Public Disclosure Authorized

Public Disclosure Authorized

THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

REPUBLIC OF KENYA

ETHIOPIAN ELECTRIC POWER CORPORATION (EEPCo)

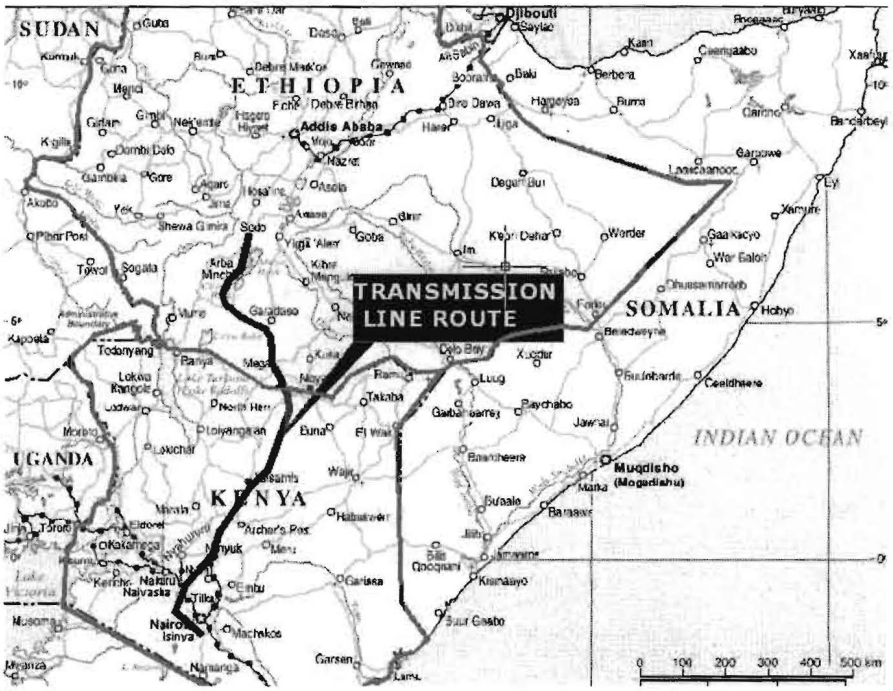
KETRACO

KENYA ELECTRICITY TRANSMISSION COMPANY LIMITED

ETHIOPIA-KENYA POWER SYSTEMS INTERCONNECTION PROJECT

REVISION OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND RESETTLEMENT ACTION PLAN STUDIES

ESIA FINAL REPORT



PART 1: ETHIOPIA

JANUARY 2012

Tropics Consulting Engineers Plc

P.O.Box 351 Addis Ababa, Ethiopia

TEL 251-11-618 54 66 Fax 251-11-618 38 61

e-mail: tropicsemt@ethionet.et

web-site www.tropicsconsultingengineers.com

Gamma Systems Ltd

P O Box 1033 – 00606
NAIROBI, Kenya
Tel: +254 20 44 51 528
Fax: +254 20 44 51 529

General Table of Contents

Abbreviations

AC	Alternating Current
AFD	Agence Française de Développement
AfDB	African development Bank
AIA	Appropriation in Aid
ARCCH	Authority for Research and Conservation of Cultural Heritage (Ethiopia)
BP	Bank Procedure (of the World Bank)
CBO	Community Based Organisation
CIS	Corrugated Iron Sheet
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSE	Conversation Strategy of Ethiopia
DC	Direct Current
DC	District Commissioner Democratic Republic of Congo and Kenya
EAPP	East African Power Pool
EELPA	Ethiopian Electric Light and Power Authority (now EEPCo)
EEPCO	Ethiopian Electricity and Power Corporation
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMU	Environmental Management Unit of EEPCo
EPA	Environmental Protection Authority (Ethiopia)
EPC	Engineering, Procurement and Construction
EPE	Environmental Policy of Ethiopia
ERC	Energy Regulatory Commission (Kenya)
ESA	Environmental and Social Assessment
ESAP	Environmental and Social Impact Procedures
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization of the United Nations
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GIS	Geographic Information System

GPS	Global Positioning System
ha	hectare (100 x 100 meters)
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IAPs	Interested and affected parties
IBA	Important Bird Area
IESIAG	Integrated Environmental and Social Impact Assessment Guidelines
IFC	International Finance Corporation
IFC EHS	International Finance Corporation Environmental, Health & Safety
IUCN	International Union for Conservation of Nature
Kebele	Smallest Administrative Unit (Ethiopia)
KfW	Reconstruction Loan Corporation in Germany (KfW Entwicklungsbank),.
Km	Kilometre
Km^2	Square Kilometre
KPLC	Kenya Power & Lighting Company Ltd.
kV	kilo volt – 1,000 volts
m	Meters
masl	Meter above sea level
MoE	Ministry of Energy (Kenya)
MoFED	Ministry of Finance and Economic Development
NELSAP	Nile Equatorial Lakes countries: Uganda, Rwanda, Burundi, Tanzania,
NFPA	*National Forest Priority Areas*
NEMA	National Environment Management Authority (Kenya)
NFPA	National Forest Priority Area
NGOs	Non-governmental Organizations
NIP	National Implementation Plan for the Stockholm Convention
NO_X	Nitrogen oxides
NRRLAS	Natural Resource and Rural Land Administration Sector
OEPO	Oromia Environmental Protection Office
OIA	Organizational and Institutional Analysis Report
OP	Operational Policy of the World Bank
pa	per annum

PAP	Project affected persons
PCBs	Polychlorinated Biphenyls
PCR	Physical Cultural Resources
PIC	Project Implementation Committee
PIU	Project Implementation Unit
PMUs	Project Management Units
POPs	Persistent Organic Pollutants
PPA	Power Purchase Agreement
ppb	Parts per billion, e.g. one ozone molecule for every thousand million air molecules
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RLA	The Registered Land Act
ROW	Right of Way
SNNP(RS)	South Nations and Nationalities People's (Regional State)
STP	Shovel Test Pits
TL	Transmission Line
TOR	Terms of Reference
UEAP	Universal Electricity Access Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTM	Universal Transverse Mercator (projection)
WB	World Bank
WB EHS	World Bank Environmental Health and Safety (guidelines)
WGS84	World Geodetic System of 1984
Woreda	Rural Town and Local Government Administrative Division (Ethiopia)

Table of Contents

E. EXECUTIVE SUMMARY

E.1 Introduction

Government of the Federal Democratic Republic of Ethiopia and the Government of the Republic of Kenya have reached an understanding to implement a power interconnection project between the two systems after taking into consideration recent developments in the countries and the region at large.

In view of that a memorandum of understanding for the implementation of Ethiopia–Kenya interconnection line has been signed which eventually led to the preparation of the ESIA/RAP study.

Tropics Consulting Engineers Plc of Ethiopia and Gama Systems Ltd. of Kenya are jointly undertaking the ESIA/RAP of the Project under the contract agreement signed between the Consultants and Clients

The main objective of preparing an ESIA is to ensure that potential impacts of the project are identified at the early stage of a feasibility study and minimizing or avoiding strategies can be developed. The implementation of the Project should be carried out without creating much adverse impacts on the environment and the livelihood of the project area population. The main principle is that people living in the project area should not be impoverished due to the implementation of the Project. Appropriate mitigation and compensation measures have to be taken to ensure, that adverse impacts from the construction of the transmission line are reduced to as low as reasonable acceptable level.

E.2 Transmission Line Route Options

Four route lines were considered before selecting the preferred route based on certain technical and environmental consideration. The four routes had been analyzed in details and compared with each other to arrive at a decision on the best environmentally friendly alternative. In this route study, several environmental factors including physical, biological, socio-cultural, technological conditions and constraints have been discussed. As a result route A/C was selected for further study on ESIA/RAP.

Route A/C starts from Sodo substation and passes through Arba Minch, Konso Brindar, Yabello, Mega and proceeds southwardly entering the Kenyan territory and stretching up to Lngonot.

The total length of the project in the routing in Ethiopia can be divided into two distinct sections. The first section of the route for the transmission line, which is from km 00 to km 204 (from Sodo substation to Konso woreda) comprises about 53% of the total km distance and is located in SNNPRS. This section is known for its intensive cultivation and dense population. In this section, one can say that, there existing no uncultivated land or without settlements.

The second section, which is from km 204 to the border (433 km), covers a very wide uninhabited area with very low cultivation and thinly distributed population and is located in the Oromia region. This section is partly occupied by crop producer, agro pastoralist and also by pastoralist nomadic communities. Agro climatically, it is located in mid land and low land areas except for some specific locations (Kenya-Ethiopia border) located in the high lands. In this section, the transmission line partly traverses through bush areas, natural forest and grazing area for livestock.

A substation will be located in Sodo Zuria Woreda at a place named Waranza Lasho (Gantry Center), approx. 5 km north-western from the town of Sodo. The substation will like 200,000 m² (or 20 hectare) and will be constructed on a plot size of 500m x 400m.

E.3 Project description

The infrastructure to be constructed for the power interconnection project is mainly conventional lattice self-supporting steel tower and substations.

The system consists of 1082 km, ±500 kV HVDC bipolar overhead line, from Wolayta/Sodo S/S on the Ethiopian side to a new Longonot 400 kV S/S on the Kenyan side.

Approximate number of towers: in Ethiopia are 1060 (assuming 2.5 towers per line–km as average) on flat and hilly terrain as mentioned in the feasibility study. The supply comprises of:

- Approximate average span length: 400 m
- Width of line corridor (RoW): 50-60 m
- Overall project implementation time: 30 months, six work teams
- Access road: a 4 m wide road from main road or villages as well as 2 m wide along the line route will be required for repair and maintenance purposes, when public roads cannot be used.

The area of immediate impact will be the Line corridor Right-of-way (ROW) which will be 50-60 m in width by 1045 km (433 km in Ethiopia) in length from Sodo in Ethiopia to Longonot in Kenya. A parallel strip of land through those sections of the route which pass through vegetation will also be completely cleared of all trees, scrub and undergrowth above a height of 150 mm during the construction stage. Appropriate clearance between conductors and vegetation/structures along this corridor will be maintained throughout the life of the transmission line. Cropping and grazing beneath the conductors is normally permitted.

The total land required will be 2387 ha permanently and 86.2 ha temporarily.

E.4 Resettlement Cost in Ethiopia

Compensation estimates are made for lost assets and properties on affected crops, houses and lost income. No cost estimate is made for land since land in Ethiopia belongs to the public and that it could not be sold or mortgaged. The estimated cost for the RAP includes costs for compensation of crops, compensation for trees, houses, and also administrative, monitoring and income restoration and contingency costs. The total estimated cost for the RAP will be 268,514,294 Birr (or 15,371,870 USD) and of which about 72% goes for compensation payment.

E.5 Legal and regulatory framework

Policies, regulatory and institutional framework of Ethiopia applicable to this project are the constitution of Ethiopia, Environmental legislations and guidelines of Ethiopia, Environmental policies of Ethiopia, relevant sectoral policies, International agreement, the AfDB and The World Bank safeguard policies and guidelines, and etc.

E.6 Institutional Framework

The institutions responsible to ensure implementation of environmental public instruments at Federal and Regional levels are the (Federal) Ethiopian Environmental Protection Authority (EPA) is which the lead institution and the regional Environmental Organs established at regional and Woreda level.

Proclamation No. 295/2002 empowers each Regional state to establish its own independent environmental agency with the responsibilities to coordinate and follow-up the regional effort to ensure public participation in the decision making process, to play an active role in coordinating the formulation, implementation, review and revision of regional conservation strategies as well as to foster environmental monitoring, and protection and regulation.

Some sectoral institutions that were established for the purposes of the sectoral development are, currently, fully delegated by EPA for environmental impact assessment and follow up in their respective sectors. Thus the sectoral institutions that are delegated by EPA are five sectoral institutions. For the environmental matters regarding hydropower and transmission line the responsible institution is the Ministry of Water and Energy. The ESIA/RAP reports shall be evaluated by HoWE and environmental clearance shall be obtained from the same.

E.7 Baseline condition of the project area

E.7.1 Physical Environment

The routing starts at an altitude about 1950 m at Sodo Gantry Centre, where the substation will be build. The altitude decreases from there on, until it reaches Konso Special Woreda at 1270 masl. Then it gradually increases to 2035 m north of Yabello, and further decreases to 1900 m at Mega. The area from Mega onwards decreases up to 965 m at Megado. The land setting of the route line varies between flatter areas and through undulating hills and gentle slopes.

The geology of the route line is characterized by a Precambrian Rocks including a wide variety of sedimentary, volcanic and intrusive rocks that have been metamorphosed to varying degrees.

The soil along the route varies with the topography. In the higher altitude where there is intensive cultivation, the soil is predominantly blackish clay with stone mulches. Gravels and pieces of stone along the route on farms and open land indicate that the soil is not very vulnerable to erosion. The most dominant soil type are (1) red soil around bend 3 & 4. (2) Brownish fertile soil as in Mirab Abay, (3) agricultural farm and (4) Black cotton soils near Mega Hill

E.7.2 Biological Environment

These localities along the transmission lines are agricultural land mainly cultivating crops like pulses (maize, and sorghum) and fruit like avocado and mango sometimes, interspersed with wild plants. The areas between Konso to Mega and down to Megado are mainly covered with woodlands, occasionally with cultivated fields. The Sodo substation is part of the Afromontane grassland without much tree and shrub cover.

Several species of large wild animals have been reported from the area. The study area is no exception to this process. The areas past Konso to Yabello-Mega-Kenyan border have some intact woodland ecosystems which harbors various wild animals.

There are two important conservation areas along the transmission route; the Nech Sar National Park and the Yabello wildlife Sanctuary.

The areas past Konso in direction to Yabello via Mega towards the Kenyan border has some intact woodland ecosystems which harbors various wild animals. The wilde animals observed in the area include the Olive Baboon, Leopard, Serval, Bush Duiker and Mountain Nyala. The characteristic birds include six endemic birds: Black-headed Siskin, Abyssinian Catbird, Abyssinian Long claw, Abyssinian Woodpecker, Yellow fronted Parrot and Spot-breasted Plover.

Threatened mammals are African Wild Ass, and Grevy's Zebra. Endemic bird species occurring are Abyssinian Woodpecker, Yellow-fronted Parrot and Abyssinian Bush Crow. In addition to these, near-endemic bird species like Lappet-faced Vulture, Imperial Eagle, Lesser Kestrel, Wattled Crane, Abyssinian Bush Crow, White-tailed Swallow and Nechisar Night Jar are categorized as vulnerable.

E.7.3 Socioeconomic and Cultural Environment

The population of the Project Woredas are estimated at 1, 376,811 in 2011. Out of this the project woredas in SNNP accounted for 80 percent of the total Project woreda (1,099,8280) people while in Oromia the population accounted only 20 % of the Project Woreda Population (276,983).

Hence overwhelming majority of the total people identified in the Project Woredas live in the SNNP. The proportion of male and female population are evenly split; almost 50% are female. The average population density of the project area is 154 persons per square kilometers in the case of SNNPRs and 11 persons per kilometer square in the case of Oromia.

The people living in the project woredas are mainly from six ethnic groups. These ethnic groups belong to Omotic, Cushetic, Semetic and Nilo Sahara linguistic families. The Cushitic and the Omotic are the most popular and diversified groups. There are other minority ethnic groups living the area including, Amhara, Gurage, Tigre, etc but they are in small number particularly in the rural area where the line passes.

The houses are scattered family dwellings made up of mostly thatched roof and sometimes corrugated iron made of wood wall plastered with mud in most parts of the project area. The settlements are isolated villages on varied terrain particularly without adequate socio-economic infrastructure and services.

The major types of livelihood activities in the project area are Crop Production, Pastorals, agro-pastorals and trade. Pastorals are the most prevalent lively sources especially in Borena zone. The vast arid and semi-arid region is conducive for production of livestock of different types such as cattle, camels and goats. The livestock by-products such as hides and skins are delivered to the central market. The other products such as milk, butter, etc

The third significant livelihood activity is trade which is mainly practiced by town and village dwellers. Another lively hood source is illegal production and sale of charcoal.

Hence the mainstay of the people in both regions is dependent on agriculture and agro pastoralism, farming and livestock rearing are the basic livelihood of the people. Land is the major source of income and food for the population living in the project area.

Cultural and archaeological assessment is conducted to investigate the route A/C of the Ethio-Kenya Power System Interconnection to examine the effects of cultural and natural heritage sites by the project along the transmission line route.

The Konso cultural landscape is the major concerns of cultural heritage located in Konso special woreda. Most of Konso woreda is associated to communal heritage of terraces, cultural sites and very important landscapes of SNNP regional states of Ethiopia.

Several fossils were recovered in Konso –Gardula area in the years 1993 to 1986. The one discovered in 1991 was believed to be remains of *H. erectus* and the oldest firmly dated

Acheulean remains. Fieldwork since 1993 has clarified the temporal and spatial distributions of Konso's fossiliferous sequence. The early Pleistocene series comprises discontinuous outcrops extending for about 15 km. Most of of the Konso fossils derive from two time horizons, one at approximately 1.9 million years ago (Myr), 1.4Myr. Less-extensive collections have been made between these levels. T/L passes through one or two demarcated area of these resources.

The cultural environment of routes after Konso (in Borena Administrative Zone) is characterized by unfertile land covered with acacia commiphora wood land. The important heritage concerns observed during the study along the line routes within the Borana Administrative Zone are water wells and living religious and burial places.

E.7.4 Major Impacts of the project

The main positive impacts of the project are employment opportunities, additional power capacity, development of ICT Hubs, and conservation measures

This study has made evaluation of the negative impacts, with regard to:

- Social Impacts including Settlements and Community Facilities;
- Archaeological and Historical Sites;
- Impacts on Agricultural Land;
- Impacts on Drainage, Surface Waters and Water Resources;
- Solid and Liquid Waste;
- Potential Aesthetic Impacts;
- Electric and Magnetic Fields;
- Impacts on Natural Vegetation;
- Impact on Flora and Fauna;
- Land Excavation, Access Roads and Campsite;
- Soil Erosion;
- Noise, Ozone and Corona;
- Chemical Pollutants;
- Occupational Health and Safety Concerns and Safety Issues as well as injuries,
- Etc, will be analyzed

E.8 Cost Estimates in Ethiopia

The environmental cost estimates address the costs of unavoidable negative impacts that will take place during the project's construction and operation. These impacts are generally categorized into physical, biological and socio-economic.as described in this study. The total environmental cost amounted at ***ETB 283,457,969 (USD 16,227,364)***.

E.9 Conclusion

The overview on the impacts during operation phase is showing that all impacts can be reduced to an acceptable level, if the proposed mitigation measures are implemented and if the IFC's General EHS and the IFC's EHS for Electric Power Transmission and Distribution are applied.

Once the construction sites are rehabilitated, the area permanently occupied by the Project, is expected to be relatively small in comparison with the large extent of the Project and other large infrastructure projects.

It is understood that the best opportunities for the reduction of impacts can mainly be made during the next phase of the Project, prior to construction and operation, while planning the detailed design and the final routing. Considering the proposed mitigation measures, the Project's impacts could be reduced to as low as reasonable possible level and the Project is environmental feasible.

Table of Contents

1 INTRODUCTION

1.1 Project Background

Ethiopia is endowed with a large hydro generation potential which is estimated at about 45,000 MW. In line with the country's energy policy, the Government of Ethiopia has given attention to the development of this indigenous resource for domestic demand and export purposes. In search of external markets, currently the Government of Ethiopia is working towards forming power system interconnection with its neighboring countries to benefit all parties.

The Ethiopia–Kenya Transmission Interconnection Project was a part of the Power Planning Study carried by Ethiopian Electric Light and Power Authority (EELPA), now EEPCo, in Oct.1982. This study recommended a feasibility study for the interconnection. Taking into account the recent developments in the Ethiopian and Kenyan power systems and in the East African Power Pool EAPP countries at large, the need of further assessment of the interconnection viability has arrived.

As further organization active in the region, the Nile Basin Initiative recognizes that the potential for electricity trade in the Eastern Nile countries is enormous and can provide significant socio-economic and environmental benefits. One of the problems to the development of a regional market is insufficient transmission infrastructures. The project is expected to solve this problem and create the transmission capacity to supply power between Ethiopia and Kenya in the long run. On top of this the project will optimize investment in power infrastructure that will facilitate the coordinated development of interconnection.

The Ethiopia – Kenya Interconnection Project is a higher level project of vital interest for the development of power exchange in Africa. The high voltage transmission line between Ethiopia and Kenya will close a major gap on the high voltage grid of the EAPP countries, because it will ultimately serve a link for the power connection of North Africa to the South.

On May 7, 2006 Ethiopia and Kenya signed a memorandum of understanding that underscored the need to recognize the comparative advantage of Ethiopia over Kenya in terms of hydropower generation, and technically cooperate in power generation, transmission, rural electrification and customer services. In this regard, it was agreed that a power system interconnection between the systems of Ethiopia and Kenya be established.

In view of that, the Government of the Federal Democratic republic of Ethiopia and the Government of the republic of Kenya have reached an understanding to implement a power interconnection project between the two systems after taking into consideration recent developments in the countries and the region at large such as the Nile basin initiatives, Eastern Africa Power Pool, Eastern Africa Power Master Plan, etc. the memorandum of understanding for the implementation of Ethiopia–Kenya interconnection line has been signed which eventually lead to the preparation of the TOR for ESIA/RAP study.

This project is known as '***REVISION OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTAND RESETTLEMENT ACTION PLAN STUCDIES***" is jointly conducted by Tropics Consulting Engineers Plc of Ethiopia and Gama systems Ltd. of Kenya under the contract agreement signed between the Consultants and Clients (Ethiopian Electric Power Corporation- EEPCo and Kenya Electricity Transmission Company-KETRACO).

1.2 The Previous ESIA Studies

The previous study was completed in 2009 by Fichtner of Germany. The previous contract for the Ethiopia–Kenya Power Systems Interconnection Project ESIA and RAP Studies was signed between the Ethiopian Electric Power Corporation and the Ministry of Energy of Kenya, the donor, KfW and the consultant FICHTNER in January 2008. The Ethiopian and

Kenyan parts of the project were coordinated by a joint coordination office, hosted under the Ethiopian Electric Power Corporation, in Addis Ababa.

The previous study indicated that:

1. The investigations and the preparation of ESIA and the associated RAP study was based on the technical information from the Draft Feasibility Study therefore considered to be a limitation to the study;
2. "The consultant has placed particular emphasis on the fact, that for the provision of a realistic impact assessment (ESIA), determination of resettlement activities and compensation (RAP) is mandatory, that both ESIA and RAP will need to be revised related on the finally agreed routing and the detailed design."

In addition to that stakeholders gave comments that would improve the studies and required to address the comments during the revision.

1.3 The Present Study

The present ESIA and Associated RAP study tries to correct the problem encountered in the previous study. Compares the advantages and the disadvantages of the route options identified earlier and the new defined routes under the current project. Hence after thorough analysis of the routes, a preferred option is selected based on defined criteria. The base line and impact and mitigation as well as EMSP is elaborated for selected route option. Furthermore opinions expressed by the stakeholders were carefully examined and incorporated in the new study.

1.4 Scope and Objectives of ESIA

The main objective of preparing an ESIA is to ensure that potential impacts of the project are identified at the early stage of a feasibility study and minimizing or avoiding strategies can be developed. The implementation of the Project should be carried out without creating much adverse impacts on the environment and the livelihood of population. People living in the project area should not be impoverished due to the implementation of the Project. Appropriate mitigation and compensation measures have to be taken to ensure, that adverse impacts from the construction of the transmission line are reduced to as low as reasonable acceptable level.

For the preparation of this ESIA, a baseline survey was carried out in May 2008 and in 2011 during this study to identify and document affected resources, in order to establish a project related basis for the impact assessment. The census by the RAP team was carried out from 20th June to 3rd September, after a preliminary visit in June.

Beside the collection of baseline data from field investigation, institutional and legal frameworks, information from secondary sources were reviewed, and meetings with concerned people and authorities were held at all levels (Federal, Regional, Woreda/District and Kebele/Community).

This ESIA report comprises the findings of the survey, results of the public consultation process, impact assessment and mitigation measures, against the background of the national legal and institutional frameworks, the World Bank's safeguard Policies, the AfDB's Environmental and Social Assessment Procedures (ESAP,2001) and Integrated Environmental and Social Impact Assessment Guidelines (IESIAG, 2003). The report describes in detail the mitigation measures, roles and responsibilities of the parties involved in the ESIA process, and sources of funds. It also provides the time frame for the implementation, as well as monitoring and evaluation of the same.

In order to ease the review, a request was made by different parties to provide separated reports for both counties in two parts; accordingly this part of report focuses on the Ethiopian part of the Project. Beside a conclusion for Ethiopia, this ESIA report will also include a joint conclusion for the whole Project.

1.5 Category of Impact of the Project

The power transmission lines characteristically generate impacts such as acquisition and maintenance of the right-of-way (RoW), clearing of vegetation from sites and line corridor; construction of access roads, tower pads, and substations which are the most obvious sources of construction-related impacts. The area of immediate impact will be the Line corridor RoW of maximum 60 m width along the entire length of the transmission line. Parallel strip of land traversing vegetation will also be completely cleared of all trees, scrub and undergrowth above a height of 150 mm during construction phase. Appropriate clearance between conductors and vegetation/structures along this corridor will be maintained throughout the life of the transmission line. Cropping and grazing beneath the conductors is normally permitted. Most disturbances to the environment occur during the construction phase of the project. It should however be noted that both positive and negative impacts will result from the project implementation (construction).

Thus, Ethio-Kenya Power system Interconnection Project is expected to have negative impacts including vegetation clearance, displacement, lose of farm land and generation of pollution during construction. Some of the impacts are irreversible and very sensitive. The likely impacts are degradation of air, water or soil; large-scale physical disturbance of the site and/or surroundings; lose of amounts of forest and other natural resources; and involuntary displacement of people and other significant social disturbances

Therefore such projects are classified as Category A (category 1) according to the World Bank (AfDB) classification of impacts. Accordingly Category A projects will require a full Environmental and Social Impact Assessment (ESIA), including the preparation of an Environmental and Social Management Plan (ESMP).

This ESIA study, therefore, attempts to examines the project's potential beneficial and adverse impacts, and recommends any measures needed to prevent, minimise, mitigate or compensate for adverse impacts and to enhance environmental and social project benefits.

1.6 Methodology of ESIA Study

The Impact Assessment will be primarily based and addresses the issues on (1) the materials presented in Fichtner ESIA/RAP studies of 2009, (2) the comments of the stakeholders to 2009 studies, and (3) additional data and Information collected during this study. This study has made a lot of efforts to ensure that both quantitative and qualitative data essential for the report are collected and analyzed.

The information gathered during baseline data collection (physical, biological and social) for the ESIA was also used as preparation of the census survey for the RAP. Both surveys, as well as the public consultations, were conducted in different localities with Project Affected People (PAPs) and also with other members of the community residing in the kebeles that could be affected by the transmission line. Awareness was created for the project potential impacts and on how mitigation measures will be implemented (including compensation payment and handling of relocation). The methods used in the study are the followings.

a. Document review:

Existing secondary data including documents, maps, Satellite imaginary, drawings, data and web site resources have been reviewed. The purpose of the review is to obtain an overview of the existing project environmental conditions, identify gaps and come up with ways of filling-up the gaps. Subsequently, available documentation in hard and soft copies from various institutions and administration were reviewed and evaluated against the Fichtner, 2009 ESIA/RAP studies.

The main relevant documents found on the web sites are Statistical Abstracts and other studies by CSA, Ministry of Education and other sectoral agencies. Government policies and strategies as well as planning documents on particular areas are another source of information obtained from diverse sources of the internet.

Critical information (such as cultural spots) relating to the study is supported by physical observation and positioning of important sites during field visits.

The overall approach includes collection of baseline data prior to conducting specific in-depth analysis. The same methodology and instruments will be used in collection of new corroborative data along the proposed transmission line route for purposes of building up resettlement information.

b. Semi-structured interviews with key informants and focus group discussions:

Discussions were undertaken with eleven focus groups distributed along the entire Project Area. Participants were diverse members of the community – men, women, youth, and religious leaders. Through FGDs, many issues were discussed including ecological and socio-economic conditions, vulnerable groups, religion, infrastructure, rural electrification, manpower and skills, local entrepreneurship potentials, etc. Participants were given time to raise concerns, questions and to contribute ideas on the proposed project. Mobilization of participants and arrangement of meeting venues was undertaken by local administrators and traditional leaders, especially among indigenous people, school head teachers, religious leaders, etc. Using a checklist of observations the data collection tools were found to be useful in ascertaining facts that were orally presented and in assessing the general state of the household and their livelihood. Photographs of community meetings and affected infrastructures and homesteads were taken.

The following public organizations that hold relevant data for the study were contacted and collect pertinent data and information:

- Appropriate Health Institutions in Ethiopia to obtain information on health facilities, as data on HIV/AIDS and the most common diseases of the project area.
- Central Statistical Agency to obtain demographic data and other data disaggregated at woreda/zonal level
- Bureaus/Offices of Agriculture to obtain data on agricultural and livestock production numbers, practices, etc.
- Bureau/Offices of Culture to obtain data on archaeological, historical, cultural and religious sites within the project affected area
- Environmental Protection Agencies that are relevant to study area to ensure the assessment complies with the regulations and guidelines set by the countries competent organs
- Organizations working within the project such as NGOs and others

In addition, household questionnaire was developed to undertake census of the project affected persons (PAPs) and their assets.

c. Consultations:

Consultation with various community groups, Woreda and Kebele Authorities of PAPs, elders, religious group and others were held in group and individual informant level.

Stakeholders' meetings to present and obtain comments and opinion on the study were organized and important feedback was obtained. Obtained views on crucial issues that require improvements by the consultant for the refinement of the study.

Meetings with the client and the fanciers were made for early feedbacks and communications.

d. Analysis and Report Writing:

The field study and documentations evaluated and analyzed targeting to address all relevant issues related to physical, biological and socioeconomic (income, livelihood, agriculture, livestock, gender, ethnicity, etc) in an integrated manner. In addition, in-depth analysis was made to come up with specific information on potential impacts of the project. The analysis included mitigation measures required for the negative impacts.

Table of Contents

List of Tables

2 ANALYSIS OF ALTERNATIVES

Three project alternatives have been considered including no project options in the analysis of the alternatives. The main purpose of this analysis is to assess most important elements that would help to give the best options in selecting the right technology for the transmission line in terms of various advantages of the alternatives compared to each other.

2.1 ALTERNATIVE I: NO PROJECT OPTION ("DO NOTHING" OPTION)

Ethiopia has a large hydropower potential which is in excess of its national requirement. On the other hand power demand is growing in Kenya. Since Kenya produces its energy mainly from fossil fuels, hydropower-based electricity imports from Ethiopia will lead to a reduction in greenhouse gas emissions and other air pollutants. Ethiopia will benefit from income generated from the sales of power in the form of foreign exchange. The project creates high opportunities of economic and trade enhancement that arises from the implementation of power interconnection between the two countries.

The Ethiopia and Kenya Interconnection Project provides environmental and economical benefits to the countries. If the Project would not be realized, then both Ethiopia and Kenya would miss this chance to benefit.

Besides that, the realization of this Project is important for the development of power exchange in Africa, as it will close a major gap by establishing a link for the power connection of North Africa to the South, or the Assessment of Alternatives interconnection between the ENSAP and the NELSAP countries respectively.

In the 'no project alternative' Kenya will continue to use diesel and firewood which increases with development and population growth this will increase GHG and other pollutants across the country possibly in Ethiopia.

In the first phase of the project (roughly seven years) about 29,138 GWh of electricity will be exported to Kenya from Ethiopia. In this period a total of 1,937 $ktCO_2$ per year will be reduced. In seven years the amount reduced will be 13,562,360 tCO_2 (according the data obtained from EEPCo Corporate Planning). Therefore the no project option will forego this reduction in GHG.

On the other hand, the adverse impacts identified in the Chapter Impact Assessment would not occur and Project funds could be invested in alternative projects, or rural infrastructure development projects which could bring other development benefits to communities.

The no project option is the least preferred option because it disallows the trade link that would be created and the social and economic ties between Ethiopia and Kenya. The loss of monetary and value added benefits makes this option unfavorable.

2.2 ALTERNATIVE II: HIGH VOLTAGE ALTERNATE CURRENT (HVAC) OPTION

a. Technology

A High Voltage Alternating Current (HVAC) is characterized by the movement of electric charge reversing direction periodically usually its voltage may be increased or decreased with the use of a transformer. The flow of electric charge in HVAC is only in one direction.

AC is characterized by three-phase electrical generation system. A third wire, called the bond (or earth) wire, is often connected between non-current-carrying metal enclosures and earth ground. This conductor provides protection from electric shock due to accidental contact of circuit conductors with the metal chassis of portable appliances and tools.

b. Power Loss

The power loss in AC is higher that the DC line. In AC power, the Root mean square (RMS) voltage measurement is considered the standard, but RMS is only about 71% of the peak

voltage. The peak voltage of AC determines the actual insulation thickness and conductor spacing.

There is a need for intermediate sub-station for a long line like the Ethiopia-Kenya interconnector.

c. Environmental Benefits

The environmental benefits of HVAC are less than the benefits of HVDC (see the explanation in the next section 2.3 below).

Electrical field: Under HVAC transmission lines the effects of electrical field is notably observed. This includes spark discharges from humans to bushes, grass and other vegetation. These discharges are quite frequent in HVAC. This requires significant safety measures; to mitigate the environmental impacts of a HVAC transmission lines.

Radio Interference: The radio interference caused by electric power transmission lines is the result of the corona discharge around conductors, which is generated only at positive voltages. As a result, HVAC transmission line radio interference is generated by all of the three AC phases (on a HVDC line radio interference is generated only by positive pole conductors).

The electric field intensities recommended for ac lines take into account a 10 db (decibel) increase in radio interference under rainy conditions.

Audible Noise: In the substations used on HVAC systems, the main source of audible noise of the converter transformer could reach, at times, to unacceptable level to humans.

d. Economic benefits:

The HVAC alternative will always give the lowest cost for a short transmission distance often quoted as up to 500-800 km transmission distance but loss levels increase with distance in the system above the breakeven point (about 800km). In a long AC cable transmission, the reactive power flow due to the large cable capacitance, will limit the maximum lower cost transmission. For Ethiopia- Kenya interconnector AC is a disadvantage in terms of cost because power is transmitted over 1045 Km.

2.3 ALTERNATIVE III: HIGH VOLTAGE DIRECT CURRENT (HVDC) OPTION

Many studies shows that modern high-voltage, direct-current electric power transmission systems, in contrast with alternating-current systems, is normally preferred to transmit large amounts of bulk power to interconnect alternating current power grids.

In the context of the Ethiopia–Kenya Power System Interconnection HVDC could be obtained from an alternating current supplied from Gilgel Gibe to Sodo substation by using a rectifier, which allow current to flow only in one direction for 1045 km. Then the HVDC converted to AC line after Longonot using inverter.

a. Technology

Both High voltage AC or DC electrical power transmission applications is power system for electric transmission to reduce the energy lost in the resistance of the wires. HVDC electric power transmission system uses direct current for the bulk transmission of electrical power. The technical procedure in an HVDC system is the conversion of electrical current from AC to DC (rectifier) at the transmitting end of the substation, and from DC to AC (inverter) at the receiving end which is done using (1) Natural Commutated Converters (2) Capacitor Commutated Converters (CCC), and (3) Forced Commutated Converters.

Like the Ethiopia-Kenya interconnector, bipolar HVDC transmission lines have two conductors and because of that it is simpler in design in comparison with the three-phase

structure of a HVAC line. HVDC lines require shorter tower heights in comparison with HVAC lines of equal capacity and comparable voltage levels.

One of the fundamental advantages with HVDC is that it is very easy to control the active power in the link limits short circuit currents. A HVDC transmission does not contribute to the short circuit current of the interconnected AC system.

b. Power loss

When using HVDC of ±500 kV, in the Ethiopia-Kenya interconnector, losses is expected to be about 3% per 1,000 km (Wikipedia website). This is because High-voltage direct current transmission allows efficient use of energy sources remote from load centers.

HVDC needs fewer conductors as there is no need to support multiple phases. Also, thinner conductors can be used since HVDC does not suffer from the Skin effect. HVDC line does not need intermediate station.

HVDC can carry more power per conductor, because for a given power rating the constant voltage in a DC line is lower than the peak voltage in an AC line. Because DC operates at a constant maximum voltage without RMS, this allows existing transmission line corridors with equally sized conductors and insulation to carry 29% (Wikipedia) more power into an area of high power consumption than AC, which can also lower the costs.

c. Environmental Benefits:

When the total area used for towers and the land for the transmission line right-of-way is considered the land required per unit of power of transfer capacity for HVAC and HVDC substations are reported to be the same. The largest amount of land used for HVDC or HVAC transmission systems is used for the overhead transmission line.

The area of land use, as the major ecological parameter of a transmission system, depends mostly on the system reliability requirement for the line. Assessment, of the emergency power drop in the receiving part of a transmission system, the HVDC transmission system can be implemented as one bipolar line.

Study confirmed that for a project using a ±500 kV, 2000 MW bipolar HVDC transmission system the area for the converter substation of the transmission system is about 90,000 m^2. The area required for the transmission line right-of-way is 100,000 m^2 per km of line length (L. A. Koshchev, Environmental Characteristics of HVDC Overhead Transmission Lines).

In terms of economic benefits, an estimate made for overhead HVDC and HVAC transmission lines shows, the reliability requirements and costs of environmental measures and the area of total land use and line right-of-way for an HVDC transmission line is 1.5 times less (L. A. Koshcheev) that for an equivalent HVAC line (where equal transfer capacity is assumed for each).

Effects of Electric Fields: Under a HVDC transmission line the typical problem of electric field to humans is not significantly observed.

The eclectic field perceived by a human standing under a HVDC overhead line will usually not go beyond the electrostatic stimulation of hair movement on the head. This lead to conclusion that electrical effects of HVDC transmission lines are not sufficiently hazardous and no significant safety measure is needed.

Effects of Magnetic Fields: the magnetic fields associated with DC lines produce no perceivable effects.

Radio Interference: on a HVDC line radio interference is generated only by positive pole conductors, unlike a HVAC generated by all phases. With DC lines, the radio interference decreases during rains.

Assuming equal capacity conductors and maximum levels of electrical field intensity on the conductors' surfaces, the radio interference level of HVDC lines for bad weather conditions is lower by 6-8 dB than of HVAC lines.

Audible Noise: audible noise from DC transmission lines is a broadband noise with contributions extending to high frequencies. The noise is most prevalent in fair weather. noise levels from a DC line will usually decrease during bad weather. Limiting audible noise during HVDC and HVAC transmission line operation is usually addressed with the same types of measures on both types of lines.

Ground Currents and Corrosion Effects: One of the advantages of HVDC transmission is the possibility of continuing power transfer even in the event of emergency outage of one pole of an HVDC bipolar system. In the case of an overhead line operating after an emergency outage on one pole, it is possible to use the wire of an emergency pole as the return circuit.

d. Economic Benefits

Investment cost of a HVDC transmission line costs less than the cost of an AC line for the same transmission capacity. However, the terminal stations are more expensive in the HVDC case due to the fact that they must perform the conversion from AC to DC and vice versa. On the other hand, the costs of transmission medium (overhead lines and cables), land acquisition/right-of-way costs are lower in the HVDC case. Moreover, the operation and maintenance costs are lower in the HVDC line.

The land coverage and the associated right-of-way cost for a HVDC overhead transmission line is not as high as for an AC line. This reduces the visual impact compared to AC system. It is also possible to increase the power transmission capacity for existing rights of way.

2.4 CONCLUSION

Thus, from the environmental, power loss and economic point of view, a HVDC power transmission system as a whole is preferable to a system using exclusively HVAC transmission lines (see also table 2-1 below).

Table 2- 1: Summary of Alternative Comparison

No	Description	High Voltage Alternate Current	High Voltage Direct Current
1	**Power loss**	Loss of power is less for short distance (600 km)	Loss is less than HVAC for long distance (over 600km)
2	**Environmental Benefits**	More environmental concerns compared to HVSDC including magnetic field, electric field, corona and land take (impacts on socioeconomic and biophysical conditions	advantages over HVAC transmission lines for a majority of environmental impact on socioeconomic and biophysical condition
3	**Economic Benefits**	Transmission cost more than the DC in the case of Ethiopia-Kenya interconnector	Costs less for T/L more than 600 Km distance

Table of Contents

List of Table

List of Maps

3 CONSIDERED TRANSMISSION LINE ROUTE OPTIONS

3.1 Transmission Line Route Options

Under the review period during the route selection study, the following four main route options were considered. Review of the route study under the Fichter study conducted a rapid field assessment was carried out in May, 2011. The 4th route option was identified on the field trip and compared with the three other options presented by Fichtner in 2009. Brief description of the routes is presented hereunder.

Option A route originating at Sodo substation and traversing Arba Minch, Konso, Brindar, Yabello, Mega and southward into Kenya where it crosses the border (at a coordinate point of 421519 ((E) and 397867 (N) located west of Moyale). It then traverses area to the left of Turbi, Marsabit, Laisamis, Seradupi, Isiolo, Gilgil, Naivasha and terminating at the proposed Longonot substation, a total distance of 1083 km.

Option B route originates at Sodo S/S and traverses Arba Minch, Konso, Brindar, Yabello, and Mega crosses the border at Moyale. It then traverses Turbi, Marsabit, Laisamis, Seradupi, Isiolo, Gilgil, Naivasha. It traverses the same counties as Option A but mainly east of it where its alignment was chosen so as to avoid protected areas of Marsabit National Reserve, Losai National Reserve, Matthews Range Forest Reserve and birds' migratory routes. It rejoins route Option A near Rumuruti in Laikipia County and follows the same trace as Option A to Longonot, a total distance of 1174 km.

Option C route follows more or less the same trace as Option A but has a slight bend modification of A after Mega. In Kenya the line traverses areas left of turbi, Left of Marsabit, left of Laisamis, left of Seradupi, right of Wamba and joins Longonot S/S. This route is demarcated as route A/C. This line covers a distance of 1045 km.

Option D route Option D originates at Sodo S/S traversing Arba Minch, Konso, Brindar, Teltele and straight in a southerly direction into Kenyan at coordinates of 0297450 E and 0473159 N, east of Lake Turkana. It traverses the 5 counties of Marsabit, Samburu, Laikipia, Nyandarua and Nakuru but on the last leg near Rumuruti in Laikipia County, it follows the same trace as Option A to Longonot, a total distance of 1044 km.

The route for the proposed Ethiopia–Kenya 500 kV HVDC transmission line was originally selected during the feasibility study undertaken by Fichtner and reported in 2009. Subsequent ESIA/RAP study was conducted based on this selected route, mainly route A/C[1].

The proposed 500 kV HVDC transmission line is supported on conventional lattice self supported steel towers of approximate height 38 m. The originating HVDC inverter substation is at Sodo in Ethiopia, the other inverter is located at Longonot in Kenya. At this proposed substation, HVDC would be converted to HVAC. A double-circuit 400 kV HVAC transmission line is proposed to link Longonot.

Due to environmental considerations such as line passing through several national parks and wildlife reserves mainly in Kenya and the need to shorten the length of the proposed transmission line, optimal route selection study was initiated by the stakeholders.

[1] Route A in Ethiopia is almost similar to Route C. The difference in distance (and other issues) is insignificant; it is only about 1.5 km. Therefore we can assume that route C is the same as route A with a very little alteration. In the Kenyan part route C is a modification of A and both A and C from Ethiopia join C in Kenya. In the route determination in the Fichtner study rout A/C is the basis for the feasibility, ESIA, and RAP studies. Hence A/C is now taken as the preferred option of the 2009 study. Details of the route Options are given in figure 1 below.

The route selection study dealt with identification of a new route line that starts from Wolayta Sodo Substation and passing through Arba Minch, Konso, Brindar, Teltelle and straight south to Longonot crossing the Ethio-Kenya border at 0297450 (E) and 0473159 (N). In Kenya the route line passes through Kalacha, South Horr, Kisima, Rumuruti to Longonot. This route is designated as Option D.

The Fichtner study considered only Option A/C for the feasibility and ESIA/RAP studies even though other two Options (B & A) were indicated in the studies. Option A/C Starts from Sodo Substation and passes through Arba Minch, Konso, Brindar, Yabello, Mega and crosses the Ethio-Kenya border straight south passing though west of Marsabit, west of Seradupi, Wamba, Rumuruti, Giligil, east of Naivash to Longonot.

The other two Options mentioned were Option B and Option A/C (or C/C). Option B follows the same route line as in Option A up to Mega and then extends to Moyale in Ethiopia at the border and passes through Turbi, Marsabit, Naivasha to Longonot in Kenya.

Option C is a continuation of Option A (in Ethiopia) starts from Sodo S/S and passes through Arba-Minch, Konso, Yabello, Mega to the border southwards all the way to Longonot. In Kenya, Option C passes through a line close to Seradupi to the west and continues to Rumuruti, Gilgil and Longonot (different options are presented in Table 3-1).

Table 3-1: Distance of Route Options

	Distance in Km		
Option	**Kenya**	**Ethiopia**	**Total**
Option A	649	434	1082
Option B	669	485	1154
Option D	693	351	1044
Option A/C	647	434	1045

The general objective of this study is to identify the route for Option D (in Ethiopia and Kenya) then compare and evaluate the four Options to select the optimal transmission line route with regard to environmental, social, and economic impacts.

Accordingly teams' of professionals in Ethiopia and Kenya conducted the study in 2011on desk top review and field visit to survey the route. The transmission line routes were then compared with selected parameters as shown below.

The routes have been discussed in details and compared with each other to arrive at a decision on the best environmentally friendly alternative. In this route study, several environmental factors including physical, biological, socio-cultural, technological conditions and constraints have been discussed. The result shows that:

In Ethiopia Option D has the following characteristics

1. **Biological Environment:** Avoids endemic species observed in Mega Plateau (A, B & C have to pass though this area). It avoids the line passing near Yabello Bird Sanctuary (all other lines pass near the Bird Sanctuary).
2. **Socioeconomic environment:** Expected to affect less farmland, houses and property than the other options.
3. **Historical and cultural resources:** There are no historical, cultural and archaeological sites that could be impacted by the line except that of Konso. All options pass though Konso historical and cultural sensitive area but the other options have additionally such concerns at Yabello and Dubluk area even though it could be mitigated.
4. **Technical:** Reduces the route line distance by about 82 km (Ethiopia only) than the shortest option (A/C) thereby reducing the investment cost.

In Kenya the study result shows that, Option D has the following characteristics:

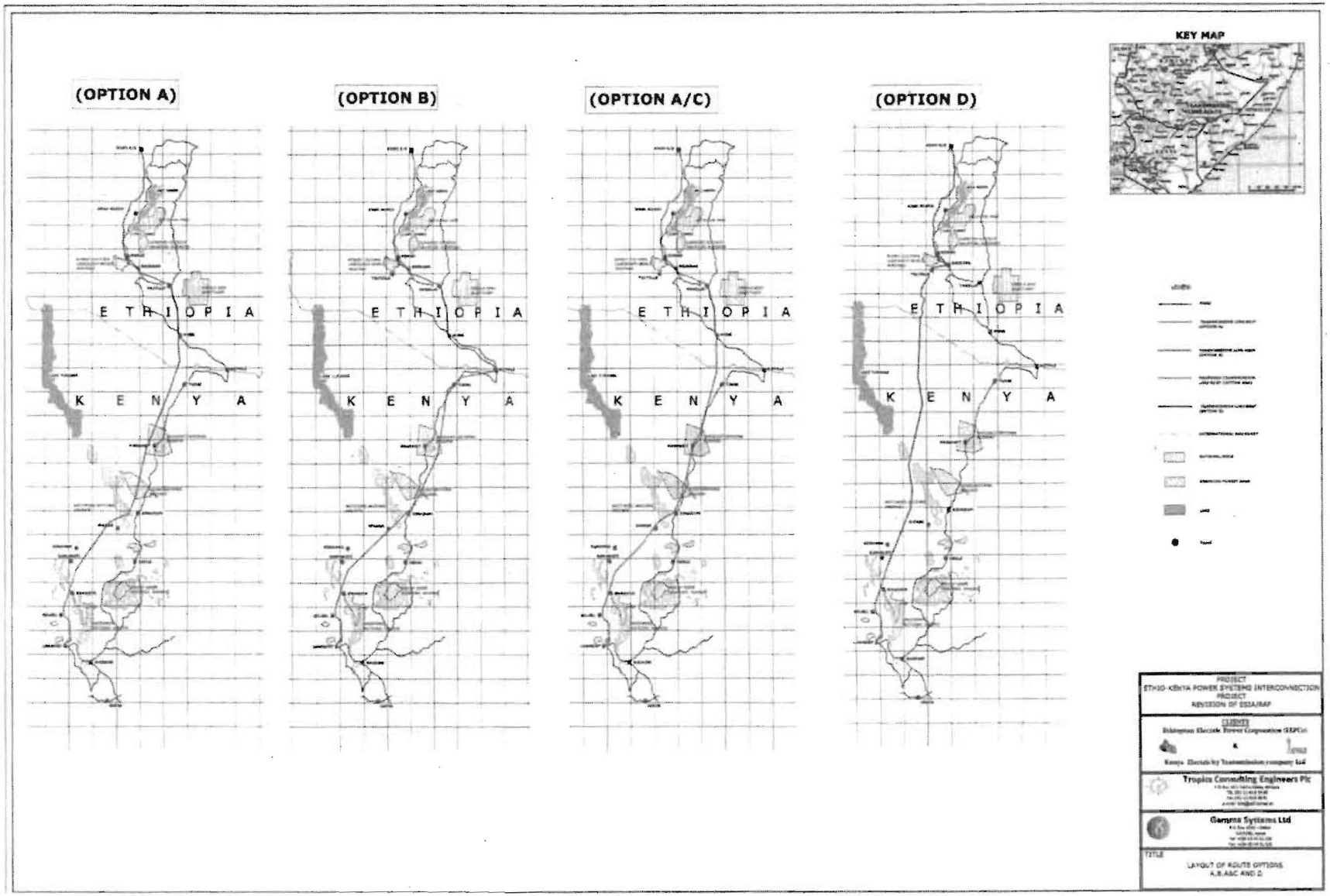
1. **Environmental Concern**: The route avoids the affected environmental hot spots including protected areas of Marsabit National Reserve, Losai National Reserve, Matthews Range Forest Reserve and birds' migration routes.

2. **Social & Economic Concern**: more or less the same impact is expected in all the options.

   Technical: As shown in table 1 above, Option B is reported as 669 km in length. **Option A is** the second shortest route at 649 km but it **is blocked at the bo**rder by Sololo Mountains and therefor**e** an attempt to by-pass the mountains would render it difficult. Opt**ion D which** is the most direct route is the longest in Kenya at 693 km. Of the three options, D traverses the most road networks in Laikipia, Samburu and Marsabit County. Since the area traversed by option D was less inhabited then although the maps show a higher concentration of public roads, they are largely impassable and need reconstruction. This means that transportation of construction materials and O & M would not be easy for this option due to the road conditions and there is a need to construct service roads during the T/L construction for this option (see Part II-Kenyan Report for more).

The study also compared the Options in terms of route distance under each option. For the new route Option D, the distance is reduced from the previous study Option A/C by 37 km. See details in Map 3-1.

Map 3-1: Transmission Line Route Options



A preliminary cost estimate exercise was also done by applying the unit rate of USD 385,000 / Km. This was arrived by escalating and converting to USD the unit rate of EURO 250,000 / Km adopted from Fichtner's study). Accordingly the construction cost of line D is 413,105,000 USD which is marginally less that A/C & B.

3.2 Conclusions and recommendation

1. The stakeholders recommended investigating route option D, assuming that investment cost will be reduced by 10% to 15% due to direct and shorter connection between Wolayita Sodo and Longonot which justifies the change in the route. But during preliminary route reconnaissance investigation the assumed reduction was estimated as 5% only. Option D, in Ethiopia, has no road after Teltelle town for the next 108 km for to transport construction materials and maintenance and hence required construction of additional road compared to other options where the T/L is located along the main asphalted road. At this stage the road cost cannot be estimated. Thus the advantages of investments costs related to reduction of length of transmission seem to be offset by the cost of road construction. .

2. Option D was also expected to reduce environmental and socioeconomic impacts significantly as compared to the other options. When comparing the options, route D is slightly better in all conditions but the reduction in cost is not as expected; that is the difference in cost between route D and A/C is found to be marginal. There are technical issues raised about rampant prolonged flooding during rainy seasons in the Chalbi Desert portion, east of Lake Turkana in Kenya and this is assumed to increase the cost of tower construction. In addition to that maintenance will be difficult since most of the traversed area is flooded every time it rains and hence remain flooded for most parts of the year. Thus the difference in cost between routes D & A/C which was initially found to be marginal has the potential of increasing phenomenally due to construction and O&M cost.

3. The environmental, social, cultural and economic impacts under option D are little lesser than the other options. Even though, all the options (including D) pass through densely populated, intensively cultivated and cultural and historical sensitive area of Konso (that is where most of the impacts occur), the route after Konso has sparse settlement (between 7-20 persons/km^2). This segment of the route (in A, B, C, D) characterized by little cultivation as most of the people are pastoralists or agro-pastoralists.

4. The route option D does not traverse towns except Teltelle where as the other routes pass through or close to number towns and villages. OPGW installed on the line will have more socio-economic benefit along route Options A/C and B in Kenya than along Option D. This is because there are more urban centers and county headquarters along the earlier than along the later. The use of OPGW for facilitating information technology (IT), FM radio, mobile phone access and television will help the countries meets its obligations under the MDGs and the Vision 2030. This socio-economic factor caused coupled with longer distances that have potential of flooding during rainy season in the Chalbi Desert, caused Option A/C to become more attractive than Option D which was earlier picked as the most optimum route.

5. Huge amount of resources (financial, manpower and time) was put on the study of route A/C in the past years. Fichtner has conducted feasibility and design study on route A/C. The route option D requires works on road construction, survey and preliminary and detail design and full ESIA/RAP works as well as feasibility study before determining the route is technically and environmentally feasible that might take several years. Whereas route A/C needs only review and detailed design works apart from being technically and environmentally acceptable.

6. In order to exhaust all comments of all stakeholders of the project, comparison of all possible routes- from technical, ecological, and economic points of view were undertaken to come to a final decision on the route preferred to project implementation. Discussion with the client gave emphasis on the need of long distance road construction work in option D. The construction of the road is beyond the mandates of EEPCo and that could delay the project longer than necessary. Further, during consultations with the Client and Financiers, it was discovered that the scaling of the maps included in the reports gave erroneous impression that Option A/C route traversed Matthew's Range and Losai protected areas. By increasing the scale of the map adequately it is shown that the route traverses well outside the two protected areas. Thus Option A/C route was able to regain the credit it earlier apparently lost.

7. From the above argument, it is concluded that the best implementable and more realistic route option is A/C as originally identified under the Fichtner, 2009 study. Under this consultancy, the RoW information will be updated and mitigation measures on the negative impacts recommended while positive impacts will be highlighted to enhance the project.

3.3 Analysis of Alternatives

Five project alternatives have been considered including no project options during the route selection study phase. The main purpose of the routing options analysis was to assess most important elements like existing roads along the alternative route, distance and cost and more importantly environmental and social impacts.

During the route line study, the Consultants assessed the alternatives examined the routes which can avoid ecologically sensitive areas and settlements as well as other issues such as project duration, cost and OPGW services for urban centers. The results of the observations and suggestions for routing improvements are described as below. All options (A, B, C, & D) have about 204 Km distance in common. The common route segment is characterized by dense population settlement, intensive agriculture and archaeologically sensitive area.

3.4 No Project Option ("Do Nothing" Option)

Ethiopia has a large hydropower potential which is in excess of its national requirement. On the other hand power demand is growing in Kenya. Since Kenya produces its energy mainly from fossil fuels, hydropower-based electricity imports from Ethiopia will lead to a reduction in greenhouse gas emissions and other air pollutants. Ethiopia will benefit from income generated from the sales of power in the form of foreign exchange. The project creates high opportunities of economic and trade enhancement that arises from the implementation of power interconnection between the two countries.

The Ethiopia and Kenya Interconnection Project provides environmental and economical benefits to the countries. If the Project would not be realized, then both Ethiopia and Kenya would miss this chance to profit.

Beside this, the realization of this Project is important for the development of power exchange in Africa, as it will close a major gap by establishing a link for the power connection of North Africa to the South, or the Assessment of Alternatives interconnection between the ENSAP and the NELSAP countries respectively.

On the other hand, the adverse impacts identified in the Chapter Impact Assessment would not occur and Project funds could be invested in alternative projects such as water and sanitation projects, or rural infrastructure development projects which could bring sustainable benefits to local communities.

The no project option is the least preferred option because it disallows the trade link that would be created and the social and economic ties between Ethiopia and Kenya. The loss of monetary and value added benefits makes this option unfavorable.

Route Option A

Option A starts from Sodo S/S and traverses Arba Minch, Konso, Brindar, Yabello, Mega areas and to the Kenyan border (at about 421630(E) and 399493 (N) From Ethio-Kenya Border, the line crosses through Marsabit, Seradupi, Isiolo, Gilgil, Naivasha and Longonot S/S. Environmentally, the line passes through or close to parks, bird sanctuary and endemic plant species. With respect to social, economic and cultural point of view, like all options, it passes through the areas of highly populated, intensive agriculture and historical and cultural sensitive areas. Additionally the line passes close to Yabello Bird sanctuary and passes through the Mega Plateau which is known for its endemic species in Ethiopia.

Route Option B

The route option B has the common route from Sodo S/S to Brindar and further extends to Yabello, Mega, Moyale where it crosses the border (at about 501364 (E) and 392827 (N)) and from border the route line passes through Turbi, Marsabit, Laisamis, Seradupi, Isiolo, Gilgil, Naivasha and Longonot S/S. It has the same environmental and socio-cultural concerns as option A.

Route Option C

Option C follows the same line route up to Mega. From Mega it extends to the border closely extending with line A with only 1.5 km distance apart in between the line A and C in Ethiopia. After entering the Kenyan border the line passes to the right of Marsabit, right of Laisamis, right of Seradupia, Left of Wamba, Rumuruti, Gilgil and Longonot S/S. This option has the same environmental and socioeconomic and cultural concerns as Option A

Route Option D

The option starts from Sodo S/S and passes through the most densely populated area of Sodo, Arma Minch, Konso , and Brindar town and it turns to left and continues to Telelle and straight south to the border (at 0297450 (E) and 0473159 (N). In Kenya the line passes through left of Dukana, Kalacha, Right of South Horr, Kisama, Rumuruti, Gilgil and Longonot S/S. Option D is the shortest of all the route options. It is attractive considering the distance of the line but inexistence of road makes construction and operation most difficult particularly during the rainy season where the route passes through swampy ground, raising the cost of the project. Option D raises lesser environmental, economic and cultural concerns compared to the other three alternatives. After Konso (common route) the line poses minimal threat to the environment and society.

In conclusion among the options route A/C is considered relatively better in terms of overall cost, availability of road for O & M and using the line for OPGW that benefit urban centers.

Table of Contents

List of Maps

4 SELECTED ROUTE (OPTION A/C) AND LOCATION

The transmission line inside Ethiopia traverses two Regional States, the South Nations and Nationalities People's Regional State (SNNPRS) and Oromia. It passes through eight woredas (districts) and 34 rural kebeles.

As showen in Map 4-1, the investigated part of the route in Ethiopian starts from the outskirts of Sodo Town in Sodo Zuria woreda in SNNPRS and enters in to Kenya in Mega woreda of the Oromia Region. The route crosses Sodo Zuria, Humbo, Mirab Abaya, Arba Minch Zuria, Derashie, Konso woredas of SNNPR and stretches further through Yabelo and Dire woredas of Oromia Regional State to the Kenyan border.

The total transmission line distance of route A/C in Ethiopia is about 433 km. The Routing passes near the western shores of Lake Abaya and Lake Chamo in SNNP.

The total length of the project in the routing in Ethiopia can be divided into two distinct sections. The first section of the route for the transmission line, which is from km 00 to km 204 (from Sodo substation to Konso woreda) comprises about 53% of the total km distance and is located in SNNPRS. This section is known for its intensive cultivation and dense population. In this section, there is only very little land which is not cultivated or without settlements.

The second section, which is from km 204 to the border (433 km), covers a very wide uninhabited area with very low cultivation and thinly distributed population and is located in the Oromia region. This section is partly occupied by crop producer, agro pastoralist and also by pastoralist nomadic communities. Agro climatically, it is located in mid land and low land areas except for some specific locations (Kenya-Ethiopia border) located in the high lands. In this section, the transmission line partly traverses through bush areas, natural forest and grazing area for livestock.

A substation will be located in Sodo Zuria Woreda at a place named Waranza Lasho (Gantry Center), approx. 5 km north-western from the town of Sodo. The substation will affect 200,000 m² (or 20 hectare) and will be constructed on a plot size of 500m x 400m.

Most woredas in SNNPRS have very high population density and suffer from population pressure and lack of land for cultivation. SNNPRS suffers from food shortage partly due to recurrent drought situation. The food shortage is also exacerbated by the highly fragmented land size, high population growth and degradation of soil fertility. In Oromia, the lowland and pastoralist areas also face problems of drought and shortage of water for livestock farming.

The mainstay of the people in both regions is dependent on agriculture and agro pastoralism, farming and livestock rearing are the basic livelihood of the people. The crop producing areas are mainly located in the SNNPRS, which produces cereals, pulses, root crops, fruits and stimulants like coffee and hops, whereas the two traversed districts in Oromia are dominated by pastoral nomads who mainly depend on livestock resources, mostly on cattle. Agriculture is predominately carried out by small holder farmers whose land size is highly fragmented, the average holding size in most woredas is below 1 hectare.

Farming is practiced by using traditional methods, like oxen plough and hoe cultivation. Industrial growth and other economic activities are very limited, concentrated in the major cities, and nonexistent in some rural localities.

The transmission line traverses through rural sections mainly and no urban centre is located within the RoW of the investigated routing. Anyhow, a number of rural villages having dense population and intensively cultivated farmlands will be crossed by the project.

Map 4-1: Ethiopia-Kenya Power System Interconnection Transmission Line Route A/C

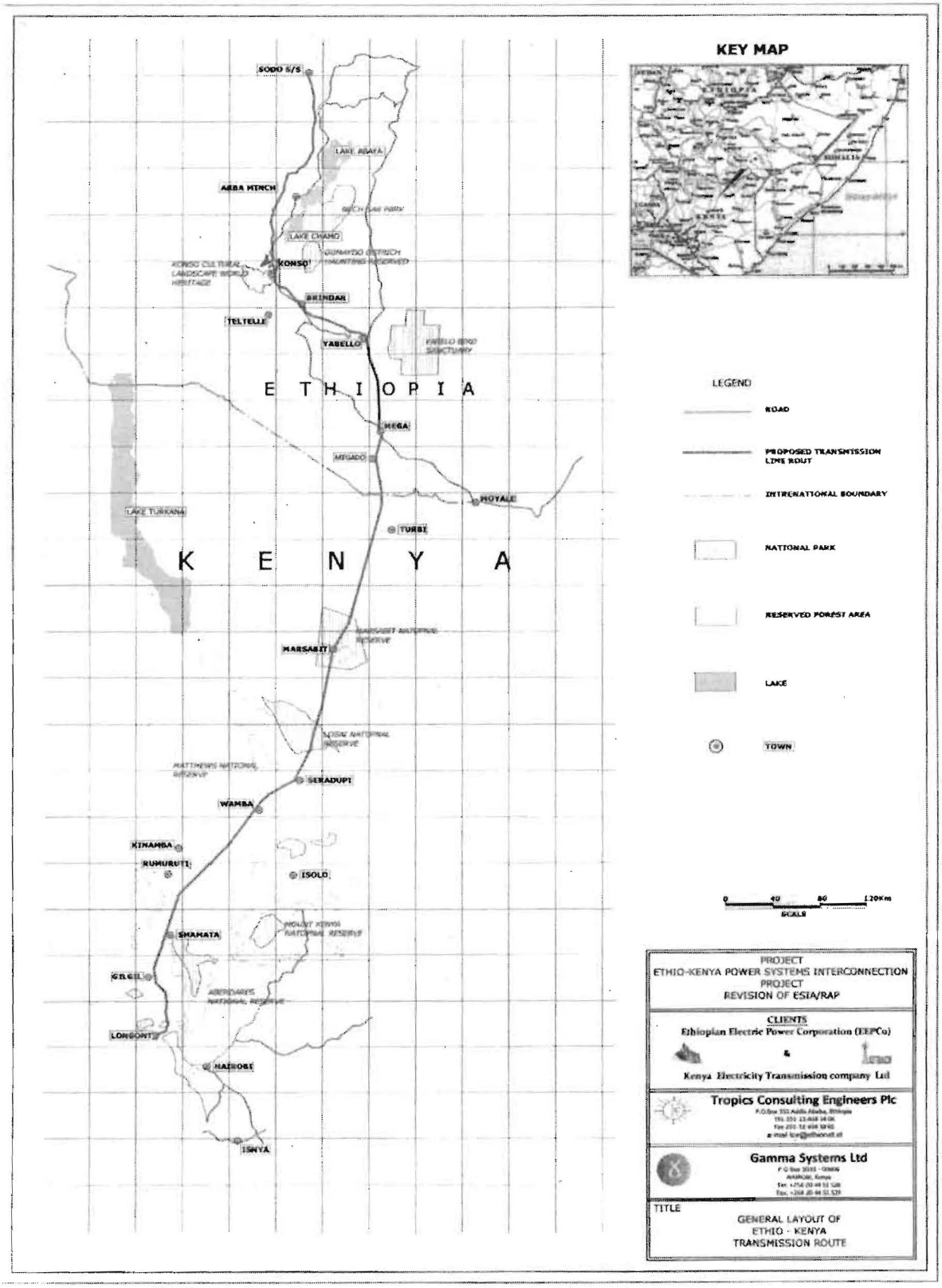


Table of Contents

List of Tables

List of Figures

5 PROJECT JUSTIFICATION AND DESCRIPTION

5.1 Introduction

Ethiopia is well endowed with a huge hydro generation potential which is estimated at about 45,000 MW. In line with the country's energy policy, the Government of Ethiopia has given attention to the development of these indigenous resources for domestic demand and export market.

In search of external markets, the Government of Ethiopia is working hard towards forming power system interconnection with its neighboring countries for the benefit all parties.

The Ethiopia–Kenya Transmission Interconnection Project was a part of the Power Planning Study carried by Ethiopian Electric Light and Power Authority (EELPA), now EEPCo, in Oct.1982. This study recommended a feasibility study for the interconnection.

The Nile Basin Initiative recognizes that the potential for electricity trade in the Eastern Nile countries is enormous and can provide significant socio-economic and environmental benefits.

One of the problems to the development of a regional market is insufficient transmission infrastructures. Therefore the project is expected to solve this problem and create the transmission capacity to supply power between Ethiopia and Kenya in the long run. On top of this the project will optimize investment in power infrastructure that will facilitate the coordinated development of interconnection

On May 7, 2006 Ethiopia and Kenya signed a memorandum of understanding that underscored the need to recognize the comparative advantage of Ethiopia over Kenya in terms of hydropower generation, and technically cooperate in power generation, transmission, rural electrification and customer services. In this regard, it was agreed that a power system interconnection between the systems of Ethiopia and Kenya be established.

The Government of the Federal Democratic republic of Ethiopia and the Government of the republic of Kenya have reached an understanding to implement a power interconnection project between the two systems after taking into consideration recent developments in the countries and the region at large such as the Nile basin initiatives, Eastern Africa Power pool, eastern Africa Power master plan, etc. the memorandum of understanding for the implementation of Ethiopia –Kenya interconnection line has been.

The Ethiopia –Kenya Power Systems Interconnection Project Feasibility study was sighed between the Ethiopain Electric Power Corporation and the Ministry of Energy of Kenya, the donor KfW and the consultant FICHTNER on Jan, 2008 to conduct the feasibility study of the project.

Terms of reference has been prepared for consultancy services to prepare the project. The terms of reference covers;

I. The feasibility study of Ethiopia and Kenya power Systems Interconnector
II. Environmental and social impact assessment (ESIA) and Resettlement Action Plan (RAP) studies.

The project coordination office is located in Addis Ababa under the Ethiopian Electric Power Corporation.

5.1.1 Description of Proposed Works

A new transmission line with self-supporting steel lattice towers with concrete foundations will be built from Sodo in Ethiopia to Longonot in Kenya. Substations will be built at Sodo (Ethiopia), and Longonot (in Kenya).

Construction activities will be caused by

- RoW clearance,
- building of construction roads, material storage and camp areas,
- excavation, foundation and erection of the towers,
- installation of the conductors,
- building of the substations,
- dismantling of construction roads, material storage and camp areas when construction activities are completed

5.1.2 Technical Description

The infrastructure to be constructed for the power interconnection project is mainly conventional lattice self-supporting steel tower and sub stations.

The technical feasibility study recommends adopting for Phase 1 of the Kenya-Ethiopia Interconnection Project a conceptual design featuring (see also Figure 5-1):

- 1045 km, ±500 kV HVDC bipolar overhead line, from Wolayta/Sodo S/S on the Ethiopian side to a new Longonot 400 kV S/S on the Kenyan side, sized for the Phase 2 link capacity of 2000 MW
- 2x500 MW line-commutated bidirectional bipole at Wolayta/Sodo and at Longonot
- Ground electrode lines at Wolayta/Sodo and Longonot
- 80 km, 400 kV double circuit HVAC line from Longonot to Isinya on the Kenyan side (operated initially at 220 kV)
- 55km, 400 kV double circuit HVAC line from Gilgel Gibe III to Wolayta/Sodo
- five 400 kV 1½ breaker diameters at Wolayta/Sodo on the Ethiopian side,
- seven 400 kV 1½ breaker diameters at Longonot on the Kenyan side, including switched shunt compensation, dynamic compensation and stepdown transformers
- provision for additional bays at Isinya S/S to accommodate the interim 220 kV and the final 400 kV operation of the Longonot line
- one synchronous condenser rated 200 MVAr at Longonot S/S

This arrangement was tested by simulations and found to have acceptable steady state and dynamic performances for the targeted maximum transfer, under permanent outages of AC or DC overhead line circuits. Taking into account the construction schedules of installations of similar complexity, it is estimated that this phase can be completed at the earliest by 2012.

Summary of basic information for the transmission line:

Approximate number of towers: 2813 (1085 in Ethiopia and 1728 in Kenya, assuming 2-3 towers per line–km as average of flat and hilly terrain as mentioned in the feasibility study)

- Approximate average span length: 400 m
- Width of line corridor (RoW):50- 60 m (Figure 5-2)
- Overall project implementation time: 30 months, six work teams
- Access road: a 5m wide road along the line route will be required for repair and maintenance purposes, when public roads cannot be used.

In Phase 2 of the project, the link capacity has to be upgraded to 2000 MW by 2019, under the same outage assumptions, using the HVDC bipolar line constructed in Phase 1 and adding 1000 MW converter capacity at each terminal. This can be done in a cost-effective way by paralleling identical converters to the existing ones.

The main reasons for recommending the above conceptual design are:

- true regional transmission configuration, allowing for flexible use of major hydro resources on the Ethiopian side
- prepared for the future HVAC interconnections to Uganda and Tanzania
- increased reliability of supply in the Nairobi area by major import/export hubs at Longonot (and Isinya)
- reduced environment impact due to DC technology on 85 % of the line length conventional,
- well proven technology for long distance HVDC links
- good dynamic stability due to de-coupling between power systems with very different generation structures (no cascading failures)
- bidirectional control of the power flow over the interconnector

Transmission Line Corridor/ Right of Way

- The width of the RoW for the Project will be related to the final design e.g.
- tower design and number of towers, which is not available at this feasibility
- stage of the Project. Space occupied as RoW by the HVDC 400 kV line is
- expected to be 65 meters
- Trees with the heights lower than 4 meter will be permitted inside a 20
- meter line corridor and the trees lower than 8 meter will be permitted in the
- rest of line corridor. The environmental and safety corridor is restricted by 2
- kV/m maximum electric field. The maximum swing deviations of the lower
- line phases is also included in the RoW

If people will need to be resettled because their remaining plot is not sufficient to rebuild their houses and provide sufficient source of livelihood, additional land will be required for their resettlement. Land will be also required for workers camps, temporary storage areas and construction roads.

The amount of required land for resettlement, workers camps, temporary storage areas and construction roads and the resulting impacts need to be established when the technical details are finally known.

5.1.3 *Transmission Line Tower Geometry*

Figure _ shows the tower geometry of the transmission line. Accordingly the height of the tower 37.25 meter above the ground the tower width is 14.5m. Construction of houses (structure) should be 30 m away from the center of the tower.

All vegetation above 4 meter within 10m range from the center will be cleared. 8 meter told of trees in the next 10m will also be cleared maximum per method trees with in 25m should be less than 25 meters (Figure 5-3)

Figure 5-1: HVDC 500kV Bipolar Line Dimensions

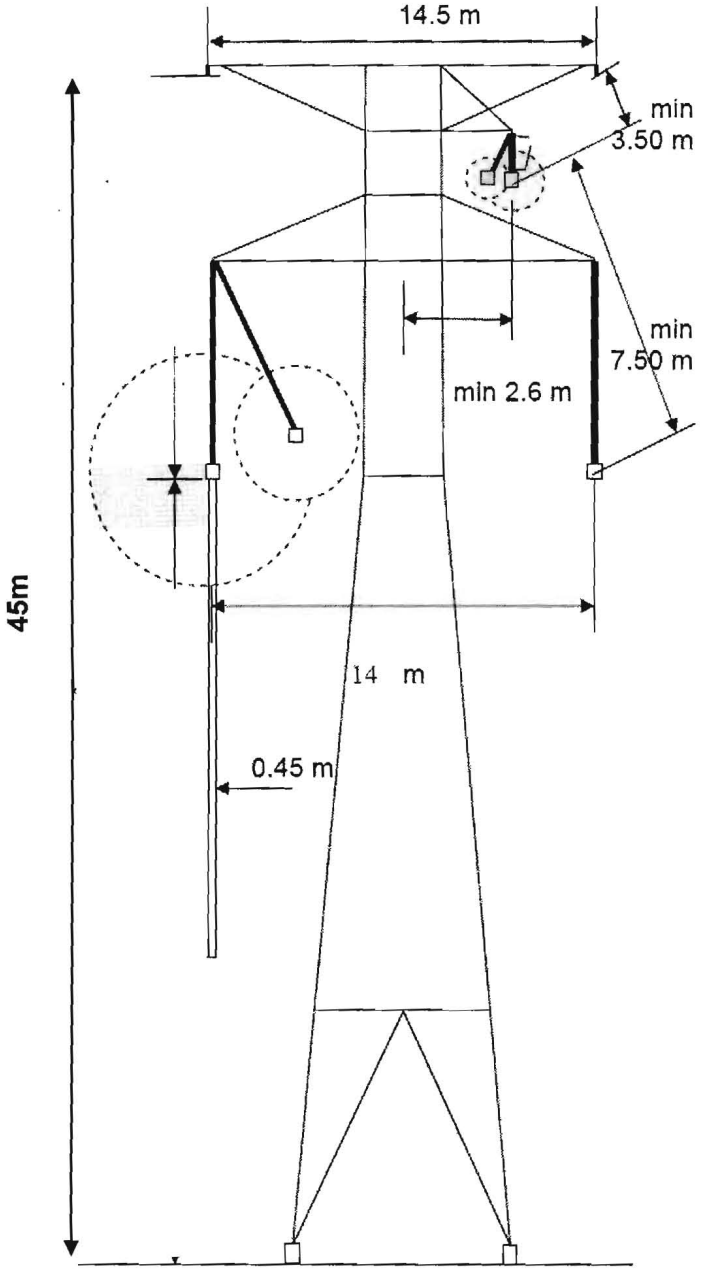


Figure 5-2: HVDC 500 kV Bipolar Line Corridor

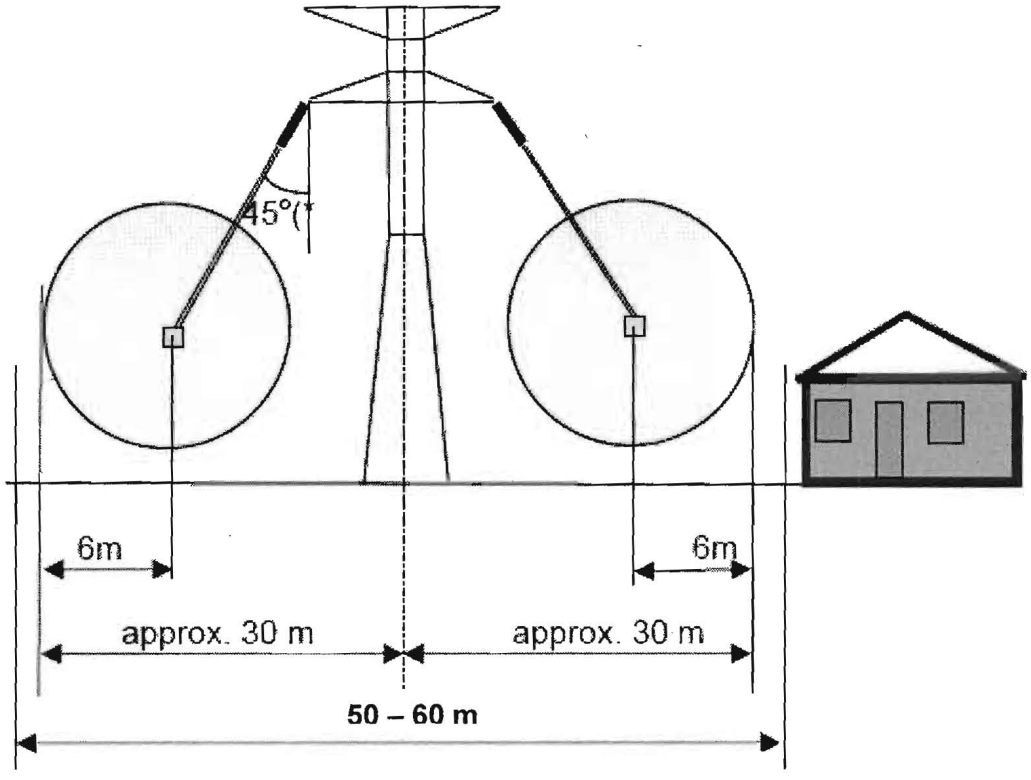
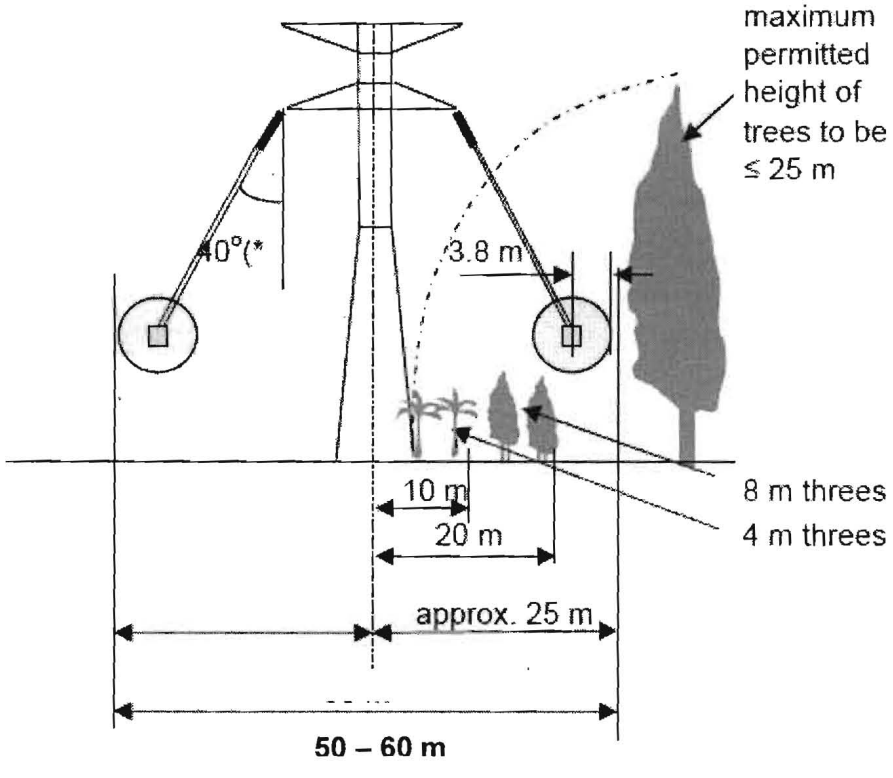


Figure 5-3: Line Corridor for Non Populated Areas



5.1.3 Ancillary facilities and services

The following construction and post-construction facilities and services will be required.

- Tower erection, this follows tower foundation excavation/construction and uses the same area used by civil works.
- Approximately 6 construction material storage and camp areas will be required (Contractor to determine actual number), each approximately 5ha in area.
- Access for stringing of conductors is along the line corridor.
- Access to tower sites will be via the line corridor whenever possible to reduce the number of temporary access roads required during construction.
- A number of permanent access roads will be required for maintenance purposes along the transmission line route.

5.1.4 Operation and maintenance Activities

Maintenance shall be carried out twice a year, but this will depend on the site conditions.

Right of Way

The area directly below the transmission line will be defined as RoW (50-60 m in width, i.e. 30 m to each side from the route line centre). Since limited land use will be as long as it is in compliance with the safety requirements, only necessary areas shall be cleared from vegetation.

The width of the areas to be cleared or cut down vegetation depends on the height of the vegetation. The maintenance measures shall ensure that appropriate clearances between towers, conductors, vegetation and other objects are maintained according to the required safety distances.

Construction roads shall remain as access to the RoW respectively the towers, only in absence of public roads.

Substation Maintenance

An ongoing maintenance program will be required for the TL and the substations. This will include controlling of isolators and periodic replacement of coolants/lubricants in the transformers. Both EEPCO and KPLC have indicated that they will no longer use transformers containing Polychlorinated Biphenyls PCBs -as commonly used in old equipment which is toxic to the environment and humans. They also have agreed to a program of replacing old transformers and disposing of any hazardous/toxic materials in accordance with international best practice.

Both countries are signatories to the Stockholm Convention on Persistent Organic Pollutants (POPs), a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods. The signatory parties shall take measures to eliminate or reduce the release of POPs into the environment.

Considering this, and the fact that Ethiopia undertakes efforts with regard to replacement and disposal of PCBs stockpiles and wastes through a phase by- phase approach, it is therefore not expected and recommended that equipment containing POPs will be used for the Project. (See also legal and regulatory section of this report for more).

5.1.5 *Area of impact*

The area of immediate impact will be the Line corridor Right-of-way (ROW) which will be 50-60 m in width by 1082 km (433 km in Ethiopia) in length from Sodo in Ethiopia to Longonot in Kenya. A parallel strip of land through those sections of the route which pass through vegetation will also be completely cleared of all trees, scrub and undergrowth above a height of 150 mm during the construction stage. Appropriate clearance between conductors and vegetation/structures along this corridor will be maintained throughout the life of the transmission line. Cropping and grazing beneath the conductors is normally permitted.

5.1.6 *Land Requirement*

For Each Suspension Tower: 300m^2 / tower permanently used and 6oo m^2 temporary needed during construction phase. 995 suspension towers are estimated in all 433 km distance (assuming 2.5 towers/ km).

For each Tension Tower (Angle Tower): 500 m^2 /Tower permanently taken and 1ooo m^2 temporarily need during construction. About 65 Angle tower estimated along the 433 km line.

Storage and Camp site required in all 433 km is 4. Each storage and camp sites is 10,000 m^2.

Access road needed is 4 m wide from villages to the T/L and 2 m wide along the T/L. The 2 meter could be within the RoW but the 4 meter access from village or main road is additional. At this moment the total such access road needed is very difficult to estimate. This could be determined during the construction period.

In conclusion: the total land required will be: 2387 ha permanently and 86.2 ha temporarily needed (details are given in Table 5.1).

Table 5-1: Permanent and Temporary Land Required

Reason for land Take	Dimension	m^2	ha
Permanent			
Substation	500 m x 400 m	200,000	20
Suspension Tower	995x300 m^2	298,500	29.85
Angle Tower	65x500	32,500	3.25
Sub-total		531,000	53.1
RoW	433 km		
Densly Populated Area (RoW 60 m)	60 m x 202,000 m	12,120,000	1212
Sparesly populated Area (RoW 50 m)	50 m x 231,000 m	11,550,000	1155
Sub-total		23,670,000	2367
Total Permanent		**24,201,000**	**2420.1**
Net Land Required (total less towers)		**23,870,000**	**2387**
Temporary			
Suspension Tower Working Space	995x600 m2	597000	59.7
Angle Tower	65x1000	65000	6.5
Storage & Camp sites	4x10000	40000	4
Access Road (every 10 km along 433 km) and 40 enterance	40x1000x4 m2	160000	16
Total Temporary		**862,000**	**86.2**

4.1.7 *Project implementation*

Considering the present situation on the market for HVDC equipment, it is expected that the manufacturing lead time for major items like power transformers and converters will be a minimum of 2 years (Table 5-2).

A standard 30 months time schedule from contract award to commercial operation of a long distance HVDC link is shown below for ease of reference.

Table 5-2: Typical Time Schedule up to Commercial Operation of a Long Distance HVDC link (taken from Feasibility Study)

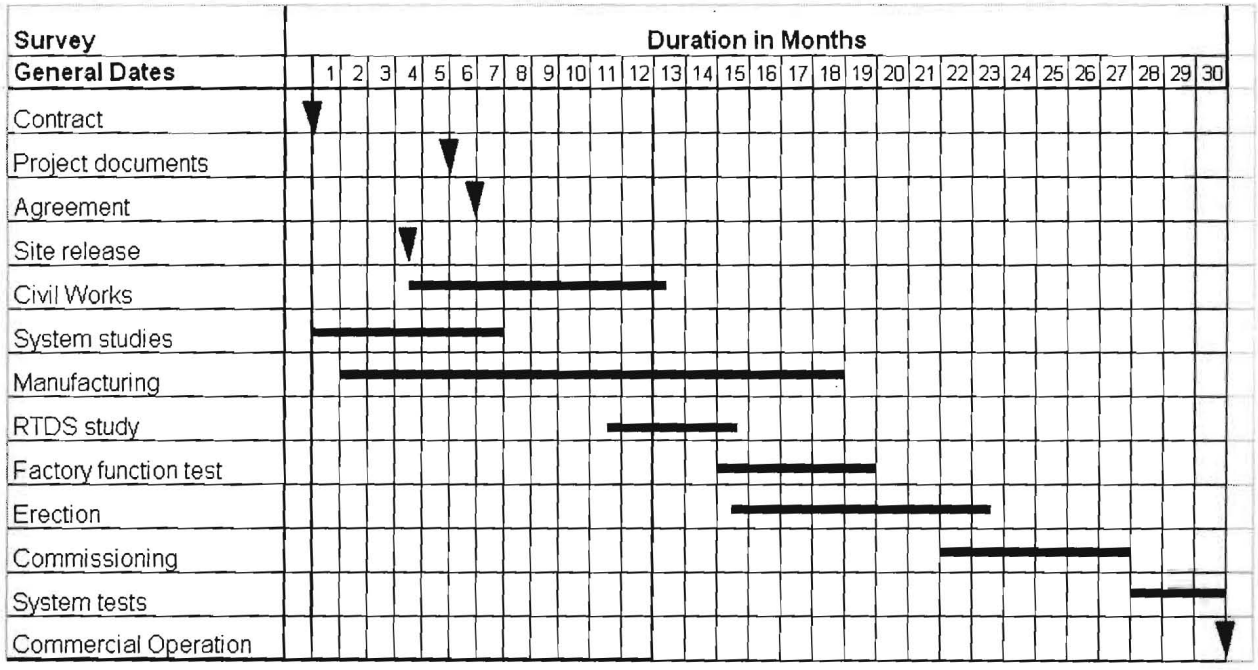


Table of Contents

6 RESETTLEMENT AND COMPENSATION IN ETHIOPIA

The main objective of the RAP is to ensure that people living in the project area are not impoverished due the implementation of the project. The implementation of the project has to be carried out without making much negative impacts on the livelihood of the population and the environment. Appropriate mitigation and compensation measures have to be taken to ensure that the impacts from the construction of the transmission line are minimal. The RAP establishes the basis for the design of relocation and resettlement of the project affected persons.

In general the RAP study is based on a development approach. It aims to avoid the impoverishment of PAPs due to development projects; it takes care of vulnerable groups, puts emphasis on community participation, and considers providing support to host communities.

The RAP study is completed on the basis of data and information collected through household census survey of the Project Affected Persons (PAP) and survey of the affected farmlands, housing structures and other assets is carried out to provide adequate information and to take appropriate mitigation and compensation measures.

Public consultation and meetings were held with PAPs and local communities crossed by the transmission line and their views and opinions included in the report. Similarly, public consultations were in all nine woredas with concerned authorities and experts from sector offices. There have been more than five public consultations and meetings carried out with each woreda starting from the reconnaissance survey to socio economic survey phases. The public have been made to be aware of the project impacts and mitigation measures, the procedures and measures to be adopted during implementation process. During public consultations and meetings held with woreda level offices, all woredas have agreed to provide support and assistance for people that will be losing their properties and assets, farmland, residence and business due to the construction of the transmission line.

A number of committees are established as per FDRE proclamation 455/2005 at each woreda level; the committees established include Compensation and resettlement committees, Property valuation committees, and Grievance redress committees. The establishment of the above committees ensures that the implementation of the RAP is carried out as per the FDRE laws and guidelines of the financing institutions.

According to the preliminary household census survey, inside Ethiopia, the project will affect 1165 households having a population or family size of 5743. Most of the impacts are mainly on farmlands and trees. In addition to farmland and trees, housing structures will also be affected by the construction of the transmission line. A total size of 321 hectares of farmland that belongs to 1165 individual farmers and institutions that are located in nine woredas (districts) is affected due to the construction of the transmission line. In addition to the farmlands, an estimated 20 hectares of communal grazing is also affected due to the construction of a substation in Sodo area.

Apart from the farmlands, 256 housing structures, and of which, 149 are constructed with wood and mud and covered with Corrugated Iron Sheet (CIS) or known as "Chika bet" and 107 are thatched roof (Tukul) are also affected.

In addition to the individual farming households that will lose their farm and housing structures, there are also 18 different public and community assets and facilities, such as, Church buildings, Fences and Trees that are going to be affected.

Since the project is a linear one, it is only some portion of farmlands that are located within the right of way will be lost in most cases. In such cases, there is no need for resettlement of PAPs outside of their locality. A PAP who may be losing part of his farmland could be able to survive and continue his livelihood in the remaining plot.

Similarly, houses affected are either partial or full depending on the proximity of the house from the right of way. In most cases, if a person's house affected by the project, he could be able to reconstruct or build in the remaining plot of land by moving to the back side.

The project affected populations even if they are not displaced from their current location, they will be made to live in economically unviable situations because of loss of land, crop, assets and housing structures. Hence, in such situations PAPs will be offered full resettlement package.

Since the project is linear one there will not be major impact in clusters. However, there will be definitely some households that need to be relocated and re established, and hence, PAPs will receive full resettlement packages.

The RAP establishes the basis of resettlement packages of the affected population and sets compensation estimates for affected properties and assets. Compensation estimates for PAPs is prepared at full replacement cost. A budget is prepared for RAP, which includes income restoration, rehabilitation measures, and project management activities and contingencies.

Compensation estimates are made for lost assets and properties on affected crops, houses and lost income. No cost estimate is made for land since land in Ethiopia belongs to the public and that it could not be sold or mortgaged. The estimated cost for the RAP includes costs for compensation of crops, compensation for trees, houses, and also administrative, monitoring and income restoration and contingency costs. The total amount of budget for the RAP is Birr 237,592,397 (or 13,601,657 USD). Out of the above budget, 78% goes for compensation payment, 4.5% for rehabilitation measures and 7.5% for project management cost and 10% is contingency.

Table of Contents

7 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

7.1 Policy and Strategy

7.1.1 Environmental Policy of Ethiopia

The Environmental Policy of the Federal Democratic Republic of Ethiopia was approved by the Council of Ministers in April 1997. Its overall policy goal may be summarized in terms of the improvement and enhancement of the health and quality of life of all Ethiopians, and the promotion of sustainable social and economic development through the adoption of sound environmental management principles. The policy is integrated with the overall long-term strategy of the country - agricultural led industrialization and other key national policies. It sets out its specific objectives and key guiding principles, contains sectoral and cross-sectoral policies and provisions necessary for the appropriate implementation of the Policy itself.

With respect to environmental impact assessment (EIA) the Policy sets out specific policies, key elements of which may be summarized hereunder:

- The need to address social, socio-economic, political and cultural impacts, in addition to physical and biological impacts, and to integrate public consultation within the EIA procedures.
- Incorporation of impact containment measures into the design process of public and private sector development projects and inclusion into EIA of mitigation measures and accident contingency plans.
- Development of detailed technical sectoral guidelines for EIA and environmental auditing.
- Establishment of an interlinked legal and institutional framework for the EIA process to ensure that development projects are subjected to environmental impact assessment, audit and approval in a coordinated manner.
- Development of EIA and environmental auditing capacity within the Environmental Protection Authority, sectoral ministries and agencies as well as regions.

The Policy has been developed as a national instrument enhancing the objectives of the Constitution and setting out clear cut directions with respect to environmental concerns particularly in terms of regulatory measures adopted as well as in the process of design, implementation and operation of development projects. Its recognition of the significance of addressing cross-sectoral environmental issues in the context of a national approach to environmental assessment and management integrates the efforts of a wide range of institutions across the country.

This policy is considered as intent for the provision of a sound and rational basis for addressing the transmission line environmental problems in a coordinated manner.

The broad guiding principles under the Federal Constitution and the more instructive directions set out under the Environmental Policy of Ethiopia, environmental issues have been further expanded and refined by three environmental framework legislations designed to enable implementation of the Federal policies on environment. These legislations are instrumental to translating the broad objectives of the policies into practice, as they provide for specific rules of substance and procedures having the force of law across the country. The legislations are described below in sections 6.2.2, 6.2.3 and 6.2.4.

7.1.2 *Cultural Policy of Ethiopia*

The working cultural policy of Ethiopia (endorsed in 1997) gives more attention to the inventory and standardization (Article 1); Study, Research and Development (Article 2); Protection, Conservation and Inspection (Article 4) and, Repatriation and Restitution (Article 5) of Heritage. For instance, with regard to the conservation, preservation and inspection of heritage, Article 4.3 emphasizes that an appropriate precondition shall be arranged to protect sites of heritage from damages caused by construction works and other development activities

7.1.3 *Sectoral Policies*

As measures to effectively deal with environmental problems several sectoral policies have been issued. These include:

- National Population Policy issued in April 1993
- National Policy on Women issued in March 1993
- National Agricultural Resource Policy and Strategy issued in 1993
- Energy Policy issued in 1994
- Water Resource Management Policy in 1999
- Policy on Biodiversity Conservation and Research issued in April 1998
- Rural Development Policy and Strategy issued in 2002
- Sustainable Development and Poverty Reduction program issued in 2002

7.1.4 *National and Regional Conservation Strategies*

Ethiopia has formulated a National Conservation Strategy which takes a holistic view of the natural, cultural and human resources and seeks to integrate into a coherent framework, plans, policies and investment related to environmental sustainability. Within this framework, region-specific conservation strategies have been formulated and these have been taken into consideration for this ESIA. The Oromia and SNNPRS Regions have in place their own Regional Conservation Strategy).

7.2 The Federal Constitution

The constitution of the Federal Democratic Republic Ethiopia issued on August 21, 1995, forms the fundamental basis for enhancement of specific legislative instruments governing environmental matters in Ethiopia. Among the most important provisions relevant to environmental and social impact assessment are: Article 40(3) (the right to ownership of rural, urban land and natural resources); Article 40(4) (the rights of farmers to obtain the land without payment and the protection against eviction from their possession); Article 40(5) (the rights of pastoralists to free land for grazing and cultivation); Article 40(7) emphasizes on the right to acquire property for the purpose of overriding national interest it empowers the government to expropriate private property for public purposes subject to payment in advance of compensation commensurate to the value of the property; Article 41(9) deals with economic, social and cultural rights and sets out the State responsibilities to protect and preserve historical and cultural legacies; Article 43 (2) (the rights of the people to be consulted with respect to policies and projects affecting their community).

More specifically the constitution in its Article 92 affirms the commitment of the government to ensure that all Ethiopian live in a clean and healthy environment, puts the principles that designs and implementation of development programs and project not to damage the environment and the need to fulfill consultation and the expression of views in the planning and implementation of environmental policies on projects that affect them directly.

Hence the Constitution of Ethiopia is considered as the sources of sound environmental development including hydropower and transmission line activities in the country.

7.3 Environmental and Sectoral Legislation

7.3.1 Legislation on Expropriation of Land Holdings Public Purposesand Payment of Compensation(Proc. N° 255/2005)

The Federal proclamation on Expropriation of Land for Public Purposes & Compensation) sets the time limits within which land could be acquired after a request is received from a proponent, principles for assessment of compensation for properties on the land as well as for displacement compensation. In the case of public-owned infrastructures to be removed from the right-of-way the owners of the structures would assess the value of the properties to be removed. Furthermore the legislation provided for appeals on valuation decisions but such action would not delay transfer of possession of land to the proponent or contractor appointed by the proponent.

The Proclamation is applicable to the transmission line development and is the legal basis for relocation and compensation payment for lost properties to the people affected.

7.3.2 Environmental Impact Assessment Proclamation (Proc. N° 299/2002)

This Proclamation (No 299/2002) as it should be applicable to the Ethiopia-Kenya Power System Interconnection Project and aims primarily at making environmental impact assessment (EIA) mandatory for categories of projects specified under a directive issued by the Environmental Protection Authority (see 3.3.1) whether such projects belong to public or private bodies. The Authority issued several directives subjecting categories of projects to environmental impact assessment. The Proclamation describes a policy, strategy, program, law or an international agreement as "public instrument" and directs the Authority to issue guidelines distinctively classifying certain categories of public instruments as likely to entail significant environmental impact. The Proclamation requires, among others:

- Specified categories of projects to be subjected to EIA and receive an authorization from the Authority or the relevant regional environmental agency prior to commencing implementation of the project.
- Licensing agencies to ensure that the requisite authorization has been duly received prior to issuing an investment permit, a trade or operating license or a work permit to a business organization.
- The Authority or the relevant Regional environmental agencies may exempt from environmental impact assessment projects with insignificant environmental impact.
- A licensing agency may suspend or cancel a licence that has already been issued where the Authority or the relevant regional environmental agency suspends or cancels environmental authorization.

Procedures that need to be followed in the process of environmental impact assessment are described in the Proclamation. Thus a project initiator (Proponent):

- Must undertake a timely environmental impact assessment, identifying the likely adverse impacts, incorporate the means of their prevention, and submit the environmental impact study report accompanied by the necessary documents to the Authority or the relevant regional environmental agency.
- Must ensure that an environmental impact assessment is conducted and an environmental impact study report prepared by an expert who meets the requirements set forth by the directive issued by the Authority.

- Must submit an environmental impact study report to the Authority or the relevant Regional environmental agency for review.

The Proclamation directs the Authority and the relevant Regional environmental agency how to deal with an environmental impact study report they receive. Thus, after evaluating the report by taking into account any public comment and expert opinion the Authority or the relevant Regional environmental agency must do one of the following:

- Approve the project without condition and issue authorization if it is satisfied that the project may not cause negative impact.
- Approve the project and issue authorization with condition that must be met in order to reduce adverse impacts to insignificant impacts, or
- Refuse implementation of the project if the negative impact cannot be satisfactorily avoided.

In the event of a project, such as the Ethiopia-Kenya Power System Interconnection, having likely trans-national impact, the regional environmental agency would not assess an environmental impact study itself, but refer the report to the National Authority in the country.

7.3.3 Environmental Pollution Control Proclamation(Proc. N° 300/2002)

This Proclamation primarily aims to ensure the right of citizens to a healthy environment and to impose obligations to protect the environment of the country. In this connection the Proclamation provides a basis from which the relevant environmental standards applicable to Ethiopia can be developed and sanctions violation of these standards as criminally punishable offences.

In order to ensure implementation of environmental standards and related requirements, inspectors of the Authority or of the relevant Regional environmental agency are empowered by the Proclamation to enter, without prior notice or court order, any land or premises at any time, which seems to them appropriate. Such a wide discretionary power of inspectors explains the serious concern and commitment of Ethiopia to the protection of the environment from pollution.

7.3.4 Environmental Protection Institution Establishment Legislation(Proc.No 295/2002)

The Environmental Protection Organs Establishment establishes the institutional arms of the Federal Government to ensure the realization of the objectives of the Constitution and of the Environmental Policy of Ethiopia with respect to environmentally sustainable management of economic and social development of the country, both at Federal and Regional level.

The Proclamation directs every relevant sectoral agency of the Federal Government to set up an environment unit as part of its organizational structure and also for each Regional State to establish a Regional autonomous environmental agency. Apart from assigning specifically defined responsibilities to the Environmental Protection Authority the Proclamation links the efforts of Regional states with that of the Authority by instructing the Regional states to prepare and submit reports on the respective state of the environment and sustainable development and submit them to the Authority.

The key institution, at Federal level, is the Environmental Protection Authority (EPA), which was established on October 31 2002 by Proclamation No. 295/2002. It is the Federal institutional arm entrusted with the widest responsibilities on environmental protection. The Regional Environmental Protection Authorities have been established in each region as counter parts of the Federal EPA by the proclamation No. 295/2002 which empowers each

Regional State to establish its own independent environmental agency with the responsibilities to coordinate and follow-up the Regional effort to ensure public participation in the decision making process, to play an active role in coordinating the formulation, implementation and review of Regional conservation strategies and to foster environmental monitoring, protection and regulation

Each Federal and Regional organization of the government that are related with environmental matters is required by Proclamation No. 295/2002 to set up its own unit with the responsibilities to coordinate and follow-up in order to ensure that its activities are in harmony with national efforts to protect the environment. Several institutions at regional and federal level have established their in-house environmental unit. EEPCo has environmental experts under the Power System Planning. This is not adequate to discharge its duties entrusted by the law. The environmental unit has to be established as independent team under the Planning Corporate (see also text in the institutional section).

7.3.5 Proclamation No. 374/2003 to provide the legal basis for the protection of cultural heritage

In more recent decades legislations of Cultural Heritage Management have been issued to call attention to the identification and protection of cultural sites which are under private and public ownership. The law requires developers to conducting a cultural resources survey in order to identify and assess cultural sites that may be affected by the development activities. It is mandatory to undertake a cultural resources survey in order to identify and assess any cultural sites that may be affected by the development activities Ethiopia has issued Proclamation No. 374/2003 to provide the legal basis for the protection of cultural heritage.

The Proclamation defines cultural heritage broadly as "anything tangible or intangible which is the product of creativity and labor of man in the pre-history and history times, that describes and witnesses to the evolution of nature and which has a major value in its scientific, historical, cultural, artistic and handcraft content."

Prior approval of the Authority for Research and Conservation of Cultural Heritage is required to remove immovable (Art. 21/1) and movable cultural heritage (Art. 21/2) from its original site, during the execution of the project.

Proclamation 209/2000 of the Authority for Research and Conservation of Cultural Heritage (ARCCH) allows the use of cultural heritage sites for economic and other purposes if and only if such use is not detrimental to its preservation and does not impair its historical, scientific and artistic values (Art 22). The same applies to this Project. This study has paid a lot of attention to avoid or reduce impacts on cultural resources.

7.3.5.1 Environmental Guidelines

The Environmental Protection Authority issued a procedural guideline which defines specific examinations to which a proposed project needs to be subjected in the process of environmental impact assessment.

The procedural guideline requires a proponent to submit an initial environmental examination report to enable the relevant environmental agency to decide the application of a further level of assessment depending on the outcome of a screening or scoping report. At this level of examination the decision may be either of the following: No EA required, preliminary assessment is applied to or full scale ESIA applies where the project is found to be one that may have significant impacts.

The Ethiopian Environmental Protection Authority has issued other guidelines for environmental and social impact assessment of projects in different sectors. These include:

- Guidelines for Dams and Reservoirs, 2004
- Guidelines on Irrigation, 2004
- Guidelines for Mineral and Petroleum Operation Projects, 2003
- Guidelines on Road and Railway, 2004
- Guidelines on Hydropower Production, Transportation and Distribution
- Guideline on ambient water quality of domestic, agricultural and industrial wastes

These guidelines provide a comprehensive statement of the type of adverse impact that may occur and set out clearly the aspects, which need to be addressed in an initial environmental examination and in an environmental and social impact assessment. The guidelines are clear and understandable in their application, and more importantly provide a sound basis for examination and assessment of projects in the sectors for which they were designed. The source of references and further reading accompanying each guideline point out the extent of professional research conducted to develop the guidelines and encourages further reading in selected areas covered by the guidelines.

7.4 International Policies, Guidelines and Agreements

7.4.1 The World bank's Safeguard Policies, OPs and Guidelines

The World Bank's safeguard policies is intended to help promote socially and environmentally sustainable approaches to development as well as to ensure that Bank operations do not harm people and the environment.

The safeguard policies include the Environmental Assessment (EA) policy and those policies that fall within the scope of EA.

These policies are most relevant to the Ethiopia-Kenya Transmission Line project and include, among others, Safeguard policies on Environmental Assessment, Involuntary Resettlement, Natural Habitats and Safeguard policies on Physical Cultural Resources, Safeguard policies on Indigenous Peoples and Forestry apply to the Project.

7.4.1.1 Environmental Assessment (OP 4.01)

Environmental Assessment (OP 4.01) is applied to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies'.

The Ethiopia-Kenya Power system Interconnection Project is determined as Category 'A', requiring a full ESIA.

In relation to public consultation, OP 4.01 requires a two-stage process:

a) shortly after environmental screening and before the terms of reference for the full ESIA are finalized, and

b) once a draft ESIA report is prepared.

In addition, the Project is required to consult with stakeholder groups throughout project implementation as necessary to address ESIA-related issues that affect them.

The Ethiopia-Kenya Power System Interconnection Project is categorized as Category A project under the World Bank's Category classification. This happens when the project is believed to have adverse environmental impacts that are significant.

The world Bank's Category A projects include projects that have large scale conversion or degradation of natural habitat; extraction, consumption, or conversion of substantial amounts of forest, mineral and other natural resources; direct discharges of pollutants resulting in degradation of air, water, or soil; production, storage, use or disposal of hazardous material and wastes; measureable change in hydrologic cycle; risks associated with the use of pesticides, etc. Among others, hydropower and transmission line projects are considered as Category A.

In contrast in Category B project, impacts are site specific, reversible and less adverse than Category A.

Hence the Ethiopia-Kenya Interconnector is Category A where full ESIA is required.

7.4.1.2 Involuntary Resettlement (OP 4.12)

This policy applies to the Transmission Line Project because involuntary resettlement may be required.

Any requirement for involuntary resettlement is considered to be one of the most important environmental impacts of a proposed project, and Bank guidance on resettlement and compensation is now very comprehensive and specific, particularly in relation to the identification, participation and support of project-affected persons (PAPs). The policy objectives stated in OP 4.12 are as follows:

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs;
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs;
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

7.4.1.3 Natural Habitat (OP 4.04)

This policy may be triggered by the Project which states that wherever feasible, Bank-financed projects are sited on lands already converted (excluding any lands that in the Bank's opinion were converted in anticipation of the project). The Bank does not support projects involving the significant conversion of critical natural habitats unless comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs. If the environmental assessment indicates that a project would significantly convert or degrade natural habitats, the project should include acceptable mitigation measures. Such mitigation measures include, as appropriate, minimizing habitat loss (e.g., strategic habitat retention and post-development restoration) and establishing and maintaining an ecologically similar protected area. The Bank accepts other forms of mitigation measures only when they are technically justified.

The Bank encourages borrowers to incorporate into their development and environmental strategies, analyses of any major natural habitat issues, including the identification of important natural habitat sites, the ecological functions they perform, the degree of threat to the sites, priorities for conservation, and associated recurrent-funding.

Existing protected areas and areas officially proposed by governments, areas initially recognized as protected by traditional local communities (e.g., sacred groves), and sites that maintain conditions vital for the viability of these protected areas (as determined by the environmental assessment process); or sites identified on supplementary lists prepared by the Bank or other authoritative sources. Such sites may include areas recognized by traditional local communities (e.g. sacred groves); areas with known high suitability for biodiversity conservation; and sites that are critical for rare, vulnerable, migratory, or endangered species. Listings are based on systematic evaluations of such factors as species richness; the degree of endemism, rarity, and vulnerability of component species; representativeness; and integrity of ecosystem processes.

If an EIA indicates that a project would significantly convert or degrade natural habitats, the project must include mitigation measures acceptable to the Bank. Such mitigation measures may include, as appropriate, minimizing habitat loss (e.g., strategic habitat retention and post-development restoration) and the establishment and maintenance of an ecologically similar protected area. The Bank accepts other forms of mitigation measures only when they are technically justified.

The Bank takes into account the borrower's ability to implement the appropriate conservation and mitigation measures. If there are potential institutional capacity problems, the project must include components that develop the capacity of national and local institutions for effective environmental planning and management.

7.4.1.4 Physical Cultural Resources OP/BP 4.11

This policy may be triggered by the project. Cultural resources are important as sources of valuable historical and scientific information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The loss of such resources is irreversible, but fortunately, it is often avoidable. The objective of OP/BP 4.11 on Physical Cultural Resources is to avoid, or mitigate, adverse impacts on cultural resources from development projects that the World Bank finances.

The United Nations term "cultural property" includes sites having archaeological (prehistoric), paleontological, historical, religious, and unique natural values. Cultural property, therefore, encompasses both remains left by previous human inhabitants (including middens, shrines, and battlegrounds), and unique natural environmental features.

The World Bank requires that, before proceeding with a project that may risk damaging cultural property (e.g., any project that includes large scale excavations, movement of earth, superficial environmental changes or demolition), the cultural property aspects of the project site must be determined. The cultural and archaeological sensitive areas of Konso at bends 34 and 35 as well as bends 37 & 38 can trigger Op 4.11. If there is any question of cultural property in the area, a reconnaissance survey should be undertaken in the field by ARCCH specialists during construction. A Cultural Property Management Plan may also be prepared to mitigate impacts during project implementation.

7.4.1.5 Forests (OP 4.36)

This policy is unlikely to be triggered by the Transmission Line Project. Whilst this policy is principally related to World Bank activities in the forestry sector, it includes policies on the conservation of forest biodiversity, the sustainable management of forest areas, and the participation of local people particularly in the management of the surrounding forests. The

policy emphasizes that the management, conservation, and sustainable development of forest ecosystems and their associated resources are essential for lasting poverty reduction and sustainable development. This Policy states that:

- The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical natural habitats;
- If a project involves the significant conversion or degradation of natural forests or related natural habitats that the Bank determines are not critical, and the Bank determines that there are no feasible alternatives to the project and its siting, and comprehensive analysis demonstrates that the overall benefits from the project substantially outweigh the environmental costs, the Bank may finance the project provided that it incorporates appropriate mitigation measures.

7.4.1.6 Indigenous Peoples (OP 4.10)

This Operational Policy provides policy guidance to ensure that indigenous people benefit from development projects, and to avoid or mitigate potentially adverse effects on indigenous people caused by Bank-assisted activities. Special action is required where Bank investments affect indigenous peoples, tribes, ethnic minorities, or other groups whose social and economic status restricts their capacity to assert their interests and rights in land and other productive resources. The Bank defines "indigenous peoples," "indigenous ethnic minorities," "tribal groups," and "scheduled tribes" as social groups with a social and cultural identity distinct from the dominant society that makes them vulnerable to being disadvantaged in the development process.

The people living in the project area from different Ethnic groups are extremely poor, vulnerable and in need of great care concerning resettlement and restoring/improving livelihoods. None can be described as indigenous peoples under the above definition. Currently, this policy is not expected to be triggered by the project.

7.4.1.7 Pest Management (OP 4.09)

Rural development and health sector projects have to avoid using harmful pesticides. A preferred solution is to use Integrated Pest Management techniques and encourage their use in the whole of the sectors concerned.

If pesticides are considered necessary at full ESIA stage, either for crop protection at resettlement sites or in the fight against water-related vector-borne diseases, a Bank-funded project should include a Pest Management Plan (PMP), prepared by the borrower, either as a stand-alone document or as part of the Environmental Assessment. Currently, this policy is not expected to be triggered by the project.

7.4.1.8 Projects in Disputed Areas (OP 7.60)

The project area is not in a disputed area and the Bank's policy on disputed areas will not be triggered by the project. Other policy worth nothing with regard to this Project is policy on disclosure of information.

7.4.2 The African Development Bank (AfDB) safeguard policies

The African Development Bank's (AfDB) Environmental Policy was approved in 1990 and its Environmental Assessment Guideline followed in 1992. AfDB's updated policy on environment was issued 2004, incorporating and re-defining environmentally sustainable development.

The Bank's development plan seeks to ensure that environmental management tools like strategic impact assessment and project level environmental and social assessment will be used systematically to monitor environmental performances and encourage community involvement at all levels of project planning.

The environmental and social policies of the African Development Bank shall support the main objective of the Bank to provide assistance to African Regional Member Countries in their economic and social development. To reach this objective, the Bank will ensure that environment and gender issues are mainstreamed in each broad sectoral area and in a fully participatory manner.

7.4.2.1 The AfDB safeguard policies that are likely to be triggered include:

- Guidelines under the Handbook on Stakeholder Consultation and Participation in AfDB Operations;
- Cooperation with Civil Society Organizations Policy and Guidelines;
- Environmental and Social Assessment Procedures for African Development Bank's Public Sector Operations;
- Annex 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,15, and 16 of the ESIA Procedures for AfDB Public Sector Operations;
- Gender Policy , 2001;
- Bank Group Policy on Power Reduction, 2004
- Involuntary Resettlement Policy, 2003;
- The African Development Bank Group Policy on Disclosure of Information, 2005; and
- African Development Bank Group's Policy on the Environment; 2004

7.4.2.2 ESAP for AfDB's Public Sector Operations (ESAP, 2001)

The procedure details the process followed during the project identification, project preparation and project implementation phases for AfDB financed projects. The procedure also describes the process and instruments used in Environmental and Social Impact Assessment and the Environmental and Social Management Plan.

The primary objective of the ESAP is to provide a formal process for the internal and inter-departmental environmental and social review of AfDB financed projects, programs and plans. The procedures highlight the steps followed to assess environmental and social risks and benefits along the project cycle.

Purpose of the Procedures

The purpose of the ESAP is to improve decision-making and project results in order to ensure that Bank-financed projects and programs are environmentally and socially sustainable as well as in line with the AfDB's policies and guidelines.

The proposed environmental and social assessment process provides ways to improve a project environmentally and socially and thereby enhance its benefits and (in order of priority) prevent, minimize, mitigate, or compensate for adverse impacts. The ESIA process shall ensure benefit distribution to poor, women and vulnerable groups. The ESIA process shall also help to avoid incurring costs and delays in the implementation due to unanticipated problems. It also assists in reducing the need for project conditionality as appropriate measures can be taken in advance, incorporated into project design, or alternatives to the project can civil society and stakeholder participation. The assessment contents depend on the nature and scope of the project, plan or program.

Public consultations

During the ESIA process for Category 1 projects (projects requiring full ESIA and ESMP), the Borrower is required to conduct meaningful consultations with relevant stakeholders, including potential beneficiaries, affected groups, Civil Society Organizations and local authorities, about the project's environmental and social aspects and take their views into account.

These consultations shall take place according to the country's legal requirements, if they exist, but should at least meet the minimal requirements described in the ESAP.

The Borrower initiates consultations as early as possible during the project preparation phase. For meaningful consultations, the Borrower provides relevant information in a timely manner and in a form and language accessible to the groups being consulted.

The Borrower may consult a sample of primary and secondary stakeholders of the project to prepare ESIA Terms of Reference, as appropriate. These consultations aim to gather information on the stakeholders' perceptions of the project and to solicit their views on the project's environmental and social impacts to better define the contents of the ESA studies.

The Borrower shall consult relevant primary and secondary stakeholders during the preparation of the ESIA Report to discuss with them the proposed project's objectives and activities, to assess potential environmental and social impacts and to solicit recommendations on project improvements.

The Borrower continues to consult with relevant stakeholders throughout project implementation (construction and operation), as necessary, to address ESIA related issues affecting stakeholders. The AfDB requires the Borrower to report on ongoing consultations as part of the normal quarterly reports submitted to the Bank.

In order to comply with the Bank's requirements, environmental and social assessment studies shall address key crosscutting issues that are: poverty reduction, environment, gender, population, health and safety related issues, vulnerable groups, destruction or degradation of substantial biological resources, significant increase in health and safety risks, or major changes in the hydrology or water quality.

The projects assigned to Category 1 and require a full Environmental and Social Impact Assessment (ESIA), including the preparation of an ESIA Report and Environmental and Social Management Plan (ESMP). These projects may also be improved by carrying out complementary studies that are not specifically required under the ESAP, such as detailed gender analyses or institutional analyses. The need for such complementary studies shall be determined on a project-by-project basis during the preparation phase."

As projects like power transmission line of more than 110 kV, crossing highly populated, forested or cultivated areas fall under this Category 1, full ESIA is required for the Ethiopia-Kenya Interconnection Project.

7.4.2.3 Integrated Environmental and Social Impact Assessment Guidelines (IESIAG, 2003)

The major objective of these guidelines is to provide reference material to the staff of the Bank and Regional Member Countries on how to adequately consider crosscutting themes while assessing the environmental and social impacts of a project.

Appendix 8 of the guidelines is related to the specific sector of hydropower production, transportation and distribution and includes the typical environmental and social issues to be considered in the description of the project environment, and the most frequent potential

impacts and enhancement/mitigation measures that should be integrated as early as possible, preferably in the project design.

7.5 International Conventions/Agreement

The following international conventions and agreement are also applicable to the transmission line Project. The agreements need to be strictly observed for any relevant provisions applicable to the Project.

7.5.1 The Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention has a specific relevance for this Project, as PCBs can be contained in equipment, such as transformers, capacitors or other receptacles containing liquid stocks.

The Stockholm Convention on POPs chemicals is a global, legally binding instrument, aimed at protecting human health and the environment across the world from the harmful impacts of persistent organic pollutants. It has entered into force on May 17, 2004, and Ethiopia has ratified the Convention on June 9, 2002. A National Implementation Plan (NIP) was prepared in 2006 and submitted to the secretariat office of Stockholm convention in 2007.

According to this NIP, stock piles of PCBs were identified and will be disposed to end of 2011, while PCBs in use will be removed from 2012 to 2026. The inventories of stock piles of Bs were taken at country level to prepare the NIP. It also recommends the preparation of an action plan, prohibiting the import and use of PCBs and PCB containing equipment and materials and establishing an adequate database on PCB and the existence of significant PCB releases from the use, stockpiles and wastes.

Considering the above, and the fact that Ethiopia undertakes efforts with regard to replacement and disposal of PCBs stockpiles and wastes through a phase-by-phase approach, it is therefore not expected and recommended that equipment containing POPs will be used for the Project. EEPCo does not import materials containing PCBs.

7.5.2 Convention Concerning the Protection of the World Cultural and Natural Heritage

The World Heritage Convention was adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris on 16 November 1972. The Convention came into force in 1975.

The aim of the World Heritage Convention is to promote cooperation among nations to protect heritage around the world that is of such outstanding universal value that its conservation is important for current and future generations.

The States that that have ratified the Convention agree to identify, protect, conserve, and present World Heritage properties. States recognize that the identification and safeguarding of heritage located in their territory is primarily their responsibility. They agree to do all they can with their own resources to protect their World Heritage properties.
Specifically they:

- 'adopt a general policy that aims to give the cultural and natural heritage a function in the life of the community and to integrate the protection of that heritage into comprehensive planning programs'

- undertake 'appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage'
- refrain from 'any deliberate measures which might damage, directly or indirectly, the cultural and natural heritage' of other Parties to the Convention, and to help other Parties in the identification and protection of their properties.

7.5.3 *African Convention On The Conservation Of Nature And Natural Resources*

This Convention applies to all areas which are within the limits of national jurisdiction of any signatories of the convention and to the activities carried out under the jurisdiction or control of the same within the area of its national jurisdiction or beyond the limits of its national jurisdiction.

The objectives of this Convention are:

- to enhance environmental protection;
- to foster the conservation and sustainable use of natural resources; and
- to harmonize and coordinate policies in these fields with a view to achieving ecologically rational, economically sound and socially acceptable development policies and programs.

The guiding principles of the convention revolve around the right of all peoples to a satisfactory environment favorable to their development and the duty of States that ensure that developmental and environmental needs are met in a sustainable, fair and equitable manner.

African countries have, a sovereign right to exploit their own resources pursuant to their environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control without causing damage to the environment of other States or of areas beyond the limits of national jurisdiction

The countries are responsible for protecting and conserving their environment and natural resources and for using them in a sustainable manner with the aim to satisfy human needs according to the carrying capacity of the environment.

The development activities should be in a manner conscious of the dangers which threaten some of these irreplaceable assets;

The undertaking of the individual and joint action for the conservation, utilization and development of these assets by establishing and maintaining their sustainable use;

7.5.4 *The Control of Transboundary Movements of Hazardous Wastes And Their Disposal*

The Control of Transboundary Movements of Hazardous Wastes and Their Disposal which is mostly known as the Basel Convention has the objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics as well as two types of wastes defined as "other wastes" (household waste and incinerator ash;

The main principles of the Convention are:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;

- the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
- a regulatory system applying to cases where transboundary movements are permissible.

The first aim is addressed through a number of general provisions requiring States to observe the fundamental principles of environmentally sound waste management (article 4). A number of prohibitions are designed to attain the second aim:
Hazardous wastes may not be exported a State not party to the Basel Convention, or to a party having banned the import of hazardous wastes (article 4).

Parties may, however, enter into bilateral or multilateral agreements on hazardous waste management with other parties or with non-parties, provided that such agreements are "no less environmentally sound" than the Basel Convention (article 11).

In all cases where transboundary movement is not, in principle, prohibited, it may take place only if it represents an environmentally sound solution, if the principles of environmentally sound management and non-discrimination are observed and if it is carried out in accordance with the Convention's regulatory system.

7.5.5 Other International Agreement

Ethiopia has ratified the following international conventions that are relevant to natural resources and environmental management:

- Convention on Biological Diversity (ratified through Proc. No. 98/94);
- Framework Convention on Climate Change (ratified through Proc. No. 97/1994);
- Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol (ratified in January 1996);
- United Nations Conventions to Combat Desertification (ratified through Proc. No. 80/1997);
- CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) through proclamation No.14/1970;

The government has established an Environmental Protection Authority, and this Authority is designated as focal point for the implementation of the conventions.

7.6 Administration Framework for the Implementation the Studies

The Institutional Framework for the ESIA is given in section 8 in detail. In addition to the Federal and Regional level institutions described in section 8, the woreda administration plays critical role in the implementation of the RAP. At Woreda and Kebele level different committees including Resettlement, Valuation Committee and Grievance Redress committee are established in each of the woredas traversed by the project, whose roles could be summarized as below.

Resettlement Committee: The committee has responsibilities of planning, coordinating and monitoring of compensation payments and relocation activities. Property Valuation Committee: The property valuation committee has the responsibility of preparing valuation and cost estimates for affected properties and assets as per FDRE proclamation 135/2007, list down all PAPs, registration of assets and properties; and shall establish unit rates, taking into account, Proclamation 455/2005 and councils of Ministers regulation 135/ 2007.

Grievance Redress committee: the Grievance redress committee is responsible to redress the grievances of the PAPs and ensure the procedures for compensation and valuation are done in accordance to the laws.

Woreda Administration: Finally the Woreda Administration coordinates the valuation process, establish resettlement and property valuation committees and facilitate compensation for PAP, provide land for land compensation, facilitate the relocation sites and the restoration of services, and maintain data of properties removed from expropriated land.

Table of Contents

List of Tables

List of Figures

8 INSTITUTIONAL ARRANGEMENT AND CAPACITIES WITHIN ETHIOPIAN

The institutions responsible to ensure implementation of environmental public instruments at Federal and Regional levels are key role players whilst sectoral institutions engaged in development activities reinforce the efforts of the key institutions as partners to the key institution. The key institutions devote their time fulltime to environmental matters, as they were established for that purposes while sectoral institutions were established for other purposes with limited environmental responsibilities. The later enhance the objectives of environmental institutions by complying with the environmental objectives of the country in the course of preparing and implementing their own projects.

8.1.1 Ethiopian Environmental Authority

The lead intuition for environmental and social issues at Federal level is the Ethiopian Environmental Protection Authority (EPA), which was established on October 31 2002 by Proclamation No. 295/2002. It is the Federal institutional arm entrusted with the widest responsibilities on environmental protection. The Authority reports directly to the Prime Minister and is responsible for:

- Preparation of environmental policies and laws and to ensure that these are implemented.
- Preparation of directives and implementation of systems necessary for the evaluation of the impact of projects on the environment.
- Preparation of environmental protection standards and implementation of directives concerning soil, water and air.
- Preparation of recommendations regarding measures needed to protect the environment.
- Enhancement of environmental awareness programs.
- The conduct of studies on desertification and the coordination of efforts to combat it.
- Implementation of international treaties concerning the environment to which Ethiopia is a signatory.
- Provision of advice and technical support to the regions on the environmental matters.

The Proclamation no 295 gives the EPA the mandate to involve itself with all environmental issues and projects that have a Federal, interregional and international scope. At present, however, EPA has delegated its mandate concerning some sectors to elected sector institutions. Hence the current powers of the EPA relate to coordination and monitoring aspects.

In view of this delegation the EPA has gone through very important restructuring process. Environmental Protection Authority (EPA) is headed and administered by a general director and deputy general director who is answerable to the Prime Minister Office. The EPA is reorganized into eight core line directorate and seven support directorates. The Core directorates are listed below (refer Appendix 10 see the organ-gram of EPA).

1. Environmental State and Changes Preparation Program Directorate;
2. Environmental Systems Preparation Program Directorate
3. Environmental Standards Preparation Program Directorate;
4. Technology Transfer Program directorate;
5. Environmental Unit Program Directorate;

6. Awareness and Education program Directorate;
7. Monitoring and Evaluation Program Directorate; and
8. Financial System Program Directorate;

The Awareness and Education program Directorate attempts to integrate environment into the education system of the country and develop awareness programs for all groups, organizations and institutions at all levels.

The Environmental Systems Preparation Program Directorate develops policy, Laws and directives as related to environmental protection and management.

The Environmental Standards Preparation Program Directorate is responsible in developing standards, guidelines, implementation of international agreements, conduct environmental audits of industries, preparation of project documents in the control of pollutions.

The Environmental Unit Program Directorate is responsible in evaluating development projects for their Environmental and Social Impact Assessment reports, provide training to regional environmental protection units, Non-governmental organization and other institutions and develop guidelines.

The regional environmental coordination service is responsible for all environmental matters of the region in question like sending EPA developed guidelines, newly developed proclamation papers, deals with various correspondences, and prepare awareness materials and ensure their dissemination.

The environmental information centre is responsible for creation of environmental networks, provide training and manage environmental documentation.

The planning and programming service is responsible for managing projects, programs and preparation of achievement reports on the quarterly and annual bases.

The organizational structures of the Environmental Protection Authority at the Federal level are given in Appendix.

8.1.2 Regional Environmental Agencies

Proclamation No. 295/2002 empowers each Regional state to establish its own independent environmental agency with the responsibilities to coordinate and follow-up the Regional effort to ensure public participation in the decision making process, to play an active role in coordinating the formulation, implementation, review and revision of regional conservation strategies as well as to foster environmental monitoring, and protection and regulation. The Regions that are directly associated with the Ethiopia-Kenya Power system Interconnection are the Oromia and the SNNP Regional States and the zones and woredas situated along the transmission line.

In general terms the regional and delegated environmental organ shall have the following roles and responsibilities concerning the environment.

The regional EPAs formulate polices, strategies and laws pertinent to environmental protection and they regulate and follow up the implementation including taking legal action for breach of the law related to environmental protection.

In collaboration with concerned organs the regional EPAs determine compensation to a person whose land holding has been expropriated for development works, regulate and follow up the person to be rehabilitated.

In addition to the above they prepare environmental standards and regulate such activities pertaining to standards. They also take legal action on any individual who illegally utilize the natural resources of the region and cause damages to them; Plan and implement the area to be rehabilitated. Furthermore they regulate and ensure that any development body shall conduct environmental impact assessment prior to project implementation.

Regulate the disposal of different pollutants and waste materials from factories, cities not to pollute the environment and take or cause to be taken proper action if it caused any damage;

Monitor damaging effects on habitats and diverse living organisms and take corrective measures or cause to be corrected if so happened;

Regarding the natural resources they regulate and monitor any damaging effects and regulate the movement of forest and wildlife products

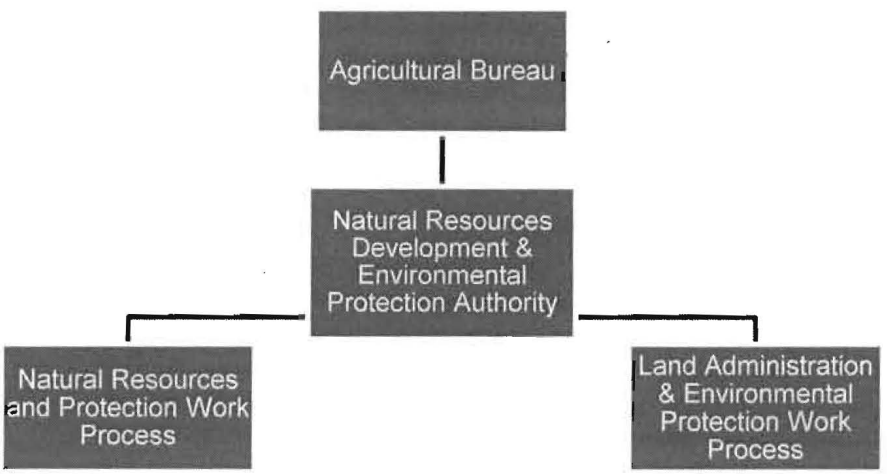
They regional EPS also serve as custodian of the information collected, stored, analyzed at their respective regions.

8.2.1 Environmental Protection Organ of SNNPR

The SNNPRS has its own environmental protection units organized under Bureau of Agriculture and Natural Resources and Rural Land Administration (NRRLAS).

The Environmental Protection Process unit has two key teams namely, Environmental and Social Impact Assessment and Pollution Control team, and Biodiversity and Environmental Education team. The Environmental and Biodiversity Protection Department and the two teams under it are responsible for ESIA evaluation of development project; prepare guidelines on the application of EISA, providing advices for the control of wastes, conservation of biodiversity as well as enhancement of environmental education. The organizational structure of the Environmental unit is presented in Figure 8-1 below. Similar Structure and Responsibilities exists at Zonal and woreda level.

Figure 8-1; Environmental Unit of SNNP



8.2.2 Environmental Protection Organ of Oromia

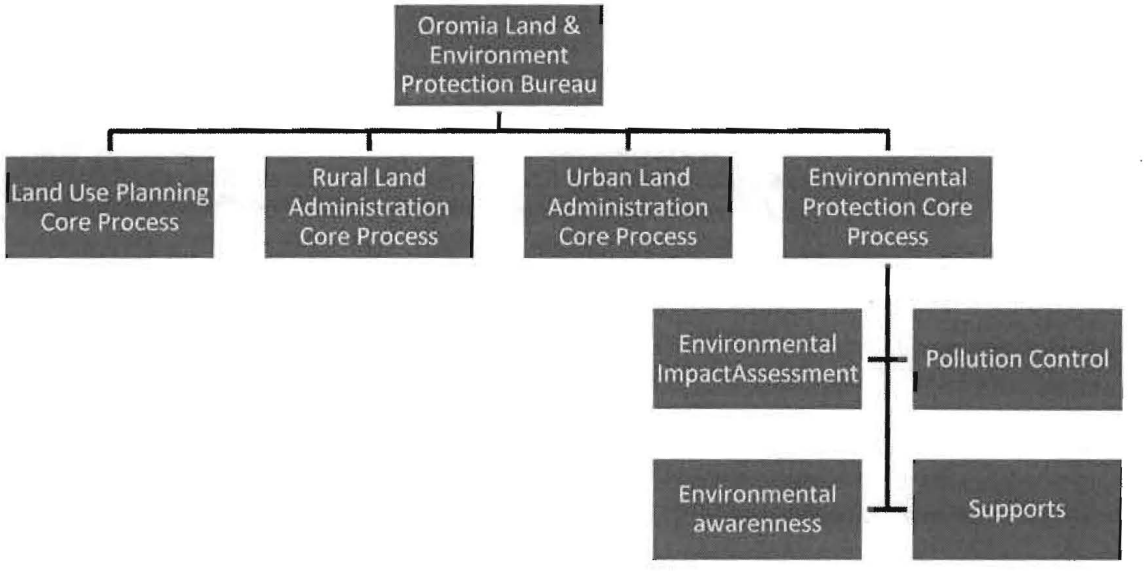
The Oromia Regional State has its Environmental Protection Core Process umit uder the Oromia Land and Environmental Protection Bureau. The unit is organized into three divisions, namely, Environment Impact Assessment Division, Environmental Pollution Control Division and Environmental Education and Awareness Creation Division with environmental experts under them to perform various environmental protection tasks. The Environmental Protection Core Process is answerable to the Oromia Land and environmental Protection Bureau (as in Figure 8-2).

Under the office there also support units like Planning and Programming Service, Manpower and Property Administration Service, Finance and Budget Section, Audit Section and a Legal Advisor (Figure 8-2).

The major tasks of the Office include, formulate policies, strategies and guidelines, regulate the environmental damaging nature of development projects, initiate environmental laws, undertake environmental auditing, collect and organize environmental data. These tasks are shared among divisions based on the various skills, experiences and training.

The Organizational Structure of the Oromia Environmental Protection Office is given as below.

Figure 8-2: Organization Structure of Oromia Environmental Office



8.1.3 Institutional Arrangements as per 'Proclamation No.295/2002'

The Environmental Protection Organs Establishment Proclamation No. 295/2002 establishes the institutional arrangements of the Federal Government to ensure the realization of the objectives of the Constitution and the Environmental Policy of Ethiopia with respect to environmentally sustainable management of economic and social development of the country, both at federal and regional level.

The Proclamation directs every relevant sectoral agency of the Federal Government to set up an environment unit as part of its organizational structure and also for each Regional State to establish a Regional autonomous environmental agency. Apart from assigning

specifically defined responsibilities to the Environmental Protection Authority the Proclamation links the efforts of Regional states with that of the Authority by instructing the Regional states to prepare and submit reports on the respective state of the environment and sustainable development and submit them to the Authority.

The institutions are responsible to ensure implementation of environmental public instruments at Federal and Regional levels and are key role players whilst sectoral institutions that are engaged in development activities, reinforce the efforts of the key institutions. The key institutions devote their time fully to environmental matters, as they were established specifically for that purpose.

8.1.4 Sectors Delegated to some of the Mandates EPA

Five sectoral institutions that were established for purposes of their respective sectoral development are currently, fully delegated by EPA for environmental impact assessment and follow up in their respective sectors. The sectoral institutions that are delegated by EPA are shown in the table below. As seen from the table environmental matters regarding hydropower and transmission line is the responsibility of Ministry of Water and Energy (Table 8-1). The ESIA/RAP reports shall be evaluated by this organ and environmental clearance shall be obtained from the same.

Table 8-1: Delegated Sector for ESIA

No	Delegated Institutions	Area of ESIA/RAP Responsibilities
1	Ministry of Water and Energy	Water, Hydropower, Transmission Line, & Energy
2	Ministry of Agriculture	Agricultural Development
3	Ministry of Mines	Mineral Exploration and development
4	Ministry of Transport	Transport related issues
5	Ministry of Construction and Urban Development	Construction, Urban Development

8.4.1 Ministry of Water and Energy

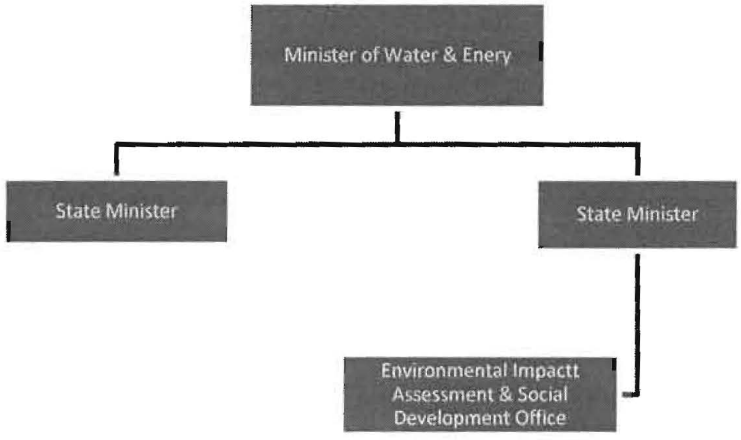
The Ministry of Water and Energy will ensure the objectives set by EPA whether or not environmental and social impact assessment studies comply with the environmental objectives of the country in the course of preparing and implementing development projects.

The MoWE is responsible for works of water and Energy at federal level. Major responsibilities, among others, are summarized as follows (as relating to the environmental matters), See also Figure 8-3.

1. Based on government policy, develop sectoral policy and strategy and follow up the same when approved
2. Evaluate environmental impact assessment report and social development project proposals; approve the documents and issue certificates to developers.
3. Follow up the operations of developers if they are in accordance to the obligation and commitment of impact assessment study and take appropriate actions
4. Study and suggest improvement for environmental and social impact assessment issued policies, proclamations, regulations, strategies, programs, plans, and standards; follow up their implementations

5. In cooperation with responsible organs coordinate compensation, resettlement and public involvement relating to the mandated. Follow up social development program operate as per EPA guidelines and make sure that compensation is paid as per agreement and follow up sustainability of the development
6. Ensure that the certificate issued by the Ministry with regard to the environmental impact assessment is executed as per the guidelines and ensure all obligations are correctly met by the developers
7. Give awareness training to stakeholders and follow up impacts of the training
8. Coordinate that data base of the stakeholders are stored and disseminated to users properly

Figure 8-3: Simplified Structure of MoWE just showing the Environment Unit



7.4.2 EEPCo's Organizational Structure/Framework

The Ethiopian Electric Power Corporation (EEPCo) is a government-owned vertically integrated utility with a staff of over 12,500. In Ethiopia, it is the only company active in grid-based generation, transmission and distribution.
EEPCo owns and operates power plants (mostly hydropower) with a total installed capacity of over 2000 MW in two separate supply systems: the Interconnected System and the Self-Contained System.

EEPCo is institutionally accountable to the Ministry of Water and Energy, and organizationally it is led by a Board of Directors. See Appendix 10 for the details of the organizational structure of EPPCo.

EEPCo's Project Implementation Unit (PIU) or Ethiopia-Kenya Interconnector Project Office respectively is responsible for the overall project coordination between all involved parties.

Environmental Monitoring Unit of EEPCo

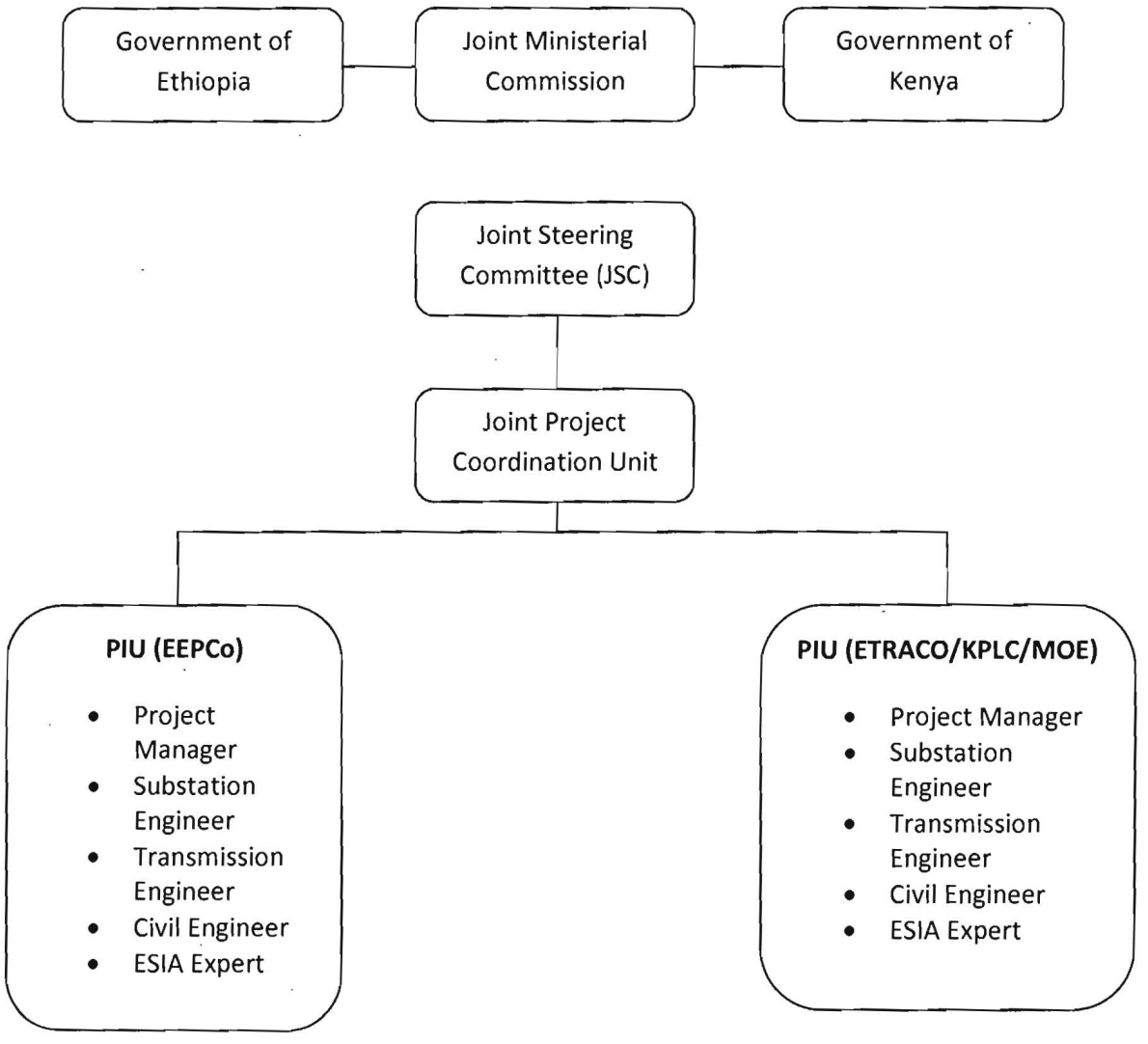
EEPCo's until very recently had Environmental Monitoring Unit (EMU) which was responsible for addressing major environmental and social issues in the utility's development works to ensure the power generation, transmission and distribution services are environmentally and socially sound and sustainable.

This unit is now dismantled and about 6 professionals are working as experts of environmental matters under the Power System Planning Team. This arrangement seems in contradiction to the law (Proclamation No. 295/2002- a proclamation provided for the establishment of environmental protection organ) which stipulates the establishment of strong unit.

Joint Project Coordination Unit

Ethiopia-Kenya Power System Interconnection Project has Joint Project Coordination Unit consisting of PIU for EEPCo and PIU for KETRACO. Under PIU ESIA Expert was envisaged as seen in the Project Implementation Structure in Figure 8-4 below.

Figure 8-4: Project Implementation Structure of Ethiopia-Kenya Power System Interconnection Project



Despite the planed environmental expert envisaged in the structure, qualified staff could not be hired as planned. The reason for that is lack of professionals in the market to be employed on the salary scale of the Corporation. Due to that the position is vacant to these days.

Regarding ESIA and RAP relevant themes, EEPCo's environmental unit and PIU both have a major role in the coordination, facilitation and implementation of the ESIA/RAP as they operate project-related at federal and regional level. The environmental Unit and PIU are responsible for:

- coordination of preparation and implementation of the ESIA/RAP,
- monitoring of adverse environmental and social impacts,
- monitoring of compliance of contractors with the technical specifications as stated in the contract agreement

EEPCo already has experience and practice in this field, as their hydropower projects necessitated preparation of ESIA and RAP. Unless the Environmental Unit is reinstated and PIU employed ESIA expert, it is hard to imagine implementation of environmental issues contained in the studies will be effective.

7.4.3 Agencies responsible for Monitoring and related activities

Organizations responsible for the implementation of the RAP, ESIA or the ESMP respectively operate at Federal and Regional Government level. At the Federal level EEPCo and Ministry of Finance and Economic Development (MoFED) are playing significant roles. The Ethiopia-Kenya Interconnector Project Office is responsible to carry out the coordination work among the different actors at federal level in consultation with the MoFED.

At regional level (Oromia & SNNP), the environmental protection unit and other organs will mainly play a monitoring role; while EMU (assuming it will be reinstated as before)/PIU will have mainly the responsibility for implementation of this ESIA/ESMP, in close cooperation with the woreda administration.

According to the Constitution of FDRE, the Regional States are established on the basis of ethnicity and language, which is also applicable for district administrations. Each concerned administration is governed by its own elected council. The woreda council is similar to that of the Federal Parliament in its structure, and appoints the executive committee which is responsible to run the day to day activities of the woreda pertinent to environmental matters.

The following Table 8-2 shows organizations that will have the role and responsibility at federal and regional level.

Table 8-2: Other Stakeholder - Institutions/stakeholders

Organizations involved	Responsibility
SNNPRS and Oromia Regional Governments	Facilitate the construction of the transmission line by informing the zonal and woreda authorities to provide the necessary support and cooperation for its smooth implementation
SNNPRS and Oromia EPA	Monitor that appropriate mitigation measures are adopted concerning the adverse environmental and social impacts created by the construction works.
Woreda Administration Offices	Coordinate the whole resettlement issue, facilitate compensation for PAP, and facilitate land for land compensation, facilitate the relocation sites and the restoration of services.
Municipalities	Identify land for the relocation of PAP and provide support in restoration; and provide special attention and support for the disabled, sick, elderly and female headed households (vulnerable groups)
Woreda Agriculture and Rural Development Office	Coordination and support of PAP and preparation of cost estimates
Kebele Administrations	Provide advice on the fairness in relocation process and valuation of compensation and coordinate on the support to be made for vulnerable groups
Representatives of PAP	Represent PAPs in all meetings and discussions held with the woreda administration, compensation committee and Ethiopia-Kenya Project Office.
Local NGOs	Local NGOs operating in the project area or in the region will be responsible to monitor the implementation of the RAP, but may also report their observation regarding environmental issues.
Representatives of PAP	Represent PAPs in all meetings and discussions held with the woreda administration, compensation committee and Ethiopia-Kenya Project Office.
Local NGOs	Local NGOs operating in the project area or in the region will be responsible to monitor the implementation of the RAP, but may also report their observation regarding environmental issues.

8.1.5 Institutional Capacities at Federal and Regional and lower administrative levels

At present, major capacity problem facing the institutions at all level of administration is the lack of qualified manpower in desired number. If we take the environmental unit of MoWE, about 9 professional and 3 support staff was envisioned in the structure. Even though the unit has made more than a year since its establishment, only 3 professionals and 1 support staff were employed due to lack qualified staff in the market. This means less than 30 % of the staff are currently available for the job. At regional, zonal and woreda level the situation is even worse.

On top of that manpower attrition rate in the sector is very high. The reasons for the problem, as per the discussions with key persons, include lack of incentives negative and positives, non conducive working environment, and lack of adequate facilities.

Salary scale and lack of career development structure in many government organizations are number one causes of the problem cited above.

Facilities such as computers, vehicles are also in short supply to perform the works of the institutions particularly true at the zonal and woreda level of administration.

In particular the capacity of environmental unit of EEPCo is much worse than other institutions mentioned above. The unit lack sufficient manpower, proper organizational arrangement and lack incentives to operate optimally. The situation in the PIU of the Project is the same. Much enhancement in manpower and other is necessary for the success of the project.

Private sector institutions such as consultants and contractors could be considered better than governments but still inadequate in term of manpower and facilities.

On top of the above requirements for smooth functioning of implementation of the study Organizational and institutional enhancement is vital. This is particularly true concerning EEPCo.

8.1.6 Re-establishing and strengthening of EEPCO's environmental Team

EEPCo is a sole public utility entrusted with generation, transmission and distribution of eclectic power across the entire nation in Ethiopia. It also carries out development projects in the electric sector in the country. Currently it is undertaking huge number of projects.
The laws of the FDRE necessitate, in all project development efforts proponents such as EEPCo are required to:

1. "... an environmental impact assessment, identify the likely adverse impacts of his project, incorporated the means of their prevention or containment, and submit to the Authority or the relevant regional environmental agency the environmental impact study report together with the documents determined as necessary by the Authority or the relevant regional environmental agency."
2. "... shall ensure that the environmental impact of his project is conducted and the environmental impact study report prepared by experts that meet the requirements specified under any directive issued by the Authority.'

In view of that EEPCo is required by law to incorporate environmental and social impact assessment and resettlement action plan. The aim is to carry out development in a sustainable manner. Normally EEPCo either outsource the ESIA and RAP studies or undertake using own force.

The law also requires EEPCo to establish its own environmental unit. Proclamation No 295/2002 environmental and social issues are mandatory to incorporate in the project development. Pursuant to this proclamation, each relevant government organization shall establish under it an environmental unit with the responsibility to ensure that its activities are being carried out in a manner which is compatible with the environmental law and obligations emanating there from. Similarly, the proclamation entrusts environmental organs to be established by the regions with extensive mandates that enables the coordination of environmental activities, avoids duplication and improves the dissemination of environmental information.
According to Proclamation No. 295/2002- a proclamation provided for the establishment of environmental protection organ, it is mandatory sectoral agencies to set up environmental organ in the institution and the provision runs as:

"Every competent agency shall establish or designate an environmental unit that shall be responsible for coordination and follow-up so that the activities of the competent agency are in harmony with this Proclamation and with other environmental protection requirements."

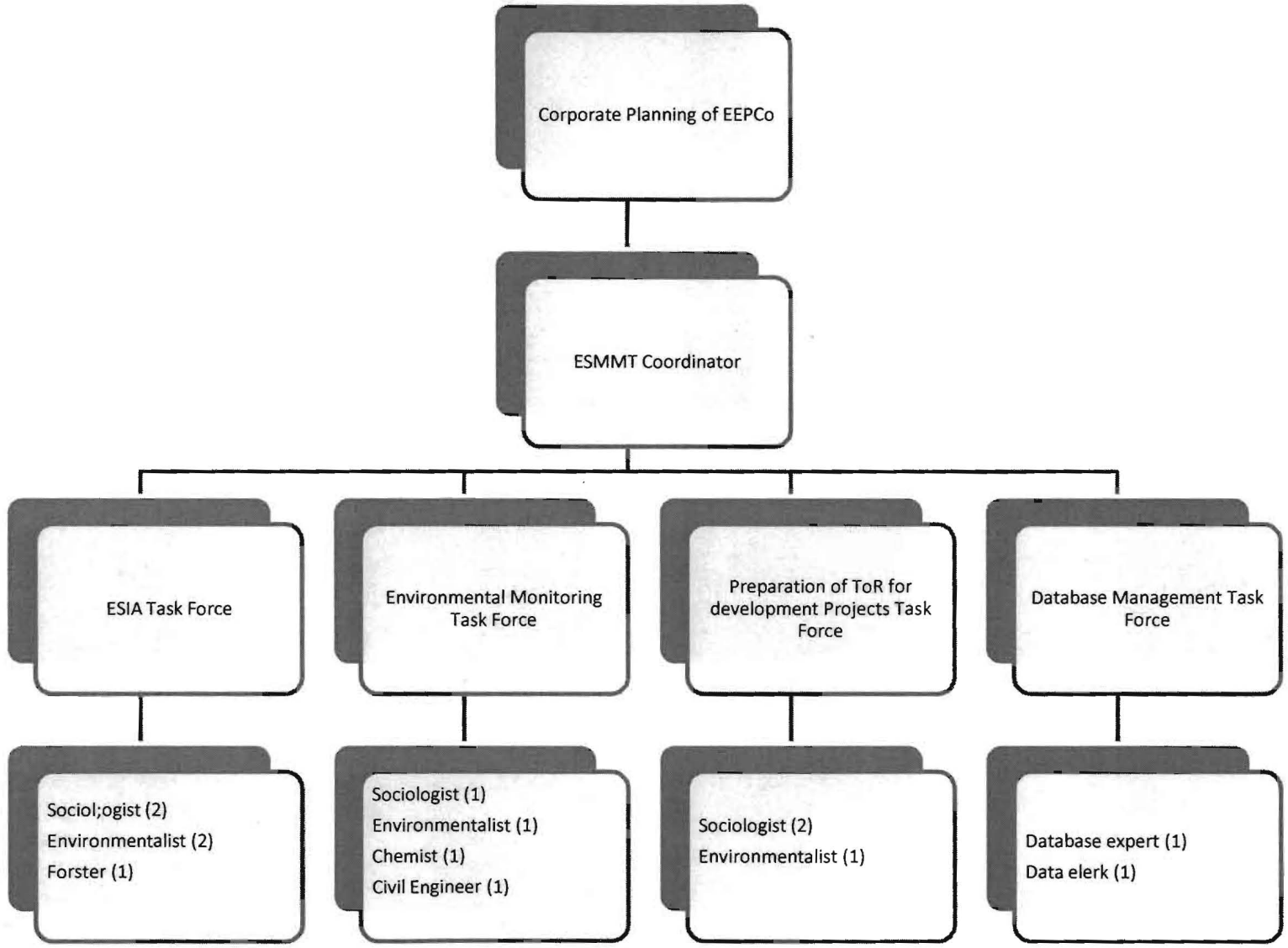
In line with those requirements it is crucial to establish a strong environmental arm within the EEPCo. Previously EEPCo had Environmental Management Unit which is believed to have assisted the utility to sustain development in the corporation by ensuring ESIA and RAP studies are conducted as per the law. Currently this unit has been dismantled as a unit but maintaining some experts under the Power System Planning Team. There is a need for strengthening the unit institutionally and organizationally

Therefore we strongly recommend independent unit as '***Environmental and Social Management and Monitoring Team***' (ESMMT) accountable to Corporate Planning with the following roles and responsibilities. Proposed Organizational Structure of the ESMU is presented in Figure 8-5

Roles and Responsibilities of the ESMMT

- Ensure and facilitate the integration of environmental and social concern into power projects;
- Conduct or supervise environmental and social impact assessment report for all projects of EEPCo;
- Undertake environmental and social impact assessment studies for projects that are not outsourced to external consultants;
- Give training on ESIA, RAP and related subjects to projects personnel and affected communities;
- Monitor and follow up construction activities of power projects are undertaken as per the ESIA study conducted for the project;
- Lead and monitor the implementation of the RAP during resettlement and post resettlement period;
- In collaboration with other concerned oversee and monitor the preparation and implementation of Resettlement Action Plan (RAP) carried out as planned;
- Based on national and international requirements, draft EEPCO's environmental and Social Policy and Guidelines as well as Procedures for approval by the Corporation;
- Prepare Resettlement policy and Environmental and Social Management Frameworks for power projects.
- Prepare environmental and social clauses in the ESIA for power projects and ensure that the clauses are incorporated.
- Provide advice and support on environmental and social issues of power projects undertaken by EEPCo.
- Ensure that contract documents for the construction of power projects meet the national as well as international social and environmental standards.
- Ensure EEPCO's projects have environmental and social monitoring plan.
- Ensure and monitor the proper handling and disposal of harmful chemicals in operational activities of the Corporation.
- Prepare project monitoring plan and checklists for individual projects.
- Collect data concerning ESIA, RAP and other environmental related information;
- Analyze, and store the raw and processed data for future use;
- Disseminate the environmental data and information at its custodianship to appropriate body and individual as per the policy of the Corporation
- Perform other related activities.

Figure 8-5: Proposed Structure of the ESMMT



Training Requirement

EEPCo has some experts knowledgeable about the Environmental Procedures, Laws and Guidelines they need however long term training to cop up with all environmental issues in the sector. In addition to that continuous refresher courses are important to update the team the current issues with regard to the environment and social matters.

8.1.7 Strengthening of Ministry of Water and Energy

The environmental unit of MoWE is already in place. The only problem currently is availability of qualified manpower from the market. The problem is the salary scale allocated for each professional which is less than the market salary. The professionals planned are assumed adequate for the time being but they have to be engaged (hired).

It is recommended to device salary mechanism that would attract professionals from the market.

8.1.8 Strengthening of environmental organ at Woreda level

The woreda environmental organs need assistance in training and equipment. Their problems vary across the project woredas. Realistic proposal of capacity building requires additional studies with regard existing manpower and level of qualification, facilities and identification existing gaps.

Table of Contents

List of Tables

List of Figures

List of Maps

9 BASELINE CONDITION OF ETHIOPIA

9.1 Background

The baseline information was compiled from secondary and primary data obtained from the project area.

Primary data are those collected during the natural resource and socio-economic assessment field surveys, and through consultations with officials and local experts. Consultations with local people were made to gather relevant information, with emphasis on local interests and problems. The expert team had a series of planning meetings both in Addis Ababa and in the field to clear doubts and create common understandings of the assignment at hand.

At the Federal level, they met people of relevant government offices and talked to the heads, teams and experts of the relevant regional offices at regional level.

The field visit study started with acquiring relevant available information and mobilization of the study team. The team consisted of an environmental, biodiversity and social science experts and spent about 15 days in the field studying the project area.

The field survey was conducted a few weeks later along the route that had been adjusted to avoid environmental hotspot areas and to reduce to a minimum any negative socio-economic impact of the affected households and communities. During the second trip data collection was undertaken targeted on leaders, communities, NGOs and other stakeholders.

The Environmental and Social Impact Assessment and Resettlement Action Plan of the Ethiopia-Kenya Power Systems Interconnection Study Project originally has been submitted by Fichtner in 2009 in collaboration with Tropics/Gama.

The Ethiopian part of the Project covered the areas between Soddo and Kenyan Border. Through the review process with EEPCO and the donors, a consensus was reached that the previous route suggested by Fichtner was the preferred option as discussed in section... above.

The environmental and social condition of the route line was reviewed the comments given by the stakeholders and incorporated the new data and information collect in this study. The baseline data has changed considerably due to the modification of the route line A/C and the updating efforts undertaken. In this section the baseline currently assessed are discussed below.

9.2 Physical Environment

9.2.1 Topography

The routing starts at an altitude at about 1950 m at Sodo Gantry Centre, where the substation will be build. The altitude decreases from there on, until it reaches Konso Special Woreda at 1270 masl. Then it gradually increases to 2035 m north of Yabello, and decreases to 1900 m at Mega (with lower altitudes in between). The area from Mega onwards decreases up to 965 m at Megado. The land setting of the route line varies between flatter areas and through undulating hills and gentle slopes.

9.2.2 Geology

Precambrian rocks with ages of over 600 million years are the oldest types of rocks in the country and form the basement on which younger formations lie. The Precambrian includes a wide variety of sedimentary, volcanic and intrusive rocks that have been metamorphosed to varying degrees. In the southern and western parts of the country where they are predominantly granites and gneisses, they have been more strongly metamorphosed than their counterparts in the north.

Based on the information obtained from the Geological Map of Ethiopia (ETHIOPIAN MAPPING AGENCY, 1998), the area from Sodo to Mega to Megado is mainly of Precambrian origin.

9.2.3 Soils

The soil along the route varies with the topography. In the higher altitude where there is intensive cultivation, the soil is predominantly blackish clay with stone mulches. The soil is not very vulnerable to erosion, and as a result no serious gully formations were observed. The soil between Soddo and the Kenyan border varies between Nitosols, Lithosols, Fluvisols, Luvisols and Xerosols (ETHIOPIAN MAPPING AGENCY, 1988). As seen in the figure below the most dominant soil type of soil are shown in Figure 9-1below. (1) red soil around bend 3 & 4. (2) Brownish fertile soil is observed at. Bend 10, in Mirab Abay at-Birbir, Kola Mudatho Wereda, (3) Agricultural farm. Black cotton soils are dominant near Mega Hill, close to Bend 65. (4) In Yabello most of the line is characterized by sandy soil (19 km Yabello to Mega + 3 km to west).

Figure 9-1: Various type of soil along the Line Route

(1) Red Soil between. Bends 3 and 4

(2) Brownish fertile soil in Mirab Abay

(3) Black cotton soils

(4) Sandy Soil Yabello

9.2.4 Climate

The variation in altitude is the primary cause of variation in climate in Ethiopia, as elsewhere in the tropics; the lower the altitude the higher the temperature. The rainfall in the study area also varies.

According to DANIEL GAMACHU (1977), the localities in the route belong to Type I and ype II rainfall regimes. Type I rainfall regime is characterized by one rainy season and can be categorised in eight rainfall regimes. The areas in the route include the highlands of Gamo Gofa and northern Sidamo (including Sodo) and the Lakes Region (including Arbaminch) and areas a little bit beyond belong to Type IB regime. In this regime, the area generally experiences nine rainy months (January to October), comprising of small rains (January and September) and the big rains from March to August and in October.

Type II rainfall regime is characterized by having two rainy periods. The route areas between Konso to the Kenyan border belong to Type IIA, areas in southern Gamo Gofa and South West Sidamo (including Mega and Yabello), are characterized by eight rainy months from February to July and in September and October. High concentration of rainfall is in April.

In the SNNPR, 116 meteorological stations are recording climate data, but none in the Oromia region. Eighteen stations record temperature, rainfall, humidity, sunshine, thirty two stations record temperature and rainfall, sixty six stations record only rainfall and two stations record all weather elements and are receiving satellite data.

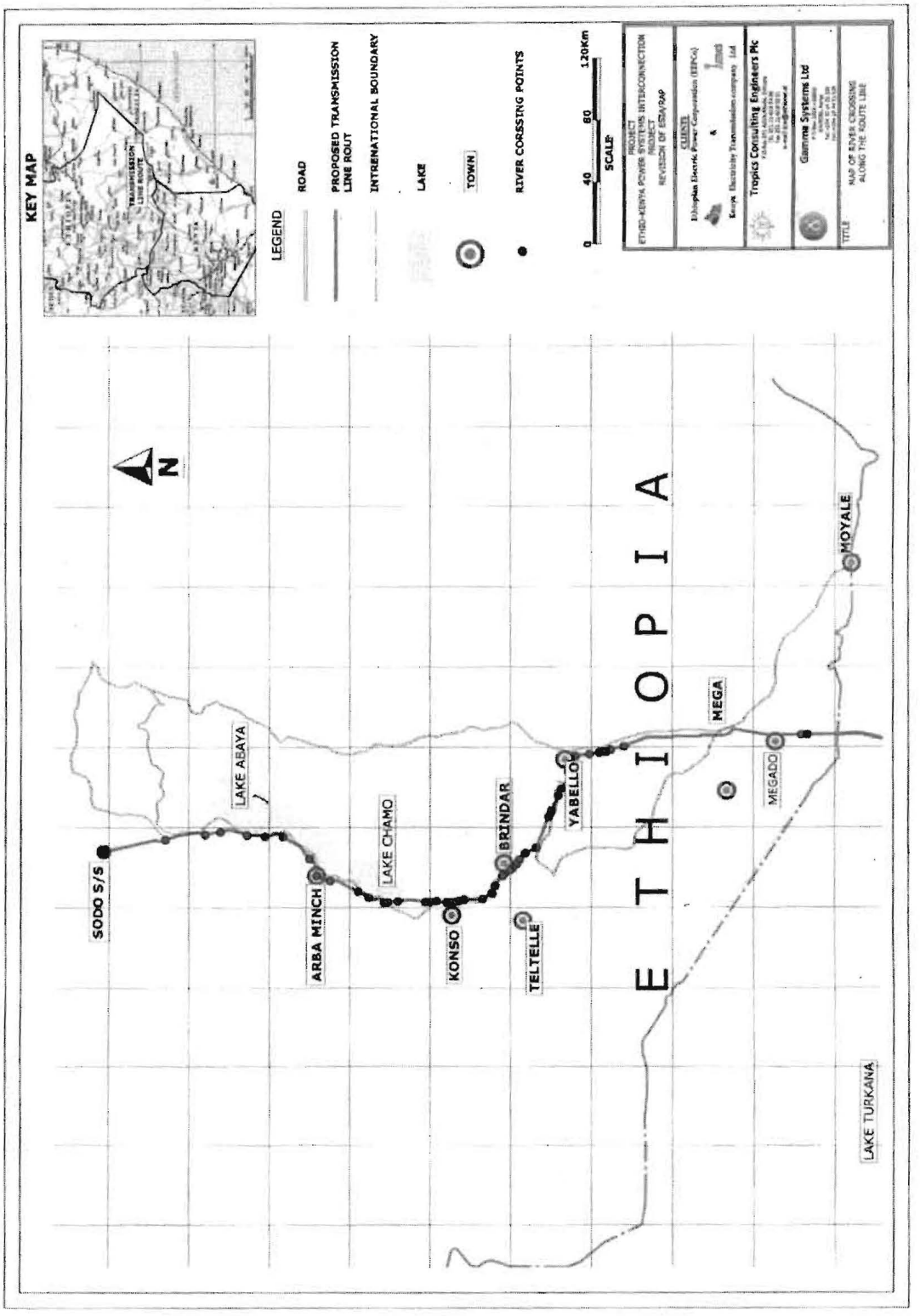
According the obtained information from Awassa and Arba Minch meteorological stations, there is a lot of variation in the recording of weather conditions for the project region.

9.2.5 Surface and Groundwater Resources

There are several perennial and intermittent rivers and streams draining the study areas. According to topographical maps, 49 will be crossed by the Project (Map 9-1).

These watercourses are usually the source of water supply for human, domestic animal consumption and other uses, such as cleaning, bathing, and recreation (swimming). Therefore, care should be taken to not to disturb or pollute the bank vegetation alongside and the water quality of these rivers and streams.

Map 9-1: Overview Map Locations River Crossings



9.3 Biological Environment

9.3.1 Vegetation

The environmental baseline information of the transmission line will be described from North to South by dividing the route line into three parts:

- Sodo gantry center to bend 21 (Sodo to Arba Minch),
- bend 23 (Nechisar of Arba Minch) to bend 48 (Birindar of Borena Zone),
- bend 49 (Brindar of Borena Zone) to bend 66 (last bend) Kenyan border.

See Figure 9-1 showing all bends and Figure 9-2 showing the bends with vegetation.

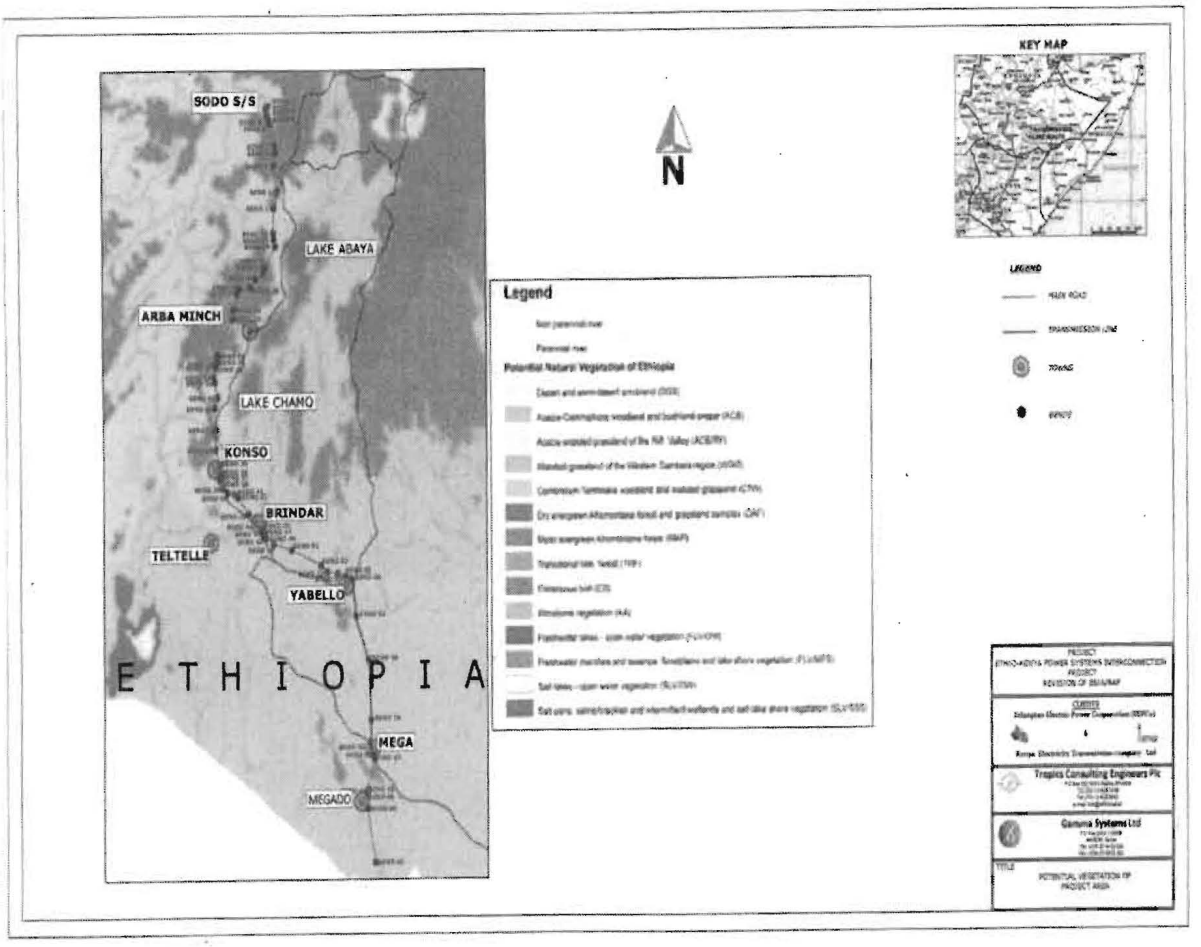
The remarks on endemic species for the Gantry Centers and bends and the list of all plant species encountered during the field study is shown in Appendix 6.

Shortly described, the route line between Sodo towards the Kenyan Border passes through various ecosystems that are inhabited by four vegetation types such as

- Dry Evergreen Afromontane and Grassland,
- Acacia-Commiphora Woodland,
- Combretum-Terminalia Woodland, and
- Riverine Vegetation.

The transmission line starts from Sodo, passes through the localities of Arba Minch and Konso. These localities are mainly cultivating crops like pulses (maize, and sorghum) and fruit like avocado and mango and eucalyptus, interspersed with wild plants. The areas between Konso to Mega to Megado are mainly covered with woodlands, occasionally with some cultivated fields. The Sodo and Mega substations are both part of the Afromontane grassland without much tree and shrub cover. A brief description of each vegetation type traversed by the project is given in Map 9-2 below.

Map 9-2: General vegetation of the preferred route line



9.3.1.1 Dry Evergreen-Montane Forest and Grassland

In general, the Dry Evergreen Montane Forest and Grassland complex is inhabited by the majority of the Ethiopian population and represents a zone of sedentary cereal-based mixed agriculture for centuries. The forests have diminished due to human interference and replaced by bush lands in most areas. The Dry Evergreen Montane Forest and Grassland complex is also an ecosystem where livestock density is one of the highest in the country and hence contributing to the destruction of the vegetation type.

The areas with Dry Afro-Montane Forest have canopies usually dominated by *Podocarpus falcatus* with *Juniperus procera* as co-dominant, *Croton macrostachyus*, *Ficus spp.*, *Olea europaea* subsp. *cuspidata*, etc. There is usually a rather well developed stratum of small to medium-sized trees. The ground cover is rich in ferns, grasses, sedges, and small herbaceous dicotyledons. At the upper limit of this type of forest, between 3000 m and 3400 m, there is often a more open type of Woodland or Evergreen Bush Land with *Erica arborea*, *Gnidia glauca*, *Hagenia abyssinica*, *Hypericum revolutum*, *Jasminum stans*, *Myrica salicifolia*, *Myrsine africana*, *Myrsine melanophlöeos*, *Rosa abyssinica*, and *Nuxia congesta*.

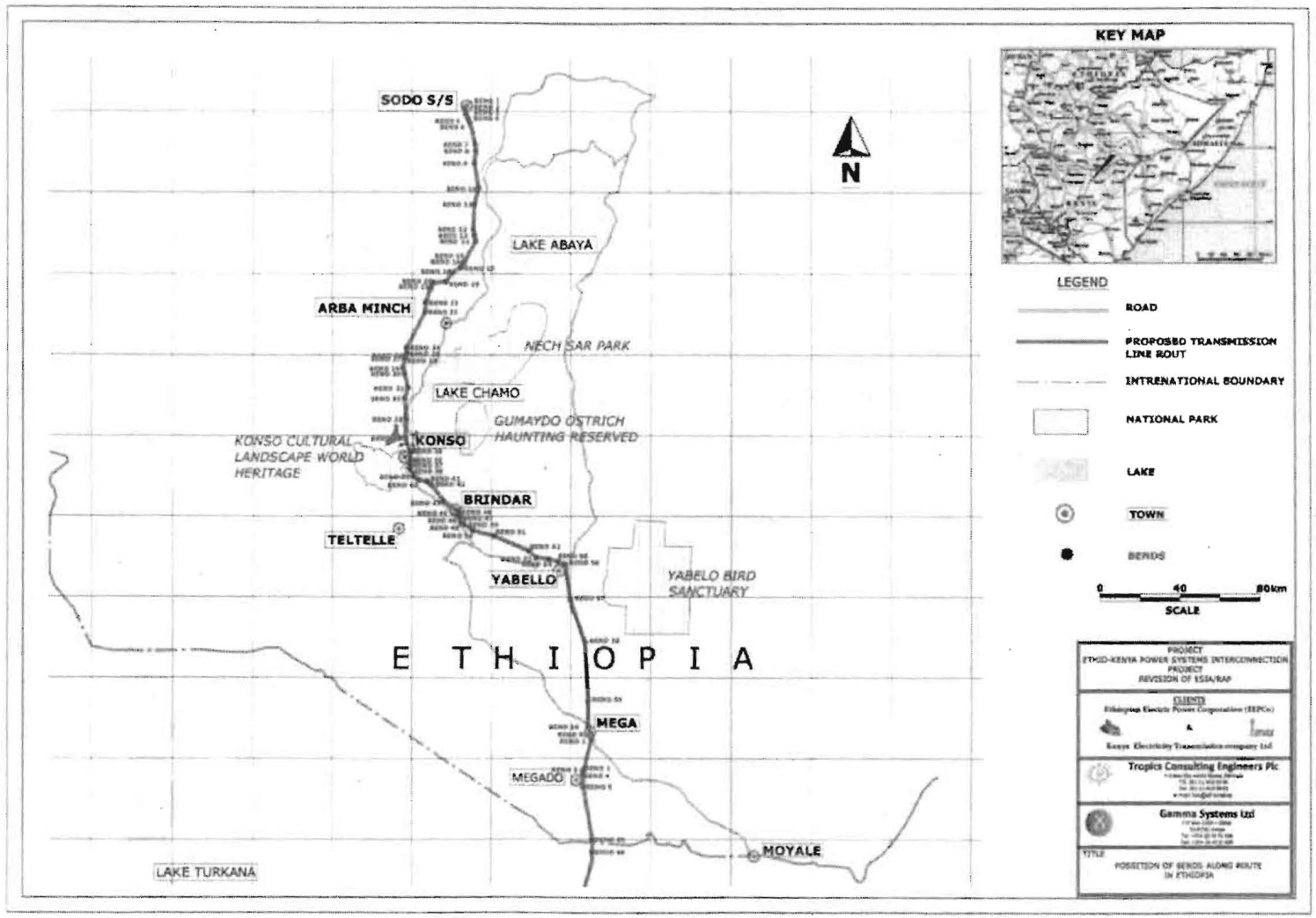
The areas with Afromontane Woodland, Wooded Grassland and Grassland include the natural woodlands and wooded grasslands of the plateau with *Acacia abyssinica*, *A. negrii*, *A. pilispina*, *A. bavazanoi*, *A. montigena*, etc. some of which are endemic to the Ethiopian highlands. This vegetation type occurs either on well-drained sites or on areas with black cotton soil, which may be flooded during the rains. It must be assumed that it has formed a mosaic with the forests and evergreen bush land vegetation of the plateau before the influence of man.

The Dry Evergreen Afromontane Forest and Grassland vegetation type covers the area between Sodo town, Yabello and Mega gantry center. The vegetation near Sodo consists of mainly trees such as *Acacia Abyssinica* (Odoro in Welayta; Girar in Amharic), *Albizia gummifera*, *Allophylus abyssinicus*, *Arundinaraia alpina*, *Cordia africana* (Mokota in Welayta;

Wanza in Amharic), *Croton macrostachyus* (Anka in Welayta; Bisana in am), *Erythina brucei* (Boroto in Welayta; Korch in Amharic), *Juniperus procera* (Tida in Welayta; Tid in Amharic), *Olea europaea* subsp. *cuspidata*,(Wegara in Welayta; Weira in Amharic), *Draceana steudneri* (Erala in Welayta) and *Podocarpus falcatus* (Ziga in Welayta; Zigba in am); *Pygeum africanum* (Garye in Welayta; Tikur Enchet in Amharic). An examples of Dry Evergreen Montane Forest in the Transmission line is seen close to Wolyita (Figure 9-2)

Figure 9-2: Representative Species of the Dry Evergreen Montane Forest Ecosystem

Map 9-3: Overview Routing and Bends in Ethiopia



9.3.1.2 Acacia-Commiphora Woodland

This vegetation type is characterized by drought resistant trees and shrubs, either deciduous or with small, evergreen leaves. The trees and shrubs form an almost complete stratum and include species of *Acacia, Balanites, Commiphora, Capparis, Combretum* and *Terminalia*. But due to the small leaves in the tree and shrub layers, light penetrates to the ground, which in turn often has a rich flora including species of *Acalypha* (Euphorbiaceae), *Barleria* (Acanthaceae), *Aerva* (Amaranthaceae), geophytes of species of *Chlorophytum* sp.(Anthericaceae), and succulents of *Aloe* species. Sometimes no trees are present, and in such cases the vegetation should be referred to as Acacia-Commiphora bushland. This vegetation type occurs in the lakes region south of Arbaminch, through Konso to the Kenyan border.

The characteristic endemic mammals include African Wild Ass, Grevy's Zebra and Black Rhinoceros. The endemic bird species in the ecosystem include the Abyssinian Woodpecker, Yellow-fronted Parrot and Abyssinian Bush Crow.

The *Acacia-Commiphora* deciduous woodland is currently under strong environmental stress. Extraction of fuel wood and charcoal for major towns in the country has increased the rate of deforestation and natural resource depletion. The ever increasing of woodland clearance for rain-fed agriculture and irrigation under takings further enhanced the vulnerability of the ecosystem.

The three endemic mammals in this ecosystem, namely, the African Wild Ass, Grevy's Zebra and Black Rhinoceros are globally threatened. In addition to these, the endemics bird species like the Abyssinian Woodpecker, Yellow-fronted Parrot and Abyssinian Bush Crow and the near-endemics, Lappet-faced Vulture, Imperial Eagle, Lesser Kestrel, Wattled Crane, Abyssinian Bush Crow, White-tailed Swallow and Nechisar Night Jar are categorized as vulnerable.

In the Transmission route line, *Acacia-commiphora* woodland is represented between Soddo and Arbaminch at the lower parts of the mountains and most parts between Konso and Yablello (Figure 9-3).

Figure 9-3: Acacia-Commiphora woodland (left); Konso-Yabello (right)

9.3.1.3 Combretum-Terminalia Woodland vegetation

This vegetation type is characterized by small to moderate-sized trees with fairly large deciduous leaves. These include *Boswellia papyrifera, Anogeissus leiocarpus* and *Stereospermum kunthianum* and species of Terminalia, Combretum and Lannea. The solid-stemmed lowland bamboo *Oxytenanthera abyssinica* is prominent in river valleys and locally on the escarpment of western Ethiopia. The ground cover is a tall stratum of perennial grasses (Poaceae), including species of *Cymbopogon, Hyparrhenia, Echinochloa*, Sorghum and *Pennisetum.*

The vegetation type includes also animal species that also occur in the *Acacia-Commiphora* woodland. The characteristic mammals include Common Eland, Bush Elephant, African Wild Dog, Leopard, Grevy's Zebra, Black Rhinoceros and Roan Antelope. The characteristic bird species include Lappet-faced Vulture, Lesser Kestrel, Stanely's Bustard, Crowned Crane, Griffon Vulture, European Sparrow Hawk, Long-toad Lapwing, Lizard Buzzard, Brown Parrot and Levaillant's Cuckoo.

Combretum-Terminalia woodland also occurs as a comparatively narrow zone in Central and Eastern Ethiopia between the *Acacia-Commiphora* woodland and bushland and the vegetation on the plateau. However

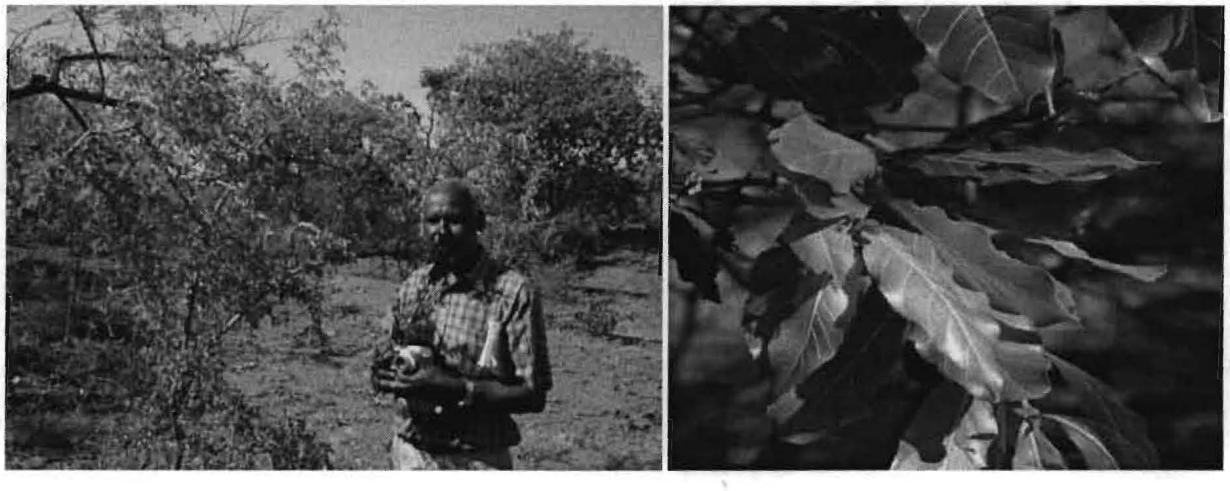
The soil erosion rate in this vegetation typeis very high especially at the onset of rains. This ecosystem generally occurs on rockier sandy soils (Beals, 1968; Tesfaye Awas *et al.*, 2001).

The area has been deforested in recent years because of indiscriminate fire, which removes huge amount of biomass, intensification of agricultural activity and extraction for the supply of construction, fuel wood and charcoal for the major towns and cities (Anonymous, 1992). Soil erosion at the beginning of the rainy season was aggravated by fire since it removes soil cover.

Examples of Combretum-Terminalia Woodland Ecosystem *in the Transmission line*

The *Combretum – Terminalia* woodland vegetation type (Figure 9-4) covers the area west of Wolayita Soodo at around Bend 9, 9km from Soddo towards Arbaminch. It consists of mainly trees such as *Anogeissus leiocarpa.* Thus the area hosts a diversity of unique flora *Combretum collinum, Combretum adenogonium, Entada africana, Erythrina abyssinica, Combretum molle, Stereospermum kunthianum.* The shrub layer includes *Grewia mollis, Maytenus sengelensis*, etc. There are also a number of herbaceous plants mainly members of the Family Acanthaceae.

Figure 9-4: The Combretum–Terminalia Woodland Vegetation Type (Left); Combretum Adenogonium Right



9.3.1.4Riparian and Swamp vegetation

This vegetation type consists of at least two physiognomically different types, riverine and riparian forest (Figure 9-5) with typical trees in riverine forest such as *Acacia polyacantha, Breonadia salicina, Phoenix reclinata, Sapium ellipticum,* and *Tamarindus indica* and open, almost treeless vegetation near Lakes Abaya and Chamo (Figure 9-6).

This vegetation type is characterized by having typical trees in reverie forest including *Celtis africana, Ficus sycomorus, Mimusops kummel* (Sapotaceae), etc. The reverie and riparian forest vegetation of the study area is very variable, and the floristic composition is dependent on altitude and geographical location. Common tree species in these forests are species of *Ficus spp, Celtia africana, Lepisanthes senegalensis, Salix spp., Trichilia emetica, Diospyros mespiliformis, Mimusops kummel, Syzygium guinnnense, Tamarindus indica, Acacia albida, Tamarix nilotica, Breonadia salicifolia*, and *Phoenix reclinata.* There is often a shrub layer, and lianas and vascular epiphytes occur. The ground cover includes grasses, ferns, and a few herbaceous dicotyledons.

The riparian vegetation close to larger lakes may include *Acacia Albida*, species of *Ficus*, *Phoenix reclinata* and *Aeschynomene elaphroxylon.*

The characteristic mammal species of this ecosystem include Hippopotamus, NileLechwe,Common Waterbuck and Bush Elephant. The ecosystem is also home for endemic and near-endemic aquatic birds such as Spot-breasted Plover, Blue-winged Goose and Rouget's Rail. The habitat is also used by considerable species of reptiles such as the Nile crocodile. Examples of Riparian and Swamp vegetation in the transmission line is shown in figure 9-5.

Figure 9-5: Amessa River, Riverine vegetation close to Bend 8

Figure 9-6: Lake Abaya (in part), looking from mountain ridge

9.3.2 *Fauna*

Wildlife other than Birds

Several species of large wild animals have been reported from the area (Appendix). However encounter with large mammals during the present field study was very rare. This is not a surprise since there has always been an ongoing conflict between wildlife conservation and increasing demand on land for agricultural and livestock development in the areas from Soddo-Arbaminch-Konso and a little bit beyond. These growing and ongoing conflicts must be seen within the context of the levels of chronic poverty, which existed and still exists throughout Ethiopia, especially rural Ethiopia. Wildlife cannot survive if it constantly has to compete with human interest in the form of cultivation and livestock raising that invariably cause wildlife habitat destruction in Ethiopia. The study area is no exception to this process. The areas past Konso to Yabello-Mega-Kenyan border have some intact woodland ecosystems which harbors various wild animals.

Birds

There are two important conservation areas along the Transmission route; the Nech Sar National Park and the Yabello wildlife Sanctuary

Yabello Sanctuary

The Ethiopian Wildlife and Natural History Society (EWHNS) have identified important bird areas in the Yabello Woreda.

The woreda includes the Yabello Sanctuary, although not clearly demarcated, it stretches from 10 km east on the main Addis-Moyale road and north of the Yabello-Arero road.

The Yabello sanctuary is designated as an important protected area for two globally threatened species, White-tailed Swallow and Abyssinian Bush Crow. The two species belong to the Southern Ethiopian Highland endemic. In addition, according to an old record, another threatened species, the Taita Falcon was recorded from Yabello in the 1940's. The Important Bird Area Project had identified about 210 bird species (EWNHS, 1996).

Nechsar National Park

The Park is found in the Southern Nations, Nationalities and Peoples Regional State (SNNPR), west of Arbaminch town. The range of altitude of the Park is between 1108 m at the shore of Lake Chamo to about 1650 on Mt Kalia on the North East part of the Park. The Park includes *Acacia-Commiphora* woodland, part of the Abaya and Chamo Lakes and their shore lines.

The importance of the Park is due to the presence of restricted-range endemic species, Nechsar Nightjar. In addition in the Park there are three globally threatened species (Lesse Kestrel, Pallid Harrier and Lesser Flamingo) and about 25 species known from Somali—Masai biome. The list of bird species that occur in the area are listed in Appendix.

The establishment of the Nechsar National park was mainly to protect the endemic Swayne's Hartebeest. There are about 37 mammal species in the Park, the prominent ones being Burchell's Zebra, Grant's gazelle, Greater Kudu, Leopard, Klipspringer, Crocodile, Hippopotamus and African Wild Dogs (EWNHS, 1996).

9.4 Baseline Information along the Line Corridoe on Biophysical Environment between Soddo and Kenyan Border

The biophysical environment baseline information of the transmission line will be presented by dividing the route line into three parts i.e. Soddo gantry center to bend 21 (Soddo to Arba Minch), bend 23 (Nechsar of ArbaMinch) to bend 48 (Birindar of Borena Zone), bend 49 (Brindar of Borena Zone) to bend 66, last bend, Kenya boarder. In order to show the diversity in vegetation in Flora (and when necessary the fauna), the format followed here is to follow the transmission line and describe the various flora and fauna encountered and the threats on them.

The Remarks on Endemic species for the Gantry Centers and. Bends is shown in Appendix and the list of all plants species encountered during the reconnaissance Soddo-Kenya Border is shown in Appendix.

The route line between Soodo – Kenya Border passes through various ecosystems that are inhabited by four vegetation types such as Dry evergreen afromontane and grassland, *Acacia-Commiphora* woodland, *Combretum-Terminalia* woodland, and the riverine and swamp vegetation. Brief description of each type is given as under

Dry evergreen afromontane and grassland

The dry evergreen afromontane forest and grass land vegetation type covers the area between Soddo town,Yabello and mega gantry center

Soddo Gantry Centre

The altitude of the areas in the vicinity of Sodo Gantry Centre (6°54'28"N 37°43'28"E) ranges from 1960 m to 2060 m at Sodo town. The Gantry centre is located North East of Bele and North West of Sodo (Figure 9-7). It is at about 17.5 km from Sodo Shell Station, close to Bekele Molla Hotel, to Butjaira asphalt road and turn to the left at the sign board showing "Wareza-Lasho Primary School (first cycle). Then, another one is located about 1 km westwards at 358941E, 763871N. (Figure 9-7).

Figure 9-7: Planned Wolayita substation with open overgrazed grassland

Bends 1 and 2

The Welayita Gantry centre and Bends 1 and 2 are degraded grassland with some depauperate woody species, such as *Carissa spinarum*, *Croton macrostachys*, *Maytenus arbutifloia*, *Solanum incanum.*

Figure 9-8: Shrubs on mounds (Welayita Soddo)

Not much mammals were observed in the area, but few bird species such as Cape Rook, White-Necked Raven, Cattle Egret, Tawny Eaget, Temminicii Courser. See Figure 9-9.

Figure 9-9: White Egret (left), White-necked Raven and Cape Rook (right) Birds

Bend 3

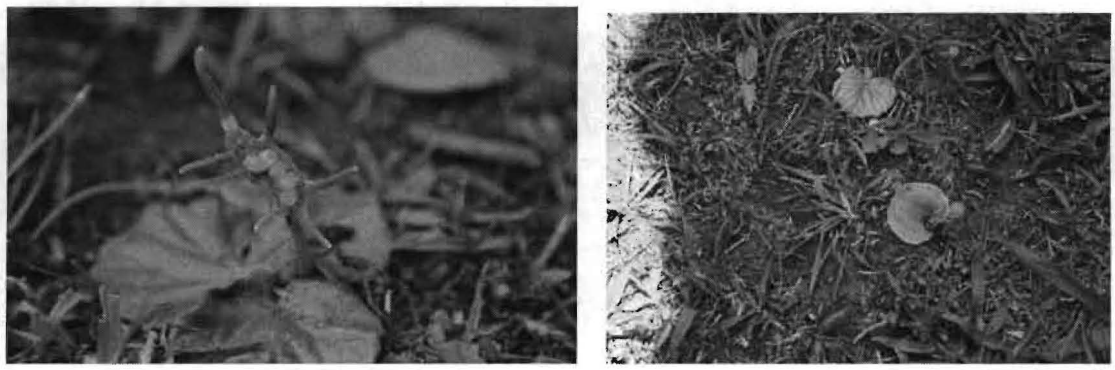
At Bend 3, the area is mainly cultivated with various shrubs and fruit trees including Avocado, species of *Dioscorea* (BOYE), Coffee (BUNNA), *Manihot* (MITA BOYE), Banana (MUZ), *Rhamnus* (GESHO), other trees such as *Eucalyptus*. There are also wild species such as *Cordia africana*, *Croton macrostachyus*, *Erythrina brucei* (endemic), *Olea europaea subsp. cuspidata*, *Podocarpus falcatus*, *Vernonoia aculifera*, etc. in the area. There are no endangered species in the area, but cultivated crops like maize around Bend (Figure 9-10).

Figure 9-10: Bend 3 Mark, with maize and other fruit cultivations, Woja Kero kebele

Bends 4, 5 and 6

Bends 4, 5 and 6 are similar to Bend 3 with mainly cultivated fields and eucalyptus plantations. However, there are few isolated open grassland spaces that have got rare plant species in the area. For example, an open area between Bends 3 and 4 (358398 E 759829 N) and 1916 m, with *Eulophia* and *Nervillea* (orchids), rare in the area. At about 8 km from Sodo towards Arba Minch (361591E 750834N), at 1813 m altitude, between bends 5 and 6, the Transmission line crosses the existing Sodo-Sawla 132 KV Transmission line.

Figure 9-11: Species of Dorstenia (Moraceae) (Left) and Nervillea (Orchidaceae)



At about 8 km from Sodo towards Arba Minch (361591E 750834N), at 1813 m altitude, between bends 5 and 6, the Transmission line crosses the existing Sodo-Sawla 132 KV Transmission line (Figure 9-12)

Figure 9-12: The T/L Crosses Soddo – Sauala 132 kv Transmission Line between Bend 5 & 6

Bend 8

The riverine vegetation of the study area (Figure 9-13) includes *Ficus spp*, *Celtia africana*, , *Syzygium guinnnense*, *Acacia albida*, and *Phoenix reclinata*.

Figure 9-13: Tebela to Arbaminch, Amessa River Riverine Vegetation

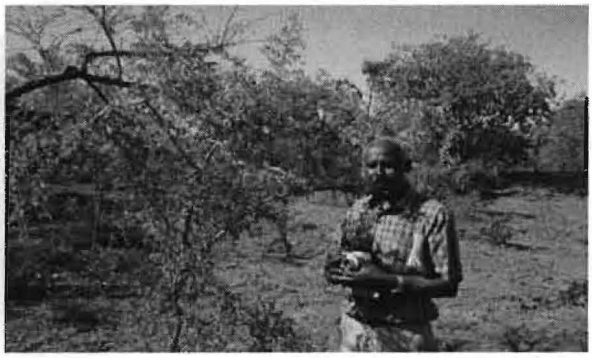
Bend 9

The area around Bend 9 consists of *Combretum-Terminalia* Woodland.

Small to moderate-sized trees with fairly large deciduous leaves are characteristic for ***Combretum-Terminalia vegetation***. These include *Anogeissus leiocarpus* and *Stereospermum kunthianum* and species of *Terminalia*, *Combretum* and *Lannea*. T. The *Combretum-Terminalia* woodland also occurs as a comparatively narrow zone in the area between the *Acacia-Commiphora* Woodland and Bushland

The *Combretum – Terminalia* woodland vegetation type covers the area west of Wolayta Sodo at around Bend 9, 9 km from Sodo towards Arba Minch (Figure 9-14).

Figure 9-14: Combretum-Terminalia at Zefne Kebele, Boreda Woreda



Bend 10

This is an agricultural area as seen in Figure 9-15

Figure 9-15: Agricultural land at bend 10

Bend 11

Acacia-Commiphora woodland is found around Bend 11 (Figure 9-16). The ***Acacia-Commiphora* Woodland vegetation** characterized by drought resistant trees and shrubs, either deciduous, or with small, evergreen leaves. The trees and shrubs include species of *Acacia*, *Balanites*, *Commiphora*, *Capparis*, *Combretum* and *Terminalia*. There is also a rich flora including species of *Acalypha* (*Euphorbiaceae*), *Barleria* (*Acanthaceae*), *Aerva* (*Amaranthaceae*), geophytes of species of *Chlorophytum sp.*(*Anthericaceae*), and succulents of *Aloe* species.

The *Acacia-Commiphora* Deciduous Woodland is currently under strong environmental stress. Extraction of fuel wood and charcoal for major towns in the country has increased the rate of deforestation and natural resource depletion.

Figure 9-16: Abandoned cotton farm with Acacia-Commiphora woodland

Bends 12 and 19. The bends cover cultivated areas and occasionally shrub lands (Figure 9-17).

Figure 9-17: Omo Lante with banana and mango and Plantations (Left) and Transmission Line Passing Later Close to Ridges Parallel to another Existing Transmission Line

Bends 22-23

Bend 22 (at Arba Minch). It is in a disturbed area possibly *Acacia-Commiphora* woodland. There is *Aloe ottalensis*, an endemic species in the area. Otherwise the transmission line passes through a flatter area on the higher parts of the escarpment above Arba Minch at Sikela Gurba Kebele. The transmission line is about 800 m further from resident houses in the area.

Bend 23, is at about 2 km from Arba Minch towards Konso. The transmission line passes at the foot hill of the mountain on flatter areas. The transmission line passes Lake Chamo and Lake Abaya at a distance of at least 850 m or 900 m respectively from the RoW. Parts of these lakes belong to the Nechisar National Park (Figures 9-18), as described in the subsequent **Chapter Protected Areas**.

Figure 9-18: Lake Chamo and Lake Abaya and Nech Sar Park

Bend 24-26
This is cultivated area mainly maize. The next bends are mainly dominated by *Acacia-Commiphora* woodland (Figures 9-19).

Figure 9-19: Bend 24, Gidole Wereda, Cultivated Field with Maize (left); Acacia-Commipohra Woodland and Cultivated Banana Beneath the Foot of the Mountain (Right)

Bend 25
This is about 15 m parallel to existing line, *Acacia* Woodland.

Bends 31-34
These Bends 31-34 are mainly cultivated fields (Figure 9-20)

Figure 9-20: Cultivated Field

Bends 36-37

These Bends pass close to Konso town that has cultural landscape and archeological sites. The bends were at $5^0$17'59.6"N and $37^0$27'56.3"E and $5^0$17'19.7"N and $37^0$27'44.1"E respectively.

The second point visited as the eastern part of the Dara walled town is at $5^0$19'36.8"N and $37^0$27'21.7"E at 1284 m. The third point visited is entrance gate to Idigle, adjacent to Dra, at $5^0$20'16.9"N and $37^0$27'05.5"E, 4 km from Karat town along the main road to Yabello. This is the eastern border of the Idigle associated with Dara walled towns and surroundings.

The fourth point visited was 6 km on the main road close to Hoy-hoyo Mtn at $5^0$19'03.9"N and $37^0$27'33.9"E at 1172 m. This is the buffer zone on the eastern part of the Dara walled Towns.

The vegetation is *Acacia-Commiphora* woodland (Figure 31) close to Hoy-Hoyo the eastern border of the walled towns) and common plants in the above points visited in addition to sorghum cultivations include characteristic species, *Acacia mellifera, Adenium obesum, Aloe* spp., *Balanites aegyptiaca, Ximenia cafra*, etc.

These bends are within Acacia-Commiphora woodland with endemic *Aloe gilbertii* subsp. *megalacanthoides* and a near endemic *Aloe pirottae* and relatively rare orchids, *Eulophia petersii* occur here (Figure 9-21).

Figure 9-21: Bend 36, Konso Wereda, 4.3 km from Konso to Yabello, Acacia-Commiphora woodland with Aloe gilbertii subsp. megalacanthoides (left) and Aloe pirottae (right)

Bend 40

Acacia – Commiphora Woodland with rare *Grewia plagiophylla* (Figure 9-22).

Figure 9-22: Bend 40 Mark, Acacia-Commiphora woodland (left), with a rare Grewia plagiophylla (right), Konso Wereda, 18 km from Konso to Yabello

Bend 43

The area occupies the best representative of the *Acacia-Commiphora* Woodland (Figure 9-23).

Figure 9-23: Bend 43 (towards Mark from base to top), 57 km Konso to Yabello, Acacia-Commiphora woodland vegetation

Bend 43

Dry Evergreen Montane Forest is found at Bend 43. It should be noted that at about 91 km from Konso to Yabello, there is a thick *Juniperus* forest along the main road, 392829E 544819N at 1835 m. The routing of the transmission line avoided this part, which is considered as positive. Thus the current routing (bend 53) is away from this *Juniperus* forest, but it still affects the Dry Evergreen Montane Forest (Figure 9-24).

Figure 9-24: Bend and 53 Close to Konso, Dry evergreen montane Forest (Left), Trachonanthus camphoratus (right) about 4 km Yabello-Konso

Note: It should be noted that at about 91 km from Konso to yabello, there is a thick Juniperus forest along the main road, 392829E 544819N at 1835 m. The transmission line avoided this part, which is considered positive. Thus the current transmission line. (bend 53) is away from this path, but it still affects the dry evergreen montane forest which is not widespread in the area (Figure 9-25).

Figure 9-25: The Forest along the current road which is avoided

Bend 55-56

Bend 55 is a continuation of the Dry Evergreen Montane Forest, which is in a degraded state at this location (Figure 9-26). In this bend, there is another endemic *Aloe rugosifolia* (Figure 9-27).

Figure 9-26: Bend 55, Remnant forest (LEFT) with Ochna inermis (right) 1 km Yabello to Mega

Figure 9-27: Bend 56 (Aloe Rugosifolia, Endemic aloe)

Bends 57, 58, 59, 60

The bends are covered with *Acacia-Commiphora* woodland (Figure 9-28).

Figure 9-28: This is Acacia-Commiphora woodland with a wood pecker bird

(Bend) Mega At this location, Afromontane Grassland is found, which is one of the sensitive habitats with at least four endemic species, such as: *Aloe rivae*, *Stachys argillicola* subsp. *argillicola*, *Ipomoea hildebrandtii* subsp. *megaensis*, *Gladiolus borenensis*. These species occur in the Gantry Centre where it was planned to build the Mega substation, which now will not be realized.

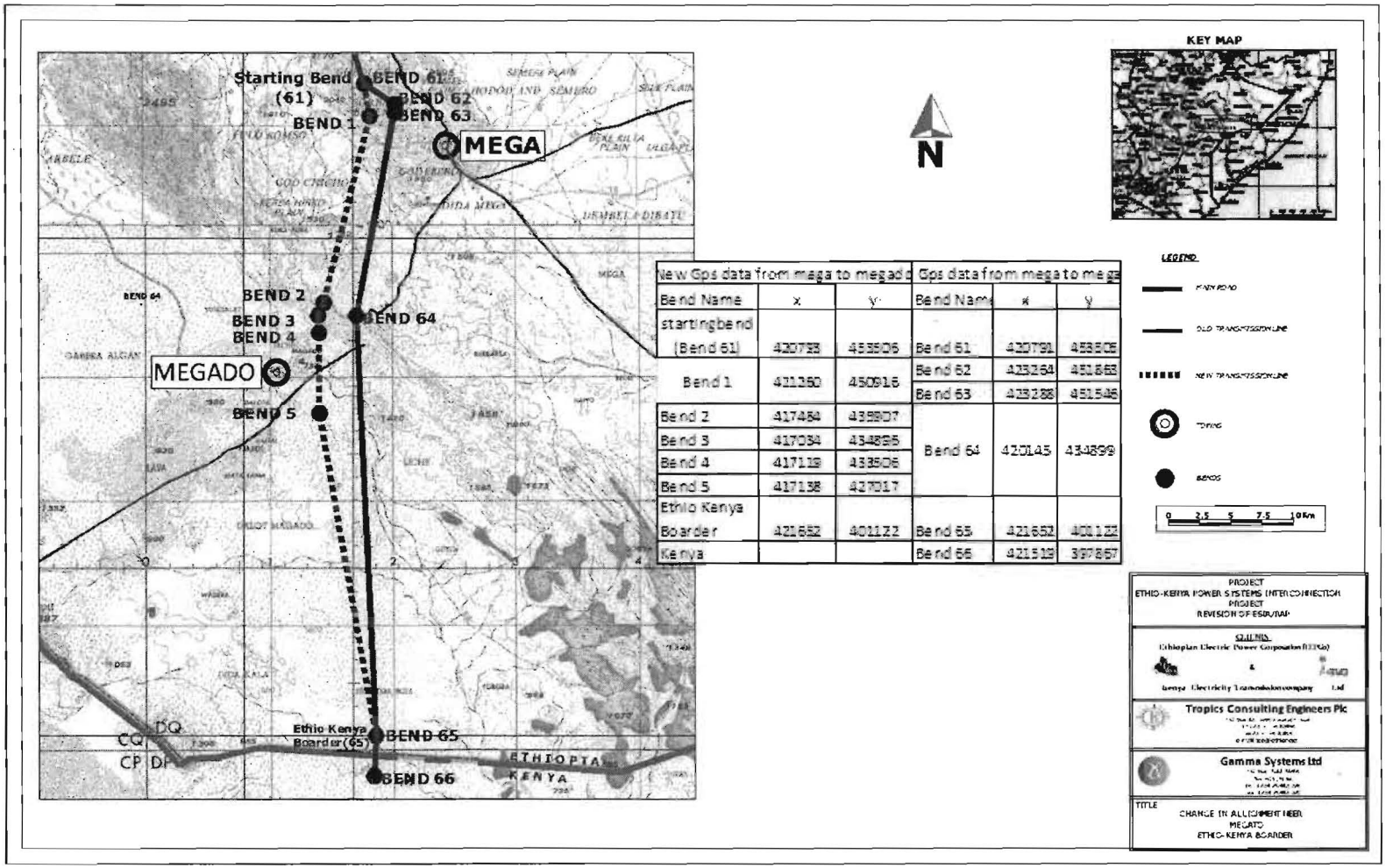
In Fichtner report the area was given the following "**Remark**: This is one of the sensitive habitats with at least four endemic species. These include: *Aloe rivae, Stachys argillicola* ssp. *argillicola, Ipomoea hildebrandtii* ssp. *megaensis, Gladiolus borenensis* (Endemic species) occur in the Gantry Centre where the main station is to be built, particularly if the surface of the whole centre covered with tarmac (Figure 9-29).

Figure 9-29: Open Montane Grassland (left, Covered with Stachys Argillicola and Gladiolus Borenensis (two of the Local Endemics Restricted to the Area)

Currently, the Bends are re-routed and the establishment of the Gantry centre is not part of this project.

In the current field visit, the new bends are evaluated as follows (Figure).

Map 9-4: Re-routed Transmission Lines between Mega and Border



New Gps data from mega to megado			Gps data from mega to mega		
Bend Name	x	y	Bend Name	x	y
startingbend (Bend 61)	420793	455506	Bend 61	420791	455505
Bend 1	411360	450916	Bend 62	423264	451863
			Bend 63	423288	451546
Bend 2	417484	435807	Bend 64	420145	434899
Bend 3	417034	434895			
Bend 4	417119	433506			
Bend 5	417138	427017			
Ethio Kenya Boarder	421652	401122	Bend 65	421652	401122
Kenya			Bend 66	421519	397857

Old Bend	New Bend
62,63	1
64	2, 3, 4, 5

Mega town is at 4°03'36.2"N and 38°19'13.0"E; 1716 m

New Bend 1 (62 & 63).

Bend 1 is at 4°04'51.8"N and 38°17'29.2"E; 1927 m. About 3-4 km on the main Mega-Yablello road and ca. 2 km to the left (Map 9-4).

It is part of the Dry Afromonatne forest and grassland vegetation type. It is on the western side of the Mega Plateau, mainly grassland.

Figure 9-30: Bend 1 (62, 63) north of Mega (left and middle); near endemic Aloe rivae (right)

There are also other characteristic species including *Juniperus procera, Ipomoea jaegeri, Clutia abyssinica,* and *Osyris quadripartita*,

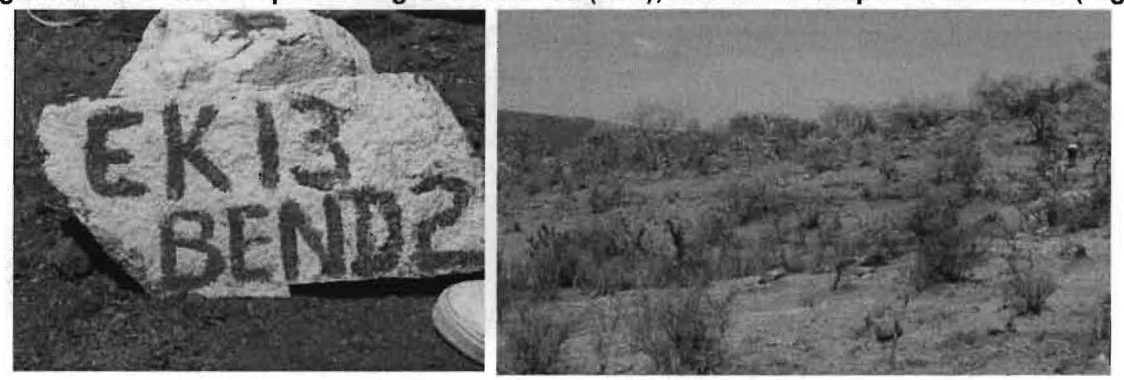
Areas between Bends 62 and 65 (to the Kenyan border) are representing by *Acacia-Commiphora* woodland. During the recent field visit to the area, the vegetation was too dry.

New Bend 2

Bend 2 represnting new Bend 64 is at 3°56'42.9"N and 38°15'27.2"E; 1518 m. It is about 19 km on the main Mega-Mega road and 15 km from New Bend 1.

It is part of the *Acacia-Commiphora* woodland (Figure 9-31).

Figure 9-31: Bend 2 Representing New Bend 62 (Left); Acacia-Commiphora Woodland (Right)



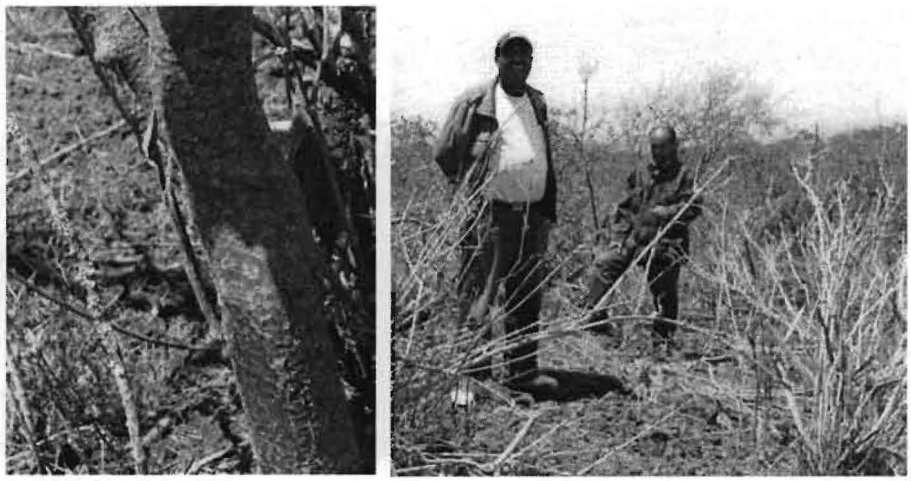
The common species that occur near the bend include, *Acacia drepanolobium, A. hockii, A. seyal, A. tortilis, Acokanthera schimperi, Asparagus natalenis, Euphorbia polyacantha, Grewia* spp. and *Pappea capensis,*

New Bend 3 (Bend 63).

Bend 3 is at 3°56'10.0"N and 38°15'12.6"E; 1462 m. It is about 20 km on the main Mega-Mega road and 1.1 km from New Bend 2.

It is part of the *Acacia-Commiphora* woodland (Fig. 9-32).

Figure 9-32: Bend 3 representing new Bend 64(Left); Acacia-Commiphora woodland (right)



The common species that occur near the bend include, *Acalypha fruticosa, Commiphora schimperi, C. terebenthina* and *Ochna inermis,*

New Bend 4 (Bend 64).

Bend 4 is at 3°55'24.9"N and 38°15'16.0"E; 1278 m. It is about 23 km on the main Mega-Mega road and 1.4 km from New Bend 3.
It is part of the *Acacia-Commiphora* woodland (Figure 9-33).

Figure 9-33: Bend 4 Representing New Bend 64 (Left); Acacia-Commiphora Woodland (Right)

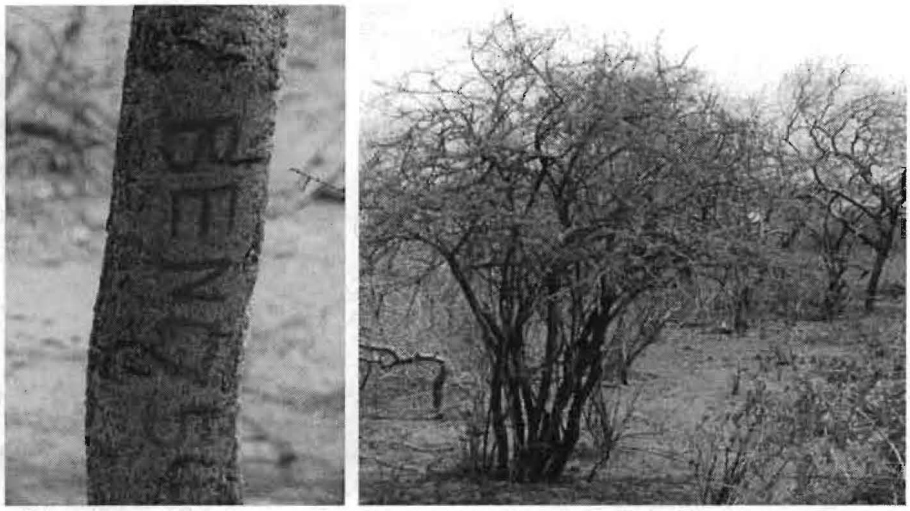
The common species that occur near the bend include, *Acacia brevispica, Euphorbia polyacantha, Grewia velutina* and *Lannea rivae,*

Bend 65

Bend 65 is at 3°51'53.4"N and 38°15'16.2"E; 931 m. It is about 32km from Mega. The distance up to Megado is about 27 km from Mega. The bend is c. 5 km beyond Megado on dry weather road and 6 km from New Bend 4.

It is part of the *Acacia-Commiphora* woodland (Figure 9-34).
The common species that occur near the bend include *Acacia oerfota, Balanites rotundifolia, Grewia erythraea* and species of *Commiphora.*

Figure 9-34: Bend 65 (Left); Acacia-Commiphora Woodland (Right)



The characteristic species that occur near this and the next bend (66) include, *Acalypha fruticosa, Commiphora schimperi, C. terebenthina* and *Ochna inermis,*

Bend 65

This is the Bend at the Kenyan border.

It is part of the *Acacia-Commiphora* woodland. The common plants encountered in this end include. The area is experiencing severe drought currently and most plants have died up.

This bend has a similar vegetation composition to Bend 64. The area covers between Bend 5 and the Kenyan border towards Turbi in Kenya.

9.4.1 Endemic Plant Species

A number of unique and endemic species are present along the transmission line. The most important being all the *Aloe* species that are cited by the CITES Aloe checklist (2001). These include *Aloe calidophilla*, *A. gilbertii*, subsp. *megalacanthoides*, *A. pirottae*, *A. rugosifolia*, and *A. secundiflora.* Some of the endemic species, *Aloe otallensis* and *A. pirottae*, *Aloe gilbertii* ssp. *megalacanthoides* and near endemics such as *A. calidophila* and *A. rivae* that also occur in Kenya are not threatened. In addition these species would re-colonize the area as these are succulent species that withstands environmental pressures (natural and anthropogenic) once the transmission work is completed.

The Mega Gantry centre is known as an important habitat for restricted flora endemics such as *Ipomoea hildebrandtii subsp. megaensis*, *Gladiolus borenensis* and *Stachys argillicola.* Particularly *Stachys argillicola* is adapted to the black cotton soil in the Mega mountains. A list of the species identified during the field trip is attached as Appendix. However, the Mega gantry centre is not considered in this revised route.

9.4.2 Wildlife

Several species of large wild animals have been reported from the protected areas in the region, Nechisar National Park and Yabello Sanctuary. However observation of large mammals during the field study was very rare. As there has always been an ongoing conflict between wildlife conservation and increasing demand on land for agricultural and livestock development in the areas from Sodo – Arba Minch – Konso and a little bit beyond, such observations were not expected. These growing and ongoing conflicts must be seen within the context of the levels of chronic poverty, which existed and still exists throughout Ethiopia, especially in rural areas. The invariably pressure of human interest on habitats and wildlife in the form of cultivation and livestock raising causes wildlife habitat degradation and destruction in Ethiopia. The study area is no exception to this process.

The areas past Konso in direction to Yabello via Mega towards the Kenyan border has some intact woodland ecosystems which harbors various wild animals.

The characteristic mammals living in the Dry Evergreen-Montane Forest areas include the Olive Baboon, Leopard, Serval, Bush Duiker and Mountain Nyala.

The characteristic birds include six endemic birds: Black-headed Siskin, Abyssinian Catbird, Abyssinian Long claw, Abyssinian Woodpecker, Yellowfronted Parrot and Spot-breasted Plover.

Characteristic and threatened mammals of *Acacia-Commiphora* Woodland are African Wild Ass, and Grevy's Zebra. Endemic bird species occurring in *Acacia-Commiphora* Woodland are Abyssinian Woodpecker, Yellow-fronted Parrot and Abyssinian Bush Crow. In addition to these, near-endemic bird species like Lappet-faced Vulture, Imperial Eagle, Lesser Kestrel, Wattled Crane, Abyssinian Bush Crow, White-tailed Swallow and Nechisar Night Jar are categorized as vulnerable.

Some species living in *Combretum-Terminalia* Woodlands also occur in the *Acacia-Commiphora* woodland. Typical mammals of *Combretum-Terminalia* Woodlands include Common Eland, African Wild Dog, Greater and Lesser Kudu, Common Bushbuck, Ground Squirrel, Abyssinian Genet, Oribi, Serval cat, Common Jackal, Leopard, Grevy's Zebra, and Roan Antelope, which are categorized as threatened.

The characteristic bird species include Lappet-faced Vulture, Lesser Kestrel, Stanely's Bustard, Crowned Crane, Griffon Vulture, European Sparrow Hawk, Long-toad Lapwing, Lizard Buzzard, Brown Parrot and Levaillant's Cuckoo, from which the first four species are also categorized as threatened.

The characteristic mammal species of Riparian vegetation and the Lakes include Hippopotamus and Common Waterbuck. This habitat is also home for reptiles such as the Nile crocodile and endemic and near-endemic aquatic birds such as Spot-breasted Plover, Blue-winged Goose and Rouget's Rail.

9.4.3 Birds

Beside the already listed birds, Lesser Flamingo *Phoeniconaias minor*, Pallid Harrier *Circus macrourus,* few individuals of Lesser Kestrel *Falco naumanni* and Pallid Harrier *Circus macrourus* (all raptor species except Flamingo) are listed on the IBA Factsheet for the Nechisar National Park, as winter or passage bird respectively. Though local experts were interviewed, no further reliable information on flyways or migrating birds could be obtained, as well as on number of observations, population and distribution of the birds listed for Nechisar National Park.

9.4.4 Areas of Ecological Importance

8.4.4.1 Protected Areas

National Forest Priority Areas

National Forest Priority Areas *(NFPA) beginning of the 1980's. The intention for the establishment of NFPAs was the development and protection of remaining natural forests, allocation of available resources on these areas and introduction of integrated forest management, with the purpose of developing self financing enterprises (Map 9-5).*

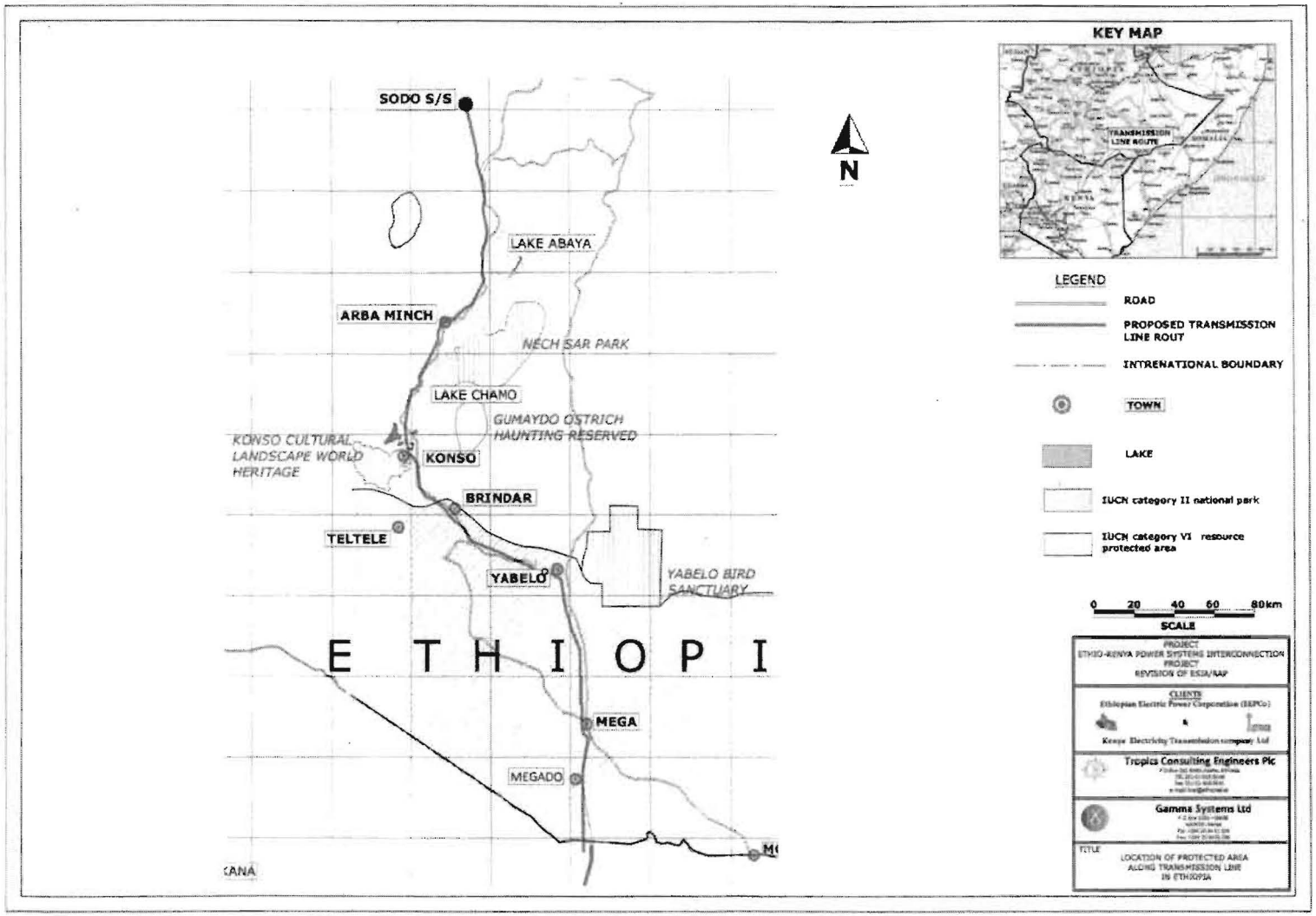
Although most of these areas have a defined border, they are not yet gazetted or legally registered, with the result that they have no administrative status.

This is also applicable for the area near Yabello and between Lake Abaya and Lake Chamo. The Yabello NFPA is described as Dry Evergreen Montane Forest, but also as secondary *Juniperus* forest. It is assumed, that it is an over aged, unproductive forest with a relatively open canopy, with no or only low *Juniperus* regeneration (FAO COUNTRY PAPER).
Based on the field observations it is assumed that the Project would not affect this area, though the exact location and boundary could not be obtained.

Borona Controlled Hunting Zone

No detailed information could be obtained for the Borona Controlled Hunting Zone, except for the boundaries, location and IUCN category. The area is classified as IUCN category VI, it is therefore a protected area with sustainable use of natural resources

Map 9-5: Overview Map Protected Areas in Ethiopia



Category VI protected areas conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area. The primary objective of such areas is to protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial (DUDLEY, N., 2008). The impact assessment for this area will be covered by the impact assessment of natural elements such as flora, fauna and habitats.

National Parks

Two areas of the IUCN Category II (National Park) were identified in the region of the Ethiopian project area, namely Nechisar National Park and Yabello Sanctuary.

Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities (DUDLEY, N., 2008).

Nechisar National Park and Yabello Sanctuary also listed as Important Bird Area (IBA). IBAs are key sites for conservation, often small enough to be conserved in their entirety and already part of a protected-area network, such as national parks.

Nechisar National Park

The Park is located in the Southern Nations, Nationalities and Peoples Regional State (SNNPR), East of Arba Minch town, at the eastern shores of Lake Abaya and Lake Chamo. The range of altitude of the park is between 1108 m at the shore of Lake Chamo to about 1650 on Mount Kalia on the North East part of the park. The park includes *Acacia-Commiphora* Woodland, parts of the Abaya and Chamo Lakes and their shore lines.

The establishment of the Nechisar National Park was mainly to protect the endemic Swayne's Hartebeest. The importance of the park is due to the presence of restricted-range endemic species, e.g. Nechisar Nightjar. In addition, there are three globally threatened species (Lesser Kestrel, Pallid Harrier and Lesser Flamingo) and about 25 species known from Somali-Masai biome found in the park. According to the IBA factsheet, all bird species are residents, except for Lesser Flamingo *Phoeniconaias minor* and Pallid Harrier *Circus macrourus.* There are about 37 mammal species in the Park, such as Burchell's Zebra, Grant's gazelle, Greater Kudu, Klipspringer, Crocodile and Hippopotamus.

The Nechisar National Park is located Easter of the RoW, with a distance of at least 7 km between the proposed routing and the nearest park border. As the town Arba Minch lies between the proposed routing and the park it is not expected that the Project will have effects on Nechisar National Park.

Yabello Sanctuary

Yabello Sanctuary is located 10 km east of Yabello town in the Borana Zone, with the Yabello-Arero road passing through its southern part. Precise boundaries for this protected area have not been set, but the area is estimated to be 250,000 ha. Most of the area is at 1,700 m, the topography is broken and varies between 1,430 and 2,000 m.

The Sanctuary was set up to afford protection to the endemic Swayne Hartbeest *Alcelaphus buselaphus swaynei* (an Antelope species). Although designated as part of the official protected-area system, very little has been done to develop the infrastructure of the Sanctuary. Bird Life International identified the Yabello Sanctuary as IBA. According to the IBA factsheet, all listed birds are residents. The common mammal species in the sanctuary include Zebra, Greater and Lesser Kudu, and Gerenuk.

Yabello Sanctuary is also located Eastern of the routing. As the boundaries of Yabello Sanctuary are not defined yet, it is difficult to estimate the distance between the Project and the Sanctuary. According to the IBA factsheet, the park is located 10 km east of Yabello town. As the Project passes the town on its Western side, it is expected that the Project will not influence the Sanctuary, as the town will increase the 10 km buffer between the Project and Yabello Sanctuary.

9.5 Socioeconomic and Cultural Environment

The Ethiopia-Kenya Power System Interconnection Project covers a total of about 433 Km distance transmission line route in Ethiopia. The line traverses the SNNP and Oromia Regional States. It crosses three zones (Gamo Gofa, Wolayta and Segen) and 7 woredas including Sodo Zuria, Humbo, Kindo Koyisha, Mirab Abaya, Arba Minch Zuria, Bonke, Derashe and Konso of the SNNP Region. It also traverses the Borena Zone and three woredas within the Zone (Yabello, Dire and Teltelle woredas).

The project Woredas in the two regions are characterized by a diverse agro ecological and socio-economic conditions. The woredas in SNNP are intensively cultivated and densely populated areas (154 people/km^2) while the Borena Zone of Oromia is sparsely populated (11 people / Km^2) and less cultivated land. The population in Borena is pastoralists and agro pastoralists where as the mainstay in area in SNNP are agriculture.

9.5.1 Administrative Framework

9.5.2 Demographic Features

9.5.2.1 Population

The population of the project Woredas adds is estimated at 1, 376,811. Out of this the project woredas in SNNP accounted for 80 percent of the total Project woreda (1,099,8280) people while the in Oromia the population accounted only 20 % of the Project Woreda Population (276,983).

Hence overwhelming majority of the total people identified in the Project Woredas live in the SNNP. The proportion of male and female population are evenly split; almost 50% are female (see Table 9-1).

The total area of the project Wored is reported to be 32,955 km^2. 78 percent of the project woredas are located in Oromia Region (in three woredas of Borena Zone). Only 22 percent of the land is located in SNNP (7 woredas in three zones in SNNP). 80 percent of the population of the project woredas lives on this 22 percent of the project area.

According to 2007 census, the population of the two regions is estimated to grow at a rate of 2.9% per annum (the urban settlement grow at a rate of 4.8 while the rural population increases by 2.8 % annually.

The average population density of the project area is 154 persons per square kilometers in the case of SNNPRs and 11 persons per kilometer square in the case of Oromia. A high concentration of people is observed in Sodo Zuria woreda (437 persons per square kilometer as compared to Dire and Teltelle Woredas (8 persons /Km^2 each). Overall average population density along the transmission line is calculated as 42 km^2.

The population density per square kilometer area ranges from 105 to 437 people per square kilometers in the SNNPRs and between 8 to 21 people per square kilometers in the Oromia Regional State. (See Table 9-1) showing the general demographic situation of the localities).

Because the rote line tries avoid to urban settlements or high population concentration, most people living along the project T/L are rural settlers (94 % of the project woreda population) do not have adequate essential facilities and services such as road, health, water supply, etc.

Figure 9-35: Traditional Costume of Borena Wopmen (left) Kebele assembly in Borena (right)

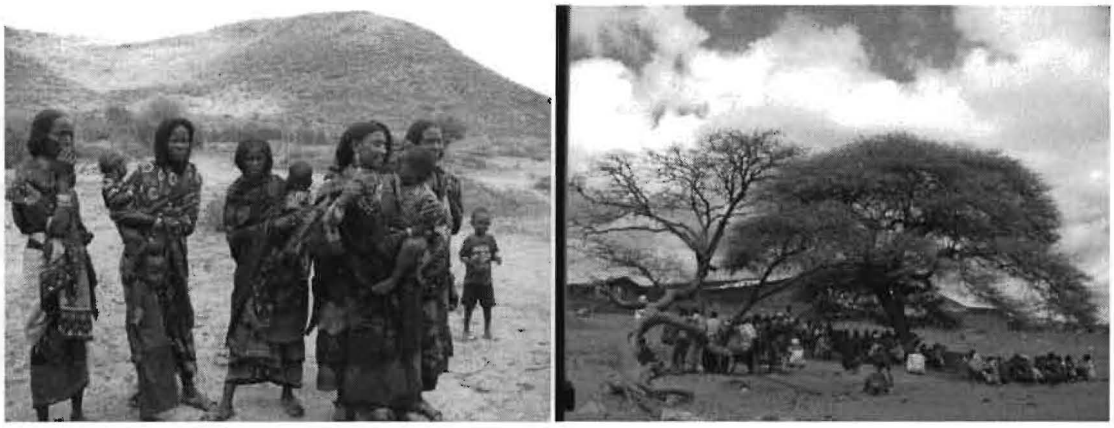


Table 9-1: Population of the Project Woredas

No	Zone	Woreda	Urban		Total	Rural		Total	Urban+Rural		Total	Area	Pop
			Male	Female	Urban	Male	Female	Rural	Male	Female	Woreda	(Km^2)	Density
SNNP													
1		Sodo Zuria	0	0	0	86,912	89,813	176,725	86,912	89,813	176,725	404.35	437
2		Humbo	3,780	3,410	7,190	64,892	64,597	129,489	68,672	68,007	136,679	859.36	159
3	Wolayta	Kindo Koysha	3,842	3,743	7,585	51,942	54,495	106,437	55,685	58,238	113,923	526.31	217
4	Gamo	Mirab Abaya	3,374	3,341	6,715	37,494	37,610	75,104	40,868	40,951	81,819	631.1	130
5	Gofa	Arba Minch Zuria	0	0	0	89,299	89,441	178,740	89,299	89,441	178,740	967.7	185
7		Derashe	7,483	7,692	15,175	69,104	71,662	140,766	76,587	79,354	155,941	1487.4	105
8	Segen	Konso	5,753	5,084	10,837	117,778	127,386	245,164	123,531	132,470	256,001	2273.8	113
Total SNNP Woredas			24,232	23,270	47,502	517,421	535,004	1,052,425	541,554	558,274	1,099,828	7150.02	154
Oromia													
9		Yabello	10,508	10,432	20,940	47,556	46,876	94,431	58,103	57,268	115,371	5343.53	21
10		Dire	4,001	4,023	8,024	37,490	36,954	74,445	41,551	40,918	82,469	10317.18	8
11	Borena	Teltelle	3,729	3,765	7,495	36,082	35,566	71,648	40,691	38,452	79,143	10143.8	8
Total Oromoia Woreda			18,238	18220.99	36,459	121,128	119,396	240,524	140,345	136,638	276,983	25804.51	11
Total Project Woreda			**42,470**	**41,491**	**83,961**	**638,549**	**654,400**	**1,292,949**	**681,899**	**694,912**	**1,376,811**	**32,955**	**42**

9.5.2.2 Ethnic Group and Language

The people living in the project woredas are mainly from seven ethnic groups. These ethnic groups belong to Omotic, Cushetic, Semetic and Nilo Sahara linguistic families. The Cushitic and the Omotic are the most popular and diversified groups. Table NN summarizes the dominant ethnic groups in the project area. There are other minority ethnic groups living the area including, Amhara, Gurage, Tigre, etc but they are in small number particularly in the rural area where the line passes. The main languages spoken in the localities are Oromifa in Oromia and several local languages in the SNNP part of the project that are shown in Table 9-2 below).

Table 9-2: Ethnic Group and Languages

No	Zone/Woreda	Ethnic Group	Language
1	Wolayita	Wolayita	Wolayitigna
2	Arba Minch Zuria	Zaeyse	Zayzegna
3	Gamo Gofa	Gamo & Gofa	Gamugna & Gofigna
4	Derashe	Derashe	Mashiltara
5	Konso	Konso	Konso
6	Borena	Oromo	Oromigna

9.5.2.3 Settlement

The Transmission Line traverses mainly through rural the settlement of the Woredas mentioned earlier. These settlements are characterized by a traditional life style engaged in backward agricultural practices including crop production and livestock rearing.

The houses are scattered family dwellings made up of mostly thatched roof and sometimes corrugated iron with wood wall plastered with mud in most parts of the project area. The settlements are isolated villages on varied terrain particularly without adequate socio-economic infrastructure and services. There are also clustered tukuls like the ones we see in Konso. These are compact houses built mostly on hills (see Figure 9-36).

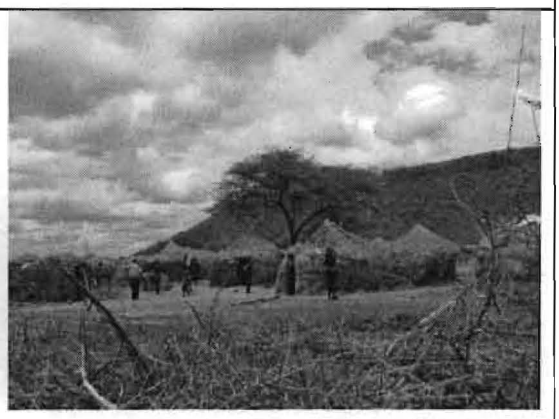
The houses affected by the transmission line are typically thatched roof or corrugated iron houses without proper sanitary facilities and waters services.

Figure 9-36: Types of Houses in the Project Area

Konso Houses are clustered

Typical Konso House

Typical house in Dublik around the line Route



Boren Family dwelling in Teltelle

9.5.3 Economic Activities and Livelihood

9.5.3.1 Land use

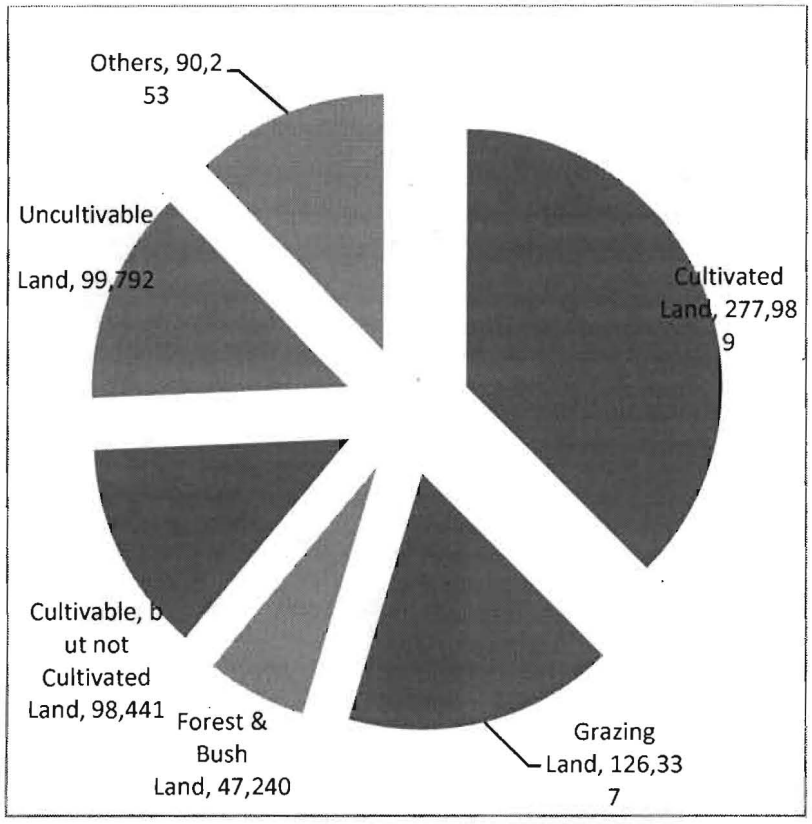
The land use types of the Southern, Nations and Nationalities and Peoples Regional state can be categorized into cultivated land, cultivable land, not cultivable land, grazing land and other land. Cultivated land is one type of land use. The major cultivated crops in the SNNPR and Oromia include cereals, pulses, and cash crops like coffee, orchards and others such as banana, hops and enset (false banana). See Figure 9-37.

The other form of land use is grazing land. The farmers /pastoralist use grazing land for rearing their cattle, sheep, donkeys, camels and goats. The grazing land is mostly highly degraded and not providing sufficient feed for free grazing animals of the farmers and pastoralists.

The other forms of land use the acacia wood lands. It is source of fire and construction wood, charcoal and grazing land for cattle, goats, donkeys and camels. Most of the accessible acacia woodland is highly disturbed. There are many cultivable lands but remain uncultivated because of shortage of water and mobile nature of the people living around in most part of the transmission line.

The other forms of land use includes bare lands, land under construction and land under parks. There are two parks, the Nechsar national park located in the Southern, Nation, Nationalities and Peoples Regional state and Yabelo wildlife sanctuary located in Oromia Regional State. These Parks are important habitat for diversified flora and fauna and good attraction for tourists. The figure below shows the land use types of the SNNPRS and in Oromia most of the land is reported forest/bush land and grazing area (data not available).

Figure 9-37: Land Use patterns of SNNPR



9.5.3.2 Economic activities

The major types of lively hood activities in the project area are Crop Production, Pastorals, agro-pastorals and trade. Pastorals are the most prevalent lively sources especially in Borena zone. The vast arid and semi-arid region is conducive for production of livestock of different types such as cattle, camels and goats. The livestock by-products such as hides and skins are delivered to the central market. The other products such as milk, butter, etc

The third significant lively hood activity is trade which is mainly practiced by town and village dwellers. Another lively hood source is illegal production and sale of charcoal.

Hence the mainstay of the people in both regions is dependent on agriculture and agro pastoralism, farming and livestock rearing are the basic livelihood of the people. Land is the major source of income and food for the population living in the project area.

The major types of livelihood activities in the project area are pastoralism, agro-pastoralism and trade. Pastorals are the most prevalent lively sources especially in Borena zone. The vast arid and semi-arid region is conducive for production of livestock of different types such

as cattle, camels and goats. The livestock by-products such as hides and skins are delivered to the central market. The other products such as milk, butter and others are either consumed, or sold on the local market (Table 9-3).

The main economic activities in the first 200 km route line are crop production including maize sorghum, fruits, vegetable, etc. This are marked as highly exploited and cultivated.

The second principle source of livelihood is agro-pastoralism, which is a mixture of extensive livestock rearing and rain fed crop production such as maize, sorghum, teff, haricot beans, field peas, coffee, cotton, avocado, mango, banana, hops, enset (false banana) root crops such as potatoes, sweet potatoes, taro and onions are cultivated.

Other livelihood activity is trade which is mainly practiced by town and village dwellers. Another lively hood source is illegal production and sale of charcoal.

Among the surveyed households only 41 have non-farm activities, as their primary occupation, 77 members of the household have employed jobs. 53% of the surveyed households are literate, who can read and write and compute the basic maths. The table below shows the details of household characteristics by woreda.

Table 9-3: Livelihood from nonfarm activities by woreda

Region	Woreda	Household heads having nonfarm activities as primary occupation	Other members of the household having employed job	Literate Household Heads /PAPs
SNNP	Sodo Zuria	9	11	110
SNNP	Humbo	21	36	111
SNNP	Mirab Abaya	3	30	119
SNNP	Arba Minch Zuria	5	7	155
SNNP	Derashe	5	0	49
SNNP	Konso	1	0	41
Oromia	Yabello	5	0	12
Oromia	Dire	1	4	6
Total		**41**	**77**	**603**

9.5.3.3 Occupation and Income

Income of livelihoods in the area traversed by the transmission line is low and does not allow all households to meet their basic needs. A large portion of the population in the country lives below the absolute poverty line, as per studies made in the past. The income of livelihoods in the country is predominantly from farming activities.

Farming and particularly crop farming is the major source income of livelihood for more than 90% of PAPs. Since almost all PAPs are small scale farmers who make their living through traditional method of farming, it is difficult to determine their income. Households mainly use the bulk of their production for household consumption, and only very little products could be marketed.

Most woredas in SNNPRS have very high population density and suffer from population pressure and lack of land for cultivation. SNNPRS suffers from food shortage partly due to high population pressure, and drought situation.
The food shortage is also exacerbated by the highly fragmented land size, and degradation of soil fertility.

In some woredas such as Sodo, Humbo and Konso, households are also highly dependent on relief food assistance made by international donors, as some households also do not produce enough to feed their family members. In Oromia, the lowland and pastoralist areas also face problems of drought and shortage of water for livestock farming.

Land is highly scarce in the first section of the surveyed routing, or precisely in six of the woredas located in the first section. The average landholding size in Sodo Zuria and Humbo woredas does not exceed 0.5 hectares, and the land is used for both, farming and also building houses. In the other woredas the holding size not very different, the average land holding size is one hectare.
Those households who own more than one hectare are few in number.

9.5.3.4 Enterprises

In the first section of the route, western Sodo, there are two big tree nurseries located, which are owned by the Woreda Agriculture and Rural Development Office. They are mainly tree and coffee seedlings for distribution to farmers and for plantation on community forest areas grown. Another tree nursery is located in Humbo woreda.

A state farm which is operated as public business enterprise is located in Arba Minch Zuria woreda, westerly of Lake Chamo in a place called Cillaie. The state farm grows cotton, maize and banana. No other enterprises which would be affected by the Project were observed during the field survey.

9.5.3.5 Crop Production

As indicated earlier the first 200 km of the route line is mainly agricultural land producing various types of crop. In contrast the remaining segment of the route line is mainly characterized by more live stock production and less crops. The total crop area in SNNP is 780,344 ha. Crop produced in the project woreda amounted 13,617,017 quintals (see more in table 13 below.

SNNP project woredas produce a large amount of fruits (and perennial crops). The total cultivated land in 2010/11 is 14,224 ha of land producing 1,260,291 quintals of perennial crop, mainly, fruit. Out of the total Mira Abaya produced 44 %v and Arba Minch produced 25 % of all fruits. There is no significant fruit production farm reported in Borena Zone

9.5.3.6 Livestock

The rural economy in the project area is characterized by a mixture of crop production and livestock rearing. In most part traversed by the transmission line number of livestock signifies the wealth and social status of the household. Most families in the project areas are hesitant to sell or use livestock for personal consumption even in times of adversity such as drought. The total numbers of livestock in the project areas are 2,572,365 out of this 1,111, 691 are in Borena zone (see the detail in Table 9-4 below.

Table 9-4: Crop Production In the project Area

No	Type of Crop	Woylata									Gamgofa									Special Woredas						Borena Zone					
		Sodo Zuria			Kido Kosha			Humbo			Arbaminch Zuria			Mirab Abaya			Bonke			Derashe			Konso			Teltele		Yabello		Dire	
		Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qty.	Productivity	Area by Ha	Prod by Qtls.	Area by Ha	Prod by Qty.	Area by Ha	Prod by Qty.
1	Maize	3,636	137,385	38	5,523	247,646	44	12,684	292,061	23	13,606	355,420		7,116	153,708		7,545	175,045		34,832	626,976	18	49,869	249,343	5		134,352		71,988		46,980
2	Sorgum	410	7,401	18	346	5,882	17	2,142	34,382	18	950	14,250		673	10,095		3,500	56,000		17,223	378,906	22	4,097	16,388	4		87,640		5,650		5,200
3	Teff	2,113	39,970	19	2,560	41,280	16	3,500	42,000	12	2,703	32,341		1,008	10,116		5,055	54,895		13,511	159,430	12	4,220	29,538	7		81,728		33,384		11,840
4	Wheat	2,069	86,532	42	1,022	35,770	35	-	-	-	2,076	67,570		1,449	20,286		5,250	94,500		1,615	17,534	11	2,265	9,660	4		14,704		19,336		14,704
5	Barely	848	23,537	28	279	8,091	29	240	4,646	19	2,310	34,380		1,840	20,190		11,600	160,650		6,045	50,169	-	-	-	-		400		2,400		2,400
6	Horse Bean	5,593	50,151	9	-	-	-	39	507	14	1,842	21,420		667	7,136		710	8,520		-	-	-	-	-	-		84,915		47,190		69,630
7	Field Pea	329	6,251	19	-	-	-	31	403	13	-	-		-	-		300	3,300		1,415	9,987	7	-	-	-						
8	hair Coat Bear	392	7,840	20	-	-	-	6,974	61,292	9	328	3,280		175	1,575		340	4,080		10,016	80,128	8	-	-	-						
9	Chicken Pea	343	6,174	18	-	-	-	840	8,490	10	-	-		248	1,488		-	-	-	2,873	17,456	6	-	-	-						1,878
10	Ground Nut	-	-	-	-	-	-	161	1,366	9	-	-		-	-	-	3	18	6	-	-	-	-	-	-						
11	Lentils	-	-	-	-	-	-	-	-	-	-	-		-	-	-	20	80	4	65	344	5	-	-	-						
12	Linseed	-	-	-	-	-	-	-	-	-	-	-		-	-	-	7	28	4	-	-	-	-	-	-						
13	Sesame	-	-	-	-	-	-	-	-	-	4	32	8	-	-	-	10	40	4	-	-	-	-	-	-						
14	Potato	1,684	2,846,830	169	389	81,088	207	196	23,979	122	1,615	193,800		488	27,060		2,314	139,910		254	7,620	30	-	-	-						
15	Sweet Potato	4,692	773,191	165	3,775	736,130	195	6,127	1,559,716	255	1,470	183,800		520	44,200		1,380	127,700		69	5,138	75	-	-	-						
16	Godere	1,319	263,800	200	1,874	221,001	132	791	268,200	200	114	10,260		73	6,935		50	5,675		-	-	-	-	-	-						
17	Kasava	868	260,250	300	1,820	442,646	242	580	198,450	167	197	22,570		65	7,150		80	9,225		55	4,125	75	-	-	-						
18	Yam	119	23,800	200	68	8,180	135	12	1,800	150	150	18,000		68	6,528		82	8,520		-	-	-	-	-	-						
19	Onion	24	4,915	204	7	1,116	150	78	16,045	207	-	-		-	-		-	-		1,002	45,090	45	-	-	-						
20	Beet Root	121	18,175	150	0	22	86	-	-	-	-	-		-	-		-	-		80	800	10	-	-	-						
21	Carrot	356	52,645	148	1	120	120	-	-	-	-	-		-	-		-	-		128	9,600	75	-	-	-						
22	Cabbage	21	18,000	86	7	700	100	3	375	150	-	-		-	-		-	-		83	7,470	90	-	-	-						
23	Garlic	11	1,100	100	2	165	100	-	-	-	-	-		-	-	-	-	-					-	-	-						
24	Tomato	6	1,620	270	2	350	175	38	5,430	145	-	-		-	-	-	-	-		88	5,280	60	-	-	-						
25	Pepper	3	25	10	6	64	8	554	2,135	4	68	748		-	-		18	168		80	800	10	-	-	-						
26	Cotteon	-	-	-	-	-	-	1,484	27,476	15	350	5,250		225	3,600		-	-		-	-	-	-	-	-						
27	Inset	-	-	-	-	-	-	-	-	-	514	43,690		560	47,600		1,248	106,080		69	103,950	150	-	-	-						
28	Coffee	-	-	-	-	-	-	-	-	-	154	1,386		108	3,770		758	7,959		-	-	-	-	-	-						
29	Millet	-	-	-	-	-	-	193	3,168	16	-	-		-	-	-	10	90	9	-	-	-	-	-	-						
	Total	24,956	4,629,592	2,213	17,682	1,830,251	1,791	36,666	2,551,921	1,558	28,451	1,008,197		15,283	371,437	-	40,280	962,483		89,503	1,530,802		60,451	304,929		274,773	403,739	61,000	179,948	131,300	152,632

Table 9-5: Fruits cultivated and produced in the Project Woredas

Production of fruits in the project woredas

Crops	Konso			Derashe			Mirab Abaya			Arba Minch			**Humbo**		
	Caltivated (ha)	Prodtion (qts)	Productivity (qts/ha)	Caltivated (ha)	Prodtion (qts)	Productivity (qts/ha)	Caltivated (ha)	Prodtion (qts)	Productivity (qts/ha)	Caltivated (ha)	Prodtion(qts)	Productivity (qts/ha)	Caltivated (ha)	Prodtion (qts)	Productivity (qts/ha)
Bannana	210	36,500	1,749	1,118	112,918	101	2,659	531,800	200	5,550	166,500	150	805	120,750	150
Lemon	42	3,360	80				17	2,606	150						
Papaya	62	5,890	95				7	1,483	220	100	22,000	220	3	465	150
Mango	93	13,525	145				74	16,570	250	391	97,750	150	22	3,345	150
Avocado	20	1,900	95				10	1,552	225	103	25,750	120	52	7,725	150
Gesho	450	45,000	100												
Enset				970	29,100	309									
Coffee				1,430	7,000	5									
Apple							23	3,999	175	12	2,640	220			
Orange							1	163	125						
Total	**877**	**106,175**		**3,518**	**149,018**		**2,791**	**558,173**		**6,156**	**314,640**		**882**	**132,285**	

Source: From Bureau of Agriculture, 2010/11

Table 9-6: Livestock of the project area

Zone	Woreda	Cattle	Sheep	Goats	Poultry	Donkey	Horse	Mule	Camel	Beehives	Total
SNNP											
Wolayta	Sodo Zuria	100,336	28,274	3,083	61,862	4,294	206	278	0	0	198,333
	Humbo	163,459	22,371	24,776	69,904	16	6,685	209	0	0	287,420
	Kindo Koysha	62,583	11,908	14,741	46,060	20	1,378	237	0	0	136,927
Gamo Gofa	Mirab Abaya	38,689	3,357	10,373	20,365	88	0	120	0	0	72,992
	Arba Minch Zuria	74,022	17,109	23,489	63,107	1,276	0	722	0	0	179,725
Segen	Derashe	93,376	32,115	55,897	86,234	390	10,236	239	3	0	278,490
	Konso	134,026	74,187	167,237	98,335	0	4,306	0	0	0	478,091
SNNP Total		**666,491**	**189,321**	**299,596**	**445,867**	**6,084**	**22,811**	**1,805**	**3**	**0**	**1,631,978**
Oromia											
Borena Zone	Yabello	200,000	21,518	77,573	142,577	2,237	200	359	11,220	5,220	460,904
	Dire	80,000	28,146	56,208	32,823	4,751	3,113	850	32,397	1,297	239,585
	Teltelle	165,000	39,265	88,294	36,759	5,370	56	168	986	4,000	339,898
Oromia Total		**445,000**	**88,929**	**222,075**	**212,159**	**12,358**	**3,369**	**1,377**	**44,603**	**10,517**	**1,040,387**
Project Woreda Total		**1,111,491**	**278,250**	**521,671**	**658,026**	**18,442**	**26,180**	**3,182**	**44,606**	**10,517**	**2,672,365**

Source: Agricultural Bureu of SNNP Agricultural Office of Borena Zone

Major Agricultural constraints: Various agricultural productivity constraints in the project area related to the performance of the agricultural activities includes:

- Frequent occurrences of drought
- Un predictable weather condition
- Erosion and land degradation
- Lack of agricultural input
- Back ward technology
- Lack of agricultural marketing network (system)
- Lack of financial institutions

9.5.3.7 Trade

Trade is particularly retailed trade is major activities, in the area, next to agriculture. The trading business includes whole sale, retail, and services. The first 204 km of the T/L is dominated by hotel and tourism trading. The area is well known for its natural features, and cultural heritage sites that attract local and international tourists. Due to that services are common businesses.

In addition to services many people are engages in small retail business such as shops, and tea room, coffee shops and grain sales.

9.5.4 Education

The education system in the project woredas follows the same patterns of educational cycle of the federal government of Ethiopia. This is, eight years of primary school, two years of lower secondary school and two years of higher secondary school (preparatory school for colleges).

Schools are run in the regions by governments and non-governments. Governmental schools are operated by Regional Education Bureaus, Ministry of Education, Universities and Colleges, Public Heath and Agriculture. The non–governmental schools are operated by Public, Religious Missions, Orthodox Church, Foreign Communities and different School Organizations. In addition Technical Vocational Education Training (TVET) is a technical stream of training that would help students equip themselves in technical and vocational education for the job market.

Growing schools in the project area are the Kindergarten schools for children age 4-6 before they enter primary school. Kindergarten make up of nursery, lower and upper KG. The Kindergartens are run by private, NGO, religious institutions and communities.

Public Schools are operated by the population of the localities, financed by the students with or without the assistance of the government. Mission Schools are operated by religious mission, Church Schools are maintained and operated by Ethiopian Orthodox Church, Foreign Community School operated by various foreign communities (primarily for their children) and Organization schools are operated by different organizations (mainly for children of adults who work in them). See Table 9-5.

The total numbers of schools in the project woredas are 396 schools. Konso has the highest number of schools while dire has the least as the numbers of schools appear to be proportional to the number of people in the Woreda. Table yyy shows schools in each project woredas by category of grades

Table 9-7: Secondary and Primary School of Project Woreda, 2010/11

Zone	Woreda	Primary	Secondary	Preparatory	Total
SNNP					
Wolayta	Sodo Zuria	35	1	0	36
	Humbo	44	3	1	48
	Kindo Koysha	30	1	1	32
Gamo Gofa	Mirab Abaya	28	1	1	30
	Arba Minch Zuria	50	2	0	52
Segen	Derashe	37	1	1	39
	Konso	58	3	1	62
SNNP Total		**282**	**12**	**5**	**299**
Oromia					
Borena Zone	Yabello	32	1	1	34
	Dire	25	1	1	27
	Teltelle	35	1	0	36
Oromia Total		**92**	**3**	**2**	**97**
Total Project Woredas		**374**	**15**	**7**	**396**

Source: Compiled from data from Educational Bureau of SNNP and Borena Education Offices

In the SNNPR, the school age population for the age group 7-14 in grade 1-8 in the year 2010 was estimated to be 205,070 and when disaggregated by gender 45 % female and 55% male students were enrolled in the in the project woredas. Corresponding figure in the Oromia part of the project is 60,320 students of which 52 % are male and 48 % are female.

In all secondary s schools including preparatory the number of students in SNNP project area are 13,891 while the number is 4570 for Oromia part. In terms of gender 64 % are male in SNNP and 65 % is male in Oromia. See more in Table 9-8 below.

With regards to the teaching staff, there are 4340 teachers. Out of this 82 % are in SNNP and 18 % are in Oromia project area. Majority of the teachers are male, making about 70 % of the teachers as seen in Table 9- 9.

Lack of teachers in the required number and qualification as well as class room shortages have adverse impacts on the quality of the service.

Table 9-8: Number of Students in the Project Woredas, 2009/10

Zone	Woreda	Primary (1-8)		Secondary (9-12)		Total		Both Sex
		Male	Female	Male	Female	Male	Female	
SNNP								
Wolayta	Sodo Zuria	20610	17978	294	224	20904	18202	39106
	Humbo	17797	14536	2659	1645	20456	16181	36637
	Kindo Koysha	14336	12299	1293	901	15629	13200	28829
Gamo Gofa	Mirab Abaya	11025	10033	1024	744	12049	10777	22826
	Arba Minch Zuria	16775	13607	619	452	17394	14059	31453
Segen	Derashe	12188	8488	891	425	13079	8913	21992
	Konso	19329	16069	2074	646	21403	16715	38118
SNNP Total		112060	93010	8854	5037	120914	98047	218961
Oromia								
Borena Zone	Yabello	6410	4721	1774	998	8184	5719	13903
	Dire	4433	4544	719	378	5152	4922	10074
	Teltelle	4873	5179	497	204	5370	5383	10753
Oromia Total		15716	14444	2990	1580	18706	16024	34730

Source: Data from Educational Bureau of SNNP and Borena Educational Offices

Table 9-9: Number of Teachers in project Woredas, 209/10

Zone	Woreda	Primary (1-8)		Secondary (9-12)		Total		Both Gender
		Male	Female	Male	Female	Male	Female	
SNNP								
Wolayta	Sodo Zuria	384	177	21	0	405	177	582
	Humbo	347	165	76	4	423	169	592
	Kindo Koysha	316	105	50	5	366	110	476
Gamo Gofa	Mirab Abaya	211	161	38	5	249	166	415
	Arba Minch Zuria	365	253	31	8	396	261	657
Segen	Derashe	329	125	40	3	369	128	497
	Konso	178	53	87	4	265	57	322
SNNP Total		2130	1039	343	29	2473	1068	3541
Oromia								
Borena Zone	Yabello	184	86	50	9	234	95	329
	Dire	130	63	39	2	169	65	234
	Teltelle	165	52	16	3	181	55	236
Oromia Total		479	201	105	14	584	215	799
Total Project Woreda		2609	1240	448	43	3057	1283	4340

Source: Data from Educational Bureau of SNNP and Borena Educational Offices

9.5.5 *Other Social Services*

The project area can be characterized as predominantly rural and lacks basic service infrastructure. Distribution of social services is incomparable to the needs and requirements of the population.

Services available in woredas traversed by the Project include transportation (road network), communication (telephone and postal services), power supply and water supply. The tables below indicate some of the social services in the respective woredas.

Energy Supply: Major sources of domestic energy supply are firewood, charcoal and animal dung in their order of usage. The district does not have any electric light and fuel station.

Water supply: Water is critical in the project area. It is more critical in the Borena Zone. Many people need to travel to fetch and draw water mostly from unprotected sources. The water schemes built by government and NGOs are not adequate to serve the entire population of the area. Shortage of water is often aggravated by frequent drought.

Telephone Services: Mobile telephone is increasingly used by the urban and rural population. Major constrain in the project woredas is availability of network in most rural areas.

Transportation: Transport facilities are available for major urban towns of the project woredas but the rural parts of the project woredas do not get adequate transportation services this include Dire, Teltelle, etc.

Currently are no notable infrastructure and social services available along, or in the direct vicinity of the proposed RoW except the crossing of the Sodo- Saula 132 kV transmission line at a distance of 14 km from Sodo Gantry center between bend 5 (36086E and 755292N) and bend 6, (322976E and 744811N).

9.5.6 *Public Health*

All project Woredas have one health post per Kebeles. The numbers of kebeles depend on the number of population. The total number of health post in the project woredas are reported to be 267 in total. Health post is only meant for prevention measures mostly based education and awareness creation.

The health centers provide much more services including curative measures. The project woredas have 51 health centers of which 37 are in SNNP and 14 are in Borena (Oromia). The health centers are not adequate for the total woreda population. Both regional governments are planning to build additional centers in the next five years.

The number of hospitals in the project location are 2 one in SNNP and 1 in Oromia. The project area population needs to travel a long distance to get hospital services.

Health Facilities and their Ratios to the Population

Access to and quality of health care is an important indicator to measure the socio-economic development of the communities. The current policy of the Federal Ministry of Health recommends one health post for every 5,000 population, one health centre for every 25,000 people and one hospital for a population of 250,000. However, data obtained from woredas' offices of health indicates an overall health facility to population ratio has been described by the professional to be low (exact data was unavailable). In fact it is reported to be very low ratio even by the standards of Sub-Saharan African countries.

The number and types of primary health facilities available are shown in Table 8-10. There is no hospital in the project woredas. In most project woredas, patients who may need a higher health care have to travel a minimum distance of more than 50 km.

By and large, the number of health facilities existing in the project areas is far from being adequate to meet the demand of the population. According to health professionals in met in all project woredas, the health facilities are severely under-staffed, ill equipped and under-supplied. The existing health facilities are built by Government in collaboration with communities, NGOs and multilateral organizations.

With regard health personnel the project woredas have sufficient number of health extension workers totaling 579 workers. However, other medical staff is far from sufficient. There are 129 health officers (diploma and degree level in all project woredas), 121 nurses (diploma level), 87 pharmacy technicians and 113 lab technicians and 50 environmentalists (the detail is given in Table 9-10, Table 9-11).

Table 9-10: Number of health institutions In the Project Woredas, 2011

Zone	Woreda	Helth Post	Health Center	Hospital	Private Clinic	NGO Clinic	Diagonstic Lab	Pharmacy	Drag Store
Wolayta	Sodo Zuria	37	6		9		2		5
	Humbo	20	6		6		1		4
	Kindo Koysha	28	5						2
Gamo Gofa	Mirab Abaya	26	4		6			1	5
	Arba Minch Zuria	37	4		8			1	8
Segen	Derashe	21	4	1					
	Konso	45	8		9		1	3	6
Total SNNP		214	37	1	38	0	4	5	30
Borena	Yabello	19	6	1	5	2		0	1
	Dire	13	3	0	4			0	3
	Teltelle	21	5	0	1			0	1
Total Oromia		53	14	1	10	2	0	0	5
Total Project Woreda		267	51	2	48	2	4	5	35

Table 9-11: medical staff in the project woredas

Zone	Woreda	Health Office	Public Healt	Nurse(Dipl.)	Pharmacy Technician	Lab Technicia	Mid wives	Environmental	Health Extension
Wolayta	Sodo Zuria	6	12	6	12	18	12	6	78
	Humbo	6	12	6	12	18	12	6	81
	Kindo Koysha	5	10	5	10	15	10	5	53
Gamo Gof	Mirab Abaya	4	8	4	8	12	8	4	48
	Arba Minch Zuria	4	8	4	8	12	8	4	69
Segen	Derashe	4	8	4	8	12	8	4	36
	Konso	8	16	8	16	16	16	16	85
Total SNNP		37	74	37	74	103	74	45	450
Borena	Yabello	1	4	38	8	5	2	2	52
	Dire	4	4	23	4	3	2	1	36
	Teltelle	5		23	1	2	0	2	41
Total Oromia		10	8	84	13	10	4	5	129
Total Project		**47**	**82**	**121**	**87**	**113**	**78**	**50**	**579**

*Figures for SNNP in Culmun 3-7 are estimated figures
Source: Data obtained from Borena Zon & Bureu of Health SNNPR

Review of records from the project area reveals that the burden of disease, as measured by premature deaths of all causes, emanates primarily from causes preventable by simple public health measures. Communicable diseases and diseases resulting from malnutrition predominate.

The main factors responsible for the burden of ill health include inadequate access to health services; poor access to clean drinking water and sanitation facilities; widespread poverty and ignorance. Access, in this case, includes not only scarcity of health facilities but also

distances and physical barriers. Women and children bear the brunt, chiefly due to their physiological make-up and the low social status accorded to them.

It is expected that the Project would pose more pressure on the health facilities of the project area unless more enhancement measures are taken to alleviate the problem

The major diseases (Table 9-12) in the project-affected areas include upper respiratory tract infections (URTI), malaria, Pneumonia, and skin infections. The patterns of disease are very similar in all project woredas, although there are slight variations in magnitude and ranking.

Table 9-12: Top 10 Disease of the Borona Woreda

No.	Disease Group Description	Male	Female	Total	%
1	Malaria all Types	600,009	527,545	1,127,554	27.63
2	Pneumonia	208,249	176,289	384,538	9.42
3	Helimentiosys (Excluding Guinea worm 042	134,024	122,047	256,069	6.27
4	TB all Types	100,047	89,129	189,175	4.63
5	Upper Respiratory Infection	97,489	88,282	185,771	4.55
6	Typhoid Fever	83,354	87,807	171,161	4.19
7	Accidents	94,437	62,150	156,566	3.84
8	Gastritis and Duodenities	69,901	85,148	155,049	3.8
9	All other diseases of genitourinary system	46,544	63,286	109,827	2.69
10	Infection of Skin and subcutaneous Tissue	52,444	44,391	96,835	2.37

Health Problems:

According to the discussion with health professional and authorities with the project areas, major problems in health sectors are problem of retaining the professionals in the woredas. More specifically the following problems are reported to be critical.

- Lack and uneven distribution of health facilities in the project woredas;
- Shortages and uneven distribution of health personnel
- Poor environmental condition for the professionals in the woredas
- Poor coverage of facilities (e.g. Education, potable water, accessibility)
- Poverty (lack of access to balanced diet);
- Traditional beliefs and cultural practices in the area that has discouraged the use of modern medical facilities;
- Scattered settlement condition in the rural areas;
- Shortage of operational budget and logistics;

9.5.7 Historical Cultural Heritage

This section attempts to identify the main archaeological and heritage concerns or objects/ cultural sites, archaeological or religious significances along the route line that be affected by project activities. Efforts have been made to address not only physical archaeological heritage properties but also cultural practices and beliefs, living religious sites and related landscapes.

The report is prepared based on desk study and field work. The field work was conducted in May, 2011. The background of the study area, the objectives, methodology, findings, and the conclusion are discussed in separated sub topics.

The cultural and archaeological assessment is conducted to investigate the route A/C of the Ethio-Kenya Power System Interconnection to investigate the effects of cultural and natural heritage sites by the project along the transmission line route.

9.5.7.1 Objectives of the cultural and Archaeological Study

The main objective of this section is to provide background information about significant heritage aspects (sites and objects of cultural, archaeological or religious significance) in the direct impact zone of the project (along the route line of the power system interconnection). It intends to collect information about:

- Past archaeological and cultural heritage sites;
- Active religious or anthropological sites, such as shrines, statues and related landscapes to be affected by the project;
- Objects and human or other animal remains that may be affected by the project.

9.5.7.2 The study applied desk top study investigating:

- Considerable research outcomes that have been carried out about the historic, archaeological, anthropological and religious sites along the proposed route lines are reviewed.
- Relevant articles from the conventions of UNESCO and the legislations of Federal Democratic Republic of Ethiopia, particularly related to cultural heritage management are examined.
- Information was also collected in personal communications with concerned archaeologists and officers of ARCCH who participated in related archaeological researches conducted in Konso.
- The World Bank Operational Manual (September 1991 and World Bank Operational Policy Note.11.03 Management of Cultural in Bank Financed Projects are also used.

In addition to that field work was conducted during the field work May, 2011 to examine if there are sites that could be impacted by the route and spot check sites found important during literature review. The main approach are (1) key informants interview individually and in group using questions prepared for interviews targeting to ask if the informants know or heard about the following along the alternative line routes:

- Ancient residences
- Worshiping places
- Burial sites
- Hot springs
- caves and rock arts
- artifacts like pottery, stone tools..., or any other cultural remains
- human bones or remains of other animals

Information was gathered though personal communications with the archaeologists and officers of local Culture and Tourism Bureaus of Konso and Teltelle and other project areas.

9.5.7.3 Findings: Cultural Landscape of the Line Routes

Heritage Site of Konso

The Konso cultural landscape is the major concerns of cultural heritage located in Konso special woreda (see Map 9-6 below). The most of Konso woreda is associated to communal heritage of terraces, cultural sites and very important landscapes of SNNP regional states of Ethiopia.

Map 9-6: The administrative boundary of Konso Special Woreda

Looking at the document (FDRE, 2009) and after discussions with the officials, among the major Walled Towns (Paletas), included in the Cultural landscape (Gamolle walled town, Gocha walled town, Mechello walled town, Dakatu walled down cluster, Dara and Olanta walled twons, and Mechelle walled town), it was agreed that only the buffer zone of eastern part of the Dara Walled Town may be affected. With this idea, it was also agreed to look in the field the eastern part of the Dara walled town and surrounding areas (Figure 9-38).

The Dara town has four main gates. These gates are: Kara Cebeqa or Baleda located at $5^0$20'00.4"N and $37^0$26'45.4"E; Kara Balambale; Kara Bilalto and Kara Chirato found near to the other gates (Demarcated area of the Konso Landscape is shown on map 9-7 below.

Map 9-7: Konso Cultural Landscape Area

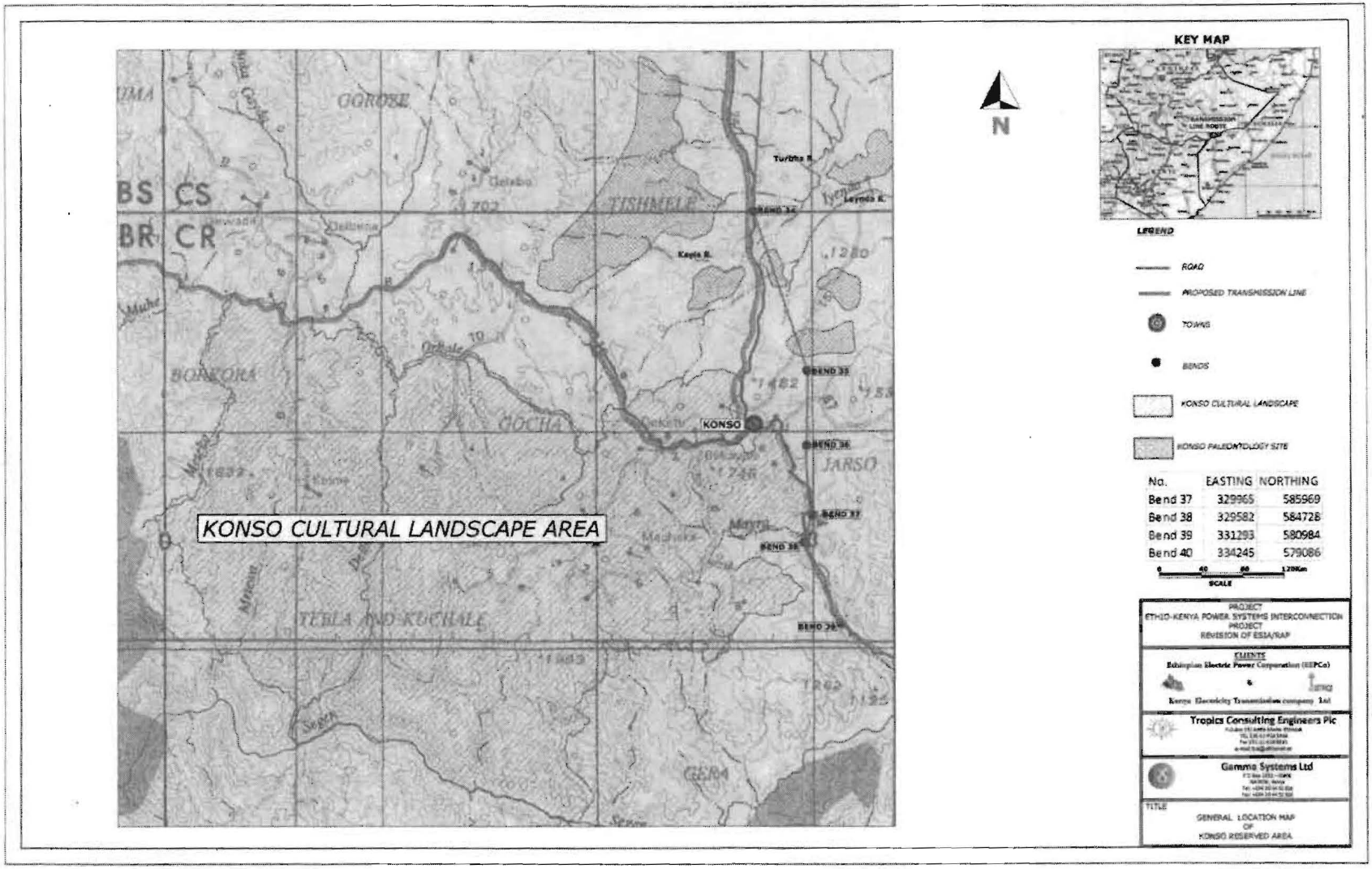


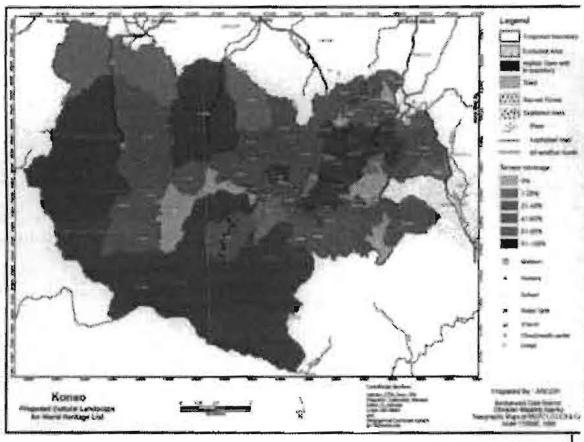
Figure 9-38: Dara Walled Heritage sites (right) and Karat Town Close to Guest House (left)

The Dara walled town is separated by a valley from Karat town by a valley that goes in NW and SE direction. The site visited is one of the border points closer to Karat town at 5020'21.5"N and 37026'31.8"E at 1445 m. The Eastern border of the Dara walled Town is at $5^0$20'16.9"N and 37027'05.5"E at 1337 masl.

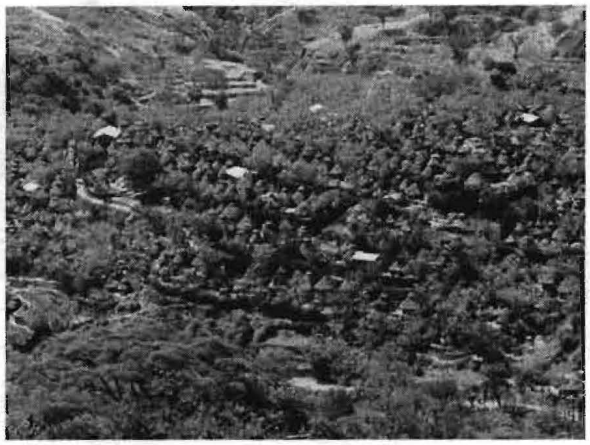
The major findings of the investigation is cultural landscape of Konso situated at about 600 kilometers south of Addis Ababa, at the southern end of Ethiopia's rift valley, 5 23'97" north and 3721'95" east and 1200- 2000 metres elevation. Konso is marked by active geological area (Yonas, 1999:1) replete with remarkable natural and cultural treasures, such as pale anthropological sites, beautifully constructed terraces, stone walled towns, wooden and stone funeral statues (the Wakas), sacred forests, important ponds and many other antiquities, Konso is registered recently as the ninth world heritage site in Ethiopia.

Konso Cultural Landscape (Map 9-8) is a 55 km^2 arid property of stone walled terraces and fortified settlements in the Konso highlands of Ethiopia. It constitutes a spectacular example of a living cultural tradition stretching 400 years back adapted to its dry hostile environment. The landscape demonstrates the shared values, social cohesion and engineering knowledge of its communities. The site also features anthropomorphic wooden statues - grouped to represent respected members of their communities and particularly heroic events - which are an exceptional living testimony to funerary traditions that are on the verge of disappearing. Stone steles in the towns express a complex system of marking the passing of generations of leaders.

Map 9-8: Konso Cultural Landscape Heritage



Konso-Landscape registered in the World Heritage site



Konso Cultural Residential Landscape

Terraces of Konso (study photo)

Waka-a statue representing respected members of the communities

Source: Authority for Research and Conservation of Cultural Heritage (ARCCH) in 2009), p. 6.

Oldest Acheulian sites were discovered in 1991 with faunal fossil remains at Konso-Gardula paleoanthropological sites to the north, east and northwest of Konso town. They are dated to be between 200,000 and 1.9million years old (Yonas, 1999:2-4)

Adopted to cope with the arid and rocky agricultural land, the dry stone terraced agriculture system created unique cultural landscape to Konso. Predominantly terraced slopes lie between an altitude of 1500 and 2000 metres and the terraced agricultural land covers an area of about 225square kilometres. In the north, northwest and west, the terraced hills are bordered by the loose late quaternary sediments and Precambrian basement rocks. In the east, the low-lying area between the main road to Yabello and the terraces of Derra, Jarso and Nalya – Segen is demarcated by the main road to Yabello (ARCCH, 2009:6-7 and 49). The following map shows the distributions of terraces of Konso within the landscape registered in the World Heritage site.

The wakas and stone steles, erected to commemorate the heroes and clan leaders, are representatives of the rare important artistic values. Sacred forests are burial places of the clan chiefs (poqollas) and their families.

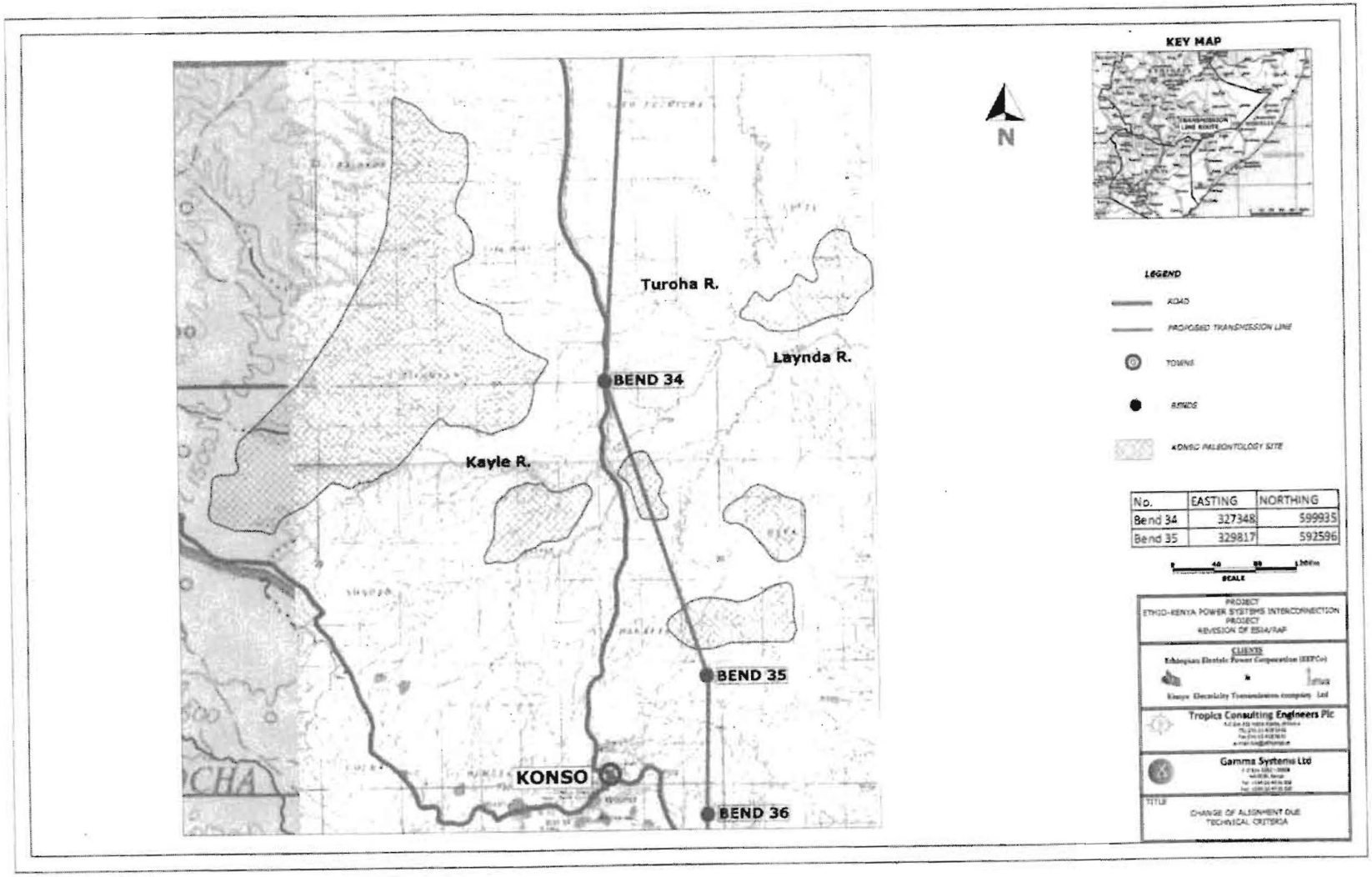
Separated walled towns are living places of the Konso people. They are closely spaced mainly in the Northeast in the town of Karat and lies between 1500metres and 1800 metres. Each walled town has symbolic gates and public places (called Moras) around the centre , where multiple social and cultural activities are performed(ARCCH, 2009:11; Yonas, 1999:6). There are three major types of social organizations in Konso: Kafa(clan/lineage organization), Kata (neighborhood organization) and Helta(age group organization). 3D and topographic maps showing the boundary of the world heritage sites of Konso are attached in Appendixes.

Konso Paleontology Sites

Discussion with ARCCH revealed the existence of important archaeological findings around Konso. One of the remains found was believed having the origin of *Australopithecus boisei* remains. The overall morphology of the calvaria, facial skeleton and dentition of these Konso hominids confirmed to be of robust *Australopithecus*, with additional features shared exclusively with *A. boisei.*

Several fossils were recovered in Konso –Gardula area in the years 1993 to 1996. The one discovered in 1991 was believed to be remains of *H. erectus* and the oldest firmly dated Acheulean remains. Fieldwork since 1993 has clarified the temporal and spatial distributions of Konso's fossiliferous sequence. The early Pleistocene series comprises discontinuous outcrops extending for about 15 km. Most of the Konso fossils derive from two time horizons, one at approximately 1.9 million years ago (Myr) and the other at, 1.4Myr. Less-extensive collections have been made between these levels. As seen in Map 9-9 below the T/L passes through one or two demarcated area of these resources.

Map 9-9: Paleontology Sites of Konso



Cultural landscape of Borana Administrative Zone

The cultural environment of both line routes after Konso (in Borena Administrative Zone) is characterized by unfertile land covered with acacia commiphora wood land. The important heritage concerns observed during the study along the line routs within the Borana Administrative Zone are water wells and living religious and burial places.

Water Wells in Borana Administrative Zone

There are a number of water wells excavated many years ago for the purpose of watering the cattle. Water is a very important source among the Borana Oromo. Water wells are essential for watering their cattle particularly during the dry season. Water in general and these water wells in particular are more important for the Borana Oromos than copping the scarcity of water during the dry season.

Water is not only a resource but also a tool for the Borana Oromo for managing range lands. These water wells help them to establish stable indigenous resources utilization, to elaborate water management culture and to support their population and livestock (Boru et.al. 2008:28).

Water wells in Borana Oromos are divided in to two groups: Tullas (deep wells) and Adadi (shallow wells). The nine permanent Tulla well complexes are mainly located in the district of Dirre. The nine Tulla well clusters are: Dubluq, Borbor, Iggo,Goof, Lae, Melbana, Dhaas, Erdar and Gago. The Borana Oromo pray in their blessing 'Tulla Salana naga' meaning,' peace to the nine deep wells.' (*Ibid.* PP. 28 -29). The following map shows the distributions of the water wells in Borana administrative Zone). See Figure 9-39

Figure 9-39: Cattle water Facilities in Borena Zone

a. Picture of one of the deep wells in Dubluk (Study)

b View of one of the deep wells in Dubluk (study)

c Partial view of one of the deep wells in Dubluk (Study)

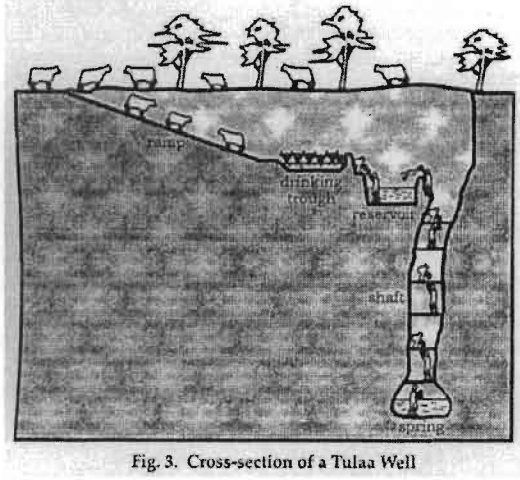


Fig. 3. Cross-section of a Tulaa Well

d Cross-section of a well- Source: Bassi Marco (2005)

Dubluk is surrounded by about 67 deep water wells. The construction of the wells is impressive. The water level reaches as far as 40m below the surface. The water is laboriously lifted by men standing on steps in the well shaft. The Borana constructed reservoir, drinking trough and ramp for each well so as to get the animals as far down the drinking trough as possible. The following map shows the cross- sections of the water wells in Borana administrative zones).

The property rights of water wells are in the konti rights of the Borana Oromos. While smaller ponds, excavated primarily for human consumptions, can be resources of individuals who excavated them, wells are privileges of clans. They belong to the clan of konti (the person who initiated the digging ceremony) and inherited paternally (Boru, et.al. 2008:29).

Besides their significance to cope with the water shortage in the area, water wells have significant values to the Borena Oromos. Using the water wells requires tremendous organization each clan of the Borena Oromo dug and administered several water wells. As they are assets of each clan, these water wells are administered by efficient and respected leader, elected from the clan. The administration of the water wells has its regulations and members of the clan use the water wells in accordance with the rules and regulations. Only the members of the clan have the right to bring their cattle to the wells, and some times, if there are serious problems, non members of the clan may bring their cattle with permission from the clan that owned the wells.

Worshiping places and burial sites in Borana Administrative Zone

Besides the above mentioned cultural properties, towns and villages such as Teltele, Drindar, Yabelo, Mega, Moyale and others , crossed by the power system, shelter a number living worshiping places (Orthodox and Protestant churches and mosques as shown in Figure 9-40) and burial sites.

Figure 9-40: Orthodox and Protestant churches and mosques

St. Mikael Church in Teltelle

One of the mosques in Moyale

Ancient Ruins in Dire Woreda

Mega also posses ruins of a building, which was constructed by the Italians (Figure 9-41) during the occupation (1936 – 1941) at the north-western outskirt of the town, on the right side of the road from Yabello. According to the local informants, this building was used by the Italians as their camp and it was also used as a prison for many years after the liberation. There is another building on the other side of the road and, and according to the local informants, this one is attributed to the British consul.

Figure 9-41: Ruins of the building constructed by the Italians, near Mega town

Traditional tombs and animal pens

During the field trip three tombs and two animal pens were identified which will be affected by the construction activities. These community sensitive points are located Southerly of Yabello in the Dire woreda, Borena Zone of the Oromia Regional State (location at 410576 E, 519607N, see also Photo Documentation Appendix 11).

Thus, it is recommend that the line route should be diverted to the left at a particular placed called Metaya, about two kilometers before entering Konso town and pass along the eastern boundaries of the town of Karat, away from the core World Heritage Sites. (The World Heritage Sites lies between 5 16'15" and 5 21'20 North and 37 20'15" and 37 26'49" East). This line will pass to the east of the health centre, about two kilometers from the Yabello road to the east and descends the Segen Valley. (Topographic maps showing the boundary

of the world heritage sites of Konso are attached. The terrace distributions, intensity, attitude variations and the boundary/interface between the modern town of Karat, Dukatu market.

In archaeology, fertile lands are supposed to have more archaeological remains than the barren areas.

Besides the living religious and burial sites, Dubluk is surrounded by about 67 deep water wells. In addition to the worshiping and burial places, one observes at Mega ruins of a building, which was constructed by the Italians during the occupation (1936 – 1941) at the north-western outskirt of the town. So, it may have at least indirect impacts on these worshiping places, burial sites and other related cultural and anthropological sites.

As we can learn from the map of Bassi (2005) about the distributions of the water wells, the cultural landscape crossed by lines A/C is dominated by a number of water wells so that attention must be given to the water wells during construction. It is seen that the T/L can pass through this area without affecting the water wells.

Local informants told us that there is no other significant archaeological heritage to be affected by the line routs of A/C.

9.5.8 Rural Electrification

Rural electrification provides an essential basis for environmental protection, poverty reduction, and supports rural economic development through power provision. Electricity, especially power supply to local communities has the potential to initiate positive development. It can e.g. support the medical care through cool and safe transportation and storage of vaccinations and other medicines.

Electrification of rural areas might have also positive effects on women's work burden, because it would reduce the exhausting and time consuming collection of water and fire wood. On the other hand, reduction of fire wood collection would have significant positive impacts on environment, because Sub-Sahara Africa is facing deforestation and forest degradation.

The Government of Ethiopia is committed to increase access to electricity and expand rural electrification. EEPCo implements grid-based rural electrification in the Interconnected System as well as the Self-Contained System within the Universal Electricity Access Program (UEAP), while off grid electrification is the responsibility of the Rural Electrification Executive Secretariat reporting to the Ministry of Water and Energy.

The Universal Electric Access Process (UEAP) Project is hosted by Ethiopian Electric Power Corporation, in Addis Ababa. For the five years planning period, from 2005/6 to 2009/2010, the project is funded by Government of Ethiopia, World Bank, African Development Bank, and Bank of Arab Development for Africa. The total target is to provide 6000 Towns or villages access to electricity. That was achieved by the end of the plan period. The total access to electricity reached 41%.

For the current five years plan period, 2010/11-2015/16, the target is to provide 4162 towns with electricity. Accordingly the access to electricity is expected to reach 75 percent of the population by the end of 2015/16 (Table 9-13).

The ulterior motive of such development or infrastructure projects is that if rural households are provided with electricity, even for lighting, it is improving the people's living standard and the gain in terms of environmental protection of rural areas is expected to be significant. It would help decreasing the rate of deforestation which this in turn the reason for huge top soil erosion, which is reducing agricultural productivity. Ethiopia has at the same time huge opportunities for electricity development, which is considered to reduce or even minimizes the problems of energy and food crises, as well as providing opportunities of environmental protection.

The table below gives a summary of number of towns to be provided with electricity by the UEAP.

Table 9-13: Planned and number of towns accessed with electricity (Country level)

Years	Planned No of Towns/Villages	No of Towns Supplied with electricity	Access to Electricity
2005/6	178	178	
2006/7	857	857	
2007/8	1714	1714	41 %
2008/9	1714	1714	
2009/10	1537	1537	46 %
2010/11-2015/16	4162	-	75 %

Source: Universal Electric Access Process (UEAP) Project
Towns or villages accessed with electricity by UEAP in the Project Area

The Ethiopia-Kenya power interconnection system will cross Seven woredas of the SNNPR State and three in the Oromia Regional State. Of these ten woredas, seven were provided with electricity by UEAP.

Accordingly the woreda, towns or villages which were accessed to electricity by the UEAP are listed in the Table 9-14 below.

Table 9-14: Towns or villages accessed to electricity by UEAP

Woreda	Towns or villages with electricity access
SNNPR	
Mirab abaya	Wankie Wafa K/Mulato
Arba Mich Zuria	Dega Chengae Wusamo Eligo
Derashe	Gato Busa kill Unute Kiaymo Shilele Argoba/Kanu
Humbo	Gancha Cara Abla Marica
Oromia	
Yabello	Elwaya
Dire	Mega M/Soda Dubluk

Source: Universal Electric Access Process (UEAP) Project

Since the Ethiopia – Kenya Interconnection Project is a higher level project of vital interest for the development of power exchange in Africa it will not contribute directly to rural electrification in the affected areas. The Project will establish not only an interconnection between the ENSAP and the NELSAP countries, but will ultimately serve a link for the power connection of North Africa to the South. As the HV transmission line between Ethiopia and

Kenya will close a major gap, it possibly contributes indirectly to rural electrification, as an improved power exchange between the nations could bring electricity in areas where it is demanded.

9.5.9 Gender Issues

Ethiopia is tradition-bound societies in many respects particularly true pertaining to gender issues. The government of Ethiopia has introduced policy instruments and legislative commitments to address women's interests. The vast majority of Ethiopian women - particularly in rural areas - are still struggling to eradicate gender injustices. Despite the laws and government efforts, women are not 100 % free of men's domination and need more times to be beneficiaries of legally granted rights and the development initiatives in general.

Due to deep installed traditional and socio-cultural nature and practices of the communities in the country, the Ethiopian people need to put a lot of efforts to eliminate the discrepancies seen in family life and in society in general.

Ethiopian has put in to effect a family law that defines the rights across gender a decade ago (the revised family law was adopted in 2001). Following the federal family code the SNNP and Oromia regional states have their own family laws.

The federal the regional laws contain important provisions relating to the gender equality and other major human right principles relating to gender. These include early marriage and abduction, polygamy, parental equal rights, female genital mutilation, violence against women, and access to land and property

Despite the provisions of the law, in practice, however, early marriage is common and affects children far younger than the ages stipulated by law. The situation is particularly severe in rural areas.

In many places early marriage is still widespread and consequently young motherhood is considered to be one of the main causes for Ethiopia's high levels of maternal mortality. Although abduction is a criminal offence but still practiced among in many regions including the project area.

While the law does not discriminate against women in matters of inheritance, in practice sons inherit family land.

Genital mutilation is widely practiced in Ethiopia. A large proportion of the female population undergoes female genital mutilation. This practice is against the new penal code.

Violence against women is still a general problem in Ethiopia, where culturally-based abuses, including wife beating and marital rape, are pervasive social problems. While women are assumed to have the protection of the police and courts, societal norms and the existing limited infrastructure and social services prevented many women from seeking legal redress, particularly in rural areas.

Considering access to land, the land reforms enacted law stipulate that women can lease land from the government. As a result a large number of rural women became landowners during the land redistribution exercise carried in some Regions.

Women have a relatively limited access to bank loans this is so much because of awareness and the existing disparities in education and social status. Public financing for women may be equally available to female heads of households but their awareness level limits the opportunity.

With regards to access to property, there is no significant difference between male-headed and female-headed households. Again the issue is that women seem to have accepted the differences in ownership between male and female.

Although Ethiopia ratified the Convention on the Elimination of all forms of Discrimination Against Women (CEDAW) in 1981, what one see in practice is that this is a widespread practices.

A study published in October 2008 that was conducted by UNFPA under the title of ' Gender Inequality and Women's Empowerment' in Ethiopia has demonstrated significant level of gender gaps with regard to literacy, educational attainment, work status, type of earning for work, occupation, access to media, age at first marriage and fertility preference or desire for children. The study concluded that Women in Ethiopia are seriously disadvantaged in terms of the above variables. Specifically, the findings for women indicate a significantly higher illiteracy rate, lower proportion with primary or secondary and above education, lower proportion not working to earn, low or non- existent media access and, by far younger age at first marriage. Women indicated more interest to limit their number of children than men.

The analysis presented in the study identified that determinants of poor educational attainment of women are early marriage and rural and household poverty, i.e. belonging to households with lower and lowest wealth quintile groups. The qualitative study results indicated that there is a widely prevalent attitude in the society, particularly in rural areas, that early marriage and assuming household responsibilities are the primary roles of women. Because of this girls are forced to discontinue their education. Household workload for both married women and young girls is also a deterrent for schooling. Similarly, factors that contribute to women's work for earning are having some education, living in urban areas, being in a household with better economic status and older age at first marriage (age at first marriage above 18).

Women's empowerment at household level was found to be generally low according to direct and evidence-based indicators which address women's involvement in household economic decision making and health matters. Better educational attainment, working to earn, living in urban areas, better household wealth status, better access to media, and age of women (being older) are significant positive contributors to women's empowerment at household level.

Gender disparity in the project Woredas are clearly seen in both SNNP and Oromia Regions.

In the two studied regions women do not posses land, unless the husband dies. The current law grants women the right to posses land but in practical terms women do not generally own the land unless they are female family head. Land lessens premature childbearing, lack of access to productive resources poverty and unemployment negatively affect women of the project area. On the other hand, women have played their part in farm activities and maintenance of community relation.

Gender disparity is manifested in different opportunities available for women in the project area. For instance if we take the educational system, women are less privileged than men in many ways.

In both regions school enrolment favours men. The number of girls enrolled in schools in SNNPR is generally less than the number of boys. Only 45 % the total students in primary school are girls. Parallel figure is 48 % for Oromia project woredas (46 % are girls in all the project woredas). Such proportion is much lower in secondary enrolment.

Hence the numbers of female students in secondary school in SNNP are roughly 1/3 of the total. The figure is 35 % for Oromia.

Girls are 45 % of all students in the project Woredas.

Similarly teaching opportunity for female is about half of that of for men (see Figure 9-42 for more).

Figure 9-42: Proportion of women in teaching profession in Project Woreda

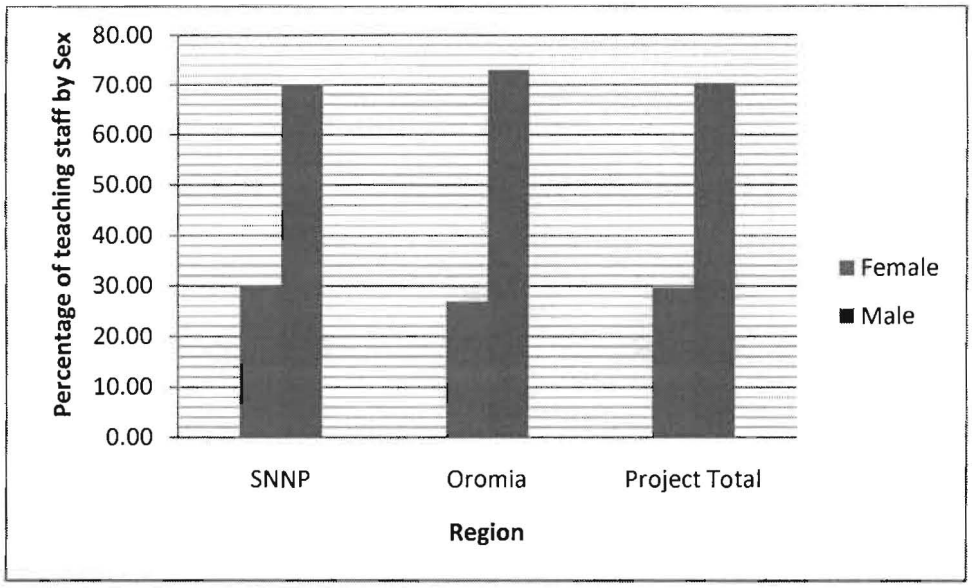


Table of Contents

10 PUBLIC CONSULTATION

In preparation of the meetings with stakeholder involved in the Project's ESIA process, the following arrangements were made by the ESIA/RAP experts during the study period of 2011 and 2008:

- Identification of stakeholders,
- Designing of questions for discussion with stakeholders,
- Development and discussion issues with key informants and key personnel in the process of consultation,
- Arrangement of consultation meetings with stakeholders, and
- Actual consultation with the identified stakeholders.

10.1 Community Participation and Public Consultation

The most important consultations were the ones held with project affected people in the Kebele communities which were held in all project kebeles along the RoW. Tropics Consulting Engineers Plc carried out a series of public consultation with these Project Affected People (PAP) at Kebele level in addition to the Authorities in the area.

The public and stakeholder consultations was carried out through formal meetings and public gatherings, focused group discussions and meetings in each of the woredas on regional, zonal and woreda level with officials, sector office heads, community members, elders and women groups, teachers and health professionals.

Further information was obtained through informal meetings held with different sections of the community. The consultations and field level investigations were carried out in all major urban centers and in those villages located in the project rural areas.

Public consultations were conducted with the objective of:

- identifying the potential social impacts (positive and negative);
- to inform the public on the potential impacts of the project, the implementation of the proposed mitigation measures for the negative impacts, and on measures of enhancement of the positive impacts, and
- seek the participation and contribution of the public prior and during the construction as well as the operation phase of the project;

The primary target of the public consultation is to protect the interest of affected persons and communities, especially of vulnerable groups, like the poor, children and women. It also provides the opportunity for the affected people to address their objections, influence the Project at a planning stage, to reduce adverse impacts, maximize additional benefits, and ensure that they receive appropriate compensation. The public consultation also creates awareness about the impacts of the Project, on how to implement mitigation measures, and how compensation payment and relocation will be handled.

The constitution program also affirms the participation of the public, in policies and projects that affect their livelihood. Article 43 No.2 states that: "*Nationals have the right* to participate in national development and, in particular, must be consulted with respect to policies and projects affecting their community".

Stakeholder consultations along the route were also conducted to increase the participation of all stakeholders, including people residing in the project area, local government officials, kebele administrations and woreda authorities and experts and professionals from all sectors and in different woredas where the Project traverses.

The consultations focused on:

- Nature of potential social impacts of the transmission line, and its impacts on social, cultural and economic set ups and networks during and after construction works; on the loss of productive resources; loss of grazing, forest areas and other assets;
- Identification of major social impact issues, such as resettlement, community severance and vulnerable groups that are at particular risk of project impacts, and compensation for affected properties and assets;
- Data and information on the current usage and ownership of land in existing width of the RoW, fixed and movable structures, trees, wells and other assets, areas of significant squatting and/ or encroachment;
- Soliciting the views of local population as how to pragmatically provide for their needs within the basic format of the Project, and what beneficial impact they expect from the transmission line.

Documentation of public consultation is provided as appendix 9 to the report (census data sheets, minutes of meeting and photo documentation).

The various consultations with different groups of people were conducted in all project woredas (about 10 woredas) and project affected kebeles. The meetings were held between May-November 2011. These consultations are in addition to the consultations held by Fichtner studies reported in the previous report.

A total of 698 PAP have participated in the consultation process. In addition to that 142 officials at different capacities also participated from all woreda administrations, and sector agencies. Among the participants about 35 percent were women. These were all formal meetings.

All formal meetings were arranged through woreda and federal agencies though appointment made before the meetings. Even though anybody could have attended in all the meetings, only targeted groups were present.

On top of that the consultant has met with many informal people who were met without any pre-arranged meetings when thought they would provide information and insights on the different issues such as cultural and historical as well as archaeological sites, about vulnerable groups, existing vegetations and historical development of the trees around their place, and other. Discussion about the project took place informally and important feedbacks were obtained from them. Many of the informal people were not counted but estimated to reach about 70 people at federal and regional level.

10.2 Results of Public Consultation in Ethiopia

During Public consultations with Woreda authorities, PAPs and local communities, and also meetings held with local sectoral officials, it was confirmed that local authorities agreed to ensure that no person will be allowed to encroach to the RoW after the cut-off date, which is June to August 2008.

According to the appointments, consultation meetings were held first at federal level and then at regional level. The study team, gave a short introduction on the Project, and used a questionnaire for the interviews, which should stimulate responses. Minutes were prepared during the meetings/consultations, which are attached as appendices to the ESIA (see Appendix).

Contact data of environmental and administrative institutions consulted or present in the meetings were documented for further inquiries (presented in Appendix).

Organizational structures of Environmental Protection of the Federal and Regional Administrations and the main duties and responsibilities were recorded. The concerns expressed, opinions and actions committed are summarized below.

Concerns of the people/organ consulted

Summary Woreda Consultations and major concerns of constructing the transmission line are:

1. There are indigenous trees around Goda Chame, Derito Kebeles and care must be taken to avoid or mitigate the impacts on these trees;
2. Cobo spring used for water supply and Water Tanker located in Gegna Keble require special attention ;
3. Protect Borena Water network used for public water supply and cattle drinking water;
4. Areri Kebele in Arbora is an assembly area for Geda (traditional democratic ritual), the project should must take all necessary precaution so that avoid the impacts on this assembly area;
5. Noise from transmission line and Electromagnetic Field;
6. Care must be taken for the Cultural and Historical Heritage of Konso including wall towns, traditional burial sites, Konso villages (houses) , traditional worship areas, and terraces, and plant ecology sites
7. Along the transmission line there is no hot spots but during construction follow up is necessary

Major Concerns of PAPs

1. This is a big project and can cause problem on the people (displaces People, animal and the environment;
2. Erosion can damage Chamo and Abaya lakes consequently affecting the fishes of the lakes;
3. The displaced people can waste the compensation money for drinks and other unnecessary use and therefore a training and awareness creation program should be devised in consultation woreda administration ;
4. Water supply pipes, forests, underground water could be damaged if necessary care are not taken before and during construction;
5. Burial sites and living cultural sites at Lante Kebeles need protection

Participants requested information if there are dense residence area, industrial location, natural forest and historical and archaeological sites that might be affected; care need to be taken to avoid important locations.

Some kebeles where the line passes do not have electricity and need connection before power is exported to other country or in parallel the transmission line construction.

The participants, apart from the above concerns, said that the project has multiple benefits such as creating employment, fostering economic growth due to foreign currency earning, and initiating development in general

- Although there is the awareness of some inconveniences, the communities are welcoming the construction of the transmission line;

- All woredas traversed by the transmission line have agreed to provide support and assistance for people who will lose their land (farmland or residential land) for the construction of the RoW, detour and other construction purposes;
- Special support will be made by the woreda and the community for female headed households and other vulnerable groups, if affected by the construction of the transmission line;
- In general, in all locations where public consultations were held, the public was highly supportive and positive about the construction of the transmission line.
- All environmental Protection Institutions advised the study team to refer and strictly follow the procedural guidelines prepared by EPA.
- Consulted decision makers and elders were asking the study team if the residents around the project areas will be supplied with electricity from the project. This question was raised everywhere during the team exploration of the route line corridor.

  Regarding this question, the local experts do not expect difficulties if the communities residing around the route line won't be supplied with electricity from the Project. The majority of woredas along the routing have access to electricity, while the rest of towns/ villages are planned to be connected to the grid by the Universal Electrification Access Program (UEAP).
- All adverse impacts during Construction and Operation Phase will be clearly identified and incorporated in the study, which was strongly emphasized by the federal and regional environmental institutions.
- The route line shall be well designed to minimize the adverse effects on natural and socio-economic environment of the project area corridor.
- The study team was advised by the Environmental and Biodiversity Protection Department of SNNPR to adopt preventive methods rather than developing mitigation measures.

Conclusion

The perception of the project by the people including the affected people is positive. They are enthusiastic about the development and hope that the project play important role in contributing to bring changes in the lifestyle of the local people and believe that it definitely enhances the national economic growth efforts of the country (the minutes of meetings is presented in Appendix 9).

The consulted people further stressed the need for mitigating all negative impacts arising from the project development. They, in addition, urged for sufficient compensation payment to PAP for the property damaged. The existing plants, animal and the physical environment must be protected during project implementation. All potential problems and measures discussed should be addressed by the proponent and concerned authorities at woreda and local level must ensure that.

Table of Contents

List of Tables

11 POTENTIAL IMPACT ANALYSIS

11.1 Approach

The assessment of environmental and social impacts is presented qualitatively and quantitatively depending on the issues. The potential impacts are described as per the guideline set by the countries, AfDB and the World Bank safeguard policies and procedures. The impacts are also presented in a detailed description and in a summary table. In addition the natures of impacts are described based using the following types of descriptors:

- The study will describe impacts whether they are negative, beneficial, no change, or not known;
- Severity of the impact and geographical extent will be specified;
- The study will also examine the reversibility of the potential negative impact
- Duration and frequency of the impact will be described;
- Timing of the impact whether it is during pre construction, construction or operation
- Circumstance of the impacts and the probability of their occurrence; and
- Significance of the impact will be evaluated

A full environmental and social impact is presented in 2009 ESIA/RAP studies of Fichtner. Important comments, however, were made by the stakeholders regarding hot spots and culturally sensitive areas in the project location. The study makes additional assessment and mitigation measures to fill the gaps seen in the 2009 studies. These were be reviewed during the baseline data collection and stakeholder consultation. The assessment of the impacts is be based on a variety of qualitative and quantitative methods for specific topics.

The recommendations of the mitigation options are developed applying the hierarchy of (1) avoid, (2) reduce, (3) remedy, and (4) offset. Avoid refers to actions such as changing the location or modification of alignments for transmission lines and access roads. Reduce the impacts deals with designing operating rules to include setting requirements. Actions to remedy adverse impacts include the clean up and restoration of temporary construction sites including camps, storage areas, and temporary clearance sites. Compensation measures are introduced where a given impact cannot be acceptably mitigated including offsetting the loss of terrestrial habitats by introducing conservation and management measures.

The 2009 Fichtner study has come up with definitive impacts of the project. This study has made evaluation of the presented impacts, and gaps have been identified. Detailed and in-depth impact assessments are be made with regard to:

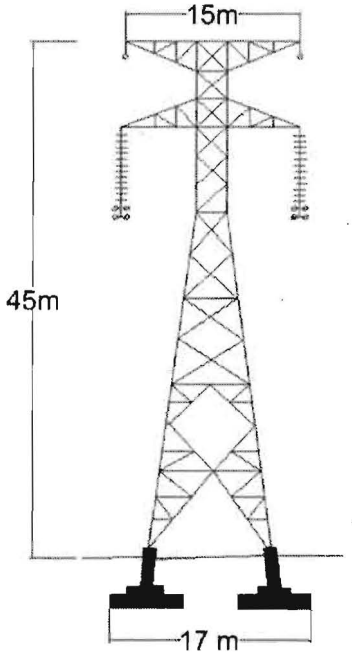
- Impacts on Agricultural Land
- Impacts on Drainage, Surface Waters and Water Resources
- Potential Aesthetic Impacts
- Electric and Magnetic Fields
- Impacts on Natural Vegetation
- Impact on Flora and Fauna
- Land Excavation, Access Roads and Campsite
- Soil Erosion
- Noise, Ozone and Corona
- Chemical Pollutants Social Impacts including Settlements and Community Facilities, Archaeological and Historical Sites, Solid Waste, etc will be analyzed
- Occupational Health and Safety Concerns and Safety Issues as well as injuries

The effects of the project are seen in both project construction and operation phases. Impacts during construction appear to be higher than the impacts during operation phase. The Project affects a large area of the transmission line routes area by claiming land for

tower foot prints, RoW, camps and storage, substation, and access road. The land taken by temporarily and permanently is given below.

Typical Outline Suspension Tower 500 kV DC and Land Take for T/L

The following Average Areas of Land are Occupied during Construction and Operation of the Transmission Line



Permanent land take
> Upper dimension range <

Permanent Temporary Land Occupation

Basic Assumptions:
Overall T/L length Ethiopia → 433km
topography → flat, gentle slope, partly hilly
soil → dense to compact, partly rocky 2.45 towers/km → total 1060 towers 1 tension (angle) tower appr. every 7 km field assessment estimation → (±5%)
995 suspension towers
65 tension (angle) towers

Land Areas:

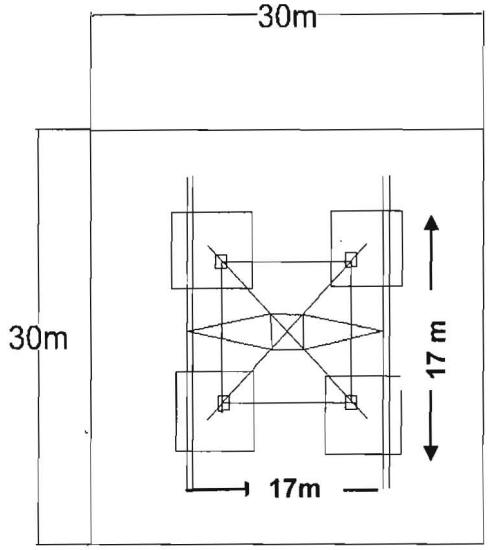
1. ***Suspension Tower***
   permanent land take = 300m^2/tower
   temporary additional for= 600m^2/tower construction

   996x300m^2 = 298,500m^2
   996x600m^2 = 597,000m^2
2. ***Tension Tower***
   500m^2/tower permanent land take
   1000 m^2/tower temporary additional for construction

   500m^{2}x65 = 32,500m^2
   1000 x65 = 65,000m^2
3. ***Right of Way***
   50m wide corridor along line route
   60m wide when adjacent settlements

   204,000^{m}x60^m = 12,240,000m^2
   229,000^{m}x50 = 11,450,000 m^2
   Total = 23,690,000m^2
4. ***Substation***
   = 200,000m^2
5. ***Storage and Camps***
   T/L Lot of say 250km Line Portion:
   2 storage (camp) places/ Lot
   10,000m^2/camp temporary land occupied
   T/L Section in Ethiopia:
   2 Lots for the entire 433km line (subject to Banks agreement) 4 storage camps in total
6. ***Access to Towers***
   4 m wide path temporary from existing village road or field track
   Access Road every 10 km along the route; 40 entrance 4m by 1 km average 40x4mx1000m = 160,000 m^2

   2m wide path temporary from tower to tower along line axis or within RoW corridor (0.5m to 1m wide in extensive cultivation)
   Depending on the distance between existing roads /tracks to the tower



location, some of the temporary access path may become permanent access path outside the RoW corridor for maintenance purpose.

11.2 Potential Positive Impacts

11.2.1 Employment Opportunities

Employment opportunities will be offered to skilled and unskilled workers and during the construction and operation phase. In addition, there will arise, opportunities for establishing shops and engaging in income generating activities especially for women.

11.2.2 Additional Power Capacity

With the additional substations and transmission line, there will be increased capacity and reliability of power supply. This additional capacity will have a positive impact by being able to meet the ever rising power demand across the entire country (Kenya).

11.2.3 Development of ICT Hubs

Ethiopia and Kenya are developing rural-based ICT networks that are geared to benefit the local populations and supply local schools with ICT terminals as ICT is being integrated into school curriculum in line with the countrys' MDGs. The policy is to incorporate optical-fibre ground wire (OPGW) in all new lines. The OPGW will therefore be able to supply broad-band communication telecommunication hubs, mobile telephone networks and digital television to population centers and schools along the project affected area.

11.2.4 Conservation Measures

Access to adequate and affordable energy for households and industry will help in rolling back the rate of deforestation and thus help in conserving water resources. Access to affordable energy will revolutionize transportation and farming methods hence cutting down on emissions of CO_2, NO_X and SO_X to the atmosphere and thus help in reducing the effects of global warming.

11.3 Potential Negative Impacts and Mitigation Measures

11.3.1 Negative Impacts During Pre-Construction Phase

Before construction begins the project need to secure land from responsible organ. There will be negative impacts on land associated with the construction activities. Some of the lands required are temporary and some others are permanent. Lands needed are:

1. **Camp:** This affects the environment temporarily and the land could be reclaimed after construction is completed.
2. **Storage:** Land is also needed for storage of materials such as construction material equipment and others. Impact will be for short term until construction is finished.
3. **Land for access Road:** The construction of temporary road to access the towers could result in loss of farm land.

All land is secured before construction is started but the impact implication and mitigation measures are detailed under construction phase below hence are not quantified in this section to avoid double counting.

11.3.2 Negative Impacts during Construction Phase and Mitigation Measures

11.3.2.1Impact on Soil

Main sources of impacts on soil during construction are building of construction roads, workers camps and temporary storage areas. Site clearing, site excavation, ground-leveling and other earthworks, and movement of construction vehicles are major causes of impacts on soil. The impacts are Loss of land due to erosion and tower footprints, Soil compaction, Soil sealing, Damage or clearance of vegetation cover (resulting in increased erosion), Increased risk of soil contamination by spillages or inadequate handling with paint, fuel or oil. Soil compaction leads to an increased run off, because the water cannot drain into the ground. Especially during heavy rainfalls more sediment can be eroded in areas of a respective slope, due to this increased run off. This effect is also supported by damage or clearance of vegetation cover, because the roots of plants cannot stabilize the soil anymore. Beside this, the damaged surface is more vulnerable to wind erosion.

The impact of construction activities on soil could be assessed as low under consideration of the proposed mitigation measures and the rehabilitation of the sites. The extent of impact is low negative.

Mitigation

These risks should be avoided or mitigated by temporary erosion control measures. The tower and substation site erosion stabilization works including replanting of the sites will be a part of the tender specification.

The risk of soil contamination by spillages or inadequate handling with fuel or oil can be significantly reduced by maintenance of vehicles and construction machines. Execution of all construction works according to the IFC's General Environmental, Health and Safety (EHS) Guidelines.

11.3.2.2Potential Aesthetic Impacts

The overall aesthetic effect of a transmission line is likely to be negative to most people, especially where proposed lines cross natural landscapes. Landowners can potentially find transmission lines bordering their property particularly disruptive to scenic views. To some, new transmission lines are viewed in a positive light because it represents economic development. The proposed development will have minimal effects on the landscape. The OHTL routes have been established so as to meet the co-inhabitancy requirements imposed by the natural landscape, objects, buildings and facilities in the neighborhoods by ensuring that they merge into the existing landscapes and thereby having minimum impacts on surrounding land.

Mitigation

In particular, most of the transmission line route has been selected to follow hilltops where there is minimum human settlements and where the view of the conductors will be against the sky and thereby having less impact than when viewed sideways or from above against the background of the horizon or the ground.

11.3.2.3 Impacts on Drainage, Ground and Surface Water

Ground Water

Risk for groundwater contamination can be caused by several activities during construction of the transmission line. These include:

- Fuel or motor oil leakages of vehicles or equipment
- Inadequate handling of fuel in unsealed areas
- Inadequate handling of paint, effluents or wastes, including hazardous waste (e.g. waste dumping)
- Inadequate handling of effluents from workers camps or at the construction site

The Impacts of Construction activities on groundwater resources are considered to be low impact.

Surface Water

Negative impacts on surface water resources might be caused by:

- oil or fuel spills resulting from fuelling or maintenance activities of construction machines, or poorly maintained construction machines,
- dumping of waste at/near surface waters or temporary rivers,
- sediment runoff from tower construction areas or transmission line clearing,
- disturbance of bank vegetation

In Ethiopia, the Project would cross 49, partly intermittent rivers. But only two tower sites will be in the vicinity of a river, namely Bend 5 (distance to the next river approx 60 m), and Bend 30 (distance to the next river approx 100 m).

The distance to Lake Abaya will be at least 900 m from the RoW and to Lake Chamo be at least 850 m from the RoW.

It seems to be unlikely that high sediment runoff from tower site works will occur, drain into the next river or lake and adversely affect the water quality in any nearby water bodies.

Impact on the surface water is low

Mitigation

All construction and related activities shall be executed in compliance with the IFC's General EHS and EHS Guidelines for Electric Power Transmission and Distribution.

The uncontrolled discharge of effluents into the ground or groundwater aquifer will be prohibited and must be avoided. Furthermore risks for ground water contamination could be managed by use of well maintained vehicles and equipment, implementation of an adequate effluent management, and suitable organization of the construction site.

Site selection of towers for the final routing should be done away from the shores of lakes and perennial and intermittent rivers, which will minimize the risk of impacts on surface waters.
If construction is in progress during rainy periods, temporary catch basins or sediment traps should be prepared.

11.3.2.4Impact on Air

Dust generation from transportation and construction activities and emissions from vehicles and machines (particularly from large construction and transportation vehicles) will be the two impacts on air quality likely to occur during the construction phase. The main source of dust emission are site clearing, pit excavation for foundation, ground leveling, other earth moving works and traffic.

It is anticipated that the natural dust concentration is relatively high in comparison with the amount of dust generated by the construction activities.

During construction, the Project will lead to an increase of the overall traffic flows for a limited period and will cause a rise in vehicular emissions. These emissions together with exhaust emissions from equipment deployed during the construction phase are likely to result in a marginal increase in the levels of CO, NOX (NO and NO2) and unburned hydrocarbons.

Since the impacts of dust and air emissions on the air quality will be timely and spatially limited to the construction activities, they are assessed to be low.

Mitigation

Spraying water would be an appropriate measure for minimizing this impact. Since water is a limiting factor for the people living in the arid climate of the affected area, especially in the dry season, it does not seem to be appropriate to propose a measure which requires a high amount of water. Hence dust preventive measures for avoiding dust generation like proper planning of vehicle movements are considered to be more appropriate.

11.3.2.5Noise

The construction of the transmission line will cause noise and vibration exposures to the adjacent areas. Especially the vehicle movements and the operation of the construction equipment for the excavation activities or tower erection could result in noise emissions. This impact will be low and of temporary nature, it has the potential to disturb local fauna and people.

Mitigation

Noisy construction should be scheduled to the day time and local people should be informed prior to the activities.

11.3.2.6Solid and Liquid Waste

The project does not envisage major excavation works; solid waste will therefore be minimal. Topsoil excavated from construction sites will be the main form of solid waste. Some of the excavated soil will be reused for backfilling while the rest will be disposed off at designated areas. Other solid wastes will include metallic pieces, wooden planks, and stone debris. All these waste items will be disposed off in accordance with the legislation or other guidelines on the same. Particular care will be taken in forest reserves, national parks and other protected areas where materials and plants brought in during construction shall be taken out at completion of the works.

Mitigation

Proper disposal of solid and liquid wastes.

11.3.2.7Flora, Fauna and Habitats

Impacts on Vegetation

Construction of substation, RoW, storage, camp sites and access road causes the clearance of different vegetation cover along the route. The preliminary estimate shows that a total area of 25,048,000 m² (2504.8 ha) is affected. All hindering vegetation will need to be removed. According to the calculation above, the total area of affected woodland is currently estimated to be 50 % of the total cleared area.

As the intensity of the construction activities varies inside the RoW, it has to be distinguished between the impacts at the construction sites (substation and towers) and the rest of the RoW.

Preparation of Construction sites

At the location of the tower construction sites and the substation all hindering vegetation will need to be removed. The total displacement of the ground vegetation cover like grasslands shall be avoided, in order to prevent vegetation will need to be removed. The total displacement of the ground vegetation cover like grasslands shall be avoided, in order to prevent erosion. Trimming and removal of trees and shrubs shall be limited to as small as possible.

The area affected by vegetation clearing at the substation site and tower is estimated to be:
- Bushland 26.55 ha
- Grassland 9.82 ha

Rehabilitation of the sites shall be done when the use and movement of heavy machineries is finalized, means after construction of the towers is finalized or the conductors are installed respectively. Compacted soil shall be breaked up in order to allow a better growth of plants and intrusion of rain. Where applicable, soil cover such as sods shall be saved before beginning of construction, stored, maintained and replaced after the construction activities are finalised. In order to minimise erosion and accelerate the natural re-vegetation, some shrubs and trees shall be planted.

Considering the limited timeframe of the impact, the rehabilitation of the construction sites including soil stabilising measures like re-vegetation, the impacts of construction works at the tower sites and substation is on vegetation is assessed to be low.

Preparation of ROW

As mentioned above, shrubs and trees lower than 4 meter will be permitted but nevertheless, as preparation of the construction works like bringing up of the conductors, hindering trees and shrubs will need to be removed or trimmed inside the RoW. Additionally, trees and shrubs might be damaged by vehicles. Trimming and removal of trees and shrubs shall be limited to an as small extend as possible. The total number of trees to be removed or trimmed will depend from the final routing.

The estimated area which might be impacted by trimming and removing of trees and shrubs, is estimated to be:
- Bushland 664 ha, and
- Grassland 476.6 ha, considering the complete RoW without the tower construction sites.

As the impact will result from removal, trimming, or damage of several plants but not the whole vegetation cover, the actual impact is expected to be significantly smaller than this estimation. Nevertheless, mitigation measures shall be in place and the construction works need to be executed carefully, in order to damage the vegetation to an extent as small as feasible. Thus for effective supervision, it is recommended that well-trained experts will be required to ensure the recommendations are observed.

Considering this, the impacts of construction works inside the residual part of the RoW on vegetation is assessed to be low.

Access roads and temporary needed areas
For the construction activities it will be necessary to prepare temporary areas for storage or workers camps, and access roads where existing roads cannot be used. These activities will result in removal or covering of vegetation. The amount of needed land is not known because it is subject of the construction planning and execution of the contractor. However, the extent of impact has to be ascertained and to be assessed, if possible during the revision of this study when the technical details are defined.

Under consideration of the mitigation and compensation measures the impacts can be reduced significantly, but not totally avoided. The loss of trees will be subject of compensation and the removal of vegetation will be partly subject of rehabilitation of the construction sites and partly of natural re-vegetation. Based on the currently available information, it is preliminarily concluded that the Project would have a low adverse impact on vegetation.

The identified Dry Evergreen Montane Forest and some parts in the *Acacia-Commiphora* woodland are evaluated as the most valuable and sensitive vegetation along the proposed routing.

Mitigation
The total displacement of the ground vegetation cover like grasslands shall be avoided, in order to prevent erosion. Trimming and removal of trees and shrubs shall be limited to and extend as small as possible. It is recommended to compensate the loss of individual trees by a compensation rate of 1: 5, while the loss of forest area and some parts in *Acacia-Commiphora* shall be based on a compensation rate of 1: 10. The compensation rate includes as well the impacts on fauna. This mitigation option refers tree planting close to the transmission line corridor.

The replanting will be made in consultation with responsible institutions such as Bureau of Agriculture or experts in order to select suitable plant species needed for the re-vegetation, this should also include the consultation of local people and responsible authorities.

It is strongly recommended to record the forest area and parts of the *Acacia-Commiphora* woodlands with certain ecology prior to the start of the construction activities. Felled trees should not be wasted piled along the line. The responsible community should take charge and sell it to use the money for community proposes. When it is individual plot, the felled trees should be given to the person who has a claim on that individual plot.

Impacts on Fauna and Habitats
No migratory bird routes were encountered during the field investigations and interviews with local experts. Important Bird Areas and other protected areas are avoided in Ethiopia. The Project's routing passes through a landscape which is already partly affected by pastorals and farming. Fauna species might be affected by noise and traffic caused by construction activities and the loss of vegetation and land, or habitats respectively.

For the preparation of the RoW trees and shrubs will be partly removed, in areas where it is necessary. The RoW clearance shall be limited to the removal of individual wooden plants to the extent which is necessary for the preparation of the construction works. It is expected that this might lead to a visible corridor in Bush- and Woodlands, but will not lead to the total removal of the vegetation cover and hence not to the fragmentation of wildlife habitats.

Preparation of Construction sites
For the preparation of the tower sites all hindering vegetation will be removed, and this results in a total loss of habitats at these sites. Assuming that 2-3 towers per line–km (as average) will be build, it is expected that this and the selective removal of individual wooden plants inside the rest of the RoW will lead to a visible corridor in areas covered with shrubs and/or trees.

The surroundings of the tower footprints will be rehabilitated, partly by re-vegetation measures and partly by natural restoration. Nevertheless, the tower construction sites will be lost as habitats and food sources until deconstruction and the vegetation is re-established/grown again.

Access roads and temporary needed areas
For the construction activities it will be necessary to prepare temporary access roads (where existing roads cannot be used) and temporary areas for storage or workers camps. These activities will result in removal or covering of vegetation until natural restoration. As long as those areas are not rehabilitated, and re-vegetated they will be lost as habitats.

The impacts can be reduced significantly, but not totally avoided. Based on the currently available information and rehabilitation of the tower construction sites, it is preliminarily concluded that the Project would have a low adverse impact on fauna and habitats.

Mitigation
The compensation for disturbance of affected fauna is already included in the assessment and compensation for vegetation losses.

11.3.2.8 Landscape

Direct negative impacts especially on woodland and agriculturally productive land are expected before and during of construction activities, as inside the RoW trees and shrubs will be partly cut, while at the tower sites all hindering vegetation will be removed. The construction of the towers will result in a permanent loss of land, while other land will be temporarily occupied for workers camps, storage areas and construction roads. The impact during construction phase will be a visible corridor in areas with wooden/higher vegetation, until the vegetation is grown again. As the routing will be mainly in parallel to existing infrastructure (roads) and no protected area will be traversed, the extent of impact on landscape is assessed to be low negative.

Mitigation
The sites for the towers and the access roads are carefully selected.

11.3.2.9 Chemical Pollutants

Rural development and health sector projects have to avoid using harmful pesticides during bush clearing, line construction and in the O&M phase of the project. Thus it is recommended mechanical ROW clearing and maintenance; it is both more environmentally friendly and provides short-term employment that can be made available to unskilled workers in adjacent communities.

Mitigation

Avoid the use of chemicals for pest management

11.3.2.10 Impact on Local Communities and relocation/Resettlement

The RAP census has initially identified 1165 households, having a total population of 5743 (individuals), who will be affected by the Project either by loosing housing structures located within the RoW, farmland, trees or perennial crops. Almost all affected households in the Ethiopian sections of the routing are dependent on crop farming, except for some who are pastoralists and few individuals who have employed jobs either in the public or private sector.

Most of the households, who may lose their accommodation due to the construction of the Project, could be able to relocate and construct their dwellings in the remaining plot of land without any need to be resettled.

Nevertheless there could be households who might lose all their assets and land, or who may not have sufficient land to re-build their housing structures in the remaining plot of land. These dwellings will need to be re-established at another site, which can be in the same community, or at another place. This is considered to be resettlement then, and it seems to be applicable especially in the Sodo, Humbo and Mirab Abaya woredas. The RAP will address all the land acquisition/involuntary resettlement issues in the project. ESIAs/ESMPs will be prepared for resettlement sites, as and when necessary.

Mitigation

Relocation and resettlement is needed for the affected. The proponent should consult the authorities to locate and resettle the PAPs on a suitable land if possible nearby their old dwellings

11.3.2.11 Fragmenting of Lands

Establishment of the way leaves could result in fragmentation of cultivation and grazing land thereby compromising productivity and incomes, loss of crops, fruit trees and grazing land. In most cases loss of cultivation land will be a temporary impact which will be compensated for in terms of crop and financial losses in cash, per the requirements of the RAP. Trees that grow beyond 4 m in height will be similarly compensation in cash. Growing of up to 4 m high crops and orchards under the line and grazing will be permitted during operation and maintenance phase of the project.

Mitigation

Compensation should be provided to the affected people for lost land.

11.3.2.12 Impacts on Agricultural Land

Transmission lines will affect farm operations and increase costs to farmers. Destruction to farmland will occur especially during construction of tower pads and during stringing. Though these will be temporary and localized along the RoW, tree plantations and orchards will be affected as they will not be permitted to grow beyond 4 m height. This is a concern especially along sections where residents have small land holdings. EEPCo (and KETRACO) will repair much of the damage that will occur during construction and provide monetary compensation for damages that cannot be easily repaired. Compensation details are provided under the RAP. Effort will be made to ensure that some of the access roads required during project implementation do not become permanent or are turned into damping sites.

Mitigation Measures

Compensation shall be paid for permanently and temporally lost agricultural land.

11.3.2.13 Income of Livelihood – Land use

For the majority of affected people small scale farming and pastorals, is the basis of livelihood. The impact on the People's income therefore is mainly caused by the disturbance of farming activities, or loss of land due to the construction works. As more land will be required for the construction activities in comparison to the post-construction situation, the impact on farming activities will be higher during construction. A total of 3,410,000 m^2 (341 ha) of farming and pasture land will be affected by the Project. The main impact will be the loss of farmland for cereal and perennial crops. Fruits and construction wood are the major sources of income on which the farmers mostly depend to cover all of their expenditures. Adverse impact on farming activities is mainly expected in the first section of the routing which traverses the SNNPR State. The impact on land use and especially agricultural land needs to be taken serious, due to the shortage of land and high population pressure.

Mitigation
Compensation shall be paid to the affected. As land for land compensation is expected to be difficult to realize due to very little availability of suitable land in the mentioned first section of the route.

11.3.2.14 Impact on Enterprises

In the first section of the route, western of Sodo, two big tree nursery sites owned by the Woreda Agriculture Office will be affected by the Project. The nursery sites mainly grow tree and coffee seedlings for distribution to farmers and for plantation on community forest areas. Another tree nursery is located in Humbo woreda. The impact on the nursery sites may force it to reduce its activities in the future.

One public business enterprise affected by the Project, is a state farm located in Arba Minch Zuria woreda, westerly of Lake Chamo in a place called Cillaie. The state farm grows cotton, maize and banana. About 164,750 m^2 of its farm land will be affected by the construction works of the transmission line.

Possession of land for the construction activities are expected to result in a decreased production area and therefore decreased profit. As land is sparse, it is not expected that those enterprises could shift their production areas, as they are also dependent on the springs in the area. Shifting of the production would also lead to further impacts on the community.

Even though it is recommended to employ local workers for the construction phase, it is expected that skilled workers from other areas will also be hired. Limited local revenue will be created by purchase of food, accommodation and fuel. As the workers will spend some money within the community at eating/drinking establishments, this is expected to create a locally positive effect for the timeframe of construction.

Mitigation
Compensation will be paid for lost enterprises to the owners

11.3.2.15 Loss of Physical Assets

As settlements of the RoW, all housing structures located within the RoW will need to be demolished and re-established outside of it. According to the current information, a total of 256 housing structures, 1 fence, 1 store, and 4 churches will be directly affected by the Project.

Different types of trees will be affected due to the clearance of the RoW. According to the RAP census and the baseline investigation, a total of:

- Timber = 128,890 trees
- Coffee, Hop (gesho) & Pepper = 13,438 tress
- Falls Banana (Enset) and other root crop = 19,743 tress
- Fruits = 7680 trees

Will be cleared Out of these about 72% is located solely in Sodo Zuria woreda.

Mitigation

Where it is not possible to realign the line route further than already achieved so as to avoid the few affected structures, compensation and assistance shall be provided to for affected land and assets, logistical provision for resettling the people, and compensation on loss of earnings. More details about resettlement and compensation is provided under the RAP.

11.3.2.16 Health/ Interaction between local Community and influx of Workers

Influx of people and interaction between locals and skilled workers from other areas can lead to tensions and provides a higher risk for the spread of socially communicable diseases including HIV/AIDS. Though most of these diseases would be of temporary nature except for HIV/ AIDS the effects should be managed by the implementation of prevention measures, which need to be developed in consultation with local communities and health experts prior and throughout the Project implementation. The workers and local communities shall be advised about HIV/AIDS and HIV/AIDS protection equipment shall be available free of charge to workers. Protection device should also be availed to the communities.

Mitigation

The threat can significantly be reduced by implementation of adequate prevention measures including education and training as well as enhancing health facilities near project construction sites to the communities and workers.

11.3.3 Impact on Cultural and Archaeological Resources

The original T/L traverses through Cultural Heritage sites and Palaeontology location of Konso. Maximum efforts were made to avoid the UNESCO registered Cultural Landscape, however, demarcated buffer segment of the landscape will be within the line route. That is the route traversing through this site is slightly touching the buffer zone. This is considered to have very minimum impact to the heritage site, majority of the area have much higher slopes and need to make maximum effort to follow up construction activities by EEPCo and ARCCH to protect any incidental impacts. However assessment shows that there is no significant impact that would affect this cultural resource. Repeated discussion with ARCCH confirmed that impacts are insignificant written confirmation is also obtained from ARCCH (see Appendix 8. The affected area has ground slopes of less than 20%.

The other important sites in Konso are the discovery of fossils in Konso-Gardula. The transmission line passes through a couple of these sites (see text). Potential concerns are the excavation of few tower foundations.

Mitigation

The Konso Paleontological sites mentioned above at bend 34 and 35 has been rerouted to avoid patches of fossils discussed above (see map in appendix 8). In addition to that all excavation works during construction in the area should be in the presence of the ARCCH

experts. Test should be carried out before tower foundations are excavated. During construction activities, if fossils are found they should be carefully taken out and relocated to some selected location or museum.

Occupational Safety Issues

11.3.3.1 Injuries

During the construction phase, the work will involve use of sharp objects, noisy machineries and dusty environment.

Mitigation

The constructors will be required to provide workers with the relevant protective gear including safety boots, gloves, protective clothing, dust masks and ear-mufflers, etc.

11.3.3.2 Climbing Dangers

Falling from heights: The nature of the work shall make it unavoidable to climb towers during construction and operation. This brings in the risk of falling from heights.

Mitigation

Among other mitigation measures to be taken shall be ensuring that workers are free from any influence of alcohol or drugs; testing structures for integrity prior to undertaking work; implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; and inspection, maintenance, and replacement of fall protection equipment.

11.3.3.3 Holes and Excavations

Since the proposed line traverses settled areas, the danger of uncovered holes might pose danger to people and animals. This could be avoided by covering tower excavations and holes, pole installation holes and other any other holes dug during the project after their use and especially at the end of the day and providing visible warning signs and barriers if not covered.

Mitigation

Workers need to be equipped with appropriate protective clothing and equipment, and should be instructed in EHS practices, e.g. considering international best practice, like IFC EHS Guidelines.

Posters or flyers at schools and social service centers, in communities which are in the vicinity of construction activities should be used to create awareness. Access of unauthorized persons to the construction sites shall be prohibited and avoided at any time. To prevent accidents with local people, safety measurements (e.g. distances, fences) shall be implemented at the construction sites where issues and initial.

11.3.3.4 Traffic interference

A temporary interference between the local traffic on district roads and local tracks during the construction phase is expected. Due to the limited time of the construction activities this impact is assessed to be low.

Mitigation

Traffic awareness creation measures training and traffic management are introduced.

11.3.3.5 Protected Areas

The Nechisar National Park is located East of the RoW, with a distance of at least 7 km between the proposed routing and the nearest park border. As the town Arba Minch lies between the proposed routing and the park it is not expected that the Project will have effects on Nechisar National Park. Yabello Sanctuary is located 10 km east of Yabello town in the Borona Zone, with the Yabello-Arero road passing through its southern part. A large controlled hunting area were indicated in the Borona zone that is traversed by the transmission line but precise boundaries for this protected area have not been set legally and institutionally, it is difficult to determine the actual effects. The only impact in this regard is accidental interference of the protected area by workers and local who are trying to resettle themselves away from the RoW. Considering the estimated distance of 10 km and as the town lies in between both, park and protected area, it is assumed, that the Project will not impact the park

Mitigation

The competent authorizes and EEPCo need to supervise any interference to the area by careful monitoring of movement and settlement caused by the project. In addition resettlement/ settlement in the controlled hunting area of Borona do to influx of people need to be monitored and prevented.

11.3.4 Impacts During Operation Phase

11.3.5.1 Electric and Magnetic Fields

Electric fields

Electric fields produced by HVDC transmission line are results of line voltage and the e charge field due to line corona. Therefore presence of a charge between a conductor and the ground has impacts. However, impacts are not significant enough to be felt substantially by humans and therefore not considered hazardous..

Magnetic Fields

The overhead line of HHVDC produces no significant magnetic field effect on people exposed or standing under the DC the line.

Mitigation

The strength of electric field decreases with distance from the transmission line and the conductors. Due to insignificant level of electric and magnetic fields emission, the proposed 60 m ROW is considered to be sufficient to mitigate any perceived health effects from the transmission line.

11.3.5.2 Impact on Soil

Liquids used for insolation, or oils and greases used in substations can lead to soil contamination, if not correct stored, handled and disposed off, after usage.

Mitigation

Technical prevention measures e.g. for safe storage shall be in place to minimize the risk of spills, as recommended in the ESMP and according to the IFC's General EHS and EHS Guidelines for Electric Power Transmission and Distribution. For the tower maintenance, only anti-corrosive paint without lead and other heavy metals shall be used. This would

prevent soil contamination with heavy metals by inadequate handling with paint and washing off of paint particles by rain or abrasion.

People handling with such substances shall be trained for a safe handling with hazardous substances.

11.3.5.3Air

The main environmental danger is airborne pollution on the insulator and tower surfaces. The most troublesome pollutants are dust pollution and the Harmatan phenomenon, but these pollution types are not severe enough to impose the need for special anti-pollutant measures.

Ozone

Ozone is an unstable from of oxygen. In air substantially unaffected by urban or industrial activity, it is found in concentrations of up to about 50 parts per billion (ppb). In the lower atmosphere, ozone is formed principally by complex photochemical reactions which depend on sunlight. Ozone is also generated in corona discharges in air, though the increased concentration beneath a high-voltage line is normally negligible. After formation, the ozone molecules immediately start to react with other components in the air, natural NOX or hydrocarbons for instance. Under normal atmospheric conditions, the half-life of the ozone is approximately one hour, while in the presence of moisture it decreases to about 20 minutes or less.
Ground level concentration of ozone due to the corona depend on the generation rate, weather conditions, wind speed and direction, air turbulence and ozone decay rate. Mathematical air pollution models taking into account all of these factors have been used to estimate the ozone concentration near high-voltage lines. These showed that most high-voltage lines up to a voltage level of about 345 kV would not produce detectable ozone.

Measurable alterations to the natural background ozone concentrations were predicted only under "worse-case" conditions. These included a very high voltage level (765 kV), heavy rain, a light wind blowing parallel to the conductors and measurement as close to the conductors as would be electrically safe. Values of 7 to 9 ppb have been calculated and verified under these conditions. A more typical, but generally immeasurable, increase in ozone concentration would be 1 ppb at ground level close to a high-voltage line in wet conditions, and even less for dry-weather conditions.

Actual measurements under existing lines are difficult, since variations in the background level are far higher than the contribution of corona originated ozone, and the expected values are at the limit of most measuring systems.

There is thus no indication that ozone production by high-voltage lines significantly influences the normal ambient level. Traces of oxides of nitrogen are also produced in corona discharges but in quantities even less than for ozone.

Mitigation

Proper maintenance of the line is needed

11.3.5.4Noise

Corona

Intense electric fields may occur at the surfaces of conductors and other "live" components of high-voltage systems. In some circumstances, this leads to ionization and electrical breakdown of the air immediately surrounding the conductor. This effect is known as a corona discharge, or simply corona.

Corona can generate high-frequency electromagnetic noise (which may interfere with radio and television reception), audible noise and traces of ozone and ions. The audible noise from corona consists of both broadband noise ("crackling") and discrete tones ("humming"). Certain other forms of discharge and sparking can also give rise to radio and television interference.

The presence on the conductor surface of even small protrusions, such as water drops, insects, or the raised edges of nicks in the metal, produces strong local enhancements of the field. The corona activity consequently varies markedly with surface and atmospheric conditions, and depends on altitude.

During the few months after new conductors are first energized, the corona activity is often slightly greater than the expected or ultimate level. This is because it takes time for the surface of the conductors to age and so permit water drops to flow freely over them. Also, any initial dirt or surface abrasions get washed off or eroded away during this time. Care is, however, necessary when installing new conductors to minimize surface contamination and damage.

Audible noise is a major consideration for overhead lines operating at voltages more than 220 kV and for these high voltages the line fittings are designed or screened so that only corona on the conductors is a potential source of audible noise. In our case, corona is not a danger factor and no special measures will be considered.

Aeolian Noise
In addition to corona noise, another type of noise may be produced by high-voltage overhead transmission lines. This second type of noise occurs under certain wind conditions and is caused by the wind striking on the different components of a line, e.g. steel towers, conductors and insulators.

The two meteorological factors which affect the level and frequency of this noise are wind speed and direction. The different line components give rise to different types of noise. The noise is not dependent on whether or not the line is energized. The occurrence of Aeolian noise from the various components of high-voltage line is uncommon, since the conditions under which the noise occurs are very specific.

Noise generated by transformers
It is known that humming sounds are emitted from substations which are generated by transformers. This noise can usually be heard within few hundred meters, depending on the ambient noise level, e.g. caused by traffic. It is understood that Sodo substation is located in a remote area, or that no settlements are within the vicinity respectively.

With the design criteria proposed for the transmission line, noise emissions (i.e. corona effect from connections) will be minimal and will be acceptable to local communities. As sound limit values will be included in the tender documents, the same is applicable for the substations.

Mitigation

Limit thresholds for sound emissions shall be defined while developing the detailed design and will then be part of the tender documents for the contractors.

With the design criteria proposed for the transmission line, noise emissions (i.e. corona effect from connections) will be minimal and will be acceptable to local communities. As sound limit values will be included in the tender documents, the same is applicable for the substations.

11.3.5.5 Flora, Fauna and Habitats

Flora

Uncontrolled growth of tall trees and accumulation of vegetation within the ROW may result in an increased risk of e.g. power outages through contact of branches and trees with transmission lines and towers, ignition of forest and brush fires or corrosion of steel equipment. Therefore, trees and shrubs need to be cut to a height less than 4 meters within a 20 m corridor, and within the rest of the RoW, trees must be lower than 8 meters.

Mitigation

To reduce these risks and to assure the compliance with safety distances within the RoW, it will be necessary to cut back or partly remove the vegetation (trees and shrubs) within 4 meters and 8 meters height during periodic maintenance of the transmission line.

11.3.5.6 Impacts on Fauna and Habitats

The noise of vehicles and machines may disturb wildlife, depending on the time, duration and intensity of the disturbance or noise respectively. The maintenance interval for the RoW clearance will depend on the growth of the respective vegetation, but is considered to be once a year or even in a more extended interval. Considering the duration and interval of the maintenance activities, the impacts on wildlife are preliminary assessed to be low.

Electrocution as accident risks for raptors and other large birds perching on transmission lines and touching un-insulated conductors is often related to low and medium voltage power lines. Such risk is not expected for this HV transmission line, as the distance between tower and live elements is assumed to be too wide to allow a contact of these elements at the same time.

Once established, the Project may cause an increased risk of collision of birds in flight, especially at night or during bad sight conditions. It is known that birds can identify the towers as obstacles, but it is reported that in some cases they recognize the conductors not early enough to avoid them and collide with it.

Both IBAs in the Project area, the Nechisar National Park and Yabello Sanctuary, are located with a distance of at least 7 km or 10 km respectively, between the proposed routing and the nearest park border. It is therefore not expected that the Project will have impacts on these IBAs.

However, from the global review on the causes and mitigation on Avian collisions with power lines with a South African perspective by A.R. Jenkins et al. (2010) published in Bird Conservation International there are important lessons to be drawn here.

1. While there is some generic knowledge of why and where avian collision mortality is most likely to occur and of the kinds of taxa most significantly affected, understanding of the scale and demographic consequences of power line collisions is generally poor, and progress in the development of effective means to mitigate collision risk has been limited.
2. On profiling collision-prone species, one finds a wide range of key contributing factors.

a. Exposure to the risk of collision is largely a function of behaviour, and may be potentially high in very aerial species (because they spend so much time on the wing), but effectively reduced to negligible by their tendency to fly well above the ground. In contrast, largely terrestrial species are much less exposed to collision risk because they spend so little time in flight, but their effective exposure is increased by doing most of their flying at around power line height.

b. Susceptibility to collision is largely a function of morphology; ocular structure and acuity affect a bird's ability to see the power line in order to take evasive action, while size, weight and wing structure influence the time required to make the necessary adjustments. Hence, theoretically: large, heavy, relatively small-winged birds with poor vision are most susceptible to collision, while small, light, relatively large-winged birds with acute vision are least susceptible.

Birds that generally appear in lists of implicated taxa are: waterbirds (which habitually congregate at wetlands and commute between them in flocks; particularly large and/or fast-flying species, such as large ducks, geese and swans, pelicans, flamingos, large herons and waders, have highest susceptibility), game birds and rails (which have limited exposure but are highly susceptible, and cranes and bustards (both of which, as large, heavy-bodied, flocking, low-level commuters are highly exposed and susceptible).

Mitigation

Previously suggested means for limiting bird:power line collisions range from proactive to reactive, with the former approaches dependent on a sound foundation of distributional and behavioral data, and the latter requiring critical understanding of avian perception. In both cases it is imperative that perception is assessed in terms of empirical data from the field, theory is put to practical testing, and that the efficacy of implemented mitigation measures is properly and objectively measured.

The surest ways to prevent birds from colliding with a proposed power line are either not to build it, to bury it underground, or to route it well away from areas known or considered likely to support collision-prone species.

Given the complexity of the bird:power line dynamic, there are few hard and consistent rules which can be applied to power line installation and routing regardless of species complement and prevailing conditions. Routing lines over or close to water bodies is clearly problematic and certain topographic features – valley heads, ridge tops – are probably also high risk options.

Experimental evidence

a. Either in a proactive or reactive context, modifying power lines to make them less dangerous and/or more conspicuous and visible to on-flying birds is the only other commonly used approach to collision mitigation globally, and is by far the most widely applied.

b. A study of the use of raptor silhouettes placed on pylons as deterrents to reduce bird traffic over lines and thereby reduce collisions, was far from exhaustive, but seemed to demonstrate conclusively that this is an entirely ineffective practice.

c. Marking lines to make them more visible is the remaining option, and a wide range of possible markers have been suggested and developed. Only a fraction of these have been properly fieldtested, but nearly all of the devices tested have yielded at least moderate reductions in collision frequency.

In order to close the knowledge gap on flyways, and for long term evaluation of bird poweline collisions and identifications of which species of birds are more prone to collisions, the local communities and authorities should be encouraged to report any concerns about possible bird/power line interactions, or evidences of accidents in the particular Project area to EEPCo's EMU or the PIU respectively.

For the short term, it is advisable to have installation of Objects such as marker balls along on the transmission line passing through both in Nechsar National Park and the Yabello sanctuary.

If such accidents will be reported, additional mitigation measures, like installation of objects such as marker balls, bird deterrents or diverters shall be installed to enhance the visibility.

11.3.5.7 Landscape

The realization of the transmission line is presumed to be visually intrusive on account of the tower dimension and the barrier effect of the conductors. Assuming that 2-3 towers per line–km (as average) will be erected, and vegetation will be trimmed, this might lead to a visible corridor in areas covered with plantations, or Bush- and Woodlands.

The height of the towers for the proposed 500 kV DC line will be approximately 45 meters above ground. Hence, the towers are expected to be visible over a long distance, while the wires will not be recognizable over the same distance.

Mitigation

Mitigation measures, such as more artistic tower shapes, camouflaged structure, non-reflecting conductors, special colored insulators, are expected to have only a very limited positive effect and are extremely costly.

11.3.5.8 Impacts on Aviation and Communication

Airplane flight paths in and out of the identified aerodromes and low-flying aircrafts anywhere along the entire transmission line route. Aircraft navigation and communication facilities have the potential of being affected by the project. The Ethiopian and Kenya Civil Aviation Authority will be requested to conduct a survey along the RoW and in particular at the three identified aerodromes and advise on the safety distances of the RoW from the aerodromes and safe tower heights and/or need for installation of warning lights and/or warning spheres in the vicinity of the aerodromes and at any other point along the entire RoW.

Mitigation

The selection of the routing, respectively towers was chosen to avoid aerodromes and zones with low-flying aircrafts, therefore the risk for accidents with low flying planes is expected to be low.

11.3.5.9Safety

The risk for electrocutions is expected to be low, because it is unlikely that people might reach into the safety distance. The tower heights of this high voltage transmission line are expected to be approximately 45 meters above ground, hence in combination with the information campaign, the risk for illegal abstraction is assumed to be low.

The risk for electrocutions is expected to be low, because

- the construction and operation works shall be carried out in compliance with the IFC's EHS Guidelines (General and for Electric Power Transmission and Distribution),
- the affected communities/people shall be informed during the construction phase about risks e.g. climbing on towers, vandalism and illegal abstraction,
- land use such as tree nurseries or agriculture, as well as construction of buildings will only be allowed as long as the safety distances are adhered under all circumstances.

Mitigation

The construction and operation works shall be carried out in compliance with the IFC's EHS Guidelines (General and for Electric Power Transmission and Distribution); The affected communities/people shall be informed during the construction phase about risks e.g. climbing on towers, vandalism and illegal abstraction, and land use such as tree nurseries or agriculture, as well as construction of buildings will only be allowed as long as the safety distances are adhered under all circumstances. Control of illegal abstraction should be enforced.

Table 11-1: Summary of Potential Impacts of Project

NVIRONMENTAL FACTOR	Construction Impact	Operation Impact	Reversibility of the Impact	Duration of the Impact	Mitigation possible	Explanation
BENEFICIAL IMPACTS						
-Employment Opportunity	O O	O	NA	LT	NA	No of people employed at national, regional & Local level
-Additional Power		O O	NA	LT	NA	Kenya will get sustainable electric supply
-Development of ICT hub		O O	NA	LT	NA	OPGW will be used for communication and training
-Economic development		O O	NA	LT	NA	The Project enhances economic development of the countries
-Conservation Measures		O O	NA	LT	NA	Use of fuel wood will be replaced by electricity inducing conservation of forest resources and reducing the green house gas release
- Gender aspects	O	O	NA	LT	NA	Improvement of life for both sexes due to higher income
Climate / Air						
- emissions	●		NR	ST	Y	Dust production by excavation and transport of construction material
-- emissions	Ø		NA	NA	NA	By exhaust emissions of the vehicles
Soil						
- loss of top soil	●		NR	LT	Y	Site clearing, excavation & traffic movement
- excavation	●		NR	ST	N	For tower footprint
- excavation	Ø		NR	LT	Y	Disposal of excavation material
- erosion	●	●	NR	LT	Y	Wind and rain cause erosion of soil after excavation & Clearance of vegetation; Soil compaction
- input of pollutants	●		NR	LT	Y	Possible by spilling of petrol and lubricants

Aesthetic Impacts	●					
Change of landscape	●		NR	LT	N	Creates disruption to scenic views to people close to activity area
Water Resources						
- Water source Contamination	Ø		NA	NA	NA	Oil leakage from vehicle and machineries can affect local area
- sediment swirl up and transport	●		R	ST	N	By construction and clearance activities
- flow regime		●	R	LT	N	Decrease of discharge
Vegetation and Fauna						
- vegetation	●		PR	ST	Y	Clearance of vegetation limited to the right of way, access road, storage, camps & foundation
- animals	●		R	ST	N	By destruction of habitats
Noise And Vibration	●					
Vehicle Movement	●		R	ST	Y	
Noise From Equipment	●		R	ST	Y	Noise from equipment for excavation activities
Chemical Pollutants						
EMF		Ø	R	LT	Y	Electric fields come from "live" conductors
Corona		Ø		LT	N	high-frequency electromagnetic noise (which may interfere with radio and television reception), audible noise and traces of ozone and ions
IONS AND OZONE		●	NR	LT	Y	The ions produced by the field at the conductor surface cause a space charge density in the line Right of Way (ROW)
PCB		Ø	R	LT		
SOCIO-ECONOMIC FACTORS						
Land Use						
- agriculture	●●		NR	ST	Y	Loss of agricultural area (right of way of T/L)
- agriculture	●●		NR	ST	Y	Reduction of harvest yields due to los of land
- Change of land use	●●	●	NR	LT	Y	Housing unit will be demolished to be replaced by T/L corridor
-Lose of Physical Assets	●●		NR	LT	Y	Any asset along the transmission line RoW will be lost
Population and Settlement	●●					
- health	●●		NR	ST	Y	Air pollution may affect health of the workers
- health	●●	●●	NA	LT	Y	Risk of STD and HIV/AIDS
Compensation	●	●	NR	LT	Y	Due to loss of agricultural land, compensation required
- traffic	●		R	ST	Y	Increase of traffic due to construction activities along the T/L
- gender aspects	●	●	NA	LT	NA	Improvement due to higher income
Cultural Heritage						
- Konso Cultural landscape	Ø	Ø	R	NA	Y	T/L passes through the edge of heritage site boundary
-Konso Paleontology site	●		R	NA	Y	The T/L slightly touches two of several fossil sites
-						
Occupational Safety						
-Injuries	●●	●	R	ST	Y	The work involves use of sharp objects noisy equipment and dust potentially affecting workers
-Climbing Danger	●●	●	R	ST	Y	T/L involves mounting very high on air falling from such height could cause danger to the workers
Chemical handling	●	●	NR	LT	Y	Risk for workers handling with chemicals

Rating Evaluation Criteria

Symbol	Description
●●	High negative impact
●	Low negative Impact
Ø	Nil (no impact)
O	Low positive impact
O O	High Positive Impact
● O	Impact uncertain
PR	Partly reversible
NR	Not reversible
R	Reversible
ST	Short term
LT	Long term
Y	Yes
N	No
NA	Not Applicable

Table of Contents

List of Tables

List of Figures

12 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

12.1 Background

Ethiopia and Kenya have both small electricity sectors, with a total installed capacity about 3000 MW. Power shortages and unreliability of supply are common in both countries. The poor quality of electricity supplies is characterized by low voltage levels and voltage fluctuations beyond acceptable levels, resulting in frequent blackouts and brownouts.

Ethiopia is endowed with a huge hydro generation potential which is estimated at approximately 45,000 MW. The Government of Ethiopia intends to develop these resources for domestic consumption and export to Kenya among other neighboring countries. The enormous potential for electricity trade in the Eastern Nile countries coupled with its socio-economic and environmental benefits will pioneer the idea of a regional power market and enhance the East African Power Pool (EAPP). A major setback to the development of such a market is insufficient transmission infrastructures. This project is expected to help overcome this setback and in addition, create transmission capacity needed in interchange of electric power between Ethiopia and Kenya, in the long run. Further, the project is expected to generate investment opportunities in electricity infrastructure and also give rise to development of other related industries.

This chapter presents the Environmental and Social Management Plan (ESMP) according to Environmental and Social Assessment Procedures for AfDB's Public sector operations (ESAP, 2001).

It proposes appropriate mitigating actions to be applied during final design, construction and operation of the Project. During Project implementation national regulations, this ESMP, and the following IFC guidelines shall be considered, whichever is more stringent:

- General Environmental, Health and Safety Guidelines, and
- Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution.

Environmental monitoring and management procedures and requirements shall be included in the construction contracts and must be in place prior to the commencement of any implementation activities. By realization of the proposed mitigation measures the impacts on the environment can be limited to an acceptable level. If the following mitigation measures are not realized, significant impacts on the environment remain.

12.2 Objectives of the ESMP

To carry out environmental monitoring and ensure mitigation measures are implemented effectively as scheduled in order to ensure that all construction and operation activities comply and adhere to environmental provisions and standard specifications. All mitigation measures are implemented. Environmental and social monitoring enables response to new and developing issues of concern during project implementation.

12.3 ESMP Rationale and Content

Environmental management of a project is concerned with implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts. In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed, constructed and functions efficiently throughout its life.
This chapter therefore introduces the actions envisaged in the Environmental Management Plans (ESMPs) in project development and implementation and introduces the probable overall institutional arrangement for project ownership and management, including management of the ESMP as one component of the project.

The proponents (EEPCo & KETRACO) are expected to finalize and adopt the environment management plans during a project's planning and design phases in order to promote self-regulation and integration of environmental management issues in the development of T/L.

The project owner (EEPCo) takes primary responsibility for protection of the environment that may be affected by the project and this responsibility may be expressed as commitments to good environmental practices set out in the prepared ESMP. The ESMP may specify all affected environmental values, all potential impacts on environmental values, mitigation strategies and relevant monitoring together with appropriate indicators and performance criteria, reporting requirements and, if an undesirable impact or unforeseen level of impact occurs, the appropriate corrective actions should be available.

The ESMP relates to the various stages of planning for a proposal including development assessment in the pre-construction phase, and in construction and operational phases. It provides a summary of likely environmental impacts, how they will be managed and the responsible implementing and supervisory agencies.

The draft ESIA/RAP study has indicated many impacts of project implementation and recommended various mitigation measures. These are brought together in a draft consolidated ESMP in following sections.

12.4 The Environment Management Plan

12.4.1 Responsibilities for Environmental Management

ESMP for T/L works in Ethiopia is presented in the table and covers transmission lines and associated works in the project areas.

This environmental management plan will be achieved only if it is undertaken as a fully integrated part of the overall project management. In order to effectively implement a comprehensive environmental management plan, coordination of efforts of various agencies (key stakeholders) is necessary.

The responsibilities for the implementation of the ESMP are outlined in the table, in the column Action/Party, while the responsibilities for monitoring of the implementation are addressed in the column Monitoring.

The overall responsibility for the day-to-day coordination and administration of the implementation of the environmental and social management and monitoring plans set out in the ESIA and RAP for activities in Ethiopia, when developed will lie with the project Owner (EEPCo). It is envisaged that an Environmental Management Unit (EMU) and a Resettlement Management Unit (RMU) of the proponents' institution will be established by the project to assist the project Owner.

The project proponent will be responsible, following the studies, for submitting the ESIA report, with its ESMP and RAP plans, to the MoWE and other competent authorities of the project regions for evaluation according to the requirement of Ethiopia. The ESIA report, with its overall management and monitoring plans, will also be submitted to competent authorities in advance for follow up.

EEPCo will compile "the Owner's requirements" in consultation with stakeholders including the federal and regional EPAs in Ethiopia and financiers for the project. These will cover, *inter alia*, environmental protection measures presented in the project's ESMP. The Owner's requirements are made known in tender documents and contractors are required in their bids to demonstrate their social and environmental awareness and capability in meeting the Owner's requirements. Once contracts are awarded, environmental management (protection) and monitoring plans schedule will be prepared by contractors, in accordance with the project's ESMP, for approval of the Owner. These contractor's plans responding to

the Owner's ESMP will be site specific, updated and reported on regularly the same contractors.

EEPCO will be responsible for developing and implementing public relations procedures and communications for the project to ensure the continuation of consultation process, ensure transparency and build up trust and confidence about the project. Regarding environment, the proponent will use his public relations procedures and communications to make known details of the project and its time schedule, impacts and mitigation measures, and grievance procedures for host and resettled communities, especially those measures relating to compensation and resettlement. Care will be taken to present information in languages that are understood by stakeholders (project area population), and by all conceivable means in order to reach all concerned effectively.

The EMU will assist EEPCo in monitoring progress of the contractor's works regarding the environmental protection measures also assists in coordinating implementation of the project's ESMP for other activities outside of the contractor's responsibilities. In addition to the EMU, it is anticipated that the project's RMU will assist EEPCo in managing and monitoring RAP, along with regional government officers, and ensuring that resettlement will be achieved according to the RAP.

12.4.2 Occupational Health and Safety

The requirements, among other, are that the contractor and his subcontractors to ensure that the workplace is a healthy and safe working environment and that public safety is safeguarded within the construction areas with respect to the works. The contractor shall provide all necessary staff, resources and materials to provide for health and safety in accordance with a Health and Safety Plan of the Conditions of Contract and other provisions of the Contract and all applicable laws.

The contractor shall, inter alia, perform the following:

a) develop all appropriate measures to be taken to control dangerous goods and prevent industrial accidents;
b) provide medical services adequate to deal with the medical needs of the contractor's and Owner's personnel, including accompanying persons, at all times on the construction areas;
c) develop appropriate fire protection, monitoring and prevention plan and services;
d) ensure that any works comply with the Environmental Management Plan and all applicable laws;
e) implement health and safety measures in respect of the buildings and adjacent areas, including offices, workshops, factories, security posts, workers' shelters, schools, accommodation blocks and houses, canteens, messes and restaurants, recreation facilities, markets and retail stores;
f) construct and maintain facilities for water supply treatment and reticulation, and sewage collection and treatment that comply with applicable laws and applicable WHO requirements;
g) provide for the collection and disposal solid and liquid wastes including used oils and hydrocarbons, that complies with the applicable laws and the Environmental Management Plan;

12.4.3 Health and Safety Plan

The primary purpose of the Health and Safety Plan is to establish a process to preserve the health of all personnel and prevent any accidents that may injure personnel or damage property within the construction areas. The Health and Safety Plan shall be based on a recognized International Standard, such as those issued by the International Labour Organisation

The Health and Safety Plan shall include:

- guidelines to be followed by the Owner, contractor, sub-contractors and other contractors and their personnel working at the construction areas;
- guidelines and safety rules to be followed by authorized visitors and local people to the construction areas;
- a plan and timetable for implementing the Health and Safety Plan;
- proposed method of implementing the contractor's Health and Safety Plan;

the contractor shall report on the implementation, monitoring and performance of the plan in each Progress Report.

12.4.4 Safety Officer

The contractor shall appoint a Site Safety Officer to undertake the general responsibilities specified in relevant clauses of the Conditions of Contract. The specific responsibilities, roles, authorities and functions of the Site Safety Officer shall be set out in the Health and Safety Plan.

12.4.5 Safety Committee

During contractor mobilization, a Safety Committee shall be established with representatives of the EEPCo and the contractor. The Safety Committee shall review general safety policy at the construction areas and its specific responsibilities, roles, authorities and functions shall be set out in the Health and Safety Plan. The responsibilities of the Safety Committee shall include:

- defining the requirements for safety monitoring and reporting;
- defining the role and responsibilities of all relevant health and safety personnel;
- reviewing emergency procedures for responding to a health or safety emergency;
- reviewing the implementation of the Plan, including safety education, safety clothing, extent of worker awareness and prominence of safety signs and reporting.

The Safety Committee shall meet quarterly or after particular circumstances at the request of the EEPCo or the contractor.

12.4.6 Emergency Procedures

Emergency procedures shall be prepared as part of the Health and Safety Plan and issued separately. The contractor shall update all emergency procedures each time there is a material change to working conditions. These emergency procedures, among other things, shall anticipate health and safety aspects of construction activities.

12.4.7 Institutional strengthening in Ethiopia

Institutional strengthening will be required in relation to environmental management and monitoring capacities for resettlement, impacts of any related construction and associated works, and impacts of construction of transmission line works.

12.5 Mitigation

The following tables (Tables 12-1, 12-2 & 12-3) presents the Mitigation Plan that has been developed to minimize the impacts of the Project on affected people and the environment. The implementation of these measures is mandatory to justify the assessment of the impacts.

Table 12-1: Mitigation Measures During Pre-Construction Phase

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
	Final routing and design of TL	• RoW survey • Development of alternatives • careful tower siting should be done to avoid unfavourable locations and reduce/avoid impacts, e.g. damage of woodland, plantations • In areas with important and undisturbed scenery (e.g. for tourism), emphasis shall be placed on a design which minimises the visual impact, e.g. by avoiding vertical barriers • Routing of access tracks and temporary occupied areas should consider avoidance of huts, buildings and ecologically sensitive areas. • Minimisation of the distance between the new TL and existing roads. • Avoidance of locating tower sites on buildings or huts by varying the span length. • Routing of TL as far as possible outside of forests, woodland, wetland and protected areas	Entire routing	During design and construction phase prior to commencement of construction	Engineering Company	
Fauna	Bird collision risk	• The design of the towers shall be selected with respect to minimisation of bird accidents and reduction of visual impacts in sensitive areas • RoW should avoid critical habitats (e.g. nesting grounds, migration corridors)				

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		• Maintain at least 1.5 meter spacing between energized components and grounded hardware or, where spacing is not feasible, cover energized parts and hardware				
	Community Consultation, Awareness building	• The communities along RoW shall be informed about Project plans, implementation schedule, compensation mechanisms and grievance mechanism • Consult the communities for the localisation of sensitive areas and preferred sites for workers camps and temporary storage areas and agree with them on locations and compensation for disturbances	Entire routing, surrounding affected communities	Prior to commencement of construction	PIU, EEPCo/MOWE, Engineering Company	Provided by documentation of meetings
	Awareness building	• Organise and conduct EHS education for affected surrounding communities about dangers of construction works/ avoidance of accidents, spread of infectious diseases, climbing on towers and demolishing electricity installations, especially towers	Surrounding affected communities	Prior to commencement of construction	PIU, EEPCo/MOWE	PIU/ EMU (int) Auditor (ext)
	Awareness building EHS Training	• Orgaruse and conduct EHS training for all Contractors with the aim to spread of infectious diseases. • Provide culture and gender based education about prevention measures for the spread of HIV / Aids such as free condoms for workers and adjacent communities. • Auditors shall attend at the training.	All construction site, workers	At least 1 month prior to commencement of construction	Contractor, Pill	PIU/ EMU (jnt) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
	Land and Building Acquisition	Complete all necessary land and building acquisition in accordance with RAP and national framework prior to the commencement of any construction works.	Entire routing	Prior to commencement of construction	PIU, EEPCo/MOWE, Engineering Company	PIU/ EMU (int) Auditor (ext)
		Provide copies of land acquisition details to the Contractor and Auditor.	Entire RoW	Prior to commencement of construction	PIU, EEPCo/MOWE,	PIU/ EMU (int) Auditor (ext)
		Provide a list of affected property owners to the Contractor and Auditor.				
	Compensation/ Resettlement/ Relocation	• Ensure that compensation is paid entirely and sufficiently prior to construction • Ensure that households belonging to groups receive special support • Provide compensation documentation to the Auditor. • Ensure that resettlement! Relocation actions are finalised prior to construction activities	Entire RoW	Prior to commencement of construction	PIU, EEPCo/MOWE,	PIU/ EMU (int) Auditor (ext)
	Re-establishment of Services	• Preparation of inventory regarding all services to be re-established.				
	Disadvantaged groups	Child labour must be prohibited	All work sites	Whole Project duration	Contractor, EEPCo/MOWE	PIU/ EMU (int) Auditor (ext)
Soil Air Water resources	Emissions Risk for leakages	• Trial run of Contractor's machinery and vehicles for ascertaining that emission and noise levels are in compliance with IFC EHS or national standards • Inspection and confirmation that Contractor's machinery and vehicles are	Site/vehicle depot	Prior to commencement of construction activities	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		well maintained and risk for leakages is minimised				
	Clearances, Clearances, Approvals and Permits	• Only licensed quarries and sand suppliers shall be allowed.	Entire RoW	Prior to commencement of construction	PIU, EEPCo/MOWE, Contractor	PIU/ EMU (int) Auditor (ext)
		• Provide copies of all necessary permits to the Contractor	Entire RoW	Prior to commencement of construction	PIU, EEPCo/MOWE, Contractor	PIU/ EMU (int) Auditor (ext)
		• Execute all activities according to international best practice and IFC's EHS Guidelines • Adhere to all conditions and permit terms	Entire Construction Area	Whole Project duration	Contractor	PIU/ EMU (int) Auditor (ext)
	Work site Survey, Pegging and Approval	• Survey the proposed RoW with GPS and a level and mark out boundaries and centre line. • Locate, peg out and seek approval from the Engineering Company/ PIU for each construction site prior to the commencement of related activities.	Entire RoW	Prior to commencement of activities	Contractor	PIU/ EMU (int) Auditor (ext)
		• Inspect the surveyed alignment jointly with PIU & Contractor	Entire RoW	Prior to commencement of activities	Contractor, PIU, Engineering Company	PIU, EEPCo/MOWE, Engineering Company
Vegetation	Loss of trees and compensation	• Determination of necessary lay-down areas with engineer/PIU to minimize cutting of trees. • Protection of large trees which are not required to cut, but are located adjacent to the construction site with wooden barriers	Entire Construction Area	Prior to commencement of activities	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		to prevent unintended destruction, also to provide root protection equipment. • Limitation of the construction activities to the outlined construction corridor • Marking of the extent of the lay-down areas and the routing of the access road, to minimise impact on an area as small as possible.				
	Site Rehabilitation, Re-vegetation	• Register the trees and woodland areas to be cleared from vegetation prior to vegetation clearance • Each tree which have to be cut for the construction of the TL shall be compensated by the plantation of five indigenous trees of appropriate size in the area adjacent to the TL corridor. • Lost *Acacia* Commiphora areas shall be compensated on a rate of 1: 10 • Establish a site revegetation plan, including: Name(s) of contact landowner/community group, summarised outcome of discussions, and decisions on what will be planted • Areas for such compensation shall be defmed in cooperation with local authorities and conununities. • Beside the communities involve local experts for selection of suitable species e.g. the responsible forest or environmental protection authorities	All sites	Prior to construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
Vegetation Soil	Erosion Prevention Minimisation of Vegetation	• Identify and map all areas where soil disturbance will occur. For each of these areas, identify appropriate sediment control structures and install structures	Entire Constructi on Area	Prior to commenceme nt of activities	Contractor, PIU, Engineering Company	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
	Clearance	prior to commencement of work. • The extent of construction tracks, workers camps and temporary storage areas shall be limited to as less space as possible. • Driving cross country must be prohibited. If access tracks will be used, these shall be clearly marked and used to avoid the broadening of driving activities. • Mark out the areas to be cleared of vegetation before clearing commences. • Seek approval from the Engineering Company/ PIU for the areas to be cleared from vegetation. • No vegetation clearance shall occur outside of these areas				
	Documentation of clearance	Type, extent and quality of the vegetation, especially trees & bushes must be documented prior to any clearance activities for the later compensation	Throughout RoW	Prior to commencement of activities	PIU, EEPCo/KPLC, Contractor	PIU/ EMU (int) Auditor (ext)
	Vandalism Prevention	• Identification of areas prone to vandalism • Develop mechanisms to avoid vandalism • Inform Contractor and Auditor about identified risks and prevention measures	Throughout RoW	Prior to commencement of construction	PIU, EEPCo/KPLC	

Table 12-2: Mitigation Measures during Construction Phase

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
Soil	Soil compaction Soil sealing	• Utilization of existing main roads and existing village tracks for the construction traffic as far as possible. Where existing roads/tracks cannot be used, routing of the access tracks should prevent the destruction of hats, buildings and ecological sensitive areas • Construction vehicles should operate within the Ro W i.e. approx. 20 m to either side of the centre line for prevent soil and vegetation damage	Entire RoW	Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Erosion prevention	• Open soils shall be covered immediately, to prevent erosion in case of heavy rainfalls. • Where applicable, vegetation cover shall be secured at the beginning of building activities, maintained and restored when completed. • top-soiled batters shall be sowed with a local common cover crop within 2 days of top-soiling. • After finalization of the construction activities, open soils should be replanted with suitable (means indigenous in relation to the location) plants to close the vegetation covers again. A list of suitable plant species shall be provided to the contractor by the PIU.				
	Topsoil Saving and Re-use	• Save all available topsoil from the construction sites and re-use it for site	All sites	Construction phase	Contractor	PIU/ EMU (int) Auditor

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		rehabilitation • Strip and stockpile substrate from construction sites at the designated sites within the RoW • Keep topsoil separate from sub-soil material				(ext)
Soil Water	Waste management	• Solid and liquid wastes shall be handled, collected, stored, separated and disposed off according to their type (hazardous - non- hazardous, paper, metal, wood, glass, plastic, organic) and in compliance with the applicable IFC's EHS and national guidelines. • The Contractor will appoint a person to manage and control waste collection, storage, treatment and disposal.	All sites	Construction and Post-Construction	Contractor	PIU/ EMU (int) Auditor (ext)
		• The Contractor shall prepare a Waste, Management Plan outlining waste sources, types, amounts, collection, storage, treatment and disposal, as well as documentation provisions which allows the tracking of waste materials, sufficiently prior to any construction activities. This Waste Management Plan shall be handed over to PIU for approval. • Where possible, construction materials shall be reused or recycled. • Burning of waste material will be prohibited. • Littering must be prohibited and a routine	All sites	Construction and Post-Construction	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
	Hazardous Materials	clean up at sites and camps needs to be established • Wastes may only handed over to third parties, if it is approved that these are licensed company whose have the capacity to dispose wastes according to national or IFC EHS standards. • Complete documentation of waste streams including amounts from origin until disposal shall be handed over to PIU/ Auditor • Hazardous materials shall be handled, stored, disposed off according to the IFC'S EHS Guidelines. • Spills of hazardous materials must be stopped and cleaned up immediately. • Contaminated soil needs to de stored and disposed off like hazardous waste. • Contaminated sites need to be rehabilitated. • Spills of hazardous materials must be reported to the PIU and relevant departments				
Water resources	Pollution of soil or surface water in case of heavy rainfall events	• All liquid materials and lubricants shall be stored in closed containers or barrels on roofed and sealed ground. • Construction material as cement bags etc. shall be stored in containers in order to avoid rinsing out. • Excavation works shall be executed as far	All sites	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		as possible during the dry season				
	Pollution of surface water through inappropriate sewage disposal Pollution of groundwater	• All sewage shall be treated, the effluents must I All sites be at least in compliance with the IFC's EHS Guidelines prior to discharge • Temporary sewage treatment facilities shall be provided in a sufficient amount for the construction site and all workers camps. • All justifiable measures shall be taken to prevent that wastewater from workers camps might enter directly into rivers or irrigation systems. • A minimum distance of any sewage source or toilet facility should be 100 meters from water sources (e.g. rivers, wells). • Performing of the construction works in the dry season, no earth works in the rainy season, if possible. • Good and regular maintenance of all vehicles and machines used on site is mandatory. Maintenance activities of the vehicles shall be performed in regular service stations. • Maintenance and re-fuelling of the construction equipment shall be done aside of the excavation and only on sealed areas (careful handling and careful maintenance, especially of the fuel tanks).	All sites	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		• On site storage of fuel, engine oil and lubricants must be in locked tanks and on sealed and roofed areas. • All wastes and hazardous wastes generated, e.g . through the use of fuel, engine oil and lubricants like drums and containers shall be collected, separated according to their waste type and properly disposed off in compliance with the applicable IFC's EHS and national guidelines. • Provide staff training to increase awareness of handling with fuel, waste rninimisation and appropriate waste disposal.				
Air	Air pollution (dust, exhausts etc.)	• Covering of construction material during transportation on vehicles with tarpaulins. • Limitations on size, weight or axle loads of vehicles using particularly difficult roads. • Reducing of speed and limited movement of vehicles. • Optimized transportation management to avoid needless truck trips. • Routine service and maintenance of vehicles and machines to reduce engine emissions • Burning of rubbish on site must be strictly forbidden.	All sites	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
Noise	Noise emissions	• Noisy construction works in areas with sensitive receptors should be scheduled to	All sites	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		the daytime • Local people shall be informed prior to activities, when there will be unusually high noise levels. • Workers in vicinity of noise emissions must wear noise protection (earplugs), working time within extreme sound emissions should be limited and in compliance with IFC's EHS Guidelines • Machinery and vehicles shall be well maintained to keep sound emissions at a minimum.				
Vegetation	Minimization of RoW Clearance	• If feasible, trees and bushes shall not be removed I All sites inside the whole RoW width, but to the extent which is at least necessary for the construction activities • Removal of the whole vegetation cover e.g. grassland shall be avoided • Firewood collection must be prohibited	All sites	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Site rehabilitation & re-vegetation	• Progressively restore immediately after final use of each construction site • Species to be used must not be foreign, invasive species • Rehabilitate the construction sites, camp sites, material storage sites etc. within 1 month after their final use, including the removal of structures, stockpiles and other temporary features. • Indigenous species shall be preferred, if possible produced in the region	All sites	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		• The sites shall be re-vegetated with a cover crop and permanent vegetation as appropriate • Progressively implement re-vegetation works, commencing in the correct planting season. • Regularly monitor the effectiveness of re-vegetation measures.				
Fauna Protected Areas	Scheduling of Construction activities	• The construction activities shall be planned and carried out in such way' that the impacts are limited to an area as small as possible and a time frame as short as possible. • Construction works shall be executed during daytime only and shall avoided at dawn and night time	Entire RoW, workers camps and adjacent areas	During Construction phase	Contractor once, maintenance by EEPCo/ KPLC	PIU/ EMU (int) Auditor (ext)
Fauna	Poaching	• Acquisition and consumption of wild meat/bush meat shall be prohibited at any time • Tracking, disturbing, poaching and hunting of animals shall be prohibited at any time	Entire RoW, workers camps and adjacent areas	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
Local communities	Socio-environmental issues	• Avoid disturbances near residential areas where possible. • Identify culturally sensitive areas and avoid disturbing them. • Arrange for local people to be employed and trained. • Maintain or provide temporary services	Entire RoW, workers camps and adjacent areas	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		during construction, including temporary water supplies, if feasible.				
	Accidents & Safety	• Access of un authorized persons to the construction sites shall be prohibited and avoided • Pits e.g. for the tower foundations shall be secured to prevent accidents for persons or animals. • Ear protection devices shall be provided to and used by the workers if they are exposed to high noise levels. • Safety shoes, gloves and helmets shall be provided to and used by the workers • Provisions for fall prevention and protection shall be provided and secured, for all workers working at heights.				
	Construction traffic causing damage to local roads due to overloading, increase in congestion, and increased road safety hazards	• Contractor and subcontractors, to use appropriate vehicles, and to comply with legal gross vehicle and axle load limits. • Contractor to repair damage at own expense.				
	Construction Camps	• Accommodation of workers in adjacent towns should have priority.				

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		• In the case that construction camps are necessary, the location shall be defined in close corporation with the relevant municipal authorities. • The construction camps shall be located preferred in the vicinity of towns. • Ensure that workers act in a responsible manner to local people • To harvest other people's goods, or take personal resources is prohibited. • Firewood collection is prohibited • Ensure that no or minimal wood is burnt by any construction workers on at off site. • Provide kerosene or gas for all workforce cooking needs • Adequate housings, including clean and safe drinking water (WHO standard) and a proper waste disposal and sewage treatment system shall be provided to the workers • Workers camps shall be catered or Food shall be bought on the local market, if feasible				
		• Inspect and approve if all camp sites are correctly located	Camp sites	Construction phase	PIU, EEPCO/MOWE	PIU/ EMU (int) Auditor (ext)
		• Contractor will be required to pay all costs associated with cleaning up any pollution caused by his activities, as well as to pay full compensation for the damage	All areas affected by constructi	Site rehabilitation	Contractor	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
			on activities			
Historical and cultural sites	Effects on historical and cultural Sites	• Surveyors and contractors to cease work, must notify the PIU of any archaeological artifacts or relics or disputes relating to archaeological relics or cultural religious sites. • Instruction of construction workers to stop earth or foundation works immediately and call the district archaeological authorities, if there are any signs for historical or cultural sites (like bones, tone shreds, metal works, etc) visible. • Preparation of Physical Cultural Resources Management Plan to manage and mitigate any impacts on cultural sites.	All areas affected by construction activities	During construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Vandalism Prevention	Towers shall be constructed with anti vandalism bolts in vandalism prone areas	Tower sites if applicable	During Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
Electric and Magnetic Fields	Induced settlement, RoW clearance	• Though the safety distances/RoW and the design of towers shall ensure compliance with limit values of magnetic and electric fields, it must be ensured that no settlements will be established in the RoW • Determination and proceeding of suitable measures to prevent new settlements within the RoW	Entire RoW	During construction and operation phase During operation phase	PIU EEPCo/KPLC, responsible local authorities PIU EEPCo/KPLC responsible local authorities	PIU/ EMU (int) Auditor (ext) PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
Local Communities & Socio-economic Aspects	Safety/ Health risks through TL for local population	• Measuring of electric and magnetic fields after beginning of operation of the TL in adjacent settlements • Regular line testing, insulator cleaning and parts replacement maintenance	Selected testing points RoW & adjacent settlements	During construction and operation phase	EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)
Soil Water resources Flora, Fauna & Habitats	RoW Maintenance	• Developing of RoW Maintenance Plan outlining frequency & methods to maintain the adequate clearance between conductors and vegetation • Updating this plan, when necessary • People need to be informed about restricted land use inside the RoW which must be in compliance with the safety distances • Selective (single tree) hand clearance of vegetation to maintain designed clearances e.g. trimming of tops and removal of single trees • Employment of local labor for the RoW clearance, if feasible • Removed wood shall be handed over to the community or person who has the claim on it • Fire or biocides (pesticides, herbicides and others) must be forbidden for the clearance of the RoW. • Use of existing roads to the maximum extent possible, use of same tracks and not driving cross country	Entire RoW	Sufficiently prior to and during operation	PIU EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)

Reference/ Corresponding ESIA Chapter	Issue/ Potential Impact	Action	Location	Time	Action Party	Monitoring
		• Maintenance reports including photographs (before/after maintenance)				
Fauna	Risk for bird accidents	• Local people and communities shall be encouraged l Entire RoW to report observed bird or bat accidents or evidences for that to EEPCo/ MOWE • If it is determined, that bird or bat accidents occur, then other prevention measures shall be developed and applied. • The responsible environmental protection authorities shall be consulted in order to find a suitable solution, if necessary.	Entire RoW	During construction and operation phase	EEPCO/ MOWE	PIU/ EMU (int) Auditor (ext) Auditor reports to EPA/NEMA
Soil and Water Resources	Adequate storage & handling of hazardous substances Waste disposal	• It must be assured that paint, liquids, oils and greases used in substations are handled adequately on sealed grounds, considering international best practice and compliance with the IFC's EHS Guidelines. This is also applicable for the storage of such substances. • All wastes generated by the Project must be treated and disposed off adequately and in compliance with the applicable national requirements and IFC's EHS guidelines.	Entire RoW construction sites	During construction and operation phase	EEPCO/ MOWE	PIU/ EMU (int) Auditor (ext)

Table 12-3: Mitigation Measures during Operation

Object	Project Phase	Parameter	Standard	Location	Frequency	Duration	Responsibility for Implementation	Monitoring
Water Quality	Construction	pH, EC, SS, turbidity, color, NH4+, NO3-, total P, Fe, Al, DO, BOD, grease & oil, total Coliform	WB/IFC EHS guidelines	Effluent treatment at all workers camps & surface waters in the vicinity	Monthly	During camp operation & once after rehabilitation of the sites	Contractor	PIU/ EMU (int) Auditor (ext)
Noise levels	Construction	Noise levels on dB (A) scale	WB/IFC EHS guidelines	At noise emitting sources & boundary of workers camps	Monthly	During camp operation	Contractor	PIU/ EMU (int) Auditor (ext)
Vegetation Clearing	Construction	Monitor clearing to ensure compliance with ESMP	ESMP	RoW, areas related to construction activities	As required, at least monthly	During construction	Contractor	PIU/ EMU (int) Auditor (ext)
Soil Erosion	Construction	Turbidity in storm water	WB/IFC EHS guidelines	Where applicable at hole construction area	Monthly & in case of heavy rainfall	Pre-rainy season and post rainy season	Contractor	PIU/ EMU (int) Auditor (ext)
	Pre-Construction, Construction Operation Phase	Visible signs of soil erosion, absence of vegetation		Whole construction area	Monthly, and during 2 years after re-establishment of the sites (half year interval)	Pre-, during and after Construction Phase	PIU	PIU/ EMU (int) Auditor (ext)
Rehabilitation of Work sites	Construction, Operation Phase	Monitoring to ensure all work sites are progressively rehabilitated	ESMP	Along ROW and work areas	once for approval, and during 2 years after re-establishment of the sites (half year interval)	2 years after finalisation of construction activities	Contractor once, and for maintenance EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)

Object	Project Phase	Parameter	Standard	Location	Frequency	Duration	Responsibility for Implementation	Monitoring
Health	Construction Phase	Signs, posters, health awareness lectures, provision of mosquito nets in malaria areas for each worker, health checks for workers	ESMP	RoW, work camps and surrounding areas	Monthly	Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Pre-Construction, Construction & Phase	Public education about socially communicable diseases	ESMP	Along RoW, surrounding communities	Monthly	Pre-Construction, Construction & Phase	PIU EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)
Accidents	Construction	HSE training for all workers, accident reports	WB/IFC EHS guidelines	Along ROW	Monthly	Pre-Construction, Construction & Phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Pre-Construction, Construction Operation Phase	Public education about dangers of climbing on towers and demolishing electricity installations, especially towers	ESMP	Along RoW, surrounding communities	Monthly	Pre-, during and after Construction Phase	PIU EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)

12.6 Monitoring Plan

12.6.1 Introduction

Monitoring concerns the process of checking and controlling the planned environmental management activities of a project. The main objective of monitoring is to measure and evaluate the project impacts on affected natural environment (Physical and the biological environment) and social environment and proper implementation of the remedial measures to avoid or minimize the adverse impacts while enhancing the beneficial ones

Monitoring ensures the follow-up of the implementation of the proposed compensation and mitigation measures, helps to identify possible environmental hazards and unpredicted impacts.

Monitoring of the compensation process will be done during the whole duration of the process. It includes interviewing of compensation committee, PAPs and NGO´s, as well as analysis and controlling of compensation (payment) documentation.

Construction monitoring includes visual observations, sampling and regular testing of environmental parameters at specific locations. The compliance with the defined environmental mitigation measures through the construction contractor shall be monitored by an independent environmental auditor, who will check at least once a month the construction site. Reporting about any violations and the Project's progress will be done as outlined above.

The monitoring plan must be in place prior to the commencement of any pre-construction activities to ensure a proper documentation of the Project's implementation. The Auditor must be assigned considering a sufficient timeframe before the commencement of any activities for the implementation of the Project, in order to

- allow an adequate familiarization with the project,
- the preparation of the monitoring, and
- to ensure that all pre-construction activities such as resettlement and compensation measures are covered by the monitoring

The environmental monitoring will focus on the aspects described in the subsequent chapters.

The Monitoring of the T/L is done in two stages. The first stage is internal monitoring periodically undertaken by the proponent and the second stages the one undertaken by competent authority as per the given laws and policy of the Environmental Protection Authority and the regional environmental organ.

The monitoring plan described here focuses on the internal monitoring activities and is carried out by the proponent. The environmental unit established within EEPCo will periodically check the environmental issues discussed in the ESIA that are associated to the transmission line and ensure that all release are below the established acceptable standards of EPA, the AfDB & World Bank. The environmental unit of EEPCo will consult with concerned government organs for the monitoring and to ensure the effects are below the described and agreed level.

The environmental unit will keep necessary records of the amount of release and the measures taken to keep performance up to the standards. The cost of monitoring will be covered by EEPCo. The data collected by the monitoring team will be analyzed and the result will be compared to certain environmental requirements such as ambient air standards, water quality standards, and compliance with environmental policy, regulation, and proclamation. The final monitoring report will be forwarded to the competent authority for decision and to key stakeholders for follow up.

Monitoring can be performed through field visit, examination of the achievements reports, financial statements, and others such as identified adverse impacts mitigation measures implemented as indicated in the management plan. If materials, chemicals stored in a safe manner, is there a good housekeeping, are all forms of solid and liquid wastes disposed in the environmentally sound manner, are personal protective equipment properly used, do workers have toilet, wash and change rooms, etc are the main areas of focus during monitoring

The monitoring activities Table 12-4 allow evaluating the accuracy of the potential environmental and social impact assessment as well as the effectiveness of the associated measurers. It also allows to include any unanticipated environmental or social impacts which may occur during project implementation or operation and to adjust the project activities accordingly.

Hence, the monitoring plan should include,

- The monitoring data should be recorded in a format, analyzed and reviewed at regular intervals and compared with EPA's AfDB's and the World Bank's emissions standards so that any necessary corrective measure can be taken
- The monitoring report should be submitted to the responsible authorities (MoWE) and the relevant parties as needed.
- Workers working in the dangerous area must use the personal protective equipment to safeguarded their health and injuries.
- Efficient use of raw materials, conservation of energy and water, reuse of wastes will be enhanced.
- Conservation and plantation of the flora and fauna will be taken as integral part of the project activities.

12.7 Responsibilities

The process of Project implementation includes also environmental monitoring and management, which involves several activities of the corresponding responsible actors and stakeholders. Environmental monitoring and management is an essential component of project implementation, because it helps to ensure that the proposed mitigation measures are implemented, and to identify possible environmental hazards and unpredictable impacts.

Active parties involved in the management and monitoring of environment and social concerns related to the implementation of the Project or the ESMP respectively are the following (also presented in Figure 12-1):

- Project Implementation Unit (PIU),
- Environmental Monitoring Unit (EMU),
- Contractor,
- Ministry Water and Energy and
- Independent Auditor.

Beside those, other stakeholders like the affected communities, the Environmental Protection Authority (EPA), and local NGOs may play a role in the implementation process, as their knowledge and opinions will be requested for several tasks.

The Project Implementation Unit is responsible for the coordination and implementation of the Project. The PIU will need to be established for both countries, means for EEPCo as well for

MOWE. Since the implementation and monitoring activities are covering cross cutting themes, it is highly recommended that the PIU team should consist of persons with different qualification, like Sociologist/RAP Expert, Environmental and Technical Experts.

The core responsibility of the PIU is to ensure that the mitigation measures are implemented and that compensations are effected as stipulated in the respective national policies. For Ethiopia this means that compensations are made at replacement costs and as per the provision in Proclamation No. 455/2005. The PIU reports to the management at a regular interval. The role and responsibility of EEPCo's Environmental Monitoring Unit focuses mainly on regular internal monitoring of the Project in order to ensure that the proposed mitigation measures are implemented and compensation is paid. It reports to the PIU in regularly intervals. As the EMU has already experience in the implementation and monitoring from other projects, it is highly recommended that they support their colleagues from the PIU, or that some of them will join the PIU during the Project Implementation Phase. The Contractor will undertake the construction works as per the detailed design and the ESMP which will be included in the contract documents. The Contractor needs to ensure that all construction activities adhere to applicable requirements regarding health, safety and environment as stipulated in

- the IFC's General EHS Guidelines,
- the IFC's Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution,
- national guidelines and regulations, and
- the ESMP

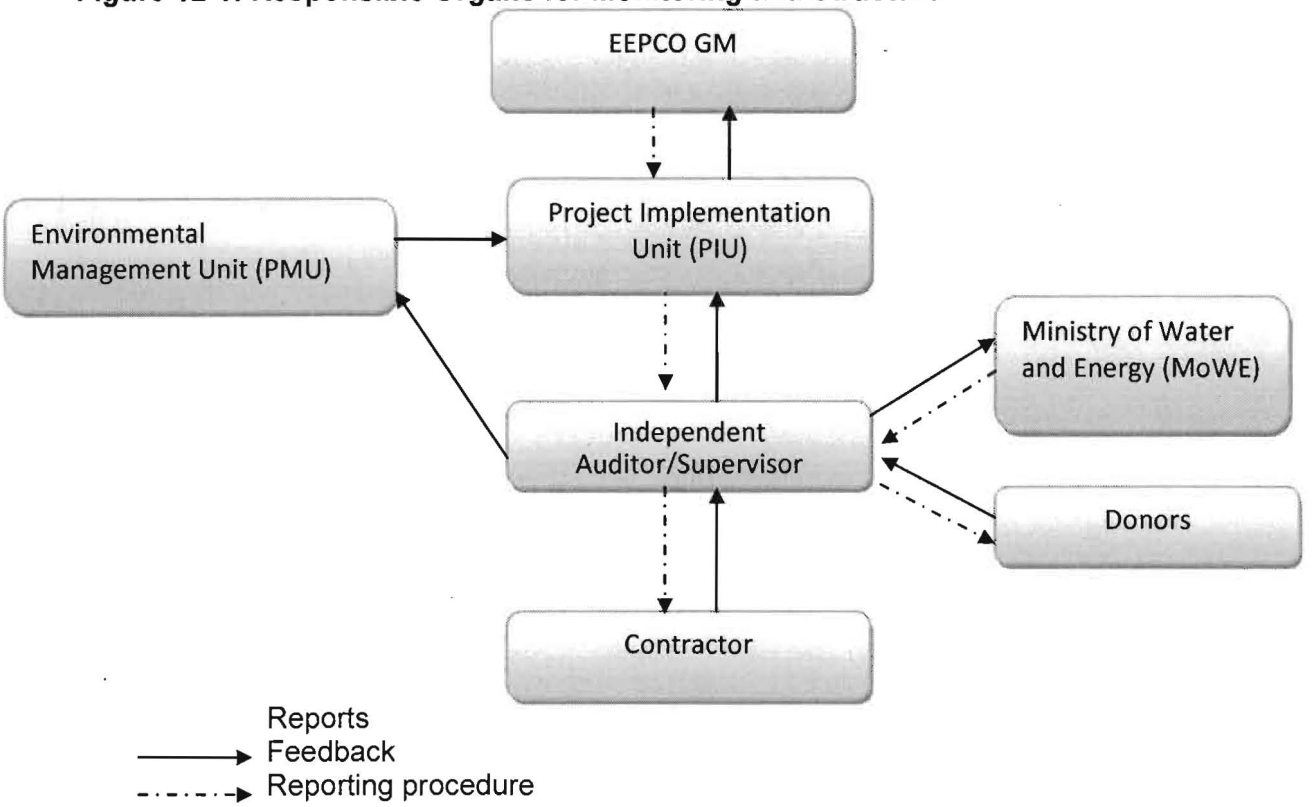
The Independent Auditor is responsible for an independent, external monitoring of the Project implementation. The Auditor approves or rejects undertakings of the contractor in relation to the requirements of the contract documents or the ESMP respectively.

The Auditor reports to the PIU and EMU, and in parallel to the EPA (MoWE) and the financing parties in regularly intervals. Feedback on those reports will be provided to the PIU. The affected Community has the right to be consulted and needs to be involved at different stages of the Project implementation to ensure that their views and concerns are considered where feasible. This public participation will increase the overall project acceptance.

The Environmental Protection Authority (EPA) is the competent federal authority for issuing approval for the Project. For ensuring that the EPA's environmental guidelines are followed during Project implementation, it is within the EPA's overall responsibility to review the environmental monitoring, compliance reports and to conduct site visits, if the situation requires the attention and involvement of the EPA.

If NGOs are involved in energy- or resettlement- related projects in the Project Area, EEPCo may approach those NGOs for their possible contributions to the Project implementation.

Figure 12-1: Responsible Organs for Monitoring and Structure



12.8 Monitoring Parameter and Topics

The Contractor's responsibility is to ensure that the construction works are carried out as per the detailed design, the measures defined in the ESMP, and the applicable IFC EHS guidelines. This implies that all construction activities are carried out according international best practice and adhere to the applicable requirements regarding health, safety and environment. Monitoring of the construction activities will be limited to the construction area, which includes the construction sites, temporary storage areas, workers camps and their adjacencies.

The following topics and parameters shall be considered as a minimum for the Environmental monitoring of the Project (See Tables 12-4 & 12-5).

12.8.1 Water Quality Monitoring

Construction camps might pose the risk for significant surface and groundwater pollution if not managed and sited properly. In order to encourage the Contractor to implement proper wastewater treatment facilities on site through the use of settling and treatment ponds and as proposed in the ESMP, any effluent, waste water, or rainfall runoff discharged from campsites need to be monitored. Parameters to be analyzed should include at least the following:

- pH
- EC
- SS
- Turbidity
- Colour
- NH_4^+
- NO_3^-
- Total P
- Fe
- Al
- DO
- BOD
- Grease and oil
- Total Coliform

If the discharged effluent does not meet the IFC's EHS and national standards, then the Contractor must take further treatment measures which will lead to compliance with the mentioned guidelines.

12.8.2 Noise Levels Monitoring

Although noise generation during the construction phase is not expected to be a significant problem outside of the workers camps, periodic sampling should be undertaken, to confirm that the noise levels are not exceeding national and WB/IFC thresholds. The noise level monitoring might be supplemented by consulting with PAPs or their representatives to confirm the Auditor's overall impression of the sites. This might be also applicable for other monitoring issues.

12.8.3 Monitoring of Vegetation Clearing

The routing was planned considering ecologically important areas, and it is recommended to further improve the routing. It is therefore not expected, that unique groups or single old indigenous trees will be affected by the RoW and the Vegetation clearance within this corridor. Anyhow, in case that such tress might be affected by vegetation clearance for the RoW, the establishment of towers or other activities, the Contractor shall immediately consult the Auditor, the PIU and EEPCo's EMU in order to find a solution for preserving such trees. Within the RoW, the vegetation shall be removed to an extent necessary for the construction activities and provision of safety distances, under consideration of erosion prevention. Monitoring of vegetation clearance need to be done by EEPCo's EMU and the Auditor to control the compliance or non-compliance with the ESMP. The results of such monitoring will be included in the monitoring reports.

12.8.4 Soil Erosion Monitoring

Earth works for the excavation for fundaments and establishment of towers, temporary and permanent access roads, work camps and storage facilities have the potential to cause soil erosion. It is therefore the responsibility of the Contractor to ensure the implementation and control of effectiveness of erosion prevention measures. The measures shall focus on construction sites where soil is disturbed and its direct as well as along the RoW during and after vegetation clearing. The results of such erosion monitoring will be included in the monitoring reports.

12.8.5 Monitoring Rehabilitation of Work Sites

The Contractor must ensure that areas used as temporary campsites for workers, storage areas or access roads are progressively rehabilitated as they are no longer required. Once a site is rehabilitated, it should be inspected and approved by both EEPCo's EMU and the Auditor. These approvals will be included in the monitoring report in order to allow a comprehensive documentation of the Project's progress and their impacts.

12.8.6 Monitoring of Health status and Accidents

EEPCO or the PIU respectively will have overall responsibility to oversee that all HSE measures are put in place and that all relevant regulations are enforced. The Contractor must ensure and needs to proof towards EEPCo and the Auditor that an appropriate HSE management is in place for his activities, which includes e.g. the following measures:

- Warning signs are posted where necessary at appropriate locations in order to minimize health hazards, and the risk of electrocutions and other accidents;
- Awareness building measures shall be taken regarding sexually transmitted diseases, especially HIV/AIDS, and if applicable other diseases such as malaria, schistosomiasis, leishmaniasis, and onchocerciasis;

- Establishment of preventive measures to reduce/eliminate malarial, schistosomal, leishmanial, onchocercal infections whenever appropriate;
- Execution of periodic health checks for workers.

As the assignment of the Subcontractors is within the responsibility of EEPCo, EEPCo's PIU needs to approve the HSE measures undertaken by the Contractor. The Auditor might assist EEPCo by checking and verifying of EEPCo's assessment and approval.

The Auditor will check the implementation of the Contractor's HSE measures during visits of the construction sites, by using e.g. the following indicators:

- Presence of warning signs on the boundaries of the construction sites, on towers, etc.;
- Presence and quality of water treatment system, sanitary facilities and waste management system at workers camps;
- Level of the communities awareness pertaining to dangers and risks associated with construction activities and power lines;
- Presence and review of accident reports.

Documentation on actual accidents associated with the construction works and information on changes of the health status in the local community could be compiled with the help of local health workers, medical staff, and officials.

12.9 Complementary Initiatives

EEPCo in consultation with other regional authorities and agencies will implement some projects as social corporate responsibility to help the communities living in the project affected areas in activities like re-vegetation, supply of clean drinking water, rural electrification program, reforestation, OPGW services for the development of ITC to the communities.

Table 12-4: Monitoring Plan

Object	Project Phase	Parameter	Standard	Location	Frequency	Duration	Responsibility for Implementation	Monitoring
Compensation	Pre-construction	Compensation paid RAP & national regulations	RAP & national regulations	RAP & affected communities	Continuously recorded, monthly checked	Whole compensation process	PIU EEPCo/MOWE	PIU/ (int) EMU Auditor (ext)
Water Quality	Construction	pH, EC, SS, turbidity, colour, NH4+, NO3-, total P, Fe, Al, DO, BOD, grease & oil, total Coliform	WB/IFC EHS guidelines	Effluent treatment at all workers camps & surface waters in the vicinity	Monthly	During camp operation & once after rehabilitation of the sites	Contractor	PIU/ (int) EMU Auditor (ext)
Noise levels	Construction	Noise levels on dB (A) scale	WB/IFC EHS guidelines	At noise emitting sources & boundary of workers camps	Monthly	During camp operation	Contractor	PIU/ (int) EMU Auditor (ext)
Vegetation Clearing	Construction	Monitor clearing to ensure compliance with ESMP	ESMP	RoW, areas related to construction activities	As required, at least monthly	During construction	Contractor	PIU/ (int) EMU Auditor (ext)
Soil Erosion	Construction	Turbidity in storm water	WB/IFC EHS guidelines	Where applicable at hole construction area	Monthly & in case of heavy rainfall	Pre-rainy season and post rainy season	Contractor	PIU/ (int) EMU Auditor (ext)
	Pre-Construction, Construction Operation Phase	Visible signs of soil erosion, absence of vegetation		Whole construction area	Monthly, and during 2 years after re-establishment of the sites (half year interval)	Pre-, during and after Construction Phase	PIU	PIU/ (int) EMU Auditor (ext)
Rehabilitation	Construction,	Monitoring to	ESMP	Along ROW	once for	2 years after	Contractor	PIU/ EMU

Object	Project Phase	Parameter	Standard	Location	Frequency	Duration	Responsibility for Implementation	Monitoring
of Work sites	Operation Phase	ensure all work sites are progressively rehabilitated		and work areas	approval, and during 2 years after re-establishment of the sites (half year interval)	finalisation of construction activities	once, and for maintenance EEPCo/KPLC	(int) Auditor (ext)
Health	Construction Phase	Signs, posters, health awareness lectures, provision of mosquito nets in malaria areas for each worker, health checks for workers	ESMP	RoW, work camps and surrounding areas	Monthly	Construction phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Pre-Construction, Construction & Phase	Public education about socially communicable diseases	ESMP	Along RoW, surrounding communities	Monthly	Pre-Construction, Construction & Phase	PIU EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)
Accidents	Construction	HSE training for all workers, accident reports	WB/IFC EHS guidelines	Along ROW	Monthly	Pre-Construction, Construction & Phase	Contractor	PIU/ EMU (int) Auditor (ext)
	Pre-Construction, Construction Operation Phase	Public education about dangers of climbing on towers and demolishing electricity installations, especially towers	ESMP	Along RoW, surrounding communities	Monthly	Pre-, during and after Construction Phase	PIU EEPCo/KPLC	PIU/ EMU (int) Auditor (ext)

(int) = internal monitoring
(ext) = external monitoring

Table 12-5: Environmental Monitoring Performance Indicators

No	Issues	Indicators	Objectives	Target
1	**RESOURCES UTILIZATION**			
1.1	Uses of raw materials for the T/L	Conserve raw material wasted during the process	To reduce natural resources	100 % conservation
1.4	Water Management	Water Consumption liter/cement produced	Resource saving plan	Reduce water consumption by 3 % every yea for the first five years
2	**WASTE MANAGEMENT**			
2.1	Waste Disposal	Mass of waste disposed	Proper disposal of waste	100 % waste disposed wasted material like liquid waste, oil etc.
2.2	Industrial waste	Generation of biological and chemical hazards	Treatment of industrial waste	Achieve 100 % reduction in toxic material released to the environment
3	**EMISSION TO THE AIR**			
3.1	Dust emitted	Amount of dust emission reduced	to protect human health, soil and water	Keep released dust under EPA & WB environmental standards
3.3	Vehicle exhaust emission	Total CO_2 emission from energy consumption, waste production and operation of vehicles	Reduce environmental release	Improve vehicle emission proper maintenance 100 % of planned a year
4	**IMPACTS ON LAND HABITATS**			
4.1	Biodiversity and plantation	Indigenous plant propagated	Re-vegetation	Plantation of 100 % planned each year
5	**ENVIRONMENT & HEALTH**			
5.1	Control health problems (malaria, HIV/AIDS)	Number of patients	To protect human health	Reduce the number of cases by certain percentage every year through awareness and protective measures

No	Issues	Indicators	Objectives	Target
6	**OCCUPATION AL SAFETY & HEALTH**			
6.1	Accidents and Health problem	Number of patients treated	Reduce occupational accidents and health problem	Reduce accidents and treat all diseases (100 %)
7	**AUDIT**			
7.1	Environmental audit	Components having under gone environmental audit	Conduct appropriate environmental audit	Conduct environmental audit 100 % of planned per year
8	**COMPLIANCE**			
8.1	Legal and regulatory issues	Compliance with legal and regulatory requirement	Sustainable performance in compliance with the regulations	Achieve full compliance with all environmental regulation and guidelines (100 %)
9	**TRAFFIC**			
9.1	Transport	Reduction of traffic accident	Number of Accidents	Reduce traffic accident by 100 % in five years
10	**STAKEHOLDERS COOPERATION**			
10.1	Communication & Cooperation among stakeholders	No of meetings, plan of communications and No promotion and communication	Improve transparency, understanding and engagement among stakeholders	Ensure the execution of 100 % of planed target each year
10.2	Timely and proper environmental monitoring	Number of Environmental monitoring conducted per year	Environmental Monitoring	Conduct 100 % of the environmental monitoring planned per year

12.10 Capacity Building and Institutional Strengthening

The Capacity Building program in the context of transmission line regarding the environmental management drops in to several institutions depending on the management of air qualities, water qualities, traffic, solid waste, health and safety, etc. Proper environmental management requires utilization of the right technologies knowledge and procedures.

The EMSP can only be executed in collaboration with concerned and responsible institutions led by the proponent and strictly monitored by the proponent. On top of that the objectives will be fully met when the required personnel with appropriate education and experience are employed full time by the proponent (also by the competent authorities and responsible organ).

In addition to that periodic training program and reiteration of the plan are necessary. EEPCo staffs as well as employees of responsible organs nee the right capacities for the success of the project. In view of that training and environmental awareness seminar should be organized. The training is given as per the Table 12-6 below.

Seminar/workshop is recommended twice a year (however an existing conditions will dictate the frequency of annual training). The training topics should the minimum include the following:

- Environmental laws, regulation and standards of the country and relevant international institutions,
- Sampling techniques and environmental monitoring,
- Pollution health impact and air quality management,
- Environmental prevention and control measures,
- Waste management,
- Basic occupational health and safety issues,
- Accidents and fire hazards relating to T/L,
- AIV/AID awareness,
- Use of personal protective equipments.

It is recommended that permanent Environmental Management staff be engaged in T/L construction is taking Place.

As part of the capacity building program responsible institutions need to be strengthened technically as well as financially.

Table 12-6: Summary of the Proposed Plan for Capacity Building and Institutional Strengthening

No	Activity	Target	Content/Task	Responsibility	Time Frame
1	Training and awareness	Personnel involved in the various activities of the Project	Environmental awareness, knowledge and skills for the implementation of environmental management plans	EEPCo management regional EPAs	Quarterly for a period of one to two days during the first year and at least twice per year for a period of one to two days thereafter
2	Training and trainers	Permanent staff who are in charge of coordinating the implementation of the environmental Management plans	Environmental Issues Relating to T/L	EEPCo and Woreda EPAs	One to two weeks every year for at least 2 years in the construction Period
3	Training	Environmental Unit and PMU of EEPCO	Environmental management, international experience of good environmental practice , and relevance	Permanent staff at that is in charge of coordinating the implementation of the environmental management and monitoring plan plans	At least a 2 day workshop twice per year
4	Formation of environmental Committee	As the section 3.5	Assessing current environmental practices, developing an internal audit system, reviewing environmental monitoring reports, identifying required control measures, initiating public relations campaigns to report and advertise, environmental commitment	EPPCo, MoWE, Regional EPA	Formation within 6 months Extensive meeting for the first 6 months followed by regular monthly meetings

No	Activity	Target	Content/Task	Responsibility	Time Frame
5	Compliance with national and international standards,	PMU	Obtaining environmental and quality assurance and standards	Environmental Committee	Environmental Committee should monitor progress biannually
6	Public relations campaigns	General public, sector institution of Ministries Bureaus and authorities	Field questionnaires and interviews	Environmental Committee	Continuous engagement
7	Advertisement	General public and authorities	Radio, billboards, newspapers, seminars at local schools and universities, plant visits	Environmental Committee	Following major landmark accomplishments such as (EA report, installation of new Fabric Filter system, operating new production line, initiation of monitoring program, etc.)
8	Perdeum and transportation	Committee members	For Monitory	EEPCo and authorized Personnel	Continuous

12.11 Conclusion

From the assessments carried out earlier, it was established that almost all potentially negative impacts of the proposed project can be minimized if not fully prevented by implementing recommended mitigation measures. The alternative alignments were reviewed and the optimum route selected on the basis of environmental and social considerations, among other factors. This ESMP has been developed in pursuit of improving the overall net effect of the project. The ESIA observes that the bulk of adverse impacts will manifest at the construction phase in which case, the core effort in mitigation will be concentrated in the contract during construction. It will hence be required that the ESMP be integrated in the Design Report with appropriate allocation of funds in the Bills of Quantities. The construction contractor should bear clauses binding the contractor to implementation of impact mitigation as part of the civil works. EEPCo will hire competent supervision engineers to enforce compliance on monitoring. EEPCo in the capacity of Employer will mount its own internal monitoring to ascertain environmental and social sensitization at all stages of the project.

The development of the project will adhere to all applicable laws in Ethiopia and will also comply with WB and AfDB safeguard policies and guidelines. To this end, the ESIA and RAP Reports will be fully disclosed locally in the project area and at the AfDB Public Information Center and the WB Regional Office.

Table of Contents

List of Tables

13 PHYSICAL CULTURAL RESOURCES MANAGEMENT PLAN

13.1 Introduction

An assessment of physical cultural resources, which included cultural landscapes, paleontology sites, religious buildings and private grave yards, was carried out in the Ethiopia-Kenya Power System Interconnection Project within the transmission line right of way corridor and surroundings. The sites identified during the assessment are Konso Cultural Landscapes, Konso Paleontological Resources, Water Schemes, Burial Places, and other ruins and living religious sites as discussed in the Baseline Conditions of the ESIA study. These are identified as having local or national specific significance or requiring legal protection. The study has, as much as possible, avoided any impacts by the T/L on these resources.

The objective of this PCR plan is to prevent any inadvertence loss of physical and cultural as well as other related resources including grave yards and existing religious buildings during construction and establishment of access road and camp sites.

This plan includes the physical cultural resources, private graves and religious buildings in the above mentioned areas in order to:

1. Identify the nature the resources
2. Protect such resources during construction.
3. Relocate / remove graves and religious buildings as part of the resettlement and compensation plan when applicable.
4. Supervise and follow up the plan

The plan also considers Chance Procedures which identify what measures should be taken in the event that physical cultural resources are encountered during construction.

This PCR management plan contains the following:

1. Roles and responsibilities of the proponents, consultants, contractors and government departments in ensuring proper implementation of the plan
2. List of assessed physical cultural resources cultural landscapes, fossils, graves and religious buildings identified during the study.
3. Protection of cultural and archaeological resources during project implementation
4. Relocation process for resources when Chance cultural resources are encountered and found necessary to relocate
5. Chance findings procedure
6. Capacity and Training needed
7. Performance Monitoring Mechanism

13.2 Definitions of some important terms Used

The following cultural and archaeological terms that are pertinent to the study are defined for the sake of clarity of the words used in this study.

Physical cultural resources: Important sources of valuable historical and scientific information, assets for economic and social development and integral parts of a people's cultural identity and practices (Wikipedia).

Cultural Landscape: a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with an historic event, activity, or person or exhibiting other cultural or aesthetic values. (Source: http://answers.yahoo.com)

Cultural Heritage: is the legacy of physical artifacts (cultural property) and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations. Cultural heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art, and artifacts), intangible culture (such as folklore, traditions, language, and knowledge), and natural heritage (including culturally-significant landscapes, and biodiversity). (Wikipedia)

Paleontology: Scientific study of life of the geologic past, involving analysis of plant and animal fossils preserved in rocks. It is concerned with all aspects of the biology of ancient life forms: their shape and structure, evolutionary patterns, taxonomic relationships with each other and with modern species, geographic distribution, and interrelationships with the environment (Encyclopedia of Britannica).

Private Graves: one or more burial plots of the recently deceased, usually members of the family or local community, but with no sacred, cultural or religious significance to the wider community.

Religious buildings: are churches and mosque buildings where religious ceremonies take place.

The Purpose of this PCR management Plan is:

- To protect physical cultural, archaeological and other related resources of cultural or spiritual significance to the communities from damage during construction;
- To relocate, remove or replace physical cultural and other resources of cultural or spiritual significance that are not possible to avoid to the communities that will be affected, in a manner that is respectful to the community in accordance to public practices and existing laws.

13.3 Duration of the Plan

The PCR management plan shall be in place few months prior to the start of the resettlement process, and will remain effective through the pre-construction, and construction phases of the Ethiopia-Kenya Power System Interconnection Project implementation.

13.4 Types of Cultural Resources Expected in the T/L ROW

The main physical cultural resource types identified so far along the transmission line are the following elements.

Archeological resources: the remains of past human activity and records documenting the scientific analysis of these remains.

Cultural Landscapes: are settings created in the natural world. Konso Cultural Landscape contains ranges elements such as cemeteries, village quarters, Wakas (artifacts), burial sites and so on. They are special places: expressions of human manipulation and adaptation of the land.

Structures are material assemblies that extend the limits of human capability. In this case are mainly churches, mosques, and etc. In summary the following areas need special attention

1. The Konso Cultural Landscape
2. Konso Fossils
3. Traditional Water schemes
4. Cemetery along the ROW

Regular monitoring (daily, weekly, or monthly or as required if urgent matters arise) based on the resource to the work area). Record of the condition of the resource is needed and any damage. Remedial works should be carried out as necessary. The contractor should and consultant should:

1. Providing a complaints service for the public / community to report physical cultural damage or disruption of religious activities.
2. Training of workers about the sites and the protection measures.

13.5 Way Leave Corridor Land Acquisition

The project takes about 2387 ha of permanent land including ROW corridor, substation, and other about 86.2 ha temporary land for the construction of a 500 kV HVDC transmission line passing though Sodo, Mirab Abay, ArbaMinch Zuria, Konso, Brindar, Yabello and Mega woredas. Some sections of the T/L proposed project are expected to run parallel to the existing culturally sensitive area of Konso.

Establishment of the way leave corridor has avoided the most sensitive areas of physical, biological, cultural and archaeological sites found along the routes. Yet still the PCR plan is set to safeguard, eliminate and or reduce effects of proposed project on physical cultural resources identified as well as unforeseen events.

13.6 Institutions Responsible for the implementation, Administration and Management Plan of PCR

The Authority for Research and Conservation of Cultural Heritage and the Culture and Tourism Bureaus of SNNP and Oromia Regional States have primary mandate to oversee the preservation and development of valuable movable and immovable cultural heritage resources in the project area.

EEPCo, the constructor and consultant will be responsible for the overall implementation of PCR management plan in collaboration with stakeholders.

The Federal level ARCCH will be responsible for giving go-ahead or consent in case the PCR are found along the ROW during construction.

Regional and local governments are implementers at regional or local levels for relocation of resources such as graves and other structures as per the policy and laws issued by the governments as well as based on the World Bank OP 4.11 Physical Cultural Resources.

The different institutions involved in the implementation of the plan and their responsibilities are presented the Table 13.1below.

Table 13-1: Institutions Responsible for the Implementation and their Responsibilities

Actors of the Plan	RESPONSIBILITIES
EEPCo Environmental Unit	1. Overall responsibility for legal compliance. 2. Supervision including approval of the final plan and any future revisions. 3. Plan funding. 4. Providing coordination among the stakeholders and coordination of activities.
Supervising Body (ARCCH) in coordination with EEPCo Environmental Unit and PIU	1. Finalization of this plan. 2. Supervision of the Contractor. 3. Working in accordance with the Plan. Communicating and reporting incidents, monitoring and other information to key actors. 4. Managing the removal of physical cultural resources, graves and religious buildings in coordination with the procedures and timing specified. 5. Supervising the protection of the physical cultural resources, graves and religious buildings that will not be moved. 6. Reviewing the performance of the Plan and making any changes that may be appropriate for improving the management of physical cultural resources. 7. Checking compliance of the project activities with the ESIA and conditions of the competent Authorities. 8. Address complaints from the communities via a complaints management process.
Consultant	1. The consultant will supervise and serve as Management Consultant. 2. The Consultant shall be responsible in identification, evaluation, treatment and documentation of physical cultural resources in the implementation of plan. **3.** The consultant may employ an expert in physical cultural resources with sufficient scientific training or/and experience.
Contractor	1. Preparation and implementation of various sub-plans, consistent with the main plan documents. 2. Maintaining and keeping all administrative and environmental records in accordance with the Plan the reporting of these records to the concerned 3. Working in accordance with the Plan, in particular the Chance Find Procedures. 4. Physical cultural resources protection, monitoring and management, for resources that will not be moved. 5. The protection, monitoring and management of graves and religious buildings and other resources those are necessary to relocate. 6. Comply with all relevant laws and regulations.
All staff	1. Working in accordance with the Plan, in particular the Chance Procedures. 2. Making any recommendations to the Contractor, Supervising Body and that may be appropriate for improving the protection of physical cultural resources.

The following institutions will be participating in the overall supervision and monitoring activities of the implementation of the Physical Cultural Resources Management Plan.

1. EEPCo
2. ESMU and PIU
3. Ministry of Water and Energy
4. Authority for Research and Conservation of Cultural Heritage
5. Environment Agency of Project Woredas
6. Project Woreda Administration

13.7 Chance Find Procedures

Whenever a physical cultural resource, such as archeological sites, historical sites, remains and objects, or a cemetery and/or individual graves are found during excavation or construction, the Contractor shall:

1. Stop the construction activities in the area of the Chance findings;
1. Delineate the discovered site or area;
2. Secure the site to prevent any damage or loss of removable objects. In cases of removable objects or sensitive remains, a guard shall be arranged until the responsible local authorities take over to prevent theft and damage;
3. Notify the consultant who in turn will notify the responsible local authorities immediately (within a day);
4. Responsible local authorities are in charge of protecting and preserving the site before deciding on subsequent appropriate action. This would require a preliminary evaluation of the findings to be performed by archeologists. The importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
5. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
6. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
7. Construction works could resume only after permission is granted from the responsible local authorities/ and ARCCH concerning the safeguard of the physical cultural resource.

13.7.1 Chance findings during project implementation

The ARCCH together with the contractor, consultant and EEPCo will take Investigation and rapid assessment during the implementation of the project for the purpose of spotting any additional unidentified Physical Cultural Resources in the area. In this PCR management plan, both random and systematic assessment shall be employed.

All cultural materials found located on the way leave corridor, camp sites and access road shall be recorded, collected and mapped out using a global positioning system (GPS). If necessary shovel test pits (STP) shall be conducted to supplement surface observations in areas. This will be followed by evaluation of the identified PCR to decide the next steps to be taken. The evaluation process will be followed by the exercise of treatment. At this stage the handling and management of the resources will be done according to their tradition and the law of the country.

The next step will be documentation and publication of the findings recovered from the area in order to share knowledge with professionals and the community at large.

Works on salvage shall be undertaken by a qualified archaeologists recognized and permitted by the ARCCH.

13.8 Measures Taken Earlier

Rerouting of the transmission line and modification of the transmission towers footing were made during the ESIA study to avoid sites of known physical cultural significance, such as cultural heritage sites, religious sites, archaeological areas and grave yards. At this stage, a precise identification of where and how many such cultural significance lie within the way leave cannot be ascertained at a hundred per cent.

13.9 Capacity Building/Awareness and Mobilization

All non-experts in physical cultural resources involved in execution of the project shall be briefed by ARCCH on the basics of physical cultural resources. The training shall aim at enabling non-experts in physical cultural resources to identify, prevent damage to physical cultural resources, record and report whenever they encounter any cultural recourse along the way leave corridor in the absence responsible personnel.

13.10 Management Plan during Design and Construction

The table below presents an overview of the management measure i.e. mitigations for the impacts in physical cultural resources for the construction of 500 kV HVDC transmission line. The institutions responsible for the implementation of the mitigation measures at different stages of the project are shown in the Table 13.2 below summaries the plan.

Table 13-2: Physical Cultural Resources Management Plan

No.	Impact	Mitigation measures	Monitoring Action, Monitoring Frequency	Area	Responsible Body
1	Management Design	• Assessment of PCR within the way leave corridor • Inventory of PCR known close to way leave corridor as to be at risk of damage or disturbance	Monitored during design stage Daily during construction	Transmission line- corridor access road, camp sites and tower footings	Consultant
2	Impact on existing structure, archeological, cultural & spiritual sites and graves	• exact location of all graves and grave yards • managing impacts on cultural resources • managing impacts on areas of spiritual significance to local communities • Re routing of transmission line access road and adjustment of positions for the towers footings	Monitored during design stage and construction stages Done daily during construction	Transmission line- corridor access road , camp sites and tower footings areas	Consultant , EEPCO and contractor
3	Impacts on the chance finds during construction	• project operator to stop working and inform the contractor • Deliver the message to the EEPCO and inform the consultant (archaeologist) and representative of ARCCH for further action. • Action will be taken	Done daily during preconstruction and construction phase	Transmission line- corridor access road, camp site tower footings areas	Contractor , machine operators, consultant , EEPCO, Consultant (archaeologist) ARCCH. Local authorities

No.	Impact	Mitigation measures	Monitoring Action, Monitoring Frequency	Area	Responsible Body
4	Impacts for the known resources	• Spotting PCR in the area. • Assessment will be conducted in areas for possible PCR. • Evaluation, treatment and Documentation of PCR	Done during the implementation of the project	Transmission line- corridor access road, tower footings areas	EEPCO and staff Consultant (archaeologist) ARCCH Local authorities
5	Impacts on existing graves and relocation.	Relocate resources	When new findings occur	On transmission line	EEPCO , Local Authorities , Local EPA
6	Capacity of project staff and contractors regarding physical cultural resources	• Conduct training workshop for non archaeologist staff involve in the project	Before the commencement of the construction	On site	EEPCO, ESMU staff and contractors working in the field on cultural resources.
7	Conservation of Known PCR and Chance findings	• Follow all procedures for preservation and protection of sites and articles of paleontological, archaeological, and historical PCR	During and after the construction	On site, and National Museums when appropriate	EEPCO, Consultant and ARCCH

13.11 Budget

The total budget allocated to this activities including capacity building is estimated to be 2,000,000 ETB included in the contractors work.

13.12 Communication and Reporting

Reporting and review is as per the PCR management plan and review procedures.

The Contractor shall report all records on observational monitoring, protection measures, complaints, and damages to the consultant on a monthly basis. The consultant shall report their supervision records and the Contractor's records to the responsible national and regional as wll as local government agencies on a quarterly basis (or as the case may be when new things happened).

Table of Contents

List of Tables

14 PRELIMINARY ENVIRONMENTAL COST ESTIMATES

14.1.1 Cost estimates in Ethiopia

The environmental cost estimates address the costs of unavoidable negative impacts that will take place during the project's construction and operation. These impacts are generally categorized into physical, biological and socio-economic.as described in this study.

Tables 14-1 provide summaries of cost estimates in ETB and USD respectively. The exchange rate adopted is 1 USD = ETB 17.4679 (Oct 31, 2011).

The 'cost terms' referred in this section are defined as follows.

1) ***Transmission Line Clearing:*** Cost of removing most biomass (vegetation) from the 50-60 m by 433,000 m area along the route. The estimated cost can either be environmental cost or civil engineering cost estimates as the client wishes.
2) ***Technical Environmental Optimization:*** Additional cost that may be necessary to cater for environmental concerns during the detailed design of the T/L
3) ***Compensation Payment (RAP):*** Compensation for lost of various types crop production from private and public land holdings (this include all crops such as maize, sorghum banana, coffee, etc) and other property lost identified during RAP inventory.
4) ***Compensation Paid for Rehabilitation Measures:*** Cost of Rehabilitation including Income restoration, land preparation, moving and transfer costs, .and the like estimated by RAP study
5) ***Project Management and Running Cost:*** Administrative costs of Compensation (Identified by RAP Study).
6) ***Implementation of livelihood safeguard program:*** Cost of income generation projects introduced to ensure that directly affected people and communities are not disadvantaged by the project and have access to viable income generating opportunities in the (resettlement) area.
7) ***Compensation of for loss of arable land in construction areas:*** Compensation for construction activities at access roads and working areas outside of the T/L area.
8) ***Health Centre (health personnel and associated employees):*** Contribution to upgrading health facilities for local project employees, their families and other local people. This is separate from the contractor's obligations and to help counteract the likely health problems associated with the construction workforce. A health awareness campaign (focusing on HIV, STD's an other transmittable diseases) should be initiated, free condom distribution to workers, volunteer testing and counseling would be part of the cost.
9) ***Replanting:*** Cost of replanting areas disturbed and ensuring that woody biomass is replaced where possible (focus will be given to restore vegetation species that have significant ecological and economic importance)
10) ***Generic BMP for Disturbed Area:*** Remediation of areas disturbed/contaminated by construction activities (Best Management Practice), including locations exposed to increased risk of erosion, over and above responsibilities of the contractor. (Primarily focus on conservation oriented construction; physical conservation may be included as required)
11) ***Conservation Initiatives:*** Cost of further surveys of flora and fauna in the direct impact zone, plus funds for propagation if applicable. (Priority will be given to develop conservation areas and environmental offsets)

12) ***Monitoring of Construction Work:*** Monitoring/auditing construction and adherence to the EMMPs. EMU.

13) ***Socio-Economic Monitoring:*** Cost of ensuring effective implementation of the livelihood safeguard program and providing services to redress grievances; cost of monitoring disbursements under the compensation/mitigation program and the health status of the local community, etc. PMU.

14) ***Institutional Capacity Building Program:*** Institutional capacity building for local institutions to cope with the modalities of a large construction project in their locality and support to national agencies responsible for advising on and inspecting aspects of implementation including environmental mitigation projects.

15) ***Community Gain:*** Contribution to water supply, schools/education, veterinary services, etc to be decided by the Authorities together with the affected people from the direct impact zone.

16) **Cost Construction Environmental Audit:** One time cost of checking the construction site remediation after the contractor has left (final payment of contractor will be tied to a successful audit inspection).

Table 14-1: Ethiopia-Kenya Power System Interconnection Project Environmental Cost Estimate

No.	Item	Units	Quantity	Unit Cost ETB	Capital Cost (ETB)	Recurrent Cost Lump Sums (ETB)		Cost in USD
						Constr. Phase	Oper. Phase	
1	T/L corridor Clearing (could be included in Civil costs)	ha	128.8	20,000	2,576,000			
2	Technical Environmental Optimization	LS			1,500,000			
3	Compensation Payment (RAP)	LS			187,199,558			
4	Rehabilitation Measures (RAP)	LS			11,067,500			
5	Implementation of livelihood safeguard program	LS			10,000,000		1,800,000	
6	Project Management and Running Cost (RAP)	LS			17,726,000			
7	Health centre support (project employees & locals)	LS			3,000,000	11,160,000	0	
8	Replanting	ha	128.8	12,500	1,610,000			
9	Generic BMP for disturbed areas	ha			2,800,000			
10	Conservation initiatives (provisional sum)	PS			1,300,000			
11	Water quality monitoring	LS				100,000	50,000	
12	Monitoring of construction work	Year				500,000	0	
13	socio-economic monitoring	Year				1,000,000	0	
14	Institutional capacity building program	LS				900,000	400,000	
15	Community gain (Social Service Proposed)	LS				2,000,000	1,000,000	
16	Post construction environmental audit	LS				0	250,000	
Sub-Totals					238,779,058	15,660,000	3,250,000	
Contingency at 10%					23,877,906	1,566,000	325,000	
Sub-Total					262,656,964	17,226,000	3,575,000	
Grand Total							**283,457,964**	**16,227,363.55**

Table of Contents

15. CUMULATIVE IMPACT OF THE T/L PROJECT

One of the comments made by stakeholders on the 2009 Fichtner ESIA study was the need to assess cumulative impacts. This section will discuss and determine whether a project will "result in *cumulative impacts*, based upon past or reasonably anticipated future impacts, that cause a violation of environmental standards".

For the purpose common understanding cumulative impacts in this study mean environmental impacts resulting from incremental effects of an activity when added to other past, present, and reasonably foreseeable future activities regardless of what entities undertake such other actions. Cumulative impacts are the reasonably foreseeable impacts from individually minor but collectively significant activities Indirect impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Analysis of cumulative impacts is difficult in general. In this particular case in addition to other issues sufficient data on the present and future development was not possible to obtain within the given study period. For that reason quantitative analysis on the cumulative effects was not possible.

Hence the cumulative impact assessment provides qualitative estimate of the cumulative or indirect effects of the transmission line project and the combined or cumulative effects of the project along with other past, present, or/and reasonably foreseeable future development activities. The primary focus is made on the project's potential to induce growth and change land use that could in turn affect natural resources of the study area. Concerns have been on the general habitat including habitat fragmentation, and terrestrial endangered plant and animal species.

The purpose of estimating indirect and cumulative impacts of proposed projects is to contribute to the body of information that will support a decision about whether

- to proceed with the project, as proposed;
- to formulate a revised plan of project; or
- to otherwise mitigate adverse impacts associated with the proposed project.

Cumulative impact is the incremental impact on the environment that results from the impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, to determine the cumulative effects in the analysis area, past, present, and future actions within SNNP and Oromia Regions were evaluated. These actions predominantly include transmission lines and other utilities and future development projects.

Some existing transmission lines, power distribution lines, and other linear facilities are located throughout the project area. The existing transmission lines of most significance are located in TL corridor that contains the proposed HDC 500kV transmission line.

Land Use

Major cumulative impacts to land uses are not expected to be significant with the addition of Ethiopia Kenya TL, which farm land, rangeland used for grazing and forage and agricultural land would be permanently removed from production by tower foundations and spur roads, where necessary. The transmission line route strip is a rural settlement characterized by fewer or no investment. Therefore the combined effect of the project with other development is almost nil.

These impacts would accumulate with construction of a 500kV transmission line along the corridor although the total area lost from production would be small in the context of the region.

Socioeconomics

Cumulative impacts to socioeconomics are generally only a concern if they would overextend public services and accommodations in the project area. Construction and operation of the proposed transmission line would be a beneficial cumulative impact to the Countries, region, including increased availability of lower cost electricity to Kenya. Beneficial cumulative impacts also include revenues realized due to construction activities, and potential property tax revenues received by the nations and localities. Other project implementations unlikely in the foreseeable future in the project area which otherwise would cause more pressure on the existing infrastructure and services.

Employment

The transmission line construction and operation would employ a large number of people who otherwise would be unemployed. The construction activities will decrease the unemployment ratio to some extent at all level of administration..

Cultural Resources

Cumulative impacts to cultural resources could result over time from repeated incremental damage caused by motorized vehicles, dust, and pollution. Indirect impacts on cultural resources can result from degrading the setting of a significant cultural feature (e.g. Wakas) and incidental destruction of cultural sites or traditional cultural properties by motorized vehicles, due to new access roads and movement of vehicles during particularly construction phase. However, the proposed project would not require substantial activities, therefore reducing cumulative impacts to cultural resources. The presence of multiple transmission lines would not likely contribute measurably to this type of a cumulative effect. Therefore, impacts to cultural resources would minimal.

Geology, Soils, Hydrology, and Minerals

It is anticipated that the cumulative effects on earth resources would not be measurably different than the additive effects of the proposed project. The potential for soil erosion, and sedimentation in water bodies, dependent on the mitigation implemented, could be increased with the construction of the other projects in some areas. Ground disturbance would be, in general, incrementally less for the transmission line. The cumulative effects of two or three transmission lines would likely be somewhat more than any single project.

Air Quality

It is anticipated that the power transmitted over the proposed project would come from existing capacity generated in the project location. A potential indirect cumulative impact associated with the transmission line is increasing emissions from the of exhaust vehicle. The change could be additive but there is unlikely other construction activities in the area.

Cumulative air quality impacts also would result from construction activities for the proposed transmission line facilities identified in this study. The incremental effects of vehicular emissions would be expected to increase, generally according to the number of transmission line of 433 km constructed during construction period, but it is unlikely that more than one major construction project would take place simultaneously along the line location. If concurrent construction of more than one project was to occur, the amount of airborne particulates resulting from construction vehicle use on unpaved roads could be reduced

where existing access or spur roads are used for multiple projects within the same corridors. In most cases, mitigation measures to control emissions would be effective in reducing emissions such as selecting time movement, and cumulative impacts would be temporary and not long time or significant.

Traffic and Transportation

Cumulative impacts to traffic and transportation are not anticipated to be permanent, but rather temporary, occurring during construction. If the construction projects, for example, overlap or occur in the same time frame, the potential for traffic impacts would increase, but would result insignificant impacts.

Natural Habitat

Cumulative biological impacts would be generally additive and usually be directly proportional to the amount of ground disturbed. Cumulative effects also depend, to some extent, on whether construction activities are concurrent or overlapping in a given area. If construction is occurring concurrently, a higher volume of traffic may result and possibly greater amounts of ground disturbance (erosion, etc.) would occur.

Existing activities such as increased settlement, pastoralism, and forest clearance for agricultural expansion and other use has already create disturbance to wildlife for a longer period of time, resulting in prolonged or permanent displacement of wildlife from crucial habitats. The RoW clearance has additive effects of loss of habitat in the designated location.

A third line in the proposed line corridor would likely produce similar impacts. Cumulative impacts associated with the existing 500kV lines in one corridor would likely produce impacts that are of a slightly higher degree and possibly longer duration.

Bird Collision

Cumulative bird collisions would generally be additive. The addition of the third line, would likely produce similar impacts.

Cumulative impacts associated with the existing 500kV lines in one corridor would likely produce impacts that are of a slightly more collision, but because the number of birds prone to collision are the same, the effect could be less significant.

Noise

With the addition of the line, cumulative impacts associated with corona generated audible noise would be additive, but is expected to be less than double the existing levels of noise caused by operation of the existing line due to the use of polymer insulators on the proposed a line. The increased noise level at the edge of the right-of-way may be discernible or audible during wet-weather conditions, although line noise would most often be masked by naturally occurring sounds at locations beyond the right-of-way, and would not be significant.

Visual

Cumulative visual impacts would increase with effects to views from highways, residences, recreational areas, and on natural scenic quality. The transmission line built in the existing natural setting usually would cause the most noticeable incremental change because of the contrast to the surroundings. Each successive change, when added in an existing corridor,

would be less noticeable than the first. With the addition the proposed line, the resulting multi-line corridor would be more visible than two transmission lines at greater distances because of the cumulative contrast with the natural landscape. Where existing access could be utilized for the proposed line, it would avoid exposing lighter colored surface and vegetative removal. In areas where new access and vegetative removal are required, mitigation that would be effective in reducing visual impacts would include the reclamation of areas disturbed by construction-related activities. Therefore, the effect of the proposed transmission line would contribute a small increment of visual impact that would be very little.

Cumulative visual impacts that would be likely to result from this 500 KVA and existing and future 230kV would result in the route line.

Conclusions

Based on this analysis, the incremental impact of the proposed action would be minimal when added to other past, present, and reasonably foreseeable future actions. Construction and operation of the proposed transmission line would not cause significant cumulative impacts on the environment.

Table of Contents

Table of contents

16 CONCLUSION AND RECOMMENDATIONS

16.1 Conclusion

For the Ethiopia-Kenya Power System Interconnection Project, the selected route option is route A/C. A/C starts from Sodo substation (in Sodo Zuria woreda) and traverses seven woredas in the SNNP and three woredas in Oromia Regional states. The Route line enters in to the Kenyan territory at a coordinate point of 421519 (E) and 397867 (N).

The project claims public and private lands for the substation, RoW corridor, land for working area, and etc.. It is currently estimated that a total of 25,048,000 m^2 (or 2504.8 ha) will be required. Out of this total 24,156,000m^2 (or 2415.6 ha) is permanent loss for the construction of RoW and substation.

In addition to that about while 892,000m^2 (or 89.2 ha) land will be required temporarily for storage, camps and other working space. The previous study indicated that land use is bush land=50%, Grass land 37%, Farm and pasture = 11% and bare land = 2% and we assume this general land use has not been changed along the entire route (recent data generated in the last two years could not be available to verify this but discussion with authorities, confirmed as there is no change).

Hence when affected land is categorized by existing land use type:

- 50% covered with Bush land = 644 ha
- 37% covered with Grassland = 476.6 ha
- 11% used as farming and pasture land = 141.7 ha
- 2% bare land = 25.8 ha

Pertaining to the intensity of impacts, they will focus on the construction activities due to the RoW clearance, especially

- clearance of the construction sites and removal of hindering vegetation,
- the resulting impacts on soil, vegetation and fauna,
- loss of (agricultural used) land,
- dismantling of the accommodations inside the RoW, and
- the resulting impacts on households.

The intensity of impacts will be mainly at the construction sites within the RoW and at the substation construction site, as majority of construction activities will take place at those sites. Impacts will also occur in the rest of RoW, but in a less intensity.

No migratory bird routes were encountered during the field investigations and interviews with local experts. Important Bird Areas and other protected areas are avoided in Ethiopia. The Project routing passes through a landscape which is already partly affected by pastoralism and farming.

It is expected that fauna will be disturbed due to the Project's activities due to noise and traffic caused by construction activities and the loss of vegetation and land, or habitats respectively. Negative effects on wildlife caused by poaching are not expected, because hunting, poaching and active wildlife disturbance (e.g. by tracking), acquisition and consumption of wild meat/bush meat will be prohibited.

Possible negative effects of the Project on fauna and vegetation shall be mitigated to an acceptable limit due to:

- the timely limited extent of the construction activities,
- execution of the construction works according to international best practice, which includes the compliance with national regulations and the relevant IFC EHS guidelines,

- implementation of mitigation measures as proposed in the ESMP,
- rehabilitation of the construction sites, and
- compensation for removed vegetation, which includes compensation for disturbance of effected fauna

Impacts on People and Communities If implementation of proper prevention and mitigation measures will be done, and a fair and complete compensation of lost assets will be paid, it is expected that impacts caused by Loss of assets,

- Increased risk for the spread of socially communicable diseases and interaction between workers and local community,
- Increased risk for accidents due to construction activities, and
- Increased traffic could be avoided or mitigated to an acceptable level.

The impacts on local communities and enterprises are at the one hand positive, as the construction activities provide job opportunities and create income from trading, as the foreign workers will spend some money in the project area. However these positive impacts are limited to the duration of the construction activities and would not have a significant sustainable positive impact on the local economy.

The majority of impact will be in the first section of the routing, which traverses the SNNPR State, as here are more households affected than in the second section which traverses the Oromia Regional State. The effect in the second part of the route (next 240 km) is less intense compared to the first segment.

The impacts in SNNP are higher due to socioeconomic condition of the SNNPR and characterized by the following facts:

- The situation in the SNNPRS is difficult for many households, due to high population pressure, lack of land for cultivation, and drought situation. The food shortage is exacerbated by highly fragmented land size, very small plots and degradation of soil fertility.
- Available land suitable for living and farming is sparse, as population density is high in that region.
- The majority of affected households are fully dependent on the crops they are producing on the small plots they are living on. Other income sources are very few.
- Harvest is often poor and for some households it is not even enough to feed all household members. In some woredas such as Sodo, Humbo and Konso, children suffer from malnutrition and households are highly dependent on relief food assistance made by international donors.
- Based on the current information and technical planning of the Project (routing, RoW of 50-60 m) a number of up to 1165 households (97% of the total in the RoW) will be affected by relocation or resettlement, depending on the final design and location of the towers.
- Most of the households, who may lose their accommodation due to the construction of the Project, could be able to relocate and construct their dwellings in the remaining plot of land without any need to be resettled.
- It is understood that relocation is dismantling of accommodations and re-establishing within the same plot, but outside of the RoW.

Resettlement is understood to be re-establishment of the dwelling somewhere in the same community or at another place outside of the RoW. The focus of resettlement will be in the Sodo, Humbo and Mirab Abaya woredas. Their actual number and location will be ascertained once the detailed design and the final location of the towers is defined and agreed.

Land for land compensation would be the appropriate compensation method, for those households which are fully depended on their land/farming products. As suitable land is very sparse, this seems to be very difficult to realize and needs to be further investigated, when the final routing and RoW is known.

Although the construction works are timely and spatially limited, it is expected that additional impacts will occur due to the activities at workers camps and access tracks. Those impacts will have to be assessed in the next Project Phase, when their extent is known. Nevertheless, based on the currently available information it is preliminarily concluded that the Project would have a high adverse impact on the affected people.

The two tables below (Table 16-1 and Table 16-2) provide an overview of the Project's impacts during construction and operation phases.

Table 16-1: Conclusion Impacts during Construction Phase

Extent of impact on soil	●= Low Negative
Extent of impact on groundwater resources	●= Low Negative
Extent of impact on surface water	●= Low Negative
Extent of impact on air quality	●= Low Negative
Extent of impact of noise	●= Low Negative
Extent of impact on vegetation	●= Low Negative
Extent of impact on fauna & habitats	●= Low Negative
Extent of impact on landscape	●= Low Negative
Extent of impact on local communities	▲= locally positive
Extent of impact on local communities	●●●= high negative
Extent of impact on enterprises	▲= locally positive
Extent of impact on enterprises	●●●= high negative
Extent of impact on historical/ cultural sites	Ø= nil
Extent of impact on protected Areas (ETH)	Ø= nil

Table 16-2: Conclusion Impacts during Operation Phase

Extent of impact of electric & magnetic fields	●= Low Negative
Extent of impact on soil	●= Low Negative
Extent of impact on ground & surface water	Ø= nil
Extent of impact on air	Ø= nil
Extent of impact of noise	Ø= nil
Extent of impact on flora/ vegetation	●= Low Negative
Extent of impact on habitats	Ø= nil
Extent of impact on fauna	●= Low Negative
Extent of impact on landscape	●= Low Negative
Extent of impact on local communities	●= Low Negative
Extent of impact caused by land development	●= Low Negative
Extent of impact on historical/ cultural sites	Ø= nil
Extent of impact on protected Areas (ETH)	Ø= nil

The overview on the impacts during operation phase is showing that all impacts can be reduced to an acceptable level, if the proposed mitigation measures are implemented and if the IFC's General EHS and the IFC's EHS for Electric Power Transmission and Distribution are applied.

Once the construction sites are rehabilitated, the area permanently occupied by the Project, is expected to be relatively small in comparison with the large extent of the Project and other large infrastructure projects.

It is understood that the best opportunities for the reduction of impacts can mainly be made during the next phase of the Project, prior to construction and operation, while planning the detailed design and the final routing. Considering the proposed mitigation measures, the Project's impacts could be reduced to an as low as reasonable possible level and the Project is likely to be environmental feasible.

16.2 Recommendations

Based on the currently available information it is preliminarily concluded that the Project would have impacts on the affected people due to the loss of land and the associated resettlement/relocation activities and loss of income/source of livelihood. Furthermore a large area of vegetation will be affected including wildlife contained in it.

Therefore, it is strongly recommended that livelihood safeguard project be developed for income generation for the relocated people and replanting of local trees for the lost vegetation in suitable location.

For people which are fully depending on their farming products, cash for land compensation would not be a sustainable form of compensation and it is recommended to provide a land for land compensation for those households.

As the implementation of land for land compensation could be difficult to realize due to sparse availability of suitable land, all efforts should be made to reduce the area affected by the construction works (e.g., reducing the sizes of camp and storage sites). By reduction of the number of directly affected people, the need for relocation/resettlement, as well as limitations in land use/occupied land due to construction activities would be reduced significantly.

During the next Project Phase, the minimization of these impacts should be one aim of the field survey for the detailed design and routing, beside all technical aspects. It is highly recommended, that the survey team should consist on an interdisciplinary team of environmental, social and technical experts who shall consult the relevant communities and authorities in order to solve this challenge.

With regard to Cultural and Archaeological resources the ARRCCH need to be involved when exact location of the towers are determined so that they can help avoid impacts to the sensitive area in Konso (particularly fossils) and in certain location of Boren (around Dubluk and Yabello area).

17. REFERENCES FOR ETHIOPIA – KENYA POWER SYSTEM INTERCONNECTION PROJECT

Author	Year	Publication
Fichtner	2009	Ethiopia-Kenya Power System Interconnection Report: Environmental and Social Impact Assessment (ESIA)
Fichtner	2009	Ethiopia-Kenya Power System Interconnection Report: Resettlement Action Plan (RAP)
Fichtner	2009	Ethiopia-Kenya Power System Interconnection Report: Final Feasibility Study –Volume I
Fichtner	2009	Ethiopia-Kenya Power System Interconnection Report: Final Feasibility Study –Volume 2
African Development Bank	2004	African Development Bank Group's Policy on the Environment
African Development Bank	2002	African Development Bank Group's Policy on Involuntary Resettlement Policy
SNNPR- Bureau of Finance and Economic Development	2008	Regional statistical Abstract
SNNPR- Bureau of Education	2011	Education Statistical Abstract (2009/10)
Oromia Bureau of Education	2011	Education Statistical Abstract 2009/10
ARCCH	2009	The Konso Cultural Landscape: World Heritage Nomination Dossier...
Yohannes Beyene	1999	Konso – Garadula: An archaeological Site and Cultural Landscape Witnesses of a Living Culture". Paper Presented for "Regional Thematic Expert metting on Cultural Landscape in Africa" Tiwi, Kenya, March 1999
FDRE	1997	Cultural Policy of the Federal Democratic Republic of Ethiopia
Caple Christ	2000	*Conservation Skills: Judgment, Method and Decision Making.* London, Rutledge

Author	Year	Publication
Boru Shana et.al	2008	An assessment of Indigenous Resource Management System of Borana with Particular Emphasis on Range Land", BA Thesis, Department of Anthropology, University of Gondar
UNESCO	1972	Preserving and Restoring Monuments and Historic Buildings. Paris. UNESCO. 1972. Convention Concerning the Protection of the World Cultural and Natural Heritage,(Adopted in Paris)
CSA	2011	Statistical Abstract 2010/11
EEPCO	2007	Environmental and Social Management Framework (ESMF). Electricity Access Rural Expansion Project (EAREP II)
World Bank	2004	Involuntary Resettlement Sourcebook. Planning and Implementation in Development Projects.
World Bank	2005	Improving Health, Nutrition and Population Outcomes in Sub-Saharan Africa: The Role of the World Bank. World Bank Publications.
World Bank	2006	Ethiopia: Managing Water Resources to Maximize Sustainable Growth. A World Bank Water Resources Assistance Strategy for Ethiopia
World Bank	2007	Ethiopia: The Energy II project. World Bank, Findings, Infro-brief-Number 135, April 2007
Kala Meah	2008	Comparative Evaluation of HVDC and HVAC Transmission Systems
Robert Ruderval et al	2005	High Voltage Transmission Systems Technology Review Paper
N. barberis Negra et al	2005	Loss evaluation of HVAC and HVDC Transmission Solution for Large Offshore Wind Farm.
Prof. L. A. Koshchoev	2003	Environmental Characteristics of HVDC Overhead Transmission Lines