivation and weeding is the main input, and is generally said to be in short supply due to the demand of livestock herding, low population levels and poor general health. Oxen are very rarely used, partly due to cultural objections and also because of losses to disease.

**Flood recession agriculture:** The Omo River rises during the rainy season and overflows its banks to flood the land on the plains bordering the river, permitting crops to be grown on the residual soil moisture after the floods recede. Further upstream where the valley slopes are too steep to allow large scale flooding, areas of recession crops are grown on the river banks, especially where silt has been deposited at bends in the river. Flood recession cropping is important in the four weredas: Hamer, Salamago, Nyangatom and Dasenech, from the Omo River. Flood recession cropping starts as the topography levels out around latitude 5.15°N, some 70km north of Lake Turkana, around Karakorocho in Hamer wereda. The fringes of the ox-bow Lake Dipa (Dipa Hayk) in the Kara area of Hamer Wereda are also planted as the lake level drops. Peak flooding normally occurs between

August and September and the water recedes 2-4 weeks later to allow planting from August to October.

The Wereda officials reported that for most people, the grain produced from recession cultivation was only sufficient for 3-6 months. Thereafter, they depend on food aid from the government and NGOs. The food insecurity in the lower Omo River is associated with the natural factors and the socio-economic base of the population. Uneven distribution and erratic rainfall, floods, landslides, pest infestation, epidemic diseases of human and livestock are all considered natural factors. On the other hand small land holding (for flood recession) lack of drought oxen, less infrastructure and inadequate farm inputs are conceived under the second factor.

**Irrigated Agriculture:** Irrigation farms and schemes are found mainly in the lower reaches of the Omo River, because the banks of the river upstream are generally too high to permit efficient pumping. Most are small farms growing high value crops like vegetables and fruits, particularly bananas, using either diesel pumps or windmills to extract water from the river. Overall, the present level of irrigation development is really quite minimal and damage caused by annual flooding, low river levels in the dry season (too low for pumping), and limited market development are probably some of the reasons.

#### *Livestock and Grazing Resources*

The livestock population of the study area is estimated to be 1.2 million, poultry 71,880 and 132,500 bee colonies. Livestock provide the pastoralists of the Southern Omo Lowlands a number of benefits. The major ones that relate to their livelihood include milk, meat and live animals.

The major sources of feed for livestock in the Lower Omo area are natural pastures, aftermath grazing and crop residues. Natural pastures contributed greater proportion followed by crop residues. An important feature in all the four Weredas is that feed is also obtained because of the recession of the flood from the Omo River.

A wide range of livestock diseases affect animal in the Lower Omo. Existing veterinary services in the study area are limited and severely handicapped by lack of resources.

The Lower Omo River Basin is under-developed and remote. Access and other infrastructure (road, market, etc) are very poor. The types of livestock markets in the area are mainly bush markets, in some Weredas primary type of markets exist.

#### *National Parks and other Protected Areas*

The Omo, Mago, Mazie and Chabara Chorchora National Parks and Murele Controlled Hunting Area are found downstream of the Gibe III scheme. Of which, Omo and Mago NPs are gazetted. It is recommended to strengthen these parks as they all harbour at least some or all species of the animals and birds of the project area and these sites are eventually potential refuge for some of these animals in the project area. According to the information obtained from Park Wardens, reduction in the flood flow of the Omo downstream will have no effect on the wildanimals found in the Parks.

## *Tourism*

Tourism in the South Omo Zone is limited and based in small groups interested essentially in natural resources (parks, natural reserves, animals, the Omo River) and ethnic attractions. In particular Mago and Omo National Parks are the main tourist destinations.

According to the information obtained from both Omo and Mago National Park officials, currently there is an effort to start community tourism by using boat transport from Lake Turkana via Omo gorge to the upstream National parks (Omo and Mago National Parks). Community tourism is expected to help encourage the tourist to visit the different ethnic groups along the Omo River.

### **2.3.3 Baseline Information: Gibe III-Sodo Transmission Line**

**Natural Environment:** The observed land uses along the transmission line route include farmland, grazing land, eucalyptus plantation and settlements. It is also observed that a proportion of the land is unused, especially on the hillsides. Eucalyptus plantations are becoming common in many parts of the project area especially around the compounds.

Human intervention in the area, consisting of expansion for agriculture and grazing practices and encroachment for fuelwood and construction has significantly affected the vegetation cover in the area. Hence, it couldn't provide a good habitat to support diverse wildlife species.

The transmission corridor is neither contiguous with, nor in close proximity with any of the nationally protected areas like National Parks, Wildlife Reserves or Controlled Hunting Areas.

**Settlement pattern and housing:** Settlement along the proposed Transmission Line (TL) is predominantly rural organized into small villages. The villages are clustered on hilltops and valley slopes. The people along the TL have traditional tukuls as dwelling units and all dwelling units are one-room structures. The tukuls are built from local materials with wood plastered with mud and have thatched roofs build mostly out of grass.

**Agriculture:** The population and economy of the region traversed by the transmission line project is almost totally dependent upon agriculture and livestock. The farming system in the project area is well known for its complexity and variety of crops that are grown. High human population density, with extreme levels of land pressure and consequently small average farm size, characterized the area. The major crops cultivated in the area include, teff, wheat, barley and ginger. The major perennial crops produced in the three project affected weredas are coffee, enset, mango, avocado, gishta, koke and banana. Coffee, enset and banana are the dominant source of cash income contributors.

**Historical or archaeological significance:** Enquiries to residents along the transmission line route have indicated that there are no known sites of historical or archaeological significance in the vicinity of the selected route.

## **2.4 Project Alternatives**

### *General*

Five alternatives to the base-case described above have been considered and the implications of each are described in the sections which follow.

*Alternative I: “Do-nothing”:* With the “do-nothing” alternative, the potential social and socio-economic benefits to the nation would be foregone, and quality of life would remain at a low level for many of those who live in the country. Long-term development plans for the country would be compromised and slowed down, since a reliable power supply and the improved service associated with it are fundamental to achieving the full benefits of other development initiatives and meeting the Millennium Development Goal (MDG). Therefore, from an environmental viewpoint, the “do-nothing” alternative is not preferable to project implementation.

*Alternative II: Alternative dam types and layouts:* For the general layout of Gibe III hydropower project two main dam alternative solutions were studied: in a first phase, the BF (Bituminous Face) rockfill dam alternative was analysed as the most promising alternative, then the RCC GD (Roller Compacted Concrete Gravity Dam) alternative was developed and selected; the RCC scheme has been also analysed through three alternative layouts.

*Alternative III: Conservation and Demand Management:* Conservation and Demand Management free up existing energy to be used elsewhere, that postponing the need for new capacity. However, just to keep pace with the growing population, this electricity generating requirement will grow annually by between 200 and 300MW, so that over the next decade, the total electricity generating requirement of the ICS could be, at the very least, some 4,250MW. Although environmentally conservation and demand management are preferable options, the demand forecasts still call for a significant increase in generation capabilities to maintain economic growth and development.

*Alternative IV: Thermal Power:* The high costs of importing fossil fuels to land-locked Ethiopia preclude thermal power options that would depend on foreign fuels. Besides replacing capacity and energy, the use of hydropower also leads to a reduction of thermal plant emission (CO<sub>2</sub>), which is the most important Green House Gas contributor. Therefore, from an environmental viewpoint, the thermal alternative is not preferable to hydropower project implementation

*Alternative V: Renewable Energies (Wind and Solar):* The prospects for grid-bound solar and wind power generation are not significantly attractive in Ethiopia. The specific generation cost for these systems are not competitive for contributions to the national grid. This is not to say that solar and wind power have no future. They may well be of interest for remote small load centres.

*Analysis/Evaluation of Alternatives:* The Gibe III Hydropower project will produce electric energy without burning fossil fuels and without stack emissions and potential reduction of pollution. Therefore, this scheme is feasible, indeed exceptionally attractive from the technical, economical and environmental viewpoints. Therefore, implementation of such a worthwhile scheme, at the earliest possible date will bring net benefits to the nation in general and the local communities in particular.

## 2.5 Potential Impacts and Benefit Enhancement and Mitigation Measures

### 2.5.1 Beneficial/ Positive Impacts

Key potentially beneficial impacts associated with implementation of the Gibe III Project are all related to the post-construction phase and are as follows:

*Power Generation:* The Gibe III scheme is designed to supply 1,870 MW of electrical power and 6,500 GWh of average energy per year to Ethiopia's Interconnected system.

*Rural Electrification:* Under the Power Sector Development Programme, the government plans to increase electricity coverage from 22% in 2005 to 50% by 2010 and the number of customers from, 138,000 to 2.6 million. Establishing new connection to the grid requires that there is an adequate supply of power. The increase in generating capacity provided by Gibe III, together with ongoing rural electrification programmes will facilitate improved access to electricity for the Ethiopian population with associated downstream, benefits.

*Fishery Development:* The project will create a reservoir of 20,000 ha in area and 240 meter deep at the dam site. This is a large artificial lake that provides different environmental and ecological niches for diverse fish species, requiring habitats with varying depth from shallow littoral zone to deep demersal and pelagic areas. The reservoir fishery is much more productive than the riverine fishery (which is not utilized at the moment). This may directly occupy more than 300 families on a long term basis. Thus, it could be taken as an opportunity in terms of developing a more productive and flourishing fishery that helps to improve source of income in the area and to obtain additional benefit for the local fishermen.

*Prospects to Export Power:* The project will increase the generation capacity of the country and will make the power export programme of the country viable.

*Avoidance of CO<sub>2</sub> Emission:* Hydropower offsets thermal or other types of generation. Besides replacing capacity and energy, the use of hydropower also leads to a reduction of thermal plant emission (about 4.5 million t/y of CO<sub>2</sub> emission).

*Regulation of the River Flow for Irrigation:* According to the expectations of the weredas' officials, with the construction of the dam and creation of the reservoir the Omo River will come closer to the nearby settlements and the people will have the opportunity to use the river water for small scale irrigation development. The expansion of irrigation farms would increase crop production per unit area and contributes to higher income and increased food security to the community.

*Flood Protection:* The presence of Gibe III reservoir will provide flood protection (will reduce floods both in peak and in frequency) to downstream areas. As a result, the damage due to floods like loss of crops, dwellings and the suffering and possibly death of affected people will reduce. The measurements carried out at occurred in August 2006 indicated a peak flood flow in the range of about 3,500-4,000 m<sup>3</sup>/sec, being a quite frequent flood with a return period of less than 10 years. The 2006' floods have caused in the area hundreds people and thousand animals dead besides 15,000 displaced population, with an estimate of millions of US\$ of works needed to rehabilitate

Health, Education, Shelter, Water and Sanitation, Agriculture, Livestock, Fishing, Roads, etc facilities washed away. With this regulation, areas prone to frequent flooding can be used for agricultural purposes.

*Tourism Activities:* The reservoir offers potential for eco-tourism, environmental education, etc. for bird watching and sport fishing.

*Job opportunity during construction:* Comparison with other projects of broadly similar type and magnitude, suggests that the total workforce on construction contract comprising the overall project is likely to be more than 5,000 persons at peak time. The production of more hydropower would allow the expansion of power-requiring industries and factories in the surrounding urban areas creating more permanent job opportunities for the displaced and other people in the area.

*Gender Issues:* Women as well as men will benefit equally from the employment opportunities that will be created and from convenient and safe access road facility. Women often run shops and bars in the area and obviously during the construction period, there will likely be more women engaged in income-generating activities, running restaurants and bars, or selling local products to construction camp workers. These activities will benefit mainly women who are very often the sole supporters of their families. It is also recommended for the contractor to use his best endeavors to maximise local hire of labour and give priority to women, in so far as this is compatible with his skill requirements, and to maximise local procurement of supplies.

### ***2.5.2 Adverse Impacts and Mitigation Measures: Dam and Reservoir***

On the basis of the findings of this ESIA the key environmental impacts during the construction and operation and maintenance phases of the project have been identified. The potential negative impacts of the proposed Gibe III Hydropower Project on the physical, biological and socio-economic environment have been identified and benefit enhancement and mitigation measures that should be adopted to avoid or minimise potential adverse impacts are recommended. Of which, some involve good engineering practices while others viewed from socio-economic as well as humanitarian angle.

There are no confirmed occurrences of geothermal activity in dam area and because of its distance from the major Ethiopia seismic centres, located in the rift valley, any tectonical event will have negligible effects on the project area.

*Impacts on Protected Areas:* No adverse direct or indirect impacts are anticipated in respect of sensitive habitat, National Parks, Wildlife Reserves, or National Forest Priority Areas. The reservoir area is neither contiguous with, nor in close proximity with any of these nationally protected areas like national parks nor wildlife sanctuaries reserves and designated ecologically sensitive areas. There is also no endangerment of endemic or rare species in the impounded areas.

*Impacts on Natural Vegetation:* The loss of woodland grassland on the hillslopes of the valley and narrow riparian vegetation along the river and streams would not bring about marked differences in the carrying capacity. However, to compensate this loss an estimated 60,000 ha of land around the

reservoir will be developed as buffer area and it is expected to support the bio-diversity conservation by enhancing the biological value of the area.

*Impacts on Wildlife Resources:* The area harbours only limited number of wildlife species and does not rate well with areas in Lower Omo. Therefore, there will only be a minimum opportunity cost loss suffered by the dam construction and creation of reservoir. During survey it was observed that on average the human settlement in the area is limited to an altitude of 1,300 m a.s.l. For the wildlife there are ample sites on both side of the river (up or down stream) as the maximum water level remains at around 900 m a.s.l. Therefore, most terrestrial animals can take refuge in the area between these two altitudes (900 and 1,100 m a.s.l.).

*Impacts on Farmland and other Privately owned Assets:* The direct impact of the project in terms of loss of assets and property is summarized in Table 1 below. The project will affect a total of 355 households, about 188.94 hectares of privately owned land of which 138.7 ha is farmland, (excluding the TL) 47 residential housing units, and 71,852 perennial crops and other trees (see Table 0.1). The impacts of the Gibe III-Sodo transmission line include 192 households, 129 ha of farmland and 26,892 perennial crops and other trees.

**Table 1: Summary of Project Impact on Household Assets by Wereda and Project Component**

	Households (No)	Private Land Affected (ha)		Residential (No) Houses	Perennial Crops and Trees (No)
		Total Land	Farmland		
<b>By Wereda</b>					
Kindo Didaye	165	81.89	63.62	31	58,388
Kindo Koyisha	69	25.56	19.14	2	613
Loma	121	81.49	55.94	14	12,851
<b>Total</b>	<b>355</b>	<b>188.94</b>	<b>138.7</b>	<b>47</b>	<b>71,852</b>
<b>By Project Component</b>					
Reservoir	58	97.55	70.14	0	6,523
EEPCO Camp	47	22.95	14.38	29	51,748
Chida - Sodo Road Realignment	250	68.44	54.18	18	13,581
<b>Total</b>	<b>355</b>	<b>188.94</b>	<b>138.70</b>	<b>47</b>	<b>71,852</b>
<b>Gibe III-Sodo-Transmission Line</b>					
Kindo Koyisha	105	-	70.79	105	7,320
Sodo Zuriya	20	-	30.90	20	1,523
Damot Sore	67	-	27.52	67	18,047
<b>Total</b>	<b>192</b>	<b>-</b>	<b>129.21</b>	<b>192</b>	<b>26,892</b>

As we can see from the figures in Table 1, one of the most important points to note is that although the Gibe III project is one of the largest hydropower projects ever undertaken in the country, the impact from the reservoir in terms of population displacement is very small. This is because the impounded water will be confined within the gorge of the river far from large population settlement areas.

The census survey (for the reservoir, EEPCO camp and the realignment road) revealed that all PAPs would prefer to receive their compensation in the form of cash for loss of farm land, perennial crops and other trees and houses and other structures. Therefore, given their preferences cash compensation and employment within the project has been recommended.

Due to the acute shortage of resources especially land and the low income and poverty of the population, it is believed that the main benefits for PAPs will come from the income restoration and social development programmes. The recommended plan has two components: the income restoration and improvement component, which directly targets PAPs and a community or social development components for communities as well as PAPs to be implemented for project affected kebeles. The communities around the future reservoir area will also be affected directly as well as indirectly by the project including among others:

- increased human and livestock health hazards,
- loss of access to natural resources (firewood, grass, lumber, traditional beehives and various other forest products) due to submergence of forest and grassland resources,
- loss of hot springs and holy waters,
- loss of salty water pond and special soil bed used for cattle fattening, and
- partial flooding cultural sites

The possibilities of establishing the PAPs in individual small-scale business or in small-scale agro-industries enterprises have proved in other areas valuable alternatives to the agricultural production.

*Impacts on Tribal People:* There are no tribal people or ethnic minorities around the Gibe III dam and reservoir area whose traditional lifestyles could become compromised through the implementation of the proposed hydropower project. Therefore, no indigenous people development plan will be required.

*Impacts of Public Health:* The predicted annual drawdown levels of approximately 90 m should ensure that neither snails nor macrophytes would flourish in the new impoundments. Therefore, public health impacts from various disease vectors species are, at this point, not considered to be a major factor affecting the implementation of the project. However, to reduce the risk of contracting malaria and to contain malaria cases, it is recommended to implement measures to manage malaria and control vectors.

The other serious issue that should be given due attention is the social issue related to the influx of labour force during the construction period. Particularly the spread of sexually transmitted diseases especially HIV/AIDS could tremendously increase unless strong control measures are taken. At the construction site, a quality health services will be provided to the construction employee's by establishing appropriate health facility. Awareness campaign on sexually transmitted diseases (STD/HIV/AIDS) and their prevention methods will be organized for the construction workers and local communities.

*Impacts on Social Service Facilities and Infrastructure:* The long stretch of Gibe III reservoir formation on the Gibe, Gojeb and Omo Rivers, will impact upon some social service facilities and infrastructures. These include submergence of Chida-Soda road section and the Bridge on the Omo River and several river crossings. It is planned to realign the road section downstream of the proposed dam site. It is also recommended to establish a boat service at the affected nine locations to provide service to transport people and their goods and livestock.

*Impacts on Historic Sites:* The historical sites known as King Ijajo Kella Walls will be partially affected by the reservoir. The sections that will be flooded are less than 2% of the total lengths and those sections are not unique in type and location and therefore, this impact is considered to be minor. As a compensation measures, EEPCO has financially assisted ARCCH to properly study, document and register these sites as parts of Ethiopian heritage and to promote and publicize this historic sites for both local and international tourists. The result of this study will also assist to prepare a management plan to protect, conserve and manage the remaining sites (more than 98% of the existing walls) from manmade and natural hazards. The project will also finance for the construction of access road to the nearest representative sites and with associated tourist services.

Although the UNESCO World Heritage Site is located in the Lower Omo Valley downstream of the Gibe III dam and reservoir site, it will not be affected by the construction and operation of the Gibe III scheme.

### *2.5.3 Impacts on Downstream Environment Lower Omo and Mitigation Measures*

*Impacts on Recession Agriculture and Grazing Resources:* Under present ‘average’ flood condition, river banks are submerged annually along the lower Omo River and around the river mouth. The annual flooding of the land bordering the Omo River soaks the land for traditional recession cultivation and dry season grazing, replenishes lakes and swamps on the floodplain and favours fish breeding.

The downstream environmental assessment indicates that to satisfy the demand for traditional recession agriculture, dry season grazing and fishery resources, seasonally more water will be released and flooding will be created on the land bordering the Omo River. These controlled floods will allow maintaining the required environmental flows also during the drought years. The regulating capacity of the reservoir will also allow controlling the natural floods peak discharges with short durations (e.g. the 2006 floodings).

*Controlled Environmental Floods:* The reservoir operation will regulate the flows in the Omo River downstream of the plant. In broad terms there will be an increase in the flows during the dry season and a reduction of the flows during the rainy season, when the water is retained to fill the reservoir, with a substantial decrease of peak flood flows. Further downstream, as unregulated flow enter the river system from tributaries, the effect of the regulation decreases.

The Gibe III hydropower plant is designed to allow the optimization of the reservoir operation and energy production during the operational life basing on the requirements both of the energy market and of the downstream environment.

The current assessment envisages controlled environmental floods within the following ranges of characteristics:

- Period : August / September
- Flows : about 1600 m<sup>3</sup>/sec at lake Turkana (1000 - 1300 m<sup>3</sup>/sec released from Gibe III)
- Duration : 10 days (with Q = 1600 m<sup>3</sup>/sec at Turkana)

The design flows will compare approximately with the monthly average inflows at Gibe III site (38 years sequence) of September ( $Q=1,057 \text{ m}^3/\text{sec}$ ) and August ( $Q=1,520 \text{ m}^3/\text{sec}$ ). This discharged volume will allow recreating a flood reasonably similar to a natural yearly “average” flood at Lower Omo with duration of about 1 week. The wide outlet structures (two middle outlets each  $Q_{\max}=725 \text{ m}^3/\text{sec}$ , spillway with nine bays each  $Q_{\max}=2065 \text{ m}^3/\text{sec}$ , ecological outlet  $Q_{\max}=24 \text{ m}^3/\text{sec}$ ) together with the large reservoir volumes ( $11,750 \text{ Mm}^3$  live storage) and the installed capacity allow a particularly relevant flexibility of the plant operation.

*Daily Flow Variation Acoustic Warning System:*

The first section of the river downstream Gibe III dam will experience consistent fluctuation of water levels within the riverbed in the course of normal (24 hrs) hydroelectric operations. Although, due to local geomorphology, no permanent human settlement/activities are located in areas interested by the fluctuating water levels, this does not mean that humans, especially in the proximity of villages, may not approach the river for different usages or for crossing it.

To this aim, a long-term warning system constituted by sirens will be placed and operated in river sections located in the immediate proximity of nearest villages and around major river crossing to signal in advance occurrence of rising waters in a number of priority spots (provisionally estimated in 50-100 locations) along the Omo river first 200 km downstream Gibe III Dam.

The sirens will advice differently for Large Water Releases (Controlled Floodings) and Ordinary Discharges occurring daily as a result of Dam operations by mean of distinct warning signals to the understanding of which the residing population will be trained beforehand.

The Warning Units will be remotely triggered by the Dam Control Station, on a pre-organised time sequence according to the river water speed, possibly coupled with water level gauges systems reacting to rising water levels placed in the immediate proximity of warning units. Sonic Devices and water level gauges with ultrasonic sensors will be operated by solar panels.

*Riparian Release/Environmental Flow:* Although there is no regulation in Ethiopia defining required minimum flow in the rivers, a minimum flow would have to be maintained naturally to meet the ecological requirements of the Omo downstream.

From the ecological point of view, the minimum flow in the normal dry season is the most relevant having little contribution from the tributaries downstream. The recorded natural minimum mean monthly flows is in the month of March (about  $25 \text{ m}^3/\text{s}$ ) and as a priority this value has been recommended as absolute minimum monthly average compensation flow which must be sustained the under whole operation of the scheme. This flow preserves the natural regime during the dry season. However, with plant operation because the flow will be regulated there will be the added environmental benefit of reducing the incidence of extreme low monthly average flows which have been experienced in the past. During reservoir filling, it is also recommended to release a compensation flow of about  $25 \text{ m}^3/\text{s}$ .

*Impacts on Fishery Resources:* Concerning impacts on aquatic environment, the creation of additional water bodies would have a positive effect by significantly increasing a fishery potential in the area.

A number of commercially important species are known to migrate from Lake Turkana into the Omo River for spawning. However, none of these migrants reach the middle or upper reaches of the system. Therefore, construction of the proposed Gibe III dam will not affect the populations of migrant fishes because their spawning sites are far downstream of the dam site. Endemic fish species of the lake will not be adversely affected by the project as their spawning and feeding grounds are located in connection to the Turkana lakeshore and the river delta areas. There are no fish species listed as threatened or endangered in any of the study reports of the River Omo basin fish fauna study that could be affected by the dam. However, the reduction in flood pulse may impact the spawning activities in the lower Omo. Therefore, it is planned to seasonally release more water to create flooding on the land bordering the Omo River. However, detailed monitoring is envisaged to determine the discharge mechanism and operational program (timing and volume of water discharge) and to ascertain how essential these floods are for the breeding success of fish species with commercial importance.

#### *2.5.4 Adverse Impacts and Mitigation Measures: Gibe III-Sodo Transmission Line*

The principal potential adverse impacts associated with implementation of the proposed project mostly relate to the land take requirement to accommodate the transmission line and the associate facilities. Many of the other potential impacts will be short-term and reversible in nature and stem from ground disturbance, operation of equipment's and housing of the labour force, but very few that will lead to permanent change. However, no adverse direct or indirect impacts are anticipated in respect to protected areas (i.e. national parks, controlled hunting areas, protected forest areas, etc.), sensitive habitat, wildlife or cultural heritage sites and no new access will be created to previously undeveloped areas.

Realization of the proposed Gibe III-Sodo Transmission Line will have a varying degree of direct impact on productive farmlands belonging to the community in the affected weredas throughout the route line. Therefore, the transmission line project will affect a total of 192 households, about 129 hectares of privately owned farmland, 192 residential housing units, and 26,892 perennial crops and other trees.

Therefore, it is recommended to payment full and fair cash compensation, which leaves those, affected by relocation at least no worse off than they were previously.

#### *2.5.5 Adverse Impacts and Mitigation Measures: Chida-Sodo Road Realignment*

The principal potentially adverse impact is the land and property expropriation associated with this realignment. Many of the other potential impacts will be short-term and reversible in nature and stem from ground disturbance, operation of equipment's and housing of the labour force, but very few that will lead to permanent change. However, no adverse direct or indirect impacts are anticipated in respect to protect areas (i.e. national parks, controlled hunting areas, protected forest areas, etc.), sensitive habitat, wildlife or cultural heritage sites and no new access will be created to previously undeveloped areas.

In relation to engineering design, due consideration has been given during the detailed design stage to reduce the need for land and property expropriation without significantly compromising the functionality of the road. However, even with these considerations, although this impact has substantially reduced, the issue of land and property expropriation will still have to be addressed.

Based on the assessment result, the Chida-Sodo road realignment project will affect a total of 250 households, about 54.18 ha of farmland, 18 residential housing units, and 13,581 perennial crops and other trees. Most houses, however, are small and of simple construction, comprising wooden frameworks with mud plaster. Therefore, it is recommended to pay full and fair cash compensation, which leaves those, affected by realignment at least no worse off than they were previously.

### ***2.5.6 Cumulative Impact Assessment***

The Gibe III hydropower project will be the third development of hydropower schemes (Gibe I, in operation and Gibe II under completion) on the main Gibe/Omo river. One other hydropower scheme-known as – Gibe IV is foreseen downstream on the Omo River. As part of this ESIA, a cumulative impact assessment was undertaken to analyse the combined impacts of these four projects. Their cumulative effects on the natural and social environment appear to be negligible due to their geographic location.

## **2.6 Environmental Management and Monitoring Program**

### ***2.6.1 Environmental Management***

The Environmental management plan describes the range of environmental issues associated with the project and outlines corresponding management strategies that will be employed to mitigate potential adverse environmental effects.

Most of the project environmental management activities will be carried out during the construction phase, since this is when most impacts can be expected to arise. These impacts are principally associated with the construction of the Gibe III Dam, the tunnels, the power station, work camps, access road and the quarries development and spoil disposal areas, and the presence of large labour force. There are also impacts linked to the initial filling of the reservoir and subsequent operation of the plant.

The environmental management plan is comprised of a series of management plans. Each plan is under separate section by environmental components. Each management plan contains specific environmental mitigation and enhancement measures.

The plan identifies and recommends protection and mitigation measures addressing environmental impacts created by the construction activities. The recommended plans are listed below:

- Forest/natural vegetation management plan
- Wildlife Resources management and protection plan
- Cultural and Historical resources management plan
- Erosion and sediment control plan
- Spoil disposal and waste management plan

- Spill contingency and response plan
- Quarries development and restoration plan
- Water pollution control
- Air Quality
- Noise and vibration
- On-site traffic management plan
- Explosive storage and handling
- Construction camps and site installations

In general terms, the EPC contractor is responsible for implementing the majority of the day-to-day, construction related environmental mitigation measures specified in this report and measures specified in the contract. EEPCO will be fully responsible for implementing the mitigation measures related to downstream impacts, resettlement action plan and buffer area development plan. Upon completion of construction, EEPCO will also be responsible for implementing environmental management measures associated with operation of the plant and the Gibe III reservoir.

### *2.6.2 Environmental Monitoring*

Environmental monitoring program has been recommended and will be performed during all stages of the project (construction, commissioning and operation) to ensure that impacts are no greater than predicted, and to verify the predictions. For this project, it is recommended to carryout both compliance and effects monitoring. The monitoring has to indicate where changes to construction procedures or operations are required, in order to reduce impacts on the environment or local population.

The principal fields of interest requiring monitoring include the following and will be the responsibility of EEPCO/EMU.

- Reservoir inflow and outflow,
- Reservoir sedimentation,
- Air quality and noise,
- Waste management
- Water quality in the reservoir and downstream of the Power House,
- Aquatic Ecology and Fish stock
- Breeding area survey and prevalence of vectors in the reservoir,
- Periodic inspection of the reservoir area for water weed proliferation,
- Wildlife resources and their habitat
- Public Health and safety
- Resettlement compensation and livelihood improvement,
- Implementation of watershed management program and buffer area development,
- Cultural and historical assets, and
- Construction site restoration.

### **2.6.3 Monitoring Framework**

Effective monitoring of all stages of the project could be managed through an Environmental Management Team. The principal aim of the environmental management team would be advising the project authorities and local administration about the best practicable means for protecting the environment during all stages of the project's life span. It would provide the project developers and station operation manager with concrete proposals for monitoring the environment, and indicate operational procedures for protecting the environment.

The primary responsibility of this monitoring plan is of EEPKO who is the project Developer. The Gibe III Environmental monitoring plan will be administered by the Environmental Monitoring Unit (EMU) to be established within EEPKO's project coordination office. EMU will begin the implementation of the programme by forming a team of specialists to assist in monitoring the environmental effects during construction period. Furthermore, independent external environmental monitoring may also be considered by EPA for the activities that are not under the responsibility of the owner's engineer.

In addition, there are other agencies that have the responsibility and authority to monitor some of the measures. It is also recommended that EEPKO involves other Agencies (including EPA) and subcontractors as required to form the environmental management team.

During the construction phase, the EPC contractor will designate an Environmental Inspector who will be responsible for environmental monitoring issues regarding the Gibe III project.

It is recommended to carryout a regular audit of environmental and social performance by an independent body.

## **2.7 Public Consultations and Disclosure Plan**

As a continuous activity, the Gibe III hydropower project has initiated public consultations and disclosure from the outset and the project is committed to continue the process throughout the project life. A Public Consultation was initiated in 2006, 2007 and 2008 during the initial phase of the Gibe III- Hydroelectric project. As part of this continuous process, a series of public consultations were carried out with Federal, Regional, Zonal, Wereda and local officials and institutions, PAPs, community elders and NGOs, level. Consultations were carefully planned and conducted to ensure efficiency and effectiveness in covering key issues both from the PAPs and communities on the one hand, and the project interests on the other.

A combination of various consultation methods were used to assess knowledge, perception and attitude of the communities about the proposed project and its potential impacts. The methods used include interview with key informants/people, small group discussion and public/community meetings.

The overall number of the consultative participants drawn from administrative and community level amounts to more than 1,749, consisting of 203 Zonal and Wereda officials, 409 kebele peasant associations council members, 869 community members were consulted through community discussions and 268 individual household heads were consulted privately.

Discussion and interviews conducted with local community and their leaders indicated that their attitude towards the proposed project is positive. They believe such project contributes to the attainment of local, regional and national development goals.

However, they also expressed their fears and concerns and these are briefly presented below:

#### *Major Findings of Consultation for the Dam and Reservoir Area*

- Loss of common grazing land along the banks of the River;
- Loss of incense trees, gum and other important trees found along the banks of the River;
- Loss of natural forest products such as mitimita, berbere, zinjible, Korerima, etc;
- Loss of forest honey production as the result of flooding;
- Loss of holly/hot springs along Omo River which are used by the local community and their cattle;
- Loss of crossing paths on the Omo River and disruptions to the social and economic relations among different communities living on both sides of the Omo river;
- Flooding of some parts of King Halala Wall and King Ijajo Walls;
- Spread of malaria to the nearby residents due to the creation of large water body;
- Spread of HIV/AIDS to the local people;
- Flooding of wildlife habituate may cause wildlife attack on humans and their cattles;
- Extra travelling time and cost as the result of shifting the existing Chida-Sodo road bridge to as far as down strema.

#### *Finding of Consultation on Cultural Resources*

- They expressed concern about the potential damage the flooding will cause to the Heritage sites of King Halala Wall and King Ijajo Walls. Requested for the establishment of these sites as heritage site.
- The local leaders requested ARCCH together with Information and Culture Bureau of SNNPR to carry out research on these walls.
- Full and urgent documentation works should be carried out on the sections to be flooded.
- As compensation to this loss they proposed EEPKO to implement a social development plan.

#### *Major Findings of Consultation with Agro-pastoralist Community*

- The livelihood of the people is based on agro-pastoralist farming system dominantly livestock rearing.
- They move to different places along the Gibe, Gojeb and Omo River banks in search of grazing land. However, they are constantly in conflict over resources use with the indigenous people from these areas. They often attack, rob of their property and set on fire their temporary dwellings.
- The community views the potential flooding of their crossings and the possibility of losing their traditional grazing resources on the other side of the rivers as greatly affecting their major sources of pasture land for their livestock.

- They expressed the presence of strong trade, cultural, blood and marriage ties between communities on both sides of the river. The people of Hadiya zone particularly Soro Gibe and Gembor Wereda make a weekly market with the community of Dawro and Jimma zones and Konta and Yem Special Weredas.
- As a mitigation measures, the agro-pastoralist community proposed to improve livestock keeping and range amelioration forage area development and construction of a bridge across the Gibe River.

#### *Major Findings of Consultation at Lower Omo*

- The Community stressed the importance of the Omo River for agricultural, livestock and fishery activities both for home consumption as well as for commercial and economic aspects.
- In the absence of the Omo flood, there will be a substantial decline in the production of crop from recession agriculture, dry season grazing resources and fishing.
- They proposed as mitigation measures to release artificial floodings to guarantee overflowing of the river and thus continuation of recession agriculture and presence of riverine green grazing lands.
- Public Disclosure

It should be emphasized from the outset that the Gibe III hydropower project involves a multitude of stakeholders ranging from PAPs to the project developer, Federal and regional governments through to financiers, NGOs, and environmentalists, etc. It is the responsibility of the project to provide all stakeholders at all levels to provide them with accurate and up-to-date information about its plans and operations.

Based on the nature and scale of the project, the following methods will be adopted as a public disclosure exercise:

- *National Consultative Workshop:* The project will organize a national consultative workshop to bring all key players together to express their views and concerns on the project and its impact and discuss the contents of the ESIA and contribute to its finalization.
- *Permanent Project Web Site:* The project will design, host and maintain a project web site throughout the life of the project. This electronic medium will serve as a permanent promotion, information and public relations forum for the project making it easier to reach out both national and international stakeholders and address their concerns in addition to equipping them with accurate and up-to-date information about the project its program.

## **2.8 Environmental Mitigation, Management, Monitoring and Training Costs**

Costs for implementing the environmental Mitigation, environmental management and monitoring programmes and training and capacity development have been estimated and summarised in Table 02 and it amounts to some ETB 445.2 million or about 40.5 million USD. This estimate also includes the costs for Resettlement Action Plan and downstream mitigations measures.

Costs of certain items associated with environmental management and monitoring is an integral part of specific items incorporated in overall project construction budgets, and no separate budget is necessary to cover these aspects. Marginal costs of the contractor incurred in complying with environmental protection clauses in the construction contract are incorporated in unit rates and bill items and are included in construction costs. It should be noted that no significant increase in construction costs is expected in connection with requiring compliance with environmental protection clauses, since these merely require the EPC contractor and his sub-contractors to behave in a responsible manner in relation to the environmental, in accordance with good construction practice.

The cost of the environmental mitigation plan is considered as a component of the financial requirements of the project. Marginal benefits from the exploitation of the hydropower development should be set aside for financing the long term financial needs of the social and environmental needs of the area such as resettlement, agricultural extension, watershed management, development and management of buffer zones.

**Table 2: Summary of estimated environmental mitigation, monitoring and training costs**

No.	Item	Estimated Cost (Birr)
1	Environmental mitigation and management cost: Dam and Reservoir	21,500,000
2	Environmental mitigation and management cost: Downstream	245,050,000
3	Resettlement action plan	102,195,000
4	Environmental monitoring	6,550,000
5	Capacity building and procurement	5,200,000
6	Training and study tour	5,100,000
7	Environmental audit (annual audit by an independent entity for 5 years)	1,500,000
	<b>Total</b>	387,095,000
8	Administration cost (5%)	19,354,750
9	Contingency (10%)	38,709,500
	<b>Grand Total</b>	445,159,250

## 2.9 Contacts

For comments or further information, please contact:

Azeb Asnake                      Gibe III Hydroelectric Project, P.O.Box 1233 Addis Ababa,  
Ethiopia  
Phone: +251 11 5546830 / Fax: 251 11 5546844  
email [gibe3hpp\\_aa@yahoo.com](mailto:gibe3hpp_aa@yahoo.com)

Giuseppe                      Paolo CESI spa, Via Rubattino, 54 20134 Milano  
Stigliano  
Phone: +39.02.2125.4621 / Fax: +39.02.2125.4678  
email [giuseppe.stigliano@cesi.it](mailto:giuseppe.stigliano@cesi.it)

Dejène Woldemarian                      MDI Consulting Engineers, P. O. Box 1453 Addis Ababa,  
Ethiopia  
Phone: +251 11 6639616 / Fax: 251 11 6637778  
email [dejnewm@ethionet.et](mailto:dejnewm@ethionet.et)

**Full documents can be found on the following weblink:**

**<http://www.eepco.gov.et/>**

# GIBE III HYDROELECTRIC PROJECT

## ESIA SUMMARY ANNEX

### RESETTLEMENT ACTION PLAN

#### Table of Contents

<b>0</b>	<b>EXECUTIVE SUMMARY.....</b>	<b>1</b>
0.1	Introduction.....	1
0.2	Project Location and Description.....	1
0.3	Review of Policies, Legal and Institutional Frameworks.....	5
0.4	Methodology.....	5
0.5	Description of the Project Area.....	6
0.6	Census and Socioeconomic Surveys.....	6
0.7	Impacts of the Project.....	8
0.8	Public Consultations and Disclosure.....	9
0.9	Income and Livelihood Restoration Strategies.....	10
0.10	Institutional Arrangements for the Implementation of RAP.....	10
0.11	Grievance Redress Mechanism.....	11
0.12	Monitoring, Reviews and Evaluation.....	12
0.13	Implementation Budget.....	12

#### List of Tables

Table 0.1:	Summary of Project Impact on Household Assets by Wereda and Project Component.....	8
Table 0.2:	Estimated Budget for the Resettlement Action Plan.....	12

#### List of Figure

Figure 0.1:	Location Map of the Project Area.....	2
Figure 0.2:	Administration Map around the Reservoir and Road .....	3
Figure 0.3:	Administration Map around the Chida-Sodo Road Realignment .....	4

## 0 EXECUTIVE SUMMARY

---

### 0.1 Introduction

The Gibe cascade project is one of the most attractive potential hydroelectric developments in the country. The Gibe III Hydroelectric Project will be the third development in a cascade of water resource schemes on the main Gibe/Omo River. The Gibe III scheme exploits a renewable and indigenous energy source and it will not deplete Ethiopia's reserves of natural resources, it will not produce harmful gases and it will not increase the nation's dependence on imported fossil fuels. When implemented it is expected to create significant economic and social benefits, and will contribute to the attainment of the country's priority goals and ongoing national efforts to accelerate economic growth and alleviate poverty.

However, unless mitigated, it can also create various potentially adverse environmental and socio-economic effects in the form of displacement, disruptions of livelihoods, and loss of assets and property of project affected persons (PAPs). Resettlement Action Plan (RAP) is one of the major means of addressing these problems in a planned and coordinated manner.

Accordingly, EEPSCO, the implementing agency of the Gibe III project, contracted the services of the consultancy firm, MDI Consulting Engineers, to prepare a full RAP for the Gibe III project. This document contains the detailed plans and strategies for the RAP of the Gibe III project.

### 0.2 Project Location and Description

#### *Project Location*

The Gibe III hydroelectric is located within the Omo Gibe River Basin in the middle reach of the Omo River around 450km by road South of Addis Ababa. The approximate geographic coordinates of the location of the dam axis is between 312,044E and 757,343N and 312,542E and 757,107N. Figure 1 shows the location of the project Area.

Administratively, the reservoir stretches over five zones, eleven Weredas and 67 kebeles (see Figure 0.2). However, all the works concerning the construction of the Gibe III scheme dam, tunnel, power house, switchyard, construction camps and access road are concentrated in a small area under the jurisdiction of the Loma Wereda of the Dawro Zone and Kindo Didaye and Kindo Koysha Weredas of Wolayta zone of the Southern Nations and Nationalities People Regional State (SNNPRS) (See Figure 0.3).

#### *Project Description*

The Gibe III Hydroelectric Project comprises a 230m high dam and will create a huge reservoir with a surface area of some 200km<sup>2</sup> and a total storage of some 11,750 million m<sup>3</sup>. The reservoir is approximately 155 km in total length.

The direct benefits of the project will be 1,870 MW of electrical power and 6,400 GWh of energy per year. The power produced by the plant will be delivered to the Inter Connected System (ICS) through a four double circuit 400 kV overhead transmission line. The so-called specific unit cost of

the Gibe III scheme, based on the generation component (excluding the transmission component), is some 2.86 Euro cents per kWh indicative of a very attractive Hydroelectric generation scheme.

Direct access roads to the dam and powerhouse site did not actually exist, consequently two new roads were required, a 24.5 km road on the right bank (road R-1) and a 40 km road on the left bank (road L-1). A bridge across the Omo river slightly d/s of the dam has also been foreseen. Site access roads will be required to provide all weather access to channel all the traffic generated by the construction. In addition to providing access to the construction activities, the road will greatly benefit the local community by making the transport of people and produce safer, easier and quicker.

**Figure 0.1: Location Map of the Project Area**

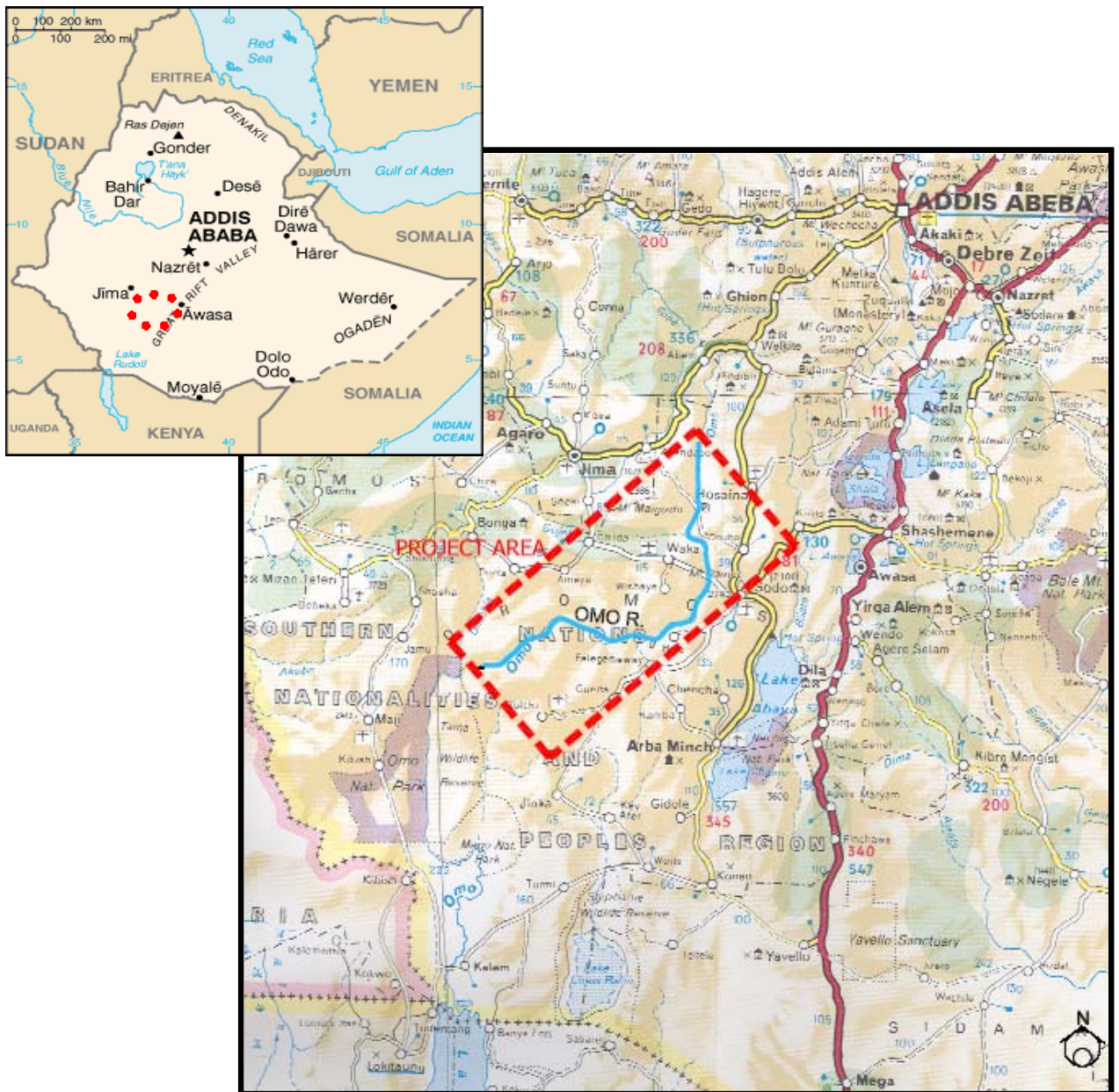
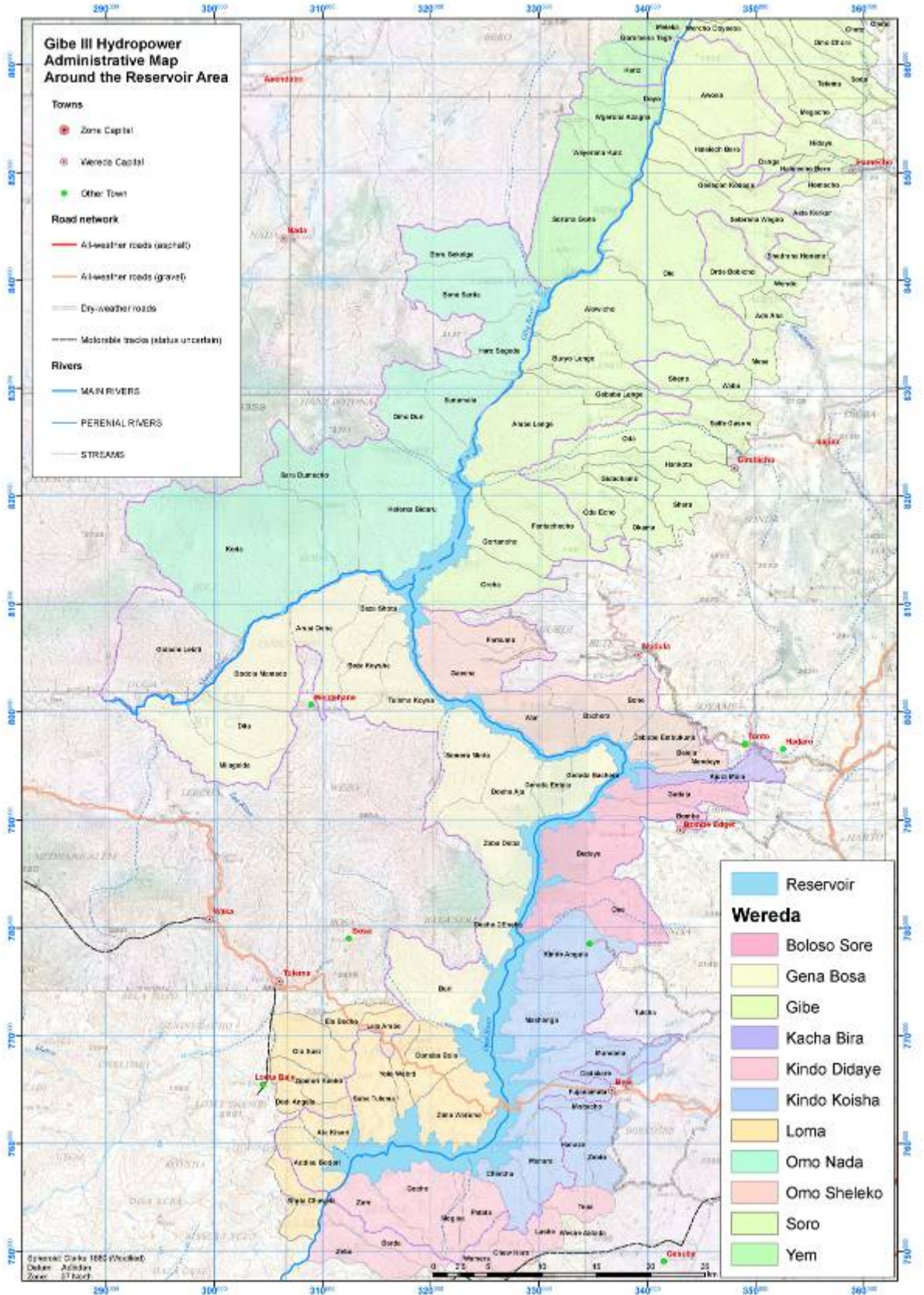
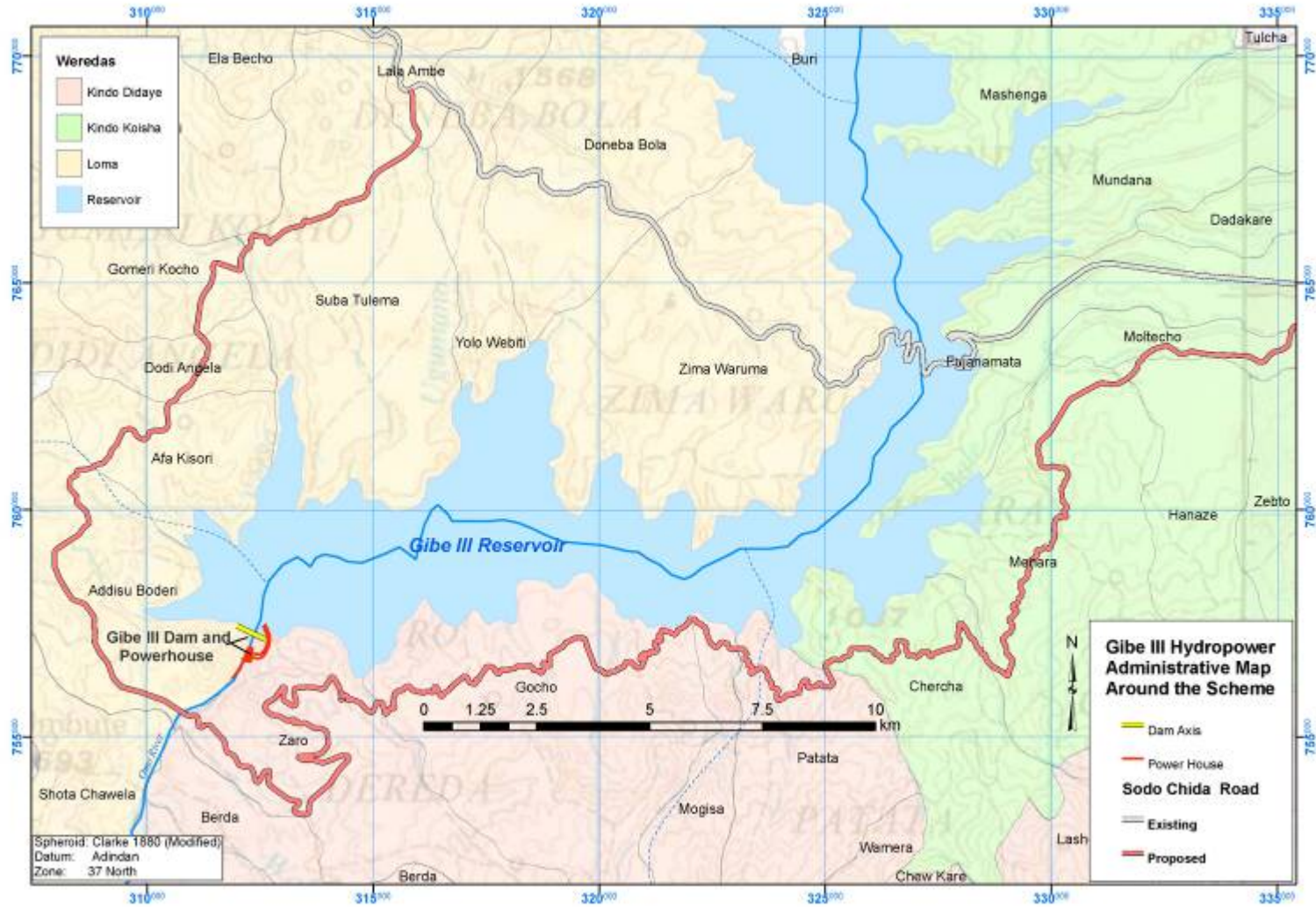


Figure 0.2: Administration Map around the Reservoir and Road



**Figure 0.3: Administration Map around the Chida-Sodo Road Realignment**



### 0.3 Review of Policies, Legal and Institutional Frameworks

In Ethiopia, there are several policy and legal documents that deal with land ownership, expropriation, entitlement, compensation and resettlement issues. Some of the key documents dealing with issues related to resettlement planning and operations include: *The Constitution of the Federal Democratic Republic of Ethiopia (FDRE)*, *The Civil Code of Ethiopia*, *Environmental Policy of Ethiopia*, *A Plan for Accelerated and Sustained Development to Eradicate Poverty (PASDEP)*, *Proclamation No. 455/2005 on Expropriation of Landholdings for Public Purposes and Payments of Compensation*, *Proclamation No. 456/2005 on Rural Land Administration and Land Use*, and *Regulation No. 135/2007 Council of Ministers Regulations on the Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes*. All relevant policies, laws and administrative and institutional frameworks were reviewed to explore their adequacy in covering involuntary resettlement issues and to examine their consistency among themselves as well as international conventions, principles and frameworks which Ethiopia is a party to.

Review of relevant policy and legal frameworks revealed a number of points pertinent to involuntary resettlement. First and foremost, the Constitution of various legislation that emanated from the Constitution bestow Regional States power to plan, direct and develop social and economic programmes, as well as to administer, develop and protect land and natural resources in their respective regions. Hence, Regional States and local level governments particularly Weredas are indispensably important on matters related to, among others, land administration, expropriation, property valuation and compensation, and provision of rehabilitation support to PAPs.

Secondly, policy, legal and institutional frameworks that deal with issues of involuntary resettlement are all in place. Existing legislations and institutional frameworks are not only comprehensive in terms of covering resettlement issues, but they are also very detailed providing justification and procedures for expropriation, property valuation, computing compensation rates, compensation payments, and mechanism for grievance redress.

Third, various policies, both national and sectoral, are such that they encourage project sponsors to avoid, as much as possible, projects that cause displacement of people. When displacement of people becomes unavoidable, then the policy principles, institutions and structures of the Government of Ethiopia (GoE) provide for the adoption of a wider developmental approach which seeks to share the benefits of the development project with Project Affected Persons (PAPs) and local communities. The principle here is that development projects at least should not impoverish people by degrading the physical environment and or letting their costs pass through to PAPs and members of local communities.

Fourth, national policies, legislations and regulations are all in conformity with one another. The national policy and legal frameworks are also consistent with the World Bank's Operational Policies (OP 4.12) and Bank Procedures (BP 4.12) on involuntary resettlement. Moreover, the national frameworks are also consistent with international conventions, treaties, and frameworks which Ethiopia is a party to.

### 0.4 Methodology

A mix of various methods, tools and techniques were adopted to collect data and information required to prepare this Resettlement Action Plan (RAP). Both quantitative and qualitative data were gathered employing various methods and instruments.

- i. **Sensitization and Familiarization Stage:** A team of experts visited the project area to initially sensitize the project among PAPs and local government officials.
- ii. **Identification and Project Impact Boundary Delineation Stage:** A survey was conducted using Geographic Positioning System (GPS) to demarcate the actual boundaries of project impacts on the ground.
- iii. **Socio-economic Surveys and Property Registration Stage:** At this stage a three-member ad-hoc Committee was formed at each affected Kebele and a complete census enumeration of all PAPs was carried out side by side with registration of affected property including land, housing and structures, crops and trees situated on land that will be affected by the project.
- iv. **Community Level Surveys:** A quantitative survey was conducted at a village level using structured questionnaire and it was designed to generate data and information, among other things, on availability or lack of social service facilities, existing levels of access to education, health, potable water and related services, local market prices as well as agricultural production and productivity, all of which were useful in valuation of assets and computation of compensation rates.
- v. **Qualitative Methods:** A series of consultations were held using both formal and informal meetings with carefully selected members of the communities and all PAPs.

## 0.5 Description of the Project Area

### *Population and settlement*

Of the total population of the weredas in the project area (2,057,069), the number and proportion of the population in the affected 67 kebeles is 253,412. Of which 49.4 % were males and 50.6% of were females. This population represent 10.8% of the Wereda population. The average household size for all affected Kebeles is about 5.4 and it ranges from 3.9 to 7.3 and this is slightly higher than the national average which is 5.0. Within the project affected Kebeles, the average population density is 127.8 persons/km<sup>2</sup> and this figure ranges from 9.43 persons/km<sup>2</sup> in Mashinga PA to 696.3 persons/km<sup>2</sup> in Belela Kebele.

The project area is characterized by a great deal of ethnic and religious diversity. More than 13 different ethnic groups live in the 11 project affected weredas (see Table 4.4). The major ethnic groups in the project Weredas are: Wolayta (23.0%), Dawro (6.9%), Kembata (6.7%), Tembaro (5.0%), Oromo (20.4%) and Hadiya (25.3%) and less than one percent of Amhara, Keffa and Sodo Gurage, Silte and Sebat-Bet Gurage.

Major religions practiced in the project Weredas are Christianity (67.7%) and Islam (24.6%). Traditional religions are practiced by about 5.3% of the population

### *Economic Conditions and Livelihood Activities*

Although small-holder farming is indisputably the primary occupation and source of income and subsistence for the majority of the population in the project area, non-farm livelihood and income generating activities play a role in the local economy and in the livelihoods of households in the project area including: small-scale trade, artisan and handcraft, the collection and sale of firewood, charcoal and grass, daily wage labor, etc. Generally, it is well-known that incomes are very low and poverty is widespread and deep in many parts of the project area, due to a combination of factors and causes such as: low and dwindling resource base (land, oxen, etc); backward technology, low productivity and the subsistence nature of production; limited access to public services and infrastructure; and exposure to shocks and vulnerability (draught, human and livestock disease).

## 0.6 Census and Socioeconomic Surveys

A census enumeration and socio-economic survey were conducted in the project affected communities. The following are among the major objectives of the surveys:

- To understand the scale and nature of project impacts on local communities,
- To identify PAPs and map out their social and economic characteristics,
- To establish institutional arrangements for the implementation of the Resettlement Action Plan (RAP) activities,
- To obtain information needed for entitlement and compensation payments for lost assets, and;
- To generate baseline data for monitoring and evaluation of livelihoods and income restoration and other sustainable development components of the RAP.

The Gibe III Hydroelectric project will adversely affect some 355 households and social service, religious institutions and an Investor in three Weredas namely, Kindo Koysha and Kindo Didaye of Wolayta Zone and Loma Wereda of the Dawro Zone. There are a total of 2,627 persons permanently residing in the 355 households directly affected by the project. Geographically, 46.5% of the affected households are in Kindo Didaye Wereda. Those from Kindo Koysha and Loma Weredas are 19.4% and 34.1% respectively. The overall average family size for the project affected households is 7.4 persons per household. The average family size is considerably higher (8 persons per household) in Loma and Kindo Koysha Wereda than Kindo Didaye (6.8) Wereda.

Nearly 42.5 % of the heads of households have no formal education. As far as marital status of the heads of households is concerned, the majority of 93.5 % are married while the remaining 6.5 % are either singles or widowers. Some 8 heads of households are reported to suffer from some kind of physical or mental disabilities. Although it might have to be verified on the ground during actual implementation of the RAP activities, a total of 37 heads of households are identified as potentially vulnerable, and hence, may require special assistance during and or after relocation. Heads of households identified as potentially vulnerable include female heads of households, the elderly, persons with disabilities and those who are said to be the poorest of the poor.

Owing primarily to very high population densities, sizes of landholding is very small in the project area in general and among project affected households in particular. Average landholding sizes vary widely between the smallest (1.1ha) in Kindo Koysha and 3.2 ha per household in Loma. Landholding sizes are considerably and consistently lower among female and child heads of households.

Apparently, the role of livestock in the project area is much greater than elsewhere in the country for it is inextricably linked with the complex farming system of the area. For example, manure is a key component in the highly intensive, and intercropped home-garden-like farming system of Wolayta. Despite the intractable linkages between livestock and local farming systems in Wolayta, however, the number of livestock owned is relatively small. The size of livestock is kept optimally, because livestock also compete for scarce resources such as land and biomass for feed both of which are not only in short supply but are also badly needed elsewhere.

Livelihood diversification is very common in the project area as it is among project affected households. Keeping agriculture (crop and livestock) as a base livelihood activity, both heads of the households and other household members engage in wide ranging non farm economic activities to provide for their families. Small

scale trade, artisan, handicrafts, and casual labour are amongst the most widely practiced non-farm livelihood activities in the households.

The overall average annual cash income for project affected households is estimated to be ETB 3,848 per household. But, the average varies significantly from the lowest ETB 2,862 in Kindo Koysa Wereda to the highest ETB 4892 in Kindo Didaye Wereda. Annual average cash income for Loma Wereda is estimated to be ETB 3,144 per household. In terms of cash income, crop production which includes, coffee, cereals, tubers, fruits and vegetables is the major economic activity contributing over 52% of total annual cash income for the households. The second most important economic activity is non farm activities (including off-farm) that contributed about 34% of total annual cash income of the households. Livestock and dairy production together contributed about 14% to annual cash income of the households. Perhaps due to chronically food-insecure nature of households in the project area, cash transfers through Food for Work (FFW) are one of the major sources of cash income among the project affected households.

Purchase of food supplies, which accounts for nearly two-thirds of the total annual expenditure, is the most important category of expenditure among the households. Investments and financial transfers accounted for 27% of the total annual expenditure among the survey households. With a contribution of about 9% of the total, expenditures related to social and religious obligations are also significant among the households.

## 0.7 Impact of the Project

The direct impact of the project on PAPs in terms of loss of assets and property is summarized in Table 01 below. The project will affect a total of 355 households, about 188.94 hectares of land of which 138.7 is farmland, 47 residential housing units, and 71852 perennial crops and other trees (see Table 01).

**Table 0.1: Summary of Project Impact on Household Assets by Wereda and Project Component**

	Households (No)	Land Affected (ha)		Residential Houses (No)	Perennial Crops and Trees (No)
		Total Land	Farmland		
<b>By Wereda</b>					
Kindo Didaye	165	81.89	63.62	31	58388
Kindo Koysa	69	25.56	19.14	2	613
Loma	121	81.49	55.94	14	12851
<b>Total</b>	<b>355</b>	<b>188.94</b>	<b>138.7</b>	<b>47</b>	<b>71852</b>
<b>By Project Component</b>					
Main Road	250	68.44	54.18	18	13581
Reservoir	58	97.55	70.14	0	6,523
EEPCCO Camp	47	22.95	14.38	29	51748
<b>Total</b>	<b>355</b>	<b>188.94</b>	<b>138.7</b>	<b>47</b>	<b>71852</b>

As we can see from the figures in Table 0.1, one of the most important points to note is that although the Gibe III project is one of the largest Hydroelectric projects ever undertaken in the country, the impact from the reservoir in terms of population displacement is very small. This is because the impounded water will be confined within the gorge of the river far from large population settlement areas.

Of the three weredas, Kindo Didaye is the most affected wereda in all respects (that is in terms of the number of households to be affected as well as magnitude of impact on all types of assets). Similarly, the Sodo-Chida relocation road is the main source of impact with regard to both the number of households to be affected as well as impact on assets, while the impact of the EEPSCO camp and especially that of the reservoir will be very minor.

On the other hand, the reservoir submerges the only bridge on the Omo River and sections of the Chida-Sodo road necessitating the relocation and construction of the submerged bridge and sections of the road (65 kms long) further below the new dam. The road is a life line in the project area, the only major all weather road in the project area (connecting Wolayta zone with Dawro zone and further with Jima area), hence requiring relocation which unavoidably (due the difficult terrain for alternative alignments for the road) passes through densely populated areas.

## **0.8 Public Consultations and Disclosure**

As a continuous activity, the Gibe III Hydroelectric project has initiated public consultations and disclosure from the outset and the project is committed to continue the process throughout the project life. As part of this continuous process, a series of public consultations were carried out with PAPs, community groups and local officials during a field work for the census and socio-economic surveys. Consultations were carefully planned and conducted to ensure efficiency and effectiveness in covering key issues both from the PAPs and communities on the one hand, and the project interests on the other.

A total of 24 consultations were held with more than 455 PAPs and communities and local officials from the project area. That is, 12 consultations with PAPs and community focus groups and another 12 consultations with local officials at Wereda as well as Kebele levels

Key agenda points that were covered during public consultations included impacts of the project – both positive and negative – on PAPs and local community members, issues regarding property registration and valuation for compensation, cut-off-date, presentation and discussion of compensation options and choices available to PAPs, and availability of skills and opportunities for participation in income and livelihood restoration schemes. Similar consultations were carried out with local officials but with additional discussion points on their duties and responsibilities in relation to the project, availability or lack of replacement land, formation of structures and committees need for successful implementation of RAP, cut-off-date, and their continued support to the project.

A number of important issues that informed the preparation of this RAP were raised and discussed during the consultations. While they are generally supportive of the project, PAPs expressed their views including fears, concerns, uncertainties, needs, hopes and expectations on the project. Local officials on their part, having fully understood the impacts of the project, renewed their commitment to supporting the smooth implementation of the Gibe III Hydroelectric project. The following are some of main outcomes of the consultations:

- Replacement land is not an option for compensation,
- Compensation payment should seriously consider the cropping pattern of the area, in which perennial and high-value crops are dominant,
- Any delays in effecting cash compensation will worsen the already fragile food security conditions of the households,

- The road component of the project will create job opportunities; and PAPs should be given a priority in such employment opportunities,
- Family graves are highly significant both culturally as well as spiritually. Therefore, compensation should be paid to households whose burial grounds are affected by the project,

As its public disclosure strategy, the project, in addition to the ongoing and continuous iterative and interactive process of consultations at all levels, will organize and host a national consultative workshop and present this RAP and other project related facts and findings for discussion and comments. Besides, the project will create and host a dynamic and interactive project web site to reach out all stakeholders at all levels to provide project related news and information and solicit their views on same throughout the project life.

## **0.9 Income and Livelihood Restoration Strategies**

One of the cardinal principles of involuntary resettlement is that beyond compensation for affected assets a RAP should aim at not only the restoration of income of PAPs to pre-project levels but also the improvement of living conditions of PAPs and communities in project affected areas. Accordingly, the plan for income restoration, improvement and social development has been identified and proposed. The plan provides detailed strategies and measures to be taken by the implementing agency in partnership with regional and local governmental and non governmental agencies and institutions.

The income restoration and improvement plan which directly targets PAPs incorporates various strategies and component activities including: land-agriculture based strategies (intensification of crop and livestock production through various extension packages), non-farm income restoration strategies (such as small-scale trade, business enterprises, employment opportunities in project construction activities), labor-saving technologies for women (e.g. fuel saving stoves and grain mills), and special assistance measures for vulnerable groups of PAPs (female-headed households, persons with disability, the elderly, and the poorest of the poor). On the other hand, under the community or social development component the implementing agency will undertake various mitigation and compensation measures and development projects including: public health intervention, improving clean water supply and rural access roads, veterinary clinics and livestock feed resources, boat services at river crossing points, and protection and promotion of historical and cultural heritages.

## **0.10 Institutional Arrangements for the Implementation of RAP**

The effective and successful implementation of the RAP ultimately depends upon the institutional and organizational arrangements made for its implementation. Experience shows that even well designed RAPs (and other similar projects) fail to achieve their objectives mainly because of inadequate institutional arrangements for their implementation. The institutional or organizational framework for the implementation of the Gibe III RAP and the detailed responsibilities, coordination mechanisms, and capacity building measures for implementing units and agencies are proposed. The major aspects of the institutional framework for the implementation of the RAP are:

- i. EEPCO will be the direct implementer of the RAP, and for this purpose;
- ii. The main responsible units within EEPCO, namely the the Gibe III Project Coordination Office (GIII-PCO) will establish a Resettlement Implementation Unit (RIU) for the direct and day to day execution of the activities of the RAP, and form a central resettlement steering committee (RSC) to provide an overall advise and guidance for the implementation of the RAP;

- iii. Under the RIU, three resettlement field offices (RFOs) will be established and a field coordinator, resettlement field officers and assistants will be employed to implement the RAP at the local level;
- iv. The RAP will be implemented in partnership with various relevant governmental, non governmental, and community organizations. More specifically wereda resettlement committees (WRCs), kebele resettlement committees (KRCs) and grievance redress committees (GRCs) will be established.

## 0.11 Grievance Redress Mechanism

The implementation of involuntary resettlement is a complex process which can involve conflicts, disagreements and grievances on the part of PAPs and other stakeholders, mainly because it involves the expropriation and compensation of land and other assets, the demolition of families, etc. Unless an effective grievance redress mechanism is put in place from the beginning, the timely implementation of the project can be jeopardized.

The most important step in conflict resolution is conflict avoidance, and the consultative and participatory nature of decision making under the implementation of the RAP is aimed at reducing the occurrence of disagreements and conflicting positions. The best means of addressing any complaints or claims is through dialogue. This means that, when a PAP has a grievance, she/he will first discuss the issue with the Resttlemnt Implementation Committee (RIC). If the RIC is not able to address the grievance, the complaints should be passed on to grievance committee.

The Grievance Redress Committee (GRCs) will be established at the kebele level in each project affected wereda. Establishing the GRCs at the kebele level facilitates easy access by PAPs. The function of the GRCs would be arbitration and negotiation based on a transparent and fair hearing of the cases of the parties in the dispute, mainly PAPs and the project implementating agency and local government. The GRCs will be independent and careful selection of the members of the GRCs is crucial to ensure its autonomy. The composition of the GRCs is as follows: Representative of Kebele Council (Chair), Representative of Kebele Social Court (Secretary), 2 members Representing Community Elders, and a member representing PAPs.

The grievance redress procedures will be as follows:

- (i) All PAPs will be informed fully about the mechanisms and procedures of grievance redress before the start of land acquisition and compensation;
- (ii) Any PAP who has a grievance would present her/his case first to the Kebele Resettlement Committee (KRC) where frequently issues can be resolved through discussion and adjustments. The complaint will be filled in writing and the secretary of the KRC will assist the PAP in filling the complaint form in 3 copies. The KRC will respond to the complaint within a period of 5 days in writing.
- (iii) If the PAP is not satisfied with the decision of the KRC, she/he will present the case to an independent GRC (again in writing). The GRC will examine the case (by hearing the testimonies of both parties) and pass its decisions and inform the PAP within a period of 7 days. If required, the GRC would undertake site visit and ask for relevant information from the project authorities, etc. The findings of the GRC are binding on the RIU.
- (iv) If the PAP is not satisfied with the decision of the GRC, she/he will fill a suit in a regular court with a jurisdiction on the matter. The implementing agency will cover all costs related to the litigation in regular court.

When the matter is taken to the courts of law, it may take a long time to settle. Therefore, the Resettlement Implementing Committee should try to resolve any complaints at the very intital stage.

## 0.12 Monitoring, Reviews and Evaluation

Monitoring, review and evaluation are essential aspects of any development plan, program or project and the same applies to RAP. The main type of monitoring to be adopted for the purpose of Gibe III RAP will be internal performance monitoring (IPM). Accordingly the implementing agency and the main units and institutions charged with the implementation of the RAP will undertake continuous and systematic IPM of the RAP.

## 0.13 Implementation Budget

### *Implementation Budget*

The total Resettlement Action Plan implementation costs for the three project components are summarised in Table 0.2. The total budget required to compensate for the loss of crop land, perennial crops and other trees, houses and other properties is estimated as ETB 117.5 million. The cost for implementing the Resettlement Action Plan is considered as a component of the financial requirements of the project.

**Table 0.2: Estimated Budget for the Resettlement Action Plan**

Sl. No.	Compensation Item	Compensation Amount (Birr)			
		Dam and Reservoir	EEPCO Camp	Realignment Road	Total
1	Compensation for loss of farmland (annual crops)	6,305,019	1,406,495	4,118,378	11,829,892
2	Compensation for loss of perennial crops and other trees	216,629	6,069,978	1,900,635	8,187,242
3	Compensation for houses and other structures	-	2,214,600	1,424,400	3,639,000
	<b>Sub Total</b>	<b>6,521,648</b>	<b>9,691,073</b>	<b>7,443,413</b>	<b>23,656,134</b>
6	Social Development Plan				76,538,400
7	Evaluation and monitoring				2,000,000
	<b>Total Implementation</b>				<b>102,194,534</b>
8	Implementation & Administration (5%)				5,109,727
9	Contingency (10%)				10,219,453
	<b>Grand Total</b>				<b>117,523,714</b>