FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

ETHIOPIAN ELECTRIC POWER CORPORATION (EEPCO)

ENVIRONMETNAL AND SOCIAL IMPACT ASSESSEMENT (ESIA)

FOR

METU –GAMBELLA 230KV TRANSMISSION LINE PROJECT

FINAL REPORT

Prepared by
Corporate Planning Process
Power system planning Office
Environmental and Social experts
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EXECUTIVE SUMMARY

I. INTRODUCTION

The Ethiopian Electric Power Corporation (EEPCo) is mandated by the Government of Ethiopia to generate, transmit, distribute and sale of electric energy through out the country.

The existing transmission system comprises a total of about 10,884.23km of transmission lines of which 685.72 km is 400kV voltage level 3,739.64km are at the 230 kV level4185.59 km are at the 132 kV level, 1886.54 km are at 66 kV and 386.79 km are at 45 kV level in the ICS system and the rest 245.3 km in SCS.
The prime purpose this power transmission project is to extend the existing grid further to Gambella substation and alleviating the overloading problem of the self contained system (SCS) of the existing Gambella I substation.

This ESIA study was carried out along the above mentioned linear sections of the project with respect to the requirements of the international financial institutions and the countries environmental policies, proclamations, rules and regulations so as to obtain the maximum benefits from the project.

The report covers the major environmental and social impacts, including their mitigation measures and costs. The environmental and social management plan (ESMP) as a key portion of the report is also incorporated in the report.

All the preliminary information has already been collected particularly from the route surveys and field assessments. Public consultations and disclosures were also conducted with key stakeholders including the project affected communities.

II. OBJECTIVES

The major objectives of the ESIA study are :

- To identify and assess the potential environmental and social impacts of the proposed project.
- To identify all potential significant adverse environmental and social impacts of the proposed project and recommend measures for mitigation measures.
- To generate baseline data for monitoring and evaluation of how well the mitigation measures will be implemented during the project cycle

- To recommend cost effective measures to be implemented to mitigate the expected impacts.

- To prepare an environmental impact assessment report compliant to the EIA Proclamation No 299/2002

III. THE ESIA TEAM

A team consisting of members of the environmental and social experts of the power system planning of EEPCo was constituted and took the responsibilities to conduct the ESIA study along the proposed route and prepare the Report.

Accordingly the following team members were participated in the assessment:

Mr. yohannes yoseph Environmentalist

Ms .Fikirte Kebede Sociologist

Mr. kassaye Gobe Surveyor

Fig 9 – The Assessment Team

IV. METHODOLOGY

For the purposes of this ESIA study, the following study procedure was pursued:

Discussions with EEPCo representatives : Discussions were held with relevant staff of EEPCo especially with the power system planning Head, Engineering Department and the transmission Construction CEO. In the discussion, the team has discussed on the major issues that most require further explanation in the project's feasibility study. The team also obtained maps and the feasibility study reports of the project.

***Collection of data from the project's report*;** the project report includes the feasibility reports and used as one of the sources of secondary data information.
Some back ground information regarding EEPCo's development status including the existing transmission line developments were also obtained from the Report. The project description is also developed is based on the projects feasibility report.

Field works and public consultations: Site investigations were made to comprehend the existing biophysical environment and have key baseline information along the proposed entire route**.** Data on hydrology, topography, soils, climate, land use, flora and fauna, settlement, historical and cultural sites, development infrastructures, etc, were collected.
Public consultation and disclosure meetings were conducted on the project sample areas .The views and attitudes of project affected people (PAPs) were duly considered as part of the ESIA process (please refer to the Amharic version of minutes of meetings attached in ANNEX-I). The public consultation as an ongoing phenomenon will be undertaken throughout the implementation of this project.
Discussions with the relevant stakeholders in government sectors were also held to make sure that the proposed development project is in conformity with the Regional sectoral policies and strategies.

Data analysis and impact prediction: all the necessary data were analyzed and the significant impacts (both the adverse and positive impacts) were predicted accordingly.
The identified impacts were described both in qualitative and quantitative terms. The national and international environmental standards, check lists, environmental guidelines were used to analyze the magnitude of the potential impacts.

Formulation of an Environmental and Social Management Plan (ESMP): all possible interventions to minimize, reduce, offset or avoid the identified adverse impacts were evaluated and presented as an impact mitigation plan of the proposed development. The ESMP includes the development of monitoring and evaluation procedures to ensure that the proposed mitigation measures are complied accordingly.

Produce a draft ESIA report: A draft ESIA report would be produced and be floated for review. Then the final ESIA report would be developed after incorporating the due comments

V. PROJECT DESCRIPTION

The proposed transmission line project is located at the Regional States of **Gambela** and **Oromiya.** It traverses some 5 districts (*woredas*).

The prime purpose of this power transmission project is to extend the existing grid further to Gambella substation and alleviating the overloading problem of the self contained system (SCS) of the existing Gambella I substation.

The transmission line covers a total of about 150 km route length.

The towers from Metu substation to the new Gambella II substation will be of the double circuit self supported steel lattice type and will carry one circuit. All the towers well be designed for long basic spans.

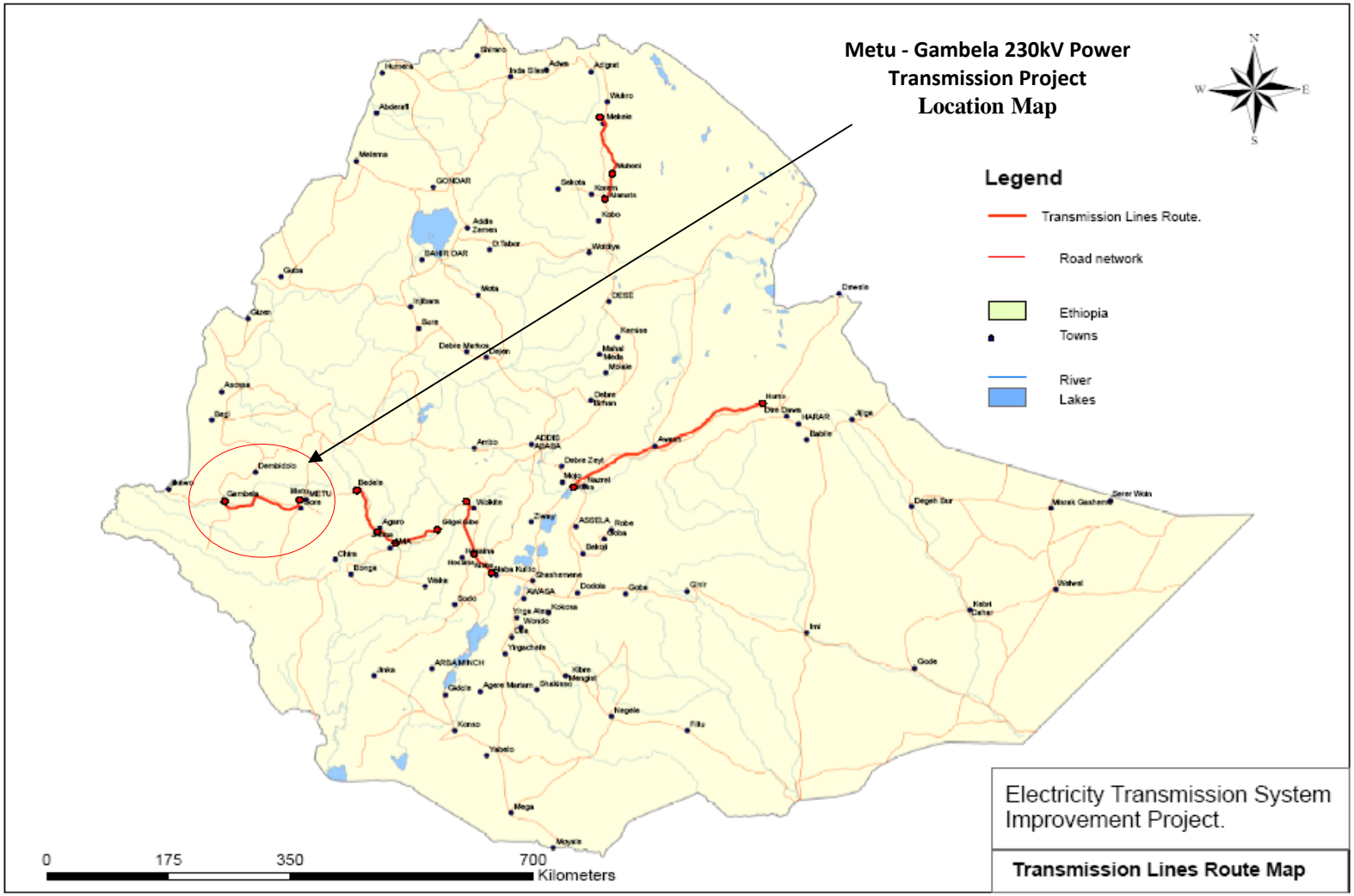
It is recommended that twin Ash 180mm2 AAAC should be adopted for 230kv transmission line. ASH conductors also used for 132kv transmission lines and this will satisfy spare requirements and maintenance efficiency.

The transmission line route is selected along the road following the o 66 Kv wooden type of transmission line. The proposed route will thus facilitate ease of construction and maintenance.

There will be a new 230/66/15kv substation to be constructed some 15 km away from the existing 66/15kv substation.

The Total Project Cost is estimated about 38 Million USD.

Average tower span is expected 350 meters which totally requires erecting about 430 pylons.


Metu - Gambela 230kV Power Transmission Project
Location Map
N
W
E
S
Legend
Transmission Lines Route.
Road network
Ethiopia
Towns
River
Lakes
0
175
350
700
Kilometers
Electricity Transmission System Improvement Project.
Transmission Lines Route Map

VI. PROJECT JUSTIFICATION

The need and demand of electric services in the country nowadays is highly increasing in almost every sector from the small rural villages' and towns' to the heavy industries. The current access to electricity is about 15%

EEPCo thus making painstaking efforts to generate and transmit electric power to meet the increasing energy demands in the country.

Specific to the project areas, most of the social services particularly the health, education and water development services are found quiet limited due to inadequate and little supply of electricity. The Project therefore is vital in improving the existing infrastructures to the level of providing adequate services to the communities.

VII. POLICY, LEGAL, INSTITUTIONAL AND ADMINISTRATIVE REQUIREMENTS

A high voltage power transmission line project activities have substantial detrimental environmental effects .such activities have been identified in the general guideline for EIA section 3 as schedule I project which needs conducting a full EIA. Prior to under take such activities, a written authorization is issued by the FEPA or by a competent authority designated as such by minister**.**

The general guidelines for EIA states that While carrying out any development activity it shall be carried out in such a manner that will protect the welfare of human being as well as sustainably protect, develop and utilize resource basis on which they depend for survival.

This environmental impact assessment report aims to assist the proponent with following the correct legal procedure as required by EPA.

The EIA is conducted in compliance with national and international policies and procedures.

VII.1. National Policies and Strategies

As the supreme law of Ethiopia, all national policies, laws and regulations as well as the institutional frameworks of the country must comply with the constitutional provisions. The constitution of the Federal Democratic Republic of Ethiopia, Proclamation No. 1/1995, contains a number of articles, which are relevant to environmental matters in connection with development projects, as well as to the environment in general.

A Plan for Accelerated and Sustainable Development to End Poverty (PASDEP, 2005-10) is one of the key official documents containing sectoral policies and strategies for

development.

As we shall see in the following section the power sector policy and strategy and poverty reduction program which contains issues related to the over all countries development strategies.

The long term strategy of EEPCO is to support the federal government of Ethiopia in promoting social and economic progress in the country. To meet this strategic goal, EEPCO has, among others, the following policies:

- To promote the development within the country of competitively priced and environmentally sustainable electricity generation projects
- Promote exploitation of indigenous energy sources,
- And to promote the participation of the private sector in the power development.

PASDEP recognizes electricity both as an input to the growth of the modern sector as well as an ingredient to the over all social and economic transformation of the nation. It also recognizes the role that electricity can play in breaking the vicious circle of energy poverty.

One of the key factors that led to poverty in Ethiopia is a heavy dependant on rain fed agriculture and reliance on traditional skills and backward technique of production these facts highly correlated with the provision of electricity to rural areas. the supply of electricity will enable the rural poor to use irrigation pumps and there by producing higher out put and increase their income which is highly crucial to poverty reduction .it also create investment opportunity in different economic sector such as food , chemical , and metallic and non –metallic industries .

Cognizant of the role of the power sector for accelerated growth, the government of Ethiopia , through EEPCo has embarked upon a plan to increases power supply from its current level of 791 Mega WATS (MW) to about 2218 by 2009/10.

One of the key component of the power development program during PASDEP is beginning of a massive rural electrification development program under the universal electrification access program (UEAP) .the UEAP envisage extending the access to electricity to some 24 million people . This is expected to increase electricity access from the current 15% to 50% of the country within the five years of PASDEP. The power sector program during aims to build 11 hydro power generation stations with a total installed capacity to about 4.1 Giga Watt. Nearly half of this capacity is expected from the Gibe III project.

The power produced at Gibe III (i.e. 1870 MW power house) will be delivered to inter connected system (ICS) through 400kV double and single circuit transmission line.

VII.2. Environmental Policy of Ethiopia (EPE)

Another important policy instrument that demonstrate the Ethiopian government commitment of the environmental and address issues relate to the development projects is Environmental Policy of Ethiopia (EPE)

The Environmental Policy (EPE) of the Federal Democratic Republic of Ethiopia was approved by the Council of Ministers in April 1997 (EPA/MEDAC 1997). It is based on the CSE, which was developed through a consultation process over the period 1989-1995.

The policy has the broad aim of rectifying previous policy failures and deficiencies, which in the past have led to serious environmental degradation. It is fully integrated and compatible with the overall long term economic development strategy of the country, known as Agricultural Development Led Industrialization (ADLI), and other key national policies like the National Population Policy and the National Policy on Women.

EPE's over all policy goals 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.

Specific policy objectives and key guiding principles are set out clearly in the EPE, and expand on various aspects of the overall goal. The policy contains sectoral and cross-sectoral policies and also has provisions required for the appropriate implementation of the policy itself.

VII.3. Sectoral Environmental Policies

Among the sectoral policies, the wildlife policy is the one developed by the Ministry of Agriculture aiming to preserve, develop and sustainably utilize the countries wildlife resources. Water resource policy is to enhance and promote all national efforts towards the efficient and optimum utilization of the available water resources for socio-economic development on sustainable bases. The policy is to establish and institutionalize environmental conservation and protection requirements as internal parts of water resources planning and project development.

VII.4. Conservation Strategy of Ethiopia (CSE)

Since the early 1990s, the Federal Government has undertaken a number of initiatives to develop regional, national and sectoral strategies for environmental conservation and protection. Paramount amongst these was CSE, approved by the Council of Ministers, which provided a strategic framework for integrating environmental planning into new and existing policies, programs and projects. The CSE provides a comprehensive and rational

approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross sectoral strategy, action plans and programs, as well as providing the basis for development of appropriate institutional and legal frame works for implementation.

Based on CSE, the Oromiya Regional State have already developed Conservation Strategy document for its respective regions. The document gives details about environmental issues prevalent in the territory and outlining how the environmental issues to be addressed.

VII.5. Environmental Legislation

VII.5.1. Environmental Impact assessment proclamation (NO. 299/2002)

This proclamation (No299/2002) aims primarily at making environmental impact assessment (EIA) mandatory for categories of projects specified under a directive issued by the authority 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, laws or an international agreement as public instrument and directs the authority to issue guidelines distinctively classifying certain categories of public instrument 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 agencies 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 operation 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 lenience that has already been issued where the environmental authorization.

The duties of the proponent described in the proclamation are:

- must under take 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 submit an environmental impact study report to the authority or the relevant regional environmental agency for review.

The proclamation also directs the authorities and the relevant regional environmental

agencies how to deal with an environmental impact assessment report they receives. Thus after evaluating the report by taking in to 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 impact to insignificant impacts ,or
- Refuse implementation of the project if the negative impact cannot be satisfactorily avoided

VII.5.2. Proclamation on Institutional Arrangement for Environmental Protection

The proclamation for the establishment of Environmental Protection Organs, No. 295/2002, was issued to establish a system that fosters coordinated but differentiated responsibilities among Environmental Protection Agencies at Federal and Regional levels. The proclamation recognizes assigning responsibilities to separate organizations for environmental development and management activities on the one hand, and environmental protection, regulations and monitoring on the other is instrumental for the sustainable use of environmental resources, thereby avoiding possible conflicts of interests and duplication of efforts.

The over arching goal of the EPE is the improvement of the health and quality of all Ethiopian and the promotion of sustainable social and economic development through the adoption of sound environmental management principles. To respond the above mentioned objectives EPA has given a mandate by law. One of the responsibilities of the EPA is to issue a series of guide lines needed to fulfill its duties. Procedural environmental impact assessment guideline which issued in 2003 is relevant for this assessment.

According to the guideline for environmental impact assessment, EPA 2003, Proposals requiring EIA have been included in schedule 1and schedule 2.proposals which would have no significant impact and doesn't require EIA are categorize as schedule 3 .
Schedule 1 Power projects that need EIA are:

- Hydropower having dams over 15 meters and ancillary structures covering a total area in excess of 20 hectares and /or reservoir with a surface area in excess of 250 hectare and displacement of 100
- Thermal power stations and other combustion installation with a heat out put of 100 mega watt or more
- High power transmission line
- Construction of combined cycle power station
- Large bio-mass energy using plants

Schedule 2 power projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but not likely to warrant an environmental impact study.

- Thermal power stations and other combustion installations with a heat output of less than 300 mega watts
- Electricity transmission lines
- Hydropower projects having dam height less than 15 meters and reservoirs with a surface area less than 250 hectares

VII.5.3. Proclamation on Environmental Pollution Control

The proclamation on Environmental Pollutions Control No.300/2002 is mainly based on the right of each citizen to live in a healthy environment, as well as the obligation to protect the environment of the country. The primary objective of the proclamation is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed, and to make the valuation of these standards a punishable act. The proclamation states that the "polluter pays" principle will be applied to all persons. Under this proclamation, EPA is given the authority to ensure implementation and enforcement of environmental standards and related requirement to inspectors assigned by EPA or Regional Environmental Agencies.

VII.5.4. Legal Framework for Expropriation and Compensation

VII.5.4.1. Land Tenure.

Land in Ethiopia is state owned by proclamation No.31/1975 issued to deal with government ownership of rural land and proclamation No. 47/1975 issued to cover Government ownership of urban land, under article 3 (1) of the first proclamation, all rural land shall be the collective property of the Ethiopian People.

In December 1994 the new constitution retained land under the control of the people and government of Ethiopia. Article 40 states that ownership of both urban and rural land is vested in the state and the people, and is common property, which is not subject to sale or other means of exchange. Peasants have the right to obtain land without payment and are protected against eviction from land in their possession.

VII.5.4.2. Expropriation

The Constitution also guarantees people whose livelihood is land based and pastoralists the right to have access to land as well as the protection against eviction from their possession (Article 40.4 and 40.5). On article 40.8, it also states that; private property may be expropriated for public use subject to payment in advance of compensation

commensurate to the value of the property".

In July 2005, the Government of Ethiopia has issued a new proclamation entitled, "Proclamation to provide for the expropriation of land holdings for public purposes and payment of compensation" proclamation No.455/2005. This new proclamation has several articles on determination of compensation, on displacement compensation, valuation procedures, property valuation committees, and on complaints and appeals in relation to compensation.

In part two, article 3, No.1 of the proclamation states that; " A Woreda or an urban administration shall, up on payment in advance of compensation in accordance with this proclamation, has the power to expropriate rural or urban land holdings for public purpose where it believes that it should be used for a better development project to be carried out by public entities, private investors, cooperative societies or other organs, or where such expropriation has been decide by the appropriate higher regional or federal government organ for the same purpose".

Proclamation No. 455/2005 provides a better displacement compensation for rural land holdings compared to previous laws.

In part 3 of article 8 it states that:

"A rural land holder whose land holding has been permanently expropriated shall, in addition to the compensation payable under Article 7 of this proclamation, be paid displacement compensation which shall be equivalent to ten times the average annual income he secured during the five years preceding the expropriation of the land".

The proclamation also states that in urban areas PAPs will be provided with a plot of land (land for land compensation) for their expropriated land to be used for the construction of house, and also be paid with compensation for displacement.

VII.5.4.3. Compensation

Regarding the determination of compensation in part three, article 7 of this proclamation (Proclamation No. 455/2005), the basis and amount of compensation is clearly explained. In article of sub article 1, a land holder whose holding has been expropriated shall be entitled to payment of compensation for his property situated on the land and for permanent improvements he made such land.

Article 7(2) states that the amount of compensation for property situated on the expropriated land shall be determined on the basis of replacement cost of the property.

Under Article 8(1) of proclamation 455/2005 a survival landholder whose land holding has been permanently expropriated shall in addition to the compensation payable under Article 7 of this proclamation is paid displacement compensation, which shall be equivalent to ten times the average annual income he secured to bring the five years

preceding the expropriations of the land.

All PAPs and organizations (whether public or private) that loss houses, crops or sources of income will be compensated or rehabilitated according to the types and amount of their losses. The cut-off-date for compensation eligibility will be set once all detailed measurements have been completed; compensation will also not be paid for any structure elected, or crops and trees planted purely for the purpose of gaining additional compensation. Cultivating land, constructing settlement in project affected areas after the cut-off-date will not be eligible for compensation or subsidies.

VII.5.4.4. EEPCo's Strategy for Expropriation and Compensation

It is the objective of EEPCo to avoid or reduce the environmental and social impacts of its power projects to a minimum level. If adverse social impacts to be occurred are unavoidable, EEPCo then will open consultation with PAPs and perform legal compensation for loss of all their properties. To achieve the social mitigation goal, EEPCo will allocate adequate budget for compensation before the project implementation. EEPCo in consultation with the administrations of Regional State Governments, Zones, Woredas and Kebele Associations shall establish property valuation committees as per the proclamation No. 455/2005. It is the project's prime task to initiate the establishment of property valuation committee to properly implement compensation payment for PAPs on time before the start of the project construction activities.

VII.6. Multi-lateral Agreements

The Federal Democratic Republic of Ethiopia has ratified several international convention and protocols and these includes:-

- Vienna Convention and Ozone Layer Protection (1990)
- Montreal Protocol for Substances Depleting the Ozone Layer (1990)
- Convention on Biodiversity (Rio convention) 1997
- Framework Convention of United Nations on Climate Change (1997)
- Convention on the Control of Trans-boundary movement of Hazardous Substance (1987)
- African Convention on the Conservation of Nature and Natural Resources
- Convention on Wetlands of International Importance especially as waterfowl habitat (Ramsar)
- Convention to Combat Desertification
- Convention Concerning the Protection of World Cultural and Natural Heritage
- Convention on International Trade in Endangered Species (CITES)
- Stockholm convention on persistent organic pollutants (PAPs, 22nd may 2001)

VII.7. International Banks' Requirements

The Regional Development Banks, such as the European Bank for Reconstruction and

Development (EBRD), the African Development Bank (AfDB) and the Asian Development Bank (ADB), all have environmental policies and guidelines which in most respects resemble those of the World Bank.

World bank OD specifies that high voltage transmission line project can be categorize A or B depending on the anticipated severity of impact , On this basis, category A transmission line projects will require to conduct a full EIA and category B will only require moderate environmental analysis.

The Regional Development Banks use environmental screening to place projects as category A, B or C (ADB & EBRD) or as category I, II or III (AfDB). These categories are similar in principle to those of the World Bank with only minor differences between each Bank. ADB and EBRD procedures are developed from the World Bank procedures (Hydro power development, Environmental effects, 1995).

World Bank OD specifies that transmission line projects can be category A or B depending on the anticipated severity of the impact. As category A transmission line project will require full EIA as a category B they will only require moderate environmental analysis. The Metu-Gambella Transmission Line Project according to the guideline is category "A" project needs full EIA.

Common to all Regional Development Banks including the World Bank is that the responsibility for meeting the environmental requirements rests on the hand of the borrower. The EPA report shall be commissioned and /or carried out by the authorities of the country seeking a loan. The Bank's controversial projects have been controlled and provided advice on how to deal with environmental aspects by establishing independent expert panels.

VII.7.1. The African Development Bank

In January 2004 the AfDB Boards approved the new Bank Group Policy on the Environment, which incorporates and redefines the former policy on environmentally sustainable development in Africa.

The new policy acknowledges that to sustain economic growth in Africa, there is an urgent need to preserve and enhance the ecological capital that enriches such growth. The main goals of the new policy are to:

- Promote a long-term view and perspective of economic and social development;
- Reverse where possible and halt the impoverishment process in Africa by enhancing the access of the poor to environmental resources;
- Help Regional Member Countries (RMCs) to build their environmental management capacity and sensitize policy makers on environmental issues and bring about institutional changes to achieve sustainable development;
- Reinforce the existing partnerships with international institutions and network also with regional and sub regional organizations to coordinate interventions in environmental sustainable development.

Two guidelines relevant to the new Policy on the Environment were completed and disseminated in 2004, namely the Strategic Impact Assessment Guidelines (SIA) and the Integrated Environmental and Social Assessment Guidelines (IESA).

The SIA is a systematic process of evaluating the environmental consequences of any proposed policy, plan or program. It is also a tool for assessing social and environmental sustainability of policy-based lending, structural adjustment, and sector investment lending. The IESA Guidelines, on the other hand, are designed to ensure that both environmental and social issues are mainstreamed in Bank projects throughout the project cycle.

In 2004 the Bank developed an Implementation Plan to execute its new Policy on the Environment. The Plan seeks to ensure that a strong and diversified economy will continue to take account of environmental protection, and to guarantee that all developmental decision-making integrates economic, social, and environmental considerations. In addition, the Plan aims to ensure that environmental management tools, like strategies and project level environmental and social assessments, will be used systematically to monitor environmental performance and encourage community involvement.

With regard to sustainable energy development, the Bank has identified the need to refocus its instruments and policy to deliver sustainable, reliable and environmentally friendly energy through replicable and scalable mechanisms to promote the exploitation of available energy resources (renewable and non-renewable); widening energy accessibility for poverty reduction; mobilizing additional financial resources; capacity building; strengthening strategic partnerships and synergies; and increased focus on climate change adaptation.

The Bank recognizes the high value of the partnership with the Global Environment facility (GEF) as this provides substantive opportunities to blend Bank lending for development projects (baseline financing) with grant and concessionary financing from GEF resources to protect the global environment in the areas of biodiversity, climate change (including adaptation), land degradation, international waters, ozone layer depletion and persistent organic pollutants.

The Environmental Policy sets out the broad strategic and policy framework under which all Bank Group lending and non-lending operations will be made to promote environmentally sustainable development in Africa. Its overall goals are two-fold: firstly, to help improve the quality of life of the people of Africa; and secondly, to help preserve and enhance the ecological capital and life-support systems across the continent of Africa.

The development of the policy has been driven by a number of factors, including the recognition and acceptance of sustainable development as the dominant development paradigm for the 21st century; need for a greater focus on pro-poor growth policies and programes to counter unacceptable impoverishment rates; rapid progress in the inevitable integration of Africa in the globalization process; and the need for an improved governance with a clearer commitment of the majority of African governments to provide

the necessary leadership for sustainable development. The policy recognizes the considerable constraints facing Africa but also its endowment with minerals, rich flora and fauna as well as large tracts of rainforest.

To help implement the policy, the Bank leverages the considerable progress made in developing appropriate tools for effective mainstreaming of environmental sustainability issues in its operations. This includes using a set of approaches and developing/strengthening procedures and guidelines, with particular focus on the full enforcement of the Environmental and Social Assessment Procedures for all lending operations of the Bank.

The African Development Bank use environmental screening to place a project as category I, II or III (AfDB). This category is similar in principle to that of the World Bank with only minor differences between them. On this basis, category I transmission line projects will require to undertake full EIA study and for category II projects it will require moderate environmental analysis only.

There fore, according to the Bank's guideline, The Metu - Gambella 230 kV Transmission line project is grouped in category **I** project and needs to pass through a full EIA process.

The African Development Bank urges that the responsibility for meeting the environmental requirements rests on the hand of the borrower. The ESIA report shall be commissioned and /or carried out by the authorities of the country seeking a loan.

VII.8. Institutional and Administrative Frameworks

The following paragraphs discuss the institutional and administrative frameworks at the federal and regional level and organizations responsible for the preparation of environmental policy and technical guidelines.

IX.2.1. Federal Democratic Republic of Ethiopia

The Federal Democratic Republic of Ethiopia (FDRE) comprises the Federal State and nine Regional State Members. The power and duties of the Federal, Regional and Local governments have been defined by proclamation numbers 33 of 1992 and 41 of 1993, and 4 of 1995. Under these proclamations, duties and responsibilities of Regional States include planning, directing and developing social and economic development programs, as well as the protection of natural resources of their respective regions.

IX.2.2. Regional Governments

The Oromiya and Gambella Regional States are the regional states established by the Federal Government. The proposed power transmission line expansion project of *Metu-Gambella 230 Kv* is fully located in this Two Regional States. The Regions have Zones and Woredas. Within each Woreda there are Kebeles or Peasant Associations. Each administrative unit has its own local government elected by the people. The Regional Governments have established sectoral Bureaus, Commissions and Authorities.

IX.2.3. Ministry of Mines and Energy (MoME)

The Ministry of Mines and Energy is the regulatory body for the energy sector. Based on the delegation from EPA, any draft ESIA reports will be submitted to the Ministry for reviewing purpose, and then they will give their due comments and recommendations. The Ministry finally gives approval /certifies for the implementation of the project and then conduct monitoring both in the construction and operation phases.

IX.2.4. Environmental Protection Authority (EPA)

The Environmental Protection Authority (EPA) was reestablished in October 2002 under the proclamation No. 295/2002. It is an autonomous government body reporting directly to the prime minister.

EPA has broad mandates covering environmental matters at federal level. The proclamation sets out the main responsibilities and broad organizational structures of EPA such as:

- Preparing policies and laws on environmental protection.
- Preparing directives and implementation of systems for the evaluation of the impact of projects on the environment.
- Preparing environmental protection standards and implementation of directives on soil, water, and air.
- Enforcing implementation of EIA process (i.e., Review EIA reports) etc.

IX.2.5. Environmental Protection, Land Administration and Use Authority

The Ministry of Agriculture and Rural Development and the Federal Environmental Protection Authority (EPA) have delegated their authority to the regional bureau of Agriculture and Rural Development and Environmental Protection, Land Administration and Use Authority.

IX.2.6. Ethiopian Electric Power Corporation

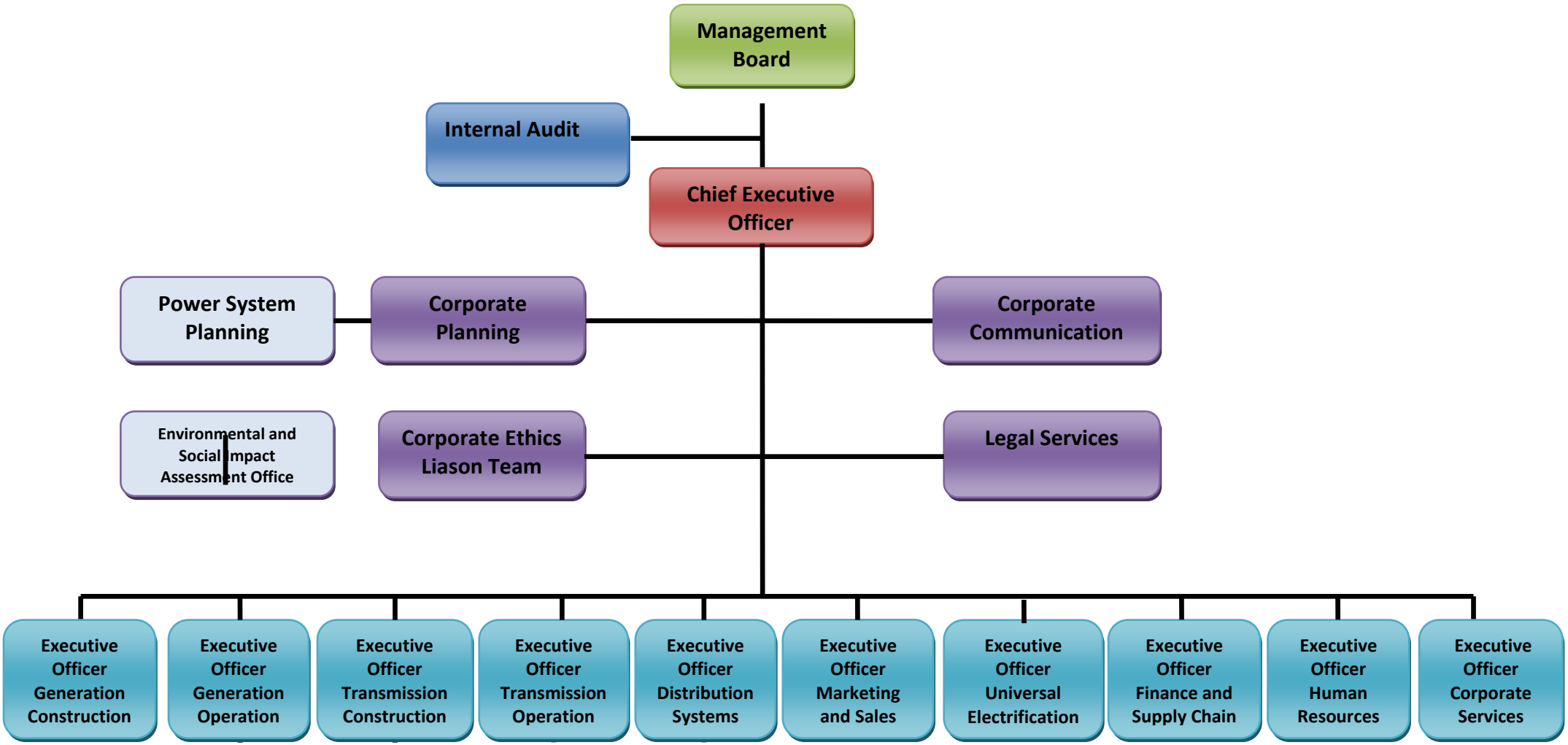
The Ethiopian electric power corporation (EEPCO), is a national electricity utility established as a public enterprises by regulation No. 18/1997 of the council of ministers. According to this regulation, the EEPCO is mandated to engage in the business of producing, transmitting, distributing and selling electrical energy and to carry out any other activities that would enable it to achieve its stated objectives. EEPCO is executing agency for this project. As an implementing agency EEPCO shall have responsibility to carry out its development activities in the manner that will protect the Environment.

VII.8.6.1. Power system planning of EEPCo

The power system planning team of EEPCo is a Division where The Environmental and social experts are occupied in the environmental and social related matters particularly on the:

- Initial Environmental Examinations (IEE)
- Category II Environmental and Social Impact Assessment (ESIA)
- Evaluation of tender documents for selecting appropriate environmental consulting firms on behalf of EEPCo as deemed necessary.
- Monitoring of environmental and socio-economic including resettlement programs in the power development sector.
- Undertake ESIA review and represents EEPCo in all matters that are related to the environmental study of projects.

ETHIOPIAN ELECTRIC POWER CORPORATION PROCESS CENTERED ORGANIZATIONAL CHART



VII.9. Relevant Guideline

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

- EPA, 2000. Environmental Study Procedural Guidelines require all projects to be subject to an IEE to decide whether the project is to be submitted to full EIA.
- EPA, 2003. Environmental Impact Assessment Procedural Guidelines Series 1.
- Sectoral Guidelines for specific types of projects, e.g. water supply, dams and reservoirs, irrigation, hydropower, rangeland management, soil conservation.
- EPA, 2004. Guidelines to prepare environmental and social management plans.
- Guidelines on Hydropower Production, Transportation and Distribution.
- Guideline on ambient water quality of domestic, agricultural and industrial wastes
- EEPCo's environmental guideline.

VIII. ANALYSIS OF ALTERNATIVES

In terms of ESIA regulations, it is required to demonstrate that feasible alternatives for the project have been considered and evaluated in terms of social, biophysical, economic and technical factors.

Option 1(Do nothing option): From purely physical environment point of view, this option is preferable. Since it would avoid creation of adverse impacts associated with the project. However, the potential social and socio economic benefits to the nation as well as to towns and villages to be electrified in the near future would be foregone and the quality of life would remain at a low level. The long term development plans for the country would also be compromised and slowed down. This option also, will worsen the fuel wood consumption by further enhancing the clearing of the natural vegetation coverage of the area.

Option 2: the transmission line traverses mountainous and large forest covered areas .The areas are comparatively rich in its biodiversity resources and could also be affected severely due to the opening of ROWs.

The topography was also found very difficult to access even for construction purposes. It requires additional forest clearing to open up access roads for construction activities.

The proposed route also makes the project cost to elevate due to the increasing

number of bends and towers.

Option 3 (preferred option): The proposed Transmission line route comparatively affects less forest coverage areas and the biodiversity loss would be minimal. The route also avoids many settlements which other wise would cause more house holds to be affected. . It avoids Clearing of additional forest areas, dislocation of more house holds, interfering to further cultivated lands, etc.

The line route is also found much more preferred than opening another new line even from the economical and engineering points of view.

Therefore, from the environmental and socio economic points of view, option 3 is preferred as the best to implement the proposed project, given that the proper mitigation measures are undertaken in advance.

Technological alternative

From the technological application points of view, the project has selected a steel lattice type of towers with danger sign on it and the transformers with PCB free. According to the current trend of construction of high voltage transmission lines, the shield wire should be with Optical Fibers Core Ground Wire (OPGW) serving as shield of the line from lightning strikes as well as data communication between the substations and the load dispatch centre. Furthermore, the overhead transmission line is less expensive than the underground one during power line construction and failure. However, the underground cable construction has less danger of electrocution. From amongst many types of conductors, the factors governing the selection of the conductor are with low resistivity, high tensile strength, low cost and ease of availability.

There fore, from the technical view point, the selected materials for the construction of the proposed transmission line project makes also technologically and economically suitable.

IX. ANALYSIS OF THE EXISTING ENVIRONMENT

IX.1. Socio-economic Environment.

The proposed transmission lines will largely pass through the Regional states of Oromiya and Gambella. The line crosses a total of 4 Woredas, known as *Metu, Ale (Gore), Halu Bure,*

IX.1.1. Population and Demographic Characteristics.

The total population of the Woredas which the transmission line crosses (route length 150 km) is estimated about 381,000.

The average population density of the woredas crossing the proposed line route is about 47 persons per km ^{2}. . As compared to the other regions, the study areas are known as one of the least densely populated areas in the country.

According to the data obtained from the Woreda Administration Office the population growth on average is 2.9%. The national average's annual population growth rate is estimated to be 3 %. (*Source: national office of population)*

The average family size for all affected woredas is 6 which are more than the national averages, 4.8.

IX.1.2. Ethnic composition

The major ethnic groups from Metu to Bure are Oromo mixed with few other ethnic groups like Amhara, Guraghe, Tigre and others. After Bure, there comes Gambella Region and the Agnwak ethnic group dominates along the line and where the new substation is located.

IX.1.3. Settlement pattern, housing and household economy

The settlement pattern of the population is totally permanent type of settlement. Most of the population along the transmission line route is sedentary cultivators, supporting their livelihood from the traditional agricultural production.

The farming techniques they practice are still traditional type of cultivation system mainly of oxen ploughing.

The common annual crops grown in the project areas are Maize, sorghum, Teff, wheat and, Barely. Coffee is the dominant perennial crop growing widely in the areas.

There fore the farmers usually support their livelihood mainly from the sale of the coffee crop production comprising the annual crops' productions, animal husbandry and honey production.

IX.1.4. Social Services

Health and education are one of the fundamental social development indicators of a country. Getting health and educational services are part of human right, and with out which the economic development of a country becomes unimaginable.

The development of social services particularly, health and education, in all woredas are improving. The average health coverage along the whole route sections is about 82%.

Regarding educational services, about 87% of the people living along the entire route sections have access to primary school education.

IX.2. Physical Environment

IX.2.1. Topography

The topographic nature of the land where the 230 kV line suppose to cross is mostly consisting of undulating hills mixed with few plain areas when specially coming closer to Gambella. There are of course steep – sloped mountains with deep valleys prevailing in some areas. The route section especially crossing the Metu Zone of Oromiya Region is most characterized by undulating hills. The other 15 km route from the proposed new Gambella-**II** Substation to the existing Gambella-**I** Substation is however crossing almost plain areas. The elevation range is between 430.and 1760 m.a.s.l

IX.2.2. Climate

The climate within the routes of traverse varies. The annual temperature range is between 15 ^{o}c-40 ^{o}c.

The Precipitation in and around the project affected Woredas is the highest in Ethiopia, with rainfall spreading throughout the year. Total annual precipitation in these areas exceeds 1500mm.

IX.2.3. Geology and Soils

Its oldest rocks are granite and metamorphic rocks sated back the Precambrian period over 600 million years ago. During the period from the Eocene to Oligocene phase of the tertiary period, eruptions of basic basalt formed an expensive lava plateau. In the subsequent Pliocene phase, volcanic activity resumed covering the plateau with welded tuff. The majority of the proposed line route is fallen under the tertiary volcanic lava and rocks. It consists of alkali olivine basalt and tufts.

Soils in the study area are generally deep; however at some sites the soil is shallow. Soil is primarily fine textured with high clay content, although medium textured soil and gravel are mixed in some localities. They are classified in the order of Eutric Nitosol (Reddish-Brown Laterite), Chromic Vertisols alluvial soil, Utric Cambisols, Humic Cambisols, Mollic Leptosols.

IX.2.4. Drainage lines

There are two major rivers in the study area known as Baro and Birbir. The river Birbir flows to Baro River and Baro eventually joins the Blue Nile or *Abay River.*

The Transmission line traverses only the Baro River. The river is crossing Gambella town

and is rich in its fish resources. The local communities practice fishing widely as their major feed source. The river is also used as the major source of water for live stocks and wild animals.

IX.2.5. Land use

The major land use systems in the study areas are:

- Cultivated land
- Grazing land
- Forest land
- Cultivable land
- Others (settlement, infrastructures, water body, etc.)

Out of the total land coverage, the cultivated land occupies about 51%, which is the largest portion of the area as compared to the other land use systems. One of the reasons for the expansion of cultivated land is mainly due to the population pressure in most of the project area. (The average rate of population growth in the project area is about 2.9%).The average land holding size per family head reaches about 5ha. The grazing land constitutes about 6% which is the least coverage..

The forest land cover does not exceed 20 % of the total land use. It is at a decreasing rate due to the expansion of cultivated land in the area, the expansion of agricultural investments (e.g. the expansion of tea plantation in *Gumero* area) in the study areas. Forestlands with little human disturbance are found only in remote areas .Forestlands with easy access are in most cases cleared for expansion and search of new crop lands.

IX.3. Biological Environment

IX.3.1. Flora

Ethiopia possesses one of the richest assemblages of plants in the African continent. In this mountainous and geologically active territory, the afromontane habitats and Somali Masai savannas among others have combined to create a unique regional identity. The richness and endemicity of the floral biodiversity have been noted by many authors (*Firiis et.al.2001, thulin 2004 vivero 2003, and William et.al. 2004).*

The country has a wild flora of some 7000 *Taxa* (vivero et al 2005). Of which about 12 % are endemic. The tree flora consists of an estimated 1100 species (Demel et al .2000)
(Red list of endemic trees and shrubs of Ethiopia and Eritrea, by Jose Luse Vivero, Ensermu Kelbesa and Sebsebie Demmissew).

Ethiopia is also the center of origin for various crop species including *Arabica coffee*, *Teff, Enset* and sorghum in the past (Source: *state of environment report, Ethiopia, august 2003).*

Forest in the south western part of Ethiopia, including the study area, is characterized by

highland rain forest, the result from the relatively ample precipitation throughout the year. In general, forest in the study area is in a fair condition, comparing to forest in other regions. Nevertheless, closed high forests without any human disturbance are found only in remote mountainous areas. Forests with easy access are in most cases selectively felled for commercially valuable timber in the past, and /or the process of invasion at present by expanding farms including coffee planting in the forest.

The Indigenous flora that commonly found in the study areas are *Cordia africana, Podocarpus gracilior Croton machrostachyus Bersama abyssinica Milletia ferruginea ,Albizzia gummifera, Aningeria adolfi -Frederick ,Albizia grandibracteata .*

From Gore at 2000m at the western end of the south western highland to Gambella at only 450m, vegetation gradates from humid forests to semi-arid type. In particular, vegetation begins to manifest savanna as the elevation declines to below 100m, with the number of species noticeably decreasing dominant species in areas below 1000m are *Celtis gomphocephalla, Celtis integrifolia, and Acacia seyal.* Forests below 1000m are free from human disturbance, although burning is frequently practiced in forests near villages.

The larger portion of the stated indigenous tree species are most found in the protected forest areas. There are of course varieties of bush and shrub plant species on many parts of the project areas.

Species mostly planted are eucalyptus (Eucalyptus camaldulensis and E.saligna), and Cupressus lusitanica. Farmers plant eucalyptus species near their houses. They use the trees for construction and fire wood, and sell surplus logs in the markets for cash income.

IX.3.2. Fauna

The diversity of wild animals in the study area is low because of the decline of their natural habitat. However, according to the information from the woredas agricultural and rural development offices, some common wild animals like, hyena *(Crocuta crocuta), Monkey (Cereopithecus aethiopis), Duiker (Sylvi capra species), Guinea fawl, Wart hog (Phacochlerus aethiopicus), Fox (Otocyon megalotis),Colobus Monkey(Colobus Polykomos) Leopard(Panthera pardus)* and birds of different types were reported to exist in their respective areas .

X. SITE VISIT REPORT

From 24th June to 5th July 2010 a study team consisting of Environmental and Social experts from EEPCo's Power System Planning conducted the Field Assessment along the proposed 230 KV Transmission Line Route from the proposed 230 Kv Transmission Line Route from Metu- Gambella about 155 km of route length.

X.1. PUBLIC CONSULTATION AND DISCLOSURE

Public consultation and participation is a continuous process which identifies and discuss the key issues and impacts of the proposed project. Views from local residents, local leaders, surrounding institutions and development partners who in one way or another would be affected or have interest were sought through interviews and public meetings.

Public participation includes both the information exchange (dissemination and consultation) and collaborative forms of decision making and participation. Dissemination refers to transfer of information from Project Authorities to the affected population. While consultation generally refers to joint discussion between Project Authorities and the affected population serving as a linkage for transfer of information and sharing of ideas. Public participation is an ongoing process throughout the implementation of the project not an event. The level of information which is disseminated or the issues on which consultation takes place vary with the progress in the Project process.

During the field assessment, the team has made public consultation with the would be affected community house holds, elders and chair persons of *Gara Bechano and Kunde kebeles (peasant* Associations).The consultation also involves the Administrator of *Alle Woreda* and other local government representatives . The consultations were conducted in the Woreda's Administrator's Office on the following major issues:

- General description of the Project
- The existing bio physical environment and socio economic conditions,
- The potential negative and positive environmental and social impacts during construction, operation and maintenance phases.
- The possible mitigation measures to be taken especially on the compensation and expropriation procedures etc.
- Communities' attitude towards the project, etc.

On this basis, the team has confirmed that almost all the participants have commonly uttered their positive attitudes and good impressions on the project. They explained that the project would foster the national economy in general and the local investments and socio economic developments in particular.

The communities' representatives have also explained their keen interest as each of their villages and towns getting electric services in the future.

On the other hand, the communities have under lined that the government to perform proper compensation for their resources to be lost or damaged. They all agree that they would shift their existing houses off the corridor line and can build their houses on their own land holdings.

The study team has clearly explained in the meetings that EEPCo would pay prior and proper compensation for all their lost assets whether they are permanent or temporary as

per the National proclamations and Regulations including the expropriation of land holdings for public purpose and payment of compensation, No 455/2005 and No. 135/2007 respectively. (Please refer to Annex-II)

The team also explained about the impacts that most likely to be occurred during the construction and operation phases and discussed on the possible mitigations that is to be proposed for each impact.

X.2. Contacted offices

June 30, 2010.

The team has also conducted various discussions and meetings on similar issues with the Development sector offices at Federal, Regional and Zonal levels including the Ethiopian Wildlife Authority and the Natural History Society of Ethiopia and HIV/AIDS secretariats.

X.2.1. Ethiopian Wildlife Conservation Authority /EWCA/

It is a governmental institution, established in 1969 by proclamation number 65.

Human induced pressure on natural habitats is increasing, causing an unsustainable use of natural resources, overgrazing by a large livestock population, conversion of natural habitat and consequently fragmentation and isolation of remaining natural habitats and forests. It manages 13 national parks, wildlife reserves, sanctuaries, controlled hunting areas, forest priority areas in the country.

Positive Issues

- There are no legally or officially designated national parks, reserve areas or sanctuaries in the proposed linear project areas.
- EEPCo's current power generation and expansion works in the country are appreciable.
- EEPCo to consider the environmental and social issues at the feasibility, construction and operation stages of the project is also appreciated and makes the development environmentally sustainable and friendly.

Negative issue

- There may encounter some death accidents on predatory birds' due to collision in the operation phase, which may also result in power outages.
- In some parts of the project area, some wild animals like baboons will spend the night climbing up the tower which might expose them to electrocution.

Suggestions

- There are many types of transmission lines and telephone lines constructed side by side which causes unsightly condition. Therefore, if possible why not use one transmission line for different capacity power (66 kV, 132kV, 230 kV and 400 kV) transmission.

- Forests are habitat for wildlife and should be taken care during vegetation clearing of the ROW especially in the construction period.

- There should not be hunting of any wildlife by construction crews.

X.2.2. Ministry of Agriculture and Rural Development /MoARD/, Natural Resource Management

The Ministry of Agriculture and Rural Development /MoARD/ is a government institute working as federal regulatory body which will establish legal frameworks, providing guidance to the regional states and formulates policies, strategies, laws and standards, giving training as capacity building for staffs working in the Regional States, planning with the regional offices and finally monitor and evaluate its proper implementation and scale up good practices of different regions.

Positive Issues

- Along the proposed line route, there are no environmentally protected areas to be affected.

- EEPCo's effort to generate and expand electric power throughout the country is highly appreciated.

- Besides, the consideration of environmental issues during the feasibility and implementation stages of the project activities makes it sustainable and encouraging.

- The provision of electricity to the rural part of the country will help the Ministry to expand its development programs more assertively.

Negative issue

- There may encounter bird collisions with the power line which simultaneously may result in power outages.

- In some part of the project area, some wild animals like baboons will spend the night climbing up the tower and might expose them to electrocution.

Suggestions

- In as much as possible, efforts should be made to find for the best option that will reduce environmental impacts than only trying to reduce cost and find short distance transmission lines.

- Forests are habitat for wildlife and should be taken care of during vegetation clearing in the ROW during construction period.

- There should not be hunting of any wildlife by construction crews.

- As much as possible avoid routing through sensitive areas and re-vegetate disturbed sites.

X.2.3. IX. 4. Institute of Biodiversity Conservation and Research

Institute of Biodiversity Conservation and Research is a government institute working at federal level which will keep the country's biodiversity and undertakes research and collect indigenous tree seeds.

Positive Issues

- Along the entire route of the project, there is no protected area,

- EEPCo's current endeavor to generate and expand transmission lines throughout the country is one indication of development and is appreciable.

- Besides this, the consideration of environmental issues during the feasibility stage makes the development sustainable

Negative issue

- The clearing of the ROW will jeopardize the indigenous trees and will have an impact in reducing the number of endangered species.

- Much care should be taken while traversing through coffee forests of and core coffee sites that are used as gene banks.

- In some part of the project area, some wild animals like baboons will spend the night climbing up the tower which might expose them to electrocution.

Suggestions

- In as much as possible, efforts should be made to find for the best option that will reduce environmental impacts than only minimizing construction costs.

- Forests are habitat for wildlife and due care should be taken to avoid excessive clearing of forests during the formation of ROWs.

- As much as possible avoid routing through sensitive areas and re-vegetate disturbed sites.

X.2.4. IX. 5. Oromiya Forest and Wildlife Enterprise /OFWE/

The Oromiya Forest and Wildlife Enterprise (OFWE) is an autonomous public enterprise established with Registration Number 122/ 2009, issued by the Oromiya National Regional State council in July 2009. It is mandated to administer and sustainably manage regional forests, woodlands and wildlife conservation areas in Oromiya.

Positive Issues

- there are no priority areas to be adversely affected by the project,
- EEPCo's current endeavor to generate and expand transmission lines throughout the country is appreciable.
- Besides this, the consideration of environmental issues during the feasibility stage and during the implementation of the project activities is encouraging.

Negative issue

- There may be bird collision with the power line in the operation period and may cause death accidents especially on some predatory birds. The collision may also result in power outages.
- In some part of the project area, some wild animals like baboons will spend the night climbing up the tower which might expose them to electrocution.

Suggestions

- It is always important EEPCo to search for best options that will reduce adverse environmental impacts than only trying to reduce construction costs.
- Forests are habitat for wildlife and should be given due attention to avoid excessive clearing of vegetation the formation of ROWs.
- There should not be hunting of any wildlife by any construction crews.
- As much as possible avoid crossing sensitive areas and re-vegetate disturbed sites.

X.2.5. IX. 6. Environment and Coffee Forest Forum /ECFF/

The Ethiopian Coffee Forest Forum (CEFF) is a non-profit civil society association, established in November 2005. Its main goal is to save the world's last remaining wild Arabica Coffee populations and their habitat, the montane rainforests of Ethiopia. ECFF aims to combat deforestation and promote the conservation and sustainable use of coffee forests in Ethiopia.

There are some designated coffee forest areas protected as core, buffer and reserved areas in the south western part of Ethiopia especially around Jimma and Yayu forests.

There are no designated coffee forest areas protected as a core, buffer and reserved area especially where the proposed line is crossing.

Positive Issues

The following is a summary of the views of the officials interviewed:

- EEPCo's current endeavor to generate and expand transmission lines throughout the country is appreciable.
- The consideration of environmental issues during the feasibility stage and during the implementation of the project activities to make it sustainable is an encouraging attempt.
- All the coffee forest protected areas are confirmed safe. They are all located out of the proposed project area and will not be affected by the project.

Negative issues

- Few flora and fauna species may be affected especially during the opening of Rows

Suggestions

- Care should be taken for endangered fauna and flora species especially in the construction period.
- In as much as possible, efforts should be made to find for the best option that will reduce environmental impacts than only trying to reduce cost and find short distance transmission lines.
- Forests are habitat for wildlife and care should be taken to avoid excessive clearing of trees during the formation of ROWs.
- It is best to take any possible measures to avoid crossing sensitive areas.
- Plan to re-vegetate some highly disturbed sites specifically.

- EEPCo as a stakeholder should plan for watershed management with other stakeholders so that the lifespan of electric power dams would be prolonged.

X.2.6. Ethiopian Wildlife and Natural History Society /EWNHS/

The Ethiopian Wildlife and Natural History Society works to enhance the conservation and sustainable use of natural resources and protection of environment through awareness raising, education, research and advocacy. It is the first indigenous environmental NGO that was officially established in 1966 as a membership-based, non political, secular and not for profit environmental non governmental organization.

Positive Issues

The following is a summary of the views of the officials interviewed:

- In the entire route of the project, there is one protected area, named Metu- Gore-Tepi forests But will not be affected by the project.
- EEPCo's current endeavor to generate and expand transmission lines throughout the country is appreciable.
- Besides this, the consideration of environmental issues during the feasibility stage and during the implementation of the project activities makes it sustainable and is an encouraging attempt.
- The provision of electricity to the rural part of the country will enable the ministry to assign development agents which is a problem at present.

Negative issue

- There may encounter bird collisions due to the power line especially against the night active once. It may also cause death accidents particularly against predatory birds and which at the same time may result power outages.
- In some part of the project area, some wild animals like baboons will spend the night climbing up the tower which might expose them to electrocution.

Suggestions

- In as much as possible, efforts should be made to find for the best option that will reduce environmental impacts than only trying to reduce cost and find short distance transmission lines.
- Forests are habitat for wildlife and care should be taken to avoid excessive clearing of vegetation during the formation of ROWs.

- There should not be hunting of wildlife by construction crews.
- As much as possible avoid routing through sensitive areas and re-vegetate disturbed sites.
- Some device like balloons should be fixed on the cables that will help minimize bird collision.

X.3. Disclosure

The ESIA Report will be released through EEPCo's Public Relations Office and be posted in EEPCo's website.

The disclosure will be announced locally on the Ethiopian newspaper and copy of the ESIA Report will be distributed to all concerned Regional and woreda Administration Offices. AfDB also discloses this ESIA study electronically through its website prior to the processing of the project.

X.4. Synthesis of resources value

During the site visit, the Assessment team has also closely discussed with PAPs the kebele representatives and the Government Stakeholders (Woredas' Administration as well as Agricultural and Rural Development Offices) on the current value of major items expected to be affected during the project implementation .They have been asked about the current market values of the different items and gave their estimated price of each.

The following categories were established to standardize the values of each item.

Tin roofed Houses (wood plus mud walls)

1. Small 30 m^2
2. Medium 40 m^2
3. Large 60 m^2

Tukuls (wood plus mud walls with thatched roof)

1. Small 4m diameter
2 Medium 6m "
3 Large 10m "

Permanent crops

Coffee

1. Small 1 – 4 years old
2. Medium 4-8 years old
3. Large(Productive) >8 years old

Eucalyptus trees:

4. Small 1 – 8 years old
5. Medium 8-20 years old
6. Large > 20 years old

The above mentioned unit price were given based on the information collected from the affected people, Kebele representatives and elders during consultation.

The given prices however would be reviewed by the valuation committee to be established right before compensation implementation.

XI. ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Electric power transmission lines are linear facilities that may affect biophysical and socio economic environments including the cultural resources. As linear facilities, the impacts of transmission lines occur primarily within in the immediate vicinity of the right of way (ROW). The magnitude and significance of the impacts may increase, as the voltage of the line increases, because it requires larger supporting structures and wider ROWs.

The predicted impacts and their proposed mitigations are described in this report. The proposed mitigations are described in more details in the environmental management plan.

XI.1. Socio-economic Impacts

XI.1.1. Impacts on Residential Areas and Community Services

According to the line surveyor's report a total of 63 living houses belonging to 63 family heads were identified as to be affected by the formation of ROWs along the proposed transmission line route during the construction period. Of the total affected houses 24 (i.e. 38 %) are tin roofed houses and 29 (i.e. 62.8 %) are thatched roofed houses (Tukuls).

During the line survey no community services' structures or facilities were found to be affected by the project. Schools, health institutions, churches, mosques, and other major community services were made to be kept off the proposed Right Off Ways (ROWs) during the selection of route alignment.

Such impacts can be avoided or minimized by careful selection of ROWs. The line surveyors during alignment have taken all the possible measures to minimize the number of residential houses to be affected by the project.

For the houses and Tukuls to be affected, there will be paid due compensation as per the Rules and Regulations of the country. It has also been confirmed from the discussion with the communities especially with the PAPs, the kebele representatives and the local government administrators that they have enough places to relocate and re-build their own houses on their own land holdings.

A Typical house and Tukul to be affected b/n Metu & Gore

Table 1 - Affected Houses and Tukuls

Route section	Type of Houses	No. of Houses	No. and type of affected houses			Unit Price in Birr			Total cost in Birr		
			S	M	L	S	M	L	S	M	L
Metu-Bedele	Tin roofed	24	5	17	2	40,000	50,000	60,000	200,000	850,000	120,000
	Tukul	39	6	23	10	15,000	20,000	30,000	90,000	460,000	300,000
Total		**63**							**290,000**	**1,310,000**	**420,000**
Grand Total									**2,020,000**		

***Source**: Field assessment and surveyor's data*

XI.1.2. Impacts on Crop Production

The total cultivated land which the proposed line crosses or affects is about 450 ha of which about 93 % would be affected temporarily during the construction period .with the exception of few coffee trees, they are all the annual crops suppose to be affected temporarily during construction. The coffee trees due to be affected permanently by the occupation of the tower pads is quite insignificant. It covers only about 0.3 ha out of the total coffee coverage area of about 11,340 ha.

Similarly, there are some fruit trees (e.g. the Mango trees) that are expected to be affected permanently. They cover some 7% (i.e. about 30 ha) of the total affected cultivated land.

There fore, the costs for the temporary and permanent loss of crop productions would be about 5,059,000 and 7,200, 000 Birr respectively.

Generally the impact is still quite insignificant as compared to the total crop productions in the project area.

There are also numbers of eucalyptus trees that would be permanently affected, and is estimated about 6,356,250 Birr.

The farmers' seasonal agricultural activities may be disrupted by the construction activities. On farm crops may also be affected temporarily during the construction period. They can however be mitigated either by undertaking the construction works after the crops harvest or doing proper compensation payments for all damaged crops.

Table 2 - Affected perennial crops and estimated compensation cost

Route section	Route length km	Type of crop	Crop coverage in ha Matured	Production Qtl/Ha	Unit price/Q Birr	Total price in Birr	For gone Value (10 Years)
Metu-Gambella	150km	coffee	120	8	2000	1,920,000	1,920,000
		fruit trees	30	80	300	720,000	7,200,000
			150 ha				**9,120,000 Birr**

Table3 :- Estimated Compensation costs for loss of annual crops

Route section	Type of crop	Crop coverage in ha	Production Q / ha	Unit price /Qtl (birr)	Total cost in Birr
Metu-Gambella	maize	195	23	300	1,345,500
	Sorghum	72	22	200	1,598,400
	Teff	30	9	650	175,500
	Barley	1.8	15	500	13,500
	Wheat	1.2	13	450	7,020
	Total	**300ha**			**3,139,920**

Table 4 - Affected Eucalyptus trees and their costs

Route section (Locality)	Route Lengh (km)	Estimated coverage Eucalyptus		Number of Eucalyptus tree			Unit Price (Birr)			Total Cost (Birr)		
		%	Ha	S	M	L	S	M	L	S	M	L
Metu Gambella	150	6.7	40	30,000	60,000	10000	10	25	200	300,000	1,500,000	2,000,000
Grand Total Cost in Birr										**3,800,000**		

The above mentioned unit price were given based on the information collected from the affected people, Kebele representatives and elders during consultation.

The given prices however would be reviewed by the valuation committee to be established right before compensation implementation.

Affected Eucalyptus tree

XI.1.3. Impacts on Cultural, Historical and Archaeological Sites

The proposed transmission line project does not have any significant impacts on cultural and historical resources.

So far, there are no known historical and cultural sites to be crossed or affected by the line. Where there are any accidental “Chances of findings” of some archaeological artifacts on the line routes, the construction workers and surveyors shall report to EEPCo’s Power System Planning. The Power System Planning Head will then report to the Authority for Research and Conservation of Cultural Heritage (ARCCH) for further investigations.

XI.1.4. Impacts on Health and Safety

XI.1.4.1. Dust Emission

During the construction period, the construction works and traffic increase may cause temporary and limited dust pollution and may sometimes result respiratory problem on construction workers and local communities. The impact of dust can be limited through taking proper dust abatement measures like watering of roads and control of traffic speed limits. The contractors will be required to incorporate the issue in to the management plan and submit with their contract proposals.

XI.1.4.2. Noise

The noise pollution due to the construction of the transmission line and access road is temporary and limited. According to the banks standard the limited value should not exceed 55 dB in the day time and 45 dB in the night time. However, if it is found beyond the stated limits, it can be minimized by adopting appropriate mitigation measures such as the provision and use of proper hearing equipment for construction workers. The working time should be limited in order not to affect the local communities in the vicinities.

XI.1.4.3. Sexually Transmitted Infections (STIs)

The major impacts on health and safety are related to the work force engaged in the construction and operation of the transmission line.

Communicable diseases like sexually transmitted infections (e.g. HIV/AIDS, Hepatitis, etc) and malaria can be spread around and in the construction areas.

The influx of labor to the construction areas and their interaction with the local community members can cause tensions and opportunities for the spread of communicable diseases in the area.

The mitigation plan will take an aggressive approach to control the spread of STIs, health education programs, control of informal sector activities near the project site.

Even with the most vigorous campaign and safe guards an increase in STIs resulting from the project is inevitable. Therefore systematic blood testing like voluntary counseling and testing VCT practice in the project area is quite necessary so as to keep the cases minimal. The blood testing must be used merely for information purposes and not to be used to dismiss infected employees.

XI.1.4.4. Other Infectious Diseases

Some diseases like intestinal cases, hepatitis, respiratory cases, and respiratory cases including TB case may occur in situations where a large work force is not provided with proper sanitary and work place facilities.

Therefore, construction camps shall be maintained in a clean and healthy condition as prescribed by international standards.

XI.1.4.5. Public Safety

Public safety will not be a significant problem, since residents within the ROW will be relocated.

Heavy vehicles' movement during the project construction may cause road accidents, mainly on local residents who are not accustomed to heavy traffic and heavy tacks and vehicles.

During the construction period, some work accidents (e.g., fall from above, hit by object, car accidents, etc) may occur mainly due to lack of safety precautions. There fore, the contractors should regularly provide adequate safety equipment and orientation to their employees.

Project related vehicles will be required to abide by good driving conducts, obey speed limits and follow the rules of safe driving.

During operation, impacts are related mainly with electrocutions and possible induce effects from Electromagnetic Fields (EMF).

The placement of low slung lines or lines near human activities (e.g. high ways, buildings) also increases the risk of electrocutions. Therefore the lines should be checked regularly, whether or not they are at low slung, so that immediate measures would be taken on time to avoid the risks on high ways and residential places.

Towers and transmission lines may disrupt air plane flight paths in and near airports and endanger low flying air craft. However it is proved that no air port or land strips that would be affected by the transmission line during operation period.

Safety orientations in schools along the transmission line will further minimize impacts on the local community.

XI.1.4.6. Hazards/ Risks

The impact might affect human health and the natural environment and the reasonable

project scenarios (cause and effect) that might result in damage to health, the environment or the financial viability of the project.

The risks expected from the transmission line projects are spill of chemicals (used oil and lubricants), and unsafe working condition during construction (fall from above, hit by objects, etc); children /herders might climb up the tower and be exposed to electrocution; towers and transmission lines might cause aircraft hazard especially on those low flying aircrafts and accidents /incidents might arise due to increased traffic during transporting of materials and personnel.

XI.1.4.7. Electro Magnetic Fields (EMF)

Electromagnetic fields (EMF) are invisible lines of force that surround any electrical device. Power transmission lines, electrical wiring and electrical equipment all produce EMF. Electric fields are produced by voltage and increase in strength as the voltage increases.

Electric fields are shielded or weakened by materials that conduct electricity – even materials that conduct poorly, including trees, buildings and human skin. Magnetic fields, however, pass through most materials and are therefore more difficult to shield. However, both electric fields and magnetic fields decrease rapidly as the distance from the source increases.

As a precautionary measure, EEPCo already adopted internationally accepted standard ROW width of 40 meters along its high voltage transmission lines. All habitation and structure are exclude from the ROW to ensure safety of people and animals from EMF's produced as well as from direct electric shocks and 'flash over'. With respect to substations, in general, the strongest EMF around and out side of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment with in the substation, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from back ground levels. (http://www. Niehs. Nih.gov/emfrapid).

Based on a recent in depth review of extensive scientific literature (world health organizations international EMF project), the WHO has concluded that "despite extensive research to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health "(http://www.who intpeh.emf./what is EMF/en.htm). The low levels referred to by the WHO are levels expected to be found out side of 50 meters ROW proposed for the 400 kV transmission line of Gibe III- Sodo Project. It is therefore, concluded that there will not be any adverse health impact to people along the route provided the proposed 50 meters ROW is enforced along the proposed transmission line route.

It should be noted that there is a concern for homes, schools and public recreational facilities including playing grounds located near the high voltage transmission line.

Playing ground and schools especially located near electrical components with high magnetic fields are a concern because the developing child is at a greater danger of biological effects from magnetic field exposure than an adult would be. (http://brain101.inf/EMF.php).

XI.1.4.8. Effects of Polychlorinated Biphenyls (PCBs)

PCBs are a mixture of individual chemicals which are no longer produced in the United States and in most European countries by 1980 but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are also known to cause cancer in animals.

Polychlorinated biphenyls (PCBs)

PCBs are mixture of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. PCBs have no known smell or taste.

PCBs have been used as coolants and lubricants in transformers, capacitors and other electrical equipments because they don't burn easily and are good insulators. The manufacturing of PCBs was stopped in the US in 1997 because of evidence they build up in the environment and can cause harmful health effect. (http://www.atddr.cdc.gov/tfacts17.hm bookmark02).

The Stockholm convention is a global treaty which Ethiopia has signed and ratified to protect human health and the environment from persistent organic pollutant (POPs) which PCBs are one of them.

For the proposed new substation they would install new PCBs free transformers, capacitors and other electrical equipments.

As per the convention most companies or manufacturers have stopped manufacturing PCBs contain transformers and capacitors.

Most transformers and capacitors manufactured after 1980s are said to have not contained PCBs.

EEPCo in cooperation with the Federal Environmental Protection Authority (EPA) already has undertaken preliminary inventory of all equipments to identify the presence of PCBs. Following the completion of the inventory, EEPCo will develop a program for the safe removal and disposal of any PCBs found in accordance with convention to which it is signatory.

XI.1.4.9. Gender Issues and Vulnerable Groups

Women comprise disproportionately large number of the poor in most countries due to gender discrimination. The situation limits the women to have an access to resources, opportunities, and public services necessary to improve the standard of living for themselves and their families.

In the project affected areas, women are subject to early marriage, abduction etc. as a result, women school dropout is high and the literacy rate of women is decreasing.

The low level of education and training among women limit the chance to hire in formal employments. According to the information obtained from each woreda administration offices the number of women employed in government and non government organization is less than men.

Due to the above mentioned problems women's economic activities are confined to the household management and agricultural production and selling of products. Economically they are dependent upon men. As a result, they have no right to decide on economic and social issues in the family. Therefore, the economic, social and political position of women in the project affected area is very weak.

Women have a burden of work. They are responsible for all domestic chores, food preparation, child rearing and collecting fire wood and water for drinking and cooking. In addition to these works, land preparation, planting and weeding is the responsibility of women. They work at least 16 hours a day.

Women are very interested on the proposed project than other social groups because they are more beneficiaries from the opportunities provided through the proposed project. The availability of electricity would help to improve the existing infrastructures and services to a level to provide adequate services to the communities. Especially the burden of women will be reduced because of improved infrastructures and social services (health, education, flour mills,) accessible to them. They may not need to go long distance for seeking flour mills, collecting fire wood, fetching water for drinking and cooking etc.

The availability of electricity in the project area also helps to encourage investments in different economic sector so women can have opportunity to get employments, participate in micro businesses, selling foods, etc. This may help to increase their income.

Women tend to rely more heavily than men do on informal support networks, such as the help of friends, neighbors, or relatives for child care. Break down of these net works due to dislocation may affect women than men.

Vulnerable groups can include households headed by women, households victimized by HIV/AIDS that are headed by children, households made up of the aged or handicapped whose members are socially stigmatized (as a result of traditional or cultural bias) and economically marginalized.

Special assistance to be rendered to vulnerable groups may consist of the following:

- Provision for separate and confidential consultation.
- Priority in site selection in the host areas.
- Relocation near to kin and former neighbors.
- Assistance with dismantling salvageable materials from their original home.
- Priority access to all other mitigation and development assistance

Women with children also have less physical mobility to travel to find ways of earning a livelihood. For these reasons, efforts to maintain the social continuity of communities affected by a project whether through the physical design of new sites, measures to prevent the disintegration of the community or the provision of specialized social services at those sites are important.

During the field survey, there observed some 7 (seven) female headed house holds due to be affected by the project since they are identified as located with in the proposed Corridor or ROWs. As a result, their houses and *tukuls* are going to be fully affected; some of their crops (be it annual or permanent) would also be affected by the project. There fore In order to compensate for all their lost items a special and prior attention shall be given beginning from the proper count and valuation of their lost assets to the final payments of compensation, construction of their new houses, and assist in moving their movable properties to their new houses. Similar measures shall also be taken for the aged, disabled; children headed HIV/AIDS victims etc.

During implementation, the monitoring team will ensure they are all properly compensated.

XI.1.4.10. Substance Abuse

Number of construction workforce especially young living away from their families with relatively stable wages and ideal time with few recreational pursuits and no domestic responsibilities can often lead to the over indulgence with alcohol. This may lead to abuse, fighting and injury, particularly if women are involved. Regarding men living around the construction area and working in the project construction may return home in an inebriated state and abuse and injure family members.

Therefore, the problem of alcohol abuse must be explained to workers as part of health education program.

Recreational areas need to be available at the camp and additional activities to be a normal of camp living. Severe penalties for drunkenness and disorderly behaviors must be

given out along with the provision of counseling services for substance abuse.

XI.2. Impacts on Physical Environment

XI.2.1. Impacts on Land Use

The proposed 230 kV Transmission Line Project of Metu- Gambella has a total of about 150 km route length and will have impacts on the existing land use both temporarily and permanently. They would be affected during the construction of the lines, erection of tower pads, and construction of access roads, etc.

The Transmission Line would totally cover about 150 km route length with a free corridor of 40 meters Right of Ways (Rows). The tower pads to be erected are expected to occupy about 36 m^2 each.

The total number of towers assumed to be erected is about 430 with an average span of 350 meters.

Some 7% (i.e. 10 km) increment has also been made for the construction of access roads thus about 6 ha of land would be affected due to the construction of access roads.

On the other hand, about 4ha of land are permanently occupied by the Tower Pads.

Totally about 606 ha of land would be affected due to the formation of ROW, construction of substation and access roads.

Table 5**:- Affected land coverage along the transmission line and due to access roads**

Rout sections	**Length (km)**	**No. of towers**	**Permanently affected (ha)**	**Temporarily affected (ha)**	**Total affected area(ha)**
Metu- Gambella	150	430	120	480	600
Access road construction	10			6	6
Total	**160**	**430**	**120**	**486**	**606**

Table 6 :- Affected land uses

Land use	**Affected area)**	
	ha	**%**
Cultivated land	260	44
Grazing land	32	5

Cultivable land	108	18
Uncultivable land	12	2
Forest land	120	20
others	68	11
Total	**600**	**100%**

In the whole Woredas, the type of land use that most to be affected by the proposed transmission line is the cultivated land. It constitutes about 44 %. .

The transmission line and the access roads may possibly open up access to remote lands for settlement, crop cultivation, hunting practice etc.

XI.2.2. Impacts on Soil

In Ethiopia up to 400 tons of fertile soil per hectare are lost annually from areas with little vegetation coverage and no effective soil conservation practices.

During the erection of tower pads and access road construction, there will be clearing of vegetation and excavation works which may lead the top soil to be threatened by wind and water erosion. The machineries used during the construction period may also cause soil erosion.

The topographic condition of the specific project areas is hilly and highly sensitive to erosion. The risk of erosion would be higher where there is an increase in land slope .The emergence of erosion may cause the increase of sedimentation load and deterioration of quality of streams nearby.

Therefore, during the design and construction of access roads, new camp sites and erection of towers, there should have a conservation plan for the proper management and control of significant soil erosion problems.

XI.2.3. Impacts on Air Quality

The project would have short term adverse impact on air quality due to dust and smoke release from machineries involved especially in the clearing of ROWs and access road construction.

XI.3. Impacts on Biological Environment

XI.3.1. Flora

There would be some clearing of trees, shrubs and bushes during the construction period which may negatively affect the genetic resources in the project area. Clearing of trees and bushes may also cause habitat loss as well as favors the expansion of alien invasive species in the study area.

During the construction period, forest encroachment may also increase in the project area due to the opening of new access roads to the natural vegetation in addition to the clearance of the ROWs.

In general, the natural vegetation coverage along the proposed line route is fair and comparatively better than other regions. Even though all possible measures were taken during the selection of routes to minimize the impacts, there still require taking considerable measures to protect against further encroachment and unnecessary forest clearing by the construction work forces. Besides, it is still very important to carry out re-forestation activities on disturbed and open areas to maintain the ecosystem and mitigate the lost woody biomass.

XI.3.2. Fauna

During the team's field assessment, it is confirmed that the areas along the proposed line route currently do not have significant wild life resources in the area with the exception of few and sparsely populated wild animals. This is because of habitat loss, environmental degradation (e. g. deforestation, etc.), expansion of cultivated lands, etc. However some wild animals may be still affected during the construction period. Some of their shelters would be disturbed and forced to evacuate or exposed to illegal hunting.

During the assessment no endangered or endemic wild animals were observed living in the proposed corridor line.

XI.3.3. Impacts on Birds

Large predatory birds including night active birds are the ones most affected by HVTL. They usually are killed by electrocution and through flying into the wires at high speeds.

There should also be given particular attention for migrant birds that most affected by high voltage transmission lines (HVTL). Various migratory birds considered endangered at international level also visit fifty sites in Ethiopia every year.

The south –western forests of Ethiopia are generally recognized as being less rich in avifaunal diversity than the country's bush land habitats, in terms of both abundance and variety of species.

In the study areas, there are no known migratory bird routes so far.

According to the *Ethiopian Wild life and Natural History Society*, there are 69 sites so far

registered as important bird areas (IBAs) in Ethiopia), of which the Metu- Gore – Tepi forests is known as one of the important bird areas.The ecosystem of the identified bird area however do not support any known migratory birds and will not pose any bird collision against the power line during operation phase.

XI.3.4. Impacts on National Parks and Reserve Area

There is a Wild life National Park in Gambella Region known as the Gambella National park which is located in the south of Gambella town between the Baro and Gilo rivers and is the largest area in Ethiopia to be designated as a national park. The centre of the park, Abobo is 82 km south of Gambella town with the northern boundary only about 15 km south of Gambella.

However, the proposed Transmission Line Project is confirmed far from the national park and would not pose any adverse impacts either in the construction or operation phases.

XI.3.5. Impacts on biodiversity

The topography and diverse climatic conditions of Ethiopia have led to the emergence of habitats that are suitable for the evolution and survival of various plant and animal species. As a result, the country is in one of the biodiversity rich parts of the world. Owing to the long history of agriculture coupled with the diversity of the environment, Ethiopia is one of the 12 Vavilov centers of crop genetic diversity.

The Ethiopian flora is estimated to contain nearly 7000 species of higher plants , of which about 12 percent are endemic, . the vegetation types with the highest proportion of endemics are the woodlands , followed by the Afro alpine and Sub-afro alpine.

Ethiopia is also the center of origin for various crop species including Arabica coffee, Teff, Niger seed or Noug (*Guizotia abyssinica*) Enset (*Ensete ventricosum*), and sorghum in part. The other crop species that have high genetic diversity in the county are barley, wheat, faba bean, field pea, lentil, linseed, and sesame. In addition, there are various wild plants that are used by communities for various purposes, including medicinal use.
(Source: State of Environment Report for Ethiopia, Environmental Protection Authority, August, 2003 Addis Ababa, Ethiopia)

According to the Ethiopian Coffee Forest Forum (ECFF), there is one Biosphere Core Area named the Yayu Coffee Forest Biosphere Reserve located in south western part of Ethiopia in Oromiya Regional state. It is one of the countries major core areas for the conservation and use of the wild population of *Coffea arabica*. The area however is already confirmed that it is completely out of the project area and will not be affected by the project since it is specifically located in between Bedele and Metu.

XII. SYNTHESIS OF ENVIRONMENTAL IMPACT

The possible negative and positive impacts predicted were classified as *very important, more important, important, fair important, and less important.* They are seen in the environmental matrix table below.

The impacts identified are also discussed in the matrix table.

Table 7 - Synthesis of Environmental Impact Matrix

No	Environment components	Pre-construction phase		Construction stage activity components				Operation phase		
		Line route survey	Land Acquisition	Equipment and material mobilization	Tree cutting &corridor free	Foundation tower erection and stringing	Access roads construction	Induction influence	Electromagnetic Wave effluence	Radio interference
I	Social -economic Env.									
	▪ Residential areas	0	c	0	C	d	0	0	0	E
	▪ Income	0	C	E	D	E	e	0	0	0
	▪ Cultural and historical sites	0	0	0	0	0	0	0		
	▪ Health & safety								0	0
	▪ Quit daily life	0	0	e	d	d	0	0	e	0
	▪ Society unrest	0	0	d	d	d	e	e	e	0
		0	E	0	0	0	e	0	0	e
II	Physical-Environment									
	▪ Soil	0	0	E	D	C	c	0	0	0
	▪ Air quality	0	0	E	e	0	e	0	0	0
	▪ Land use	0	0	c	e	d	e	0	0	0
III	Biological Environment									
	▪ Flora									
	▪ Fauna	E	0	E	d	e	C	0	0	e
	▪ Parks and reserves	e	0	E	d	e	E	0	0	e
		0	0	0	0	0	0	0	0	0

Positive Impact
A=Very important
B=More Important
D=Fair Important
E=Less Important
C=Important

Negative Impact
a=Very important
b=More Important
c=Important
d=Fair Important
e=Less Important

O=**No important**

XIII. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

XIII.1. General

The environmental management plan is concerned with implementation of the recommended mitigations necessary to avoid, minimize or offset adverse impacts and enhance positive impacts.

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 and constructed and functions efficiently throughout its life .

XIII.2. Institutional Arrangement

The implementation responsibility of the EMP rests on EEPCo or EEPCo's contracted representatives unless noted other wise.

To a considerable degree, construction contractors will be responsible for implementing mitigation measures but the ultimate responsibility to ensure the proposed mitigation measures are taken properly is of EEPCo.

The Federal Environmental Protection Authority (EPA) will oversea all the environmental activities related to the project.

The office of agricultural and rural development, health departments and other stake holders will be involved with their specific responsibilities in the environmental and socio economic activities.

Their responsibilities are exercised in the different stages, pre- construction, construction, and operation and maintenance phases.

XIII.3. Pre-construction Phase

Prior to contractors' mobilization and commencement of construction, environmental management will be concerned with the following principal activities:

- Ensure that all government and funding agency's requirements and procedures relating to ESIA are complied with.

- Ensure environmental and social considerations have been given due consideration and the major clauses are incorporated in the contract document.

- Implementation of compensation payments and land or property acquisitions.

As a proponent, EEPCo will be responsible for submitting the ESIA report to the authorized EPA for their evaluation and their comment.

XIII.4. Construction Phase

Most of the environmental management activities would be carried out during the construction phase. Because most of the impacts are expected to be occurred at this stage.

Most of the impacts to be occurred in the construction phase can be reduced or avoided through the application of sound construction guidelines.

Management is much concerned with controlling impacts that may result from the action of the contractor, through enforcement of the construction contract clauses related to protection of the environment as a whole and of the components within it.

It is important to recognize that successful mitigations can only be achieved if the environmental protection measures, as set out in the construction contract are properly enforced.

XIII.5. Operation Phase

Environmental management and monitoring at this stage will be the responsibility of the power system planning of EEPCo, with the implementation being carried out either by its own professionals or by contractors. The environmental and social experts of EEPCo are expected to take on a general overall advisory role during the operational phase.

XIII.6. Socio- economic Impacts

XIII.6.1. Compensation

EEPCo is fully committed to prepare RAP and pay full compensation for each lost items (houses, Tukuls and other properties) as per the Federal Proclamation No 455/2005. The compensation shall be completed before the commencement of the construction activities.

For the successful compensation implementation, there will be a property valuation committee designated by the woreda's administration of the specific project areas. The committee would consist of different experts with relevant qualifications to value the properties thereon.

The affected households and their family members would be adequately compensated considering the assets and opportunities they leave behind and expenses that are required for the support of their livelihood.

The scheme would be fully backed by appropriate technical and administration supports.

XIII.6.2. Impacts on Residential Places and Community Services

Impacts on residential place and community services can be avoided or minimized by careful selection of ROWs. However, the number of houses still to be affected is about 63.

The line surveying team during the route alignment takes all possible measures to minimize the number of residential houses and tukuls to be affected by the project.

We have also got confirmation from the line surveyors that during the final route survey period , they will take due care to minimize the impacts on residential houses in as much as possible to be even much less than the number indicated above.

To avoid any visual impacts on churches, mosques, graveyards, schools and health institutions, it was given special attention during the line survey that none of them would be affected by the transmission line construction and operation activities. They are already made to be kept off the corridor line.

For the residential houses and tukuls to be affected, there will be paid proper compensation for each household to be affected right before the commencement of the construction works.

The project affected households fully agreed and accepted to remove their existing houses and tukuls from the ROWs (corridor line) and rebuild their new ones by themselves on their own land holdings, as soon as they get due compensation payments.

XIII.6.3. Health and Safety

XIII.6.3.1. Safety

The contractor is responsible to organize on site environmental management and safety trainings for its construction work forces at least one month prior to the commencement of the construction. The Environmental and Social Experts of Power System Planning of EEPCo will supervise and monitor the activities.

The contractor during the construction period should regularly provide adequate safety equipments and orientation to its employees.

The contractor and sub – contractors throughout the construction period will be required to use appropriate vehicles and comply legal gross vehicle and axle load limits. They are also required to repair damages at own expense.

The contractor should minimize road safety hazards and inconvenience to other road users by taking all appropriate measures during the construction period.

Public safety may not be a significant problem since residents with ROW area will be relocated.

The transmission line would be regularly checked whether or not they are at low slung so that prompt action would be taken on time.

During operational phase safety orientation in schools along the transmission line will further minimize impacts on the local communities.

XIII.6.3.2. Hazardous Materials

During the construction of substations and line construction, the contractor shall comply the following:

- Safely handles and stores hazardous materials
- Seek directions from the engineer for disposal of hazardous material
- Clean up spills of hazardous materials immediately
- Suppress fires on or adjacent to construction or ancillary sites
- In case of spill of hazardous materials, relevant departments will be informed at once and deal with it in accordance with the spill contingency plan.

XIII.6.3.3. PCBs Chemicals

- Strict procedures would be followed to order the companies and import PCBs free transformers, capacitors, and other electrical equipments
- For the proposed new substations there would install new PCBs free transformers, capacitors, and other electrical equipments.
- As per the Stockholm convention, most companies or manufacturers have already stopped manufacturing PCBs containing transformers and capacitors especially.

XIII.6.3.4. Health

XIII.6.3.4.1. Dust Nuisance

Heavy trucks and other vehicles delivering materials shall be covered to reduce spills and dust blowing off the load through out the alignment during the construction period.

Watering of roads and control of traffic speed limit will be done by the contractor to minimize dust arising from access roads during the construction period.

XIII.6.3.4.2. Noise

During the construction period workers in the vicinity of strong noise will wear ear plugs.

Machines and vehicles will be maintained to keep noise at a minimum.

XIII.6.3.4.3. Sexually Transmitted Infections (STIs)

There should be an aggressive approach to fight against STIs including HIV/AIDS.

Health education would be provided to the construction work force and local communities nearby during construction period.

The local administration should play vital role in controlling informal sector activities near the project camps and construction sites.

The contractor is expected to provide condoms to construction employees during construction period.

XIII.6.3.4.4. Other Infectious Diseases

The contractor should comply the following during construction period:

- The contractor should use above water table pit latrines at major construction site.
- Provide and maintain proper drinking water.
- Workers health check-up and sewage and disposal facilities at camp.
- Camps shall be located away from water source (at least 100 meters away from).
- Sufficient measures would be taken by the contractor in the construction camps like provision of garbage tanks and sanitation facilities including septic tank and soak away pits
- Waste from septic tanks will be cleaned periodically.
- Garbage will be collected in covered bins and disposed off daily.
- Make certain that there is a good drainage to avoid creation of stagnant water bodies including water in old tires as insect breeding areas.
- Provide adequate sanitation and waste disposal at construction camps.

- Provide adequate health care facilities for workers.
- Comprehensive occupational health standards established by the government would be followed by the contractor.

XIII.7. Bio-physical Environment

XIII.7.1. Vegetation Clearance

During the construction period:

- Vegetation clearance shall be undertaken once consent to clear strip plantation /individual trees along the alignment has been obtained from each owner.
- Instruct all construction workers to restrict clearing to the marked areas and not to harvest any forest products for personal consumption.
- Ensure that all clearing is undertaken with minimal disturbance to the surrounding environment within the extent of approved sites only.

XIII.7.2. Protection of Vegetation

Prior to commencing the construction activities the contractor would:

- Identify vegetation that will need to be removed / protected.
- Remove identified trees in such a way as to minimize damage to surrounding vegetation.
- Ensure the construction crew is aware of the remaining vegetation must not be touched or damaged.

XIII.7.3. Erosion Control Measures

- Prior to the commencement of vegetation clearing, the contractor should clearly mark the areas to be cleared. No clearing of vegetation shall be done outside of these areas.
- Ensure re-vegetation at all work sites at the earliest time and select tree species suitable for soil conservation purposes immediately following the construction works.
- Following the completion of works the contractor shall prepare areas for rehabilitation by re-vegetation. It is preferred to engage local communities to plant different trees.

XIII.7.4. Water Pollution

During construction period the contractor shall train work crews in safe handling of petro-chemicals.

XIII.7.5. Waste Management

During the construction period and site clean up, the contractor would:

- Remove disabled equipment including machineries from the area.
- Crush burn and bury all inorganic solid wastes in an approved disposal area only.
- Contain all solid wastes at designated location with in construction sites only.

XIII.7.6. Reinstatement of Services

- The contractor would take all inventories of all services to be reinstated prior to interruption of any services.
- Maintain or provide temporary services during construction including temporary water supply.
- Progressively reinstate or repair all interrupted services to their previous position.
- The engineer would inspect and certify the adequate reinstatement of services.
- The contractor shall fill excavated sites with appropriate fill and finally covered with reserved top soil.

XIII.7.7. Loss of Trees

During the clearing operation the contractor should avoid tree clearing outside of ROWs beyond what is required for construction activities.

The contractor after completion of its construction works shall re-vegetate areas that have been cleared for temporary works according to a re-vegetation action plan.

XIII.7.8. Re-vegetation

After completion of every 10 km of ROW the contractor should:

- Progressively sow all disturbed construction and ancillary site surfaces with a cover crop mix.

- Progressively implement re-vegetation works commencing in the correct planting season.

- EMU of EEPCo will monitor the effectiveness of re-vegetation measure possibly in every six months for two years

- EMU of EEPCo will monitor the effectiveness of re-vegetation measure possibly in every six months for two years.

Environmental Management Plan table

Environmental Impact Issues	Mitigation Measures	Location	Timing	Responsible Organization	
				Implementation	Supervision Monitoring
Pre-Construction Stage					
Land and Building acquisition	Complete all necessary land and building acquisition in accordance with the commencement of any construction works. Provide copies of land acquisition details to the engineers and contractor.	Alignment of impact Throughout ROW	Before the commencement of construction Before the commencement of construction	EEPCo EEPCo	EEPCo Engineer
Safety orientation	Provide a list of affected property owners to the contractor. Organize environmental management and safety training. All contractors and supervising consultant field supervisors shall attend the training.	Throughout ROW On site	Before the commencement of construction At list one month prior to commencement of construction	EEPCo Supervision consultant contractor	EEPCo EEPCo

Construction Stage					
Vegetation clearance	Inspect and approve all correctly located and pegged clearing sites. Vegetation clearance shall only be undertaken once consent to clear strip plantation. Individual trees along the aliment have been obtained from each owner. Instruct all construction workers to restrict clearing to the marked areas and not harvest any forest products for personal consumption. Ensure that all clearing is under- taken with minimal disturbance to the surrounding environment, within the extent of approved sites only.	Throughout ROW Throughout ROW	Before clearing of the vegetation along a section of the road. Before clearing the vegetation along ROW.	Engineer Contractor	EEPCo Engineer

Erosion	Clearly mark the areas to be cleared of vegetation before clearing commences. No clearing of vegetation shall occur out side of these areas. Whenever possible avoid clearing construction areas, access trucks and construction camps on steep slopes / productive agricultural land. Following completion of works, prepare areas for rehabilitation by re-vegetation or engage local community to plant vegetation. Ensure topsoil is left in a non compacted condition following completion of works. Ensure re-vegetation at the earliest time Following completion of woks prepare areas for rehabilitation by re-vegetation or engage local community to plant vegetation.	Each 1 km of the road All project areas At all work sites At all work sites At all work sites At all work sites	Prior to commencement of vegetation clearing Prior to commencement of construction Immediately following completion of works Immediately following completion of works Immediately following completion of works Immediately following completion of works	Contractor Contractor Contractor Contractor Contractor Contractor	Engineer Engineer Engineer Engineer Engineer Engineer

Water Pollution	Ensure that potential sources of petro-chemical pollution are handled in such a way to reduce chemical spills and leaks. Train work crews in safe handling of petro- chemicals. Minimize soil sedimentation as out lined under sediment control	Through out alignment	Prior to commencement of construction	Contractor	Engineer

Waste management	Contain all solid wastes at designated location within construction sites. Crush burn and bury all inorganic solid waste in an approved disposal area. Remove disabled equipment, including machinery from the area. Use above water table pit latrines at major construction sites. Compost all green or biodegradable waste.		Through out construction Through out construction Throughout construction Throughout construction Throughout construction	Contractor Contractor Contractor Contractor Contractor	Engineer Engineer /supervisor Engineer /supervisor Engineer /supervisor Engineer /supervisor
Noise	Use well maintained equipment (with mufflers where appropriate) Use noise screens or mounds near residences, schools and health centers. Carry out noisy construction activities during day light Advise local people when there will be unusually high levels of noise	Through out alignment	Through out construction period	Contractor	Engineer

Protection of sensitive environmental areas	Identify natural areas on site plans, especially environmentally sensitive or ecologically fragile areas. Locate construction sites/activities away from sensitive areas. Provide training to construction teams to ensure an understanding of the requirements regarding environmental protection of sites.	Through out alignment	Prior to commencement of works Through out construction	Contractor	Engineer
Protection of vegetation	Identify vegetation that will need to be removed /protected. Remove identified trees in such a way as to minimize damage to surrounding vegetation Ensure the construction crew is aware remaining vegetation must not be touched or damaged.	Through out alignment	During site preparation Prior to construction Prior to commencement of construction	Contractor	Engineer
Workers' Camp	Contractor to prepare for approval detailed site environmental plans for the base camps and other work sites, which make adequate provision for safe disposal of all wastes and prevention of spillages and leakages of polluting materials etc. Contractor to be required to pay all costs associated with clearing up any pollution caused by his activities and to pay full compensation to those affected. If necessary solid waste from the camp shall be disposed off in a sanitary landfill.	Before construction starts Post use of the site Camp site	Throughout construction Throughout construction	Contractor Contractor	Engineer Engineer

Archaeological sites	Fence off archeological sites, if any sighted /uncovered during works and report it to the appropriate authority.	At all project sites	Prior to the commencement of works and throughout construction	Contractor	Engineer
Socio-environmental issues	Advise the local community of project plans in advance of construction and involve them in the site construction planning process. Identify cultural sensitive areas and avoid disturbing them. Control run-off and manage sediment near residential areas. Arrange for local people to be employed and trained. Include women, poor and vulnerable groups in the implementation of the project activities. Negotiate and agree with community about disposal areas and stockpiles sites.	For the whole project At all project sites For the whole project	Prior to commencement of works. Prior to commencement of and through out construction Throughout construction Prior to commencement of and through out construction	Contractor	Engineer

Drainage	Construct all designed drainage works prior to, during or immediately following excavation work in order to minimize the erosion hazard. Inspect all works and ancillary sites for drainage and erosion problems after each major storm event during the period of construction. Repair all failed drains and take other appropriate action as directed by the Engineer	Through out alignment	Beginning with and continuing throughout construction	Contractor	Engineer
Disposal of materials	Instruct the construction work force on approved fill /material disposal locations and strictly supervise the correct placement of fill at these sites. Identify, peg and seek approval from the Engineer for permissible disposal locations. Inspect and approve all correctly located disposal locations.	Throughout alignment	Throughout construction	Contractor	Engineer
Reinstatement of services	Inventory all services to be reinstated. Progressively reinstate or repair all interrupted services to their previous capacity. Inspect and certify the adequate reinstatement of services.	Throughout alignment	Prior to interruption of any service Following construction	Contractor Engineer	Engineer EEPCo

Stockpiling of construction materials	Locate, peg and seek approval from Engineer for the use of stockpile site Obtain written permission from landowners for stockpiling on their temporarily acquired land Inspect & approve all correctly located stockpile sites Site plans shall include all drainage provisions for construction sites Locate stockpiles or spoil heaps so there is no blocking of drainage lines.	Throughout alignment	Whenever encountered during construction	Contractor	Engineer / EEPCo Engineer
Work Force Camps	Locate, peg and seek approval from the engineer for work force campsites. Inspect and approve correctly located campsites. Provide and maintain proper drinking water, worker's health check up and selvage and waste disposal facilities at the camps. Recycle or dispose of solid waste as directed by the Engineer.	Construction camp lease area	Through out construction	Contractor for	Engineer/ EEPCo

Work force Management	Ensure workers act in a responsible manner to local people and do not harvest or take personal resources, forest products or wildlife. Ensure that no or minimal wood is burnt by any construction worker on or off site.	Near construction camp sites	Before and during building of construction camps.	Contractor	Engineer EEPCo.
Dust Nuisance	Heavy truck delivering materials shall water / sprinkle roads to reduce dust problem.	Through out alignment	Beginning with and continuing through out construction.	Contractor	Engineer
Noise	Vehicles will be maintained to keep noise at minimum	Through out alignment	Beginning with and continuing through out construction.	Contractor	Engineer
Siltation	Construction materials containing fine particles e.g. aggregates, limestone etc. will be stored in an enclosure away from water bodies to ensure that sediment laden water does not drain into nearby water courses.	Near cross-drainage structures and water bodies	Through construction	Contractor	Engineer

Alteration of Drainage	In sections along water courses earth and construction waste will be properly disposed of so as to not block rivers and streams, resulting in adverse impact on water quality. All necessary measures will be taken to prevent earth works from impeding cross drainage at rivers/streams, canal/existing irrigation and drainage systems.	Near cross-drainage structures Near cross drainage structures	Whenever encountered during construction Whenever encountered during construction	Contractor Contractor	Engineer Engineer
Contamination from wastes	All justifiable measures will be taken to prevent the waste water produced at construction camps from entering directly into rivers and irrigation systems. A minimum distance of any sewage source or toilet facility should be 100 m from water sources.	Near camps drainage structures and rivers/ streams	Through construction	Contractor	Engineer
Contamination from fuel and lubricants	Vehicle maintenance and refueling will be confined to areas in construction camps designed to contain spilled lubricants and fuels. Waste petroleum products must be collected, stored and taken to approve disposal sites, according to EPA regulation.	Construction camp lease area	Through construction	Contractor	Engineer

Sanitation and waste disposal in construction camps	Camps shall be located at a minimum distance of 100 m from water sources. Sufficient measures will be taken in the construction camps. Tanks and sanitation facilities including septic tank and soak pits. Waste in septic tanks will be cleared periodically. Drinking water will meet national standards. Garbage will be collected in covered bins and disposed of daily Special attention shall be paid to the sanitary condition of camps.	At all construction and camp sites	Before and during building of construction camps. Throughout construction period	Contractor	Engineer
Increase in Water-borne, Insect-borne Communicable Diseases	Make certain that there is good drainage at all construction areas, to avoid creation of stagnant water bodies especially in urban / industrial areas including water in old tires. Provide adequate health care for workers and locate camps away from vulnerable groups.	At all construction and camp sites	During construction	Contractor	Engineer
Cultural Resources	If archaeological relics or remains are discovered, the appropriate authority should be notified immediately. The construction should be stopped until the authorized organization assesses the remains and approves continuation of work after appropriate measures are complemented.	Whenever such archaeological remains are discovered	Through out construction	Archeological organization	Engineer EEPCo

Hazards and Hazardous Materials	Safely handle and store hazardous materials. Provide disposal directions to the contractor when requested. Clean up spills of hazardous materials immediately. Suppress fires on or adjacent to construction or ancillary sites. In case of spill of hazardous materials, relevant departments will be informed at once and will deal with it in accordance with the spill contingency plan.	Through out alignment	Through out construction as and when required	Contractor	Engineer EEPCo Engineer Engineer EEPCO
Compaction of Soil	Construction vehicles should operate within the alignment of impact i.e. approx. 20 m to either side of the center line to avoided damaging soil, and vegetation	Through out alignment especially in productive areas	During construction	Contractor	Engineer
Loss of trees	Tree clearing out side ROW should be avoided beyond what is required for construction activities and /or to provide adequate conductor clearance. All vegetated areas cleared for temporary work sites will be re-vegetated according to a re-vegetation action plan	Throughout alignment Areas of proposed tree plan tings	During clearing/grubbing activities After completion construction activities	Contractor Contractor	Engineer Engineer

Post Construction Stage					
Re-vegetation	Progressively sow all disturbed construction and ancillary site surfaces with a cover crop mix immediately following final use of each ancillary site. Progressively implement re-vegetation works commencing in the correct planting season. Regularly monitor the effectiveness of re-vegetation measures	Throughout alignment	After completion construction activities	Contractor	Engineer
Site decommissioning	Establish a site re-vegetation plan. Where possible involve local community to provide materials and implement re-vegetation.	An ancillary sites	Immediately following completion of construction work	Contractor	Engineer
Ancillary site Rehabilitation	Rehabilitate ancillary sites such as borrow areas, camp sites, material storage sites etc. within one month of their final use, including the removal of structures, refuse, stock piles and other temporary features. Re-vegetate the sites with a cover crop and permanent vegetation as appropriate	At all ancillary sites	Within 1 month of final use of the ancillary site	Contractor	

XIV. ENVIRONMENTAL MONITORING PLAN

Environmental monitoring is an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measures, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time.

Methods of monitoring includes: -

- Visual observation
- Selection of environmental parameters at specific locations.
- Sampling and regular testing of these parameters.

Monitoring provides a very useful feedback, which permits to correct the incidence of environmental problems at the right moment during the project construction and operation periods.

XIV.1. 10.1 Soil Erosion Monitoring

The excavation of earth for the establishment of towers, temporary and permanent access roads, work camps and storage facilities will exacerbate soil erosion. It will therefore be the responsibility of the contractor's implementation and effectiveness of erosion control measures. Focus should be given to work sites where soil is disturbed and its immediate environ as well as along the ROW during and after vegetation clearing.

XIV.2. Monitoring of Vegetation Clearing

Unique stands of indigenous trees should not be removed for the establishment of towers. The contractor's engineer should make sure that the unique tree stands identified during the study should not be removed.

Monitoring rehabilitation of work sites the contractor should ensure that areas used as temporary campsites for workers are progressively rehabilitated, as they are no longer required, once a site is rehabilitated, it should be "signed off" by EEPCo's environmental staff.

XIV.3. Monitoring of Accidents/Health

The Contractor must make sure that appropriate signs are posted at appropriate locations/positions to minimize/eliminate risk of electrocutions.

In addition, the contractors should make sure that:

- Measures to create awareness regarding sexually transmitted diseases, primarily HIV/AIDS, and other diseases such as malaria, etc.
- Preventive measures to reduce/eliminate malaria, and other infections where/when ever appropriate are put in place,
- Periodic health survey is carried out along the transmission route.

XIV.4. Monitoring Responsibilities

EEPCo will have overall responsibility to oversee that all environmental measures are put in place and that regulations are enforced. The construction consultant should assist EEPCo in this process in order to make sure that the contractor fulfills the environmental requirements. Some relevant stakeholders, like the Federal or Regional EPAs may also conduct joint monitoring as deemed necessary.

XIV.5. Monitoring Indicators

The following parameters could be used as indicators.

- Presence of posted visible signs on towers.
- Presence of sanitary facilities at camp sites.
- Level of awareness of communities pertaining to dangers/risks associated with power lines.
- Presence/absence of unique stands of ingenious trees along the power line establishment route; and
- Accident reports records on accidents associated with the establishment of the transmission line would be compiled by engineer and submitted to EMU.

Table 8 - Synthesis of Environmental Monitoring Matrix.

Activity Phase	Resource	Environmental Components	Environmental Indicators	Weight Effect	Standardization	Location of the observations	Observation frequency
I- Pre-construction	Site survey	Plants belonging to residents	Plant damage	e	The width of the plant damaged area.	Areas around towers and lines	Once
	Land acquisition	The society where the lower basis are	Society complaint	b	The land acquisition has been suitable with the rules.	Areas around towers lines	Time (before and after land acquisition
II: Construction	Labor equipment and material mobilization	Workers Recruitment	Society complaint	D	Level of labor recruitment	Around the tower close to residence	Once at six month
		Air quality	Dust pollution	e	Air quality Standard	Close to residence part of the tower close to residence	Once at six month
		Notice	Noise	e	Noise quality standard	Part of the tower close to credence	Once at six month
	Route clearance	Society land	Plant damage	c	New land functions	Part of the tower close to residence	Once
	Tower erection and stringing	Space and area	Land use	e	Changes in area function, erosion and land slide problems.	Part of the tower close to residence	Once at six months
		Traffic	Traffic nuisance	e	Level of traffic nuisance	Part of the tower close to residence	Once at six month
III operation	Electric power transmission	Free area	EM field	e	Free area according to the rules	Under the towers and in the R.O.W	At the beginning of operations and every six months
	Maintenance	Society plants	Plant damages	e	How many plants are damaged	Part of the tower close to residence	Once at six months
		Excavation activity	Land slide/erosion	e	How much erosion appears	The towers sole	Once at six months

Positive Impact

A=Very important
B=More Important
C=Important
D=Fair Important
E=Less Important

Negative Impact

a=Very important
b=More Important
c=Important
d=Fair Important
e=Less Important
O=No important

XV. ESTIMATED MITIGATION AND MONITORING COSTS

The total estimated costs for mitigation would be **Birr 20,822,912 (**1,507,639.38 **USD)** The cost covers to meet for compensation, environmental management including reforestation and soil conservation activities, HIV/AIDS interventions, monitoring and capacity building.

No.	Items	Cost in Birr	Cost in USD
1	Compensation for permanent loss of trees	3,800,000	275,131.05
2	Compensation for dwelling houses	2, 02 0 ,00 0	14,625.39
3	Compensation for annual crop loss	3,139,920	227,339.34
4	Compensation for perennial crops	9,120,000	660,314.52
5	HIV/AIDS intervention	250,000	18,100.73
6	Soil conservation activities & reforestation	500,000	36,201.45
7	Environmental Monitoring	100,000	7,240.29
	Total	**18,929,920**	1,370,581.25
	contingency 10%	1,892,992	137,058.13
	Grand total	20,822,912	1,507,639.38

Exchange rate date July 6, 2010
1 USD = 13.8116 Birr

XVI. CONCLUSION

From the environmental and social points of view, the proposed 230 kV transmission line project poses minimum impact on the existing bio-physical and socio-economic environment.

The overall mitigation cost as compared to the total project cost is minimum. It is only about 4% of the total project cost.

Therefore, it is highly recommended to implement the selected scheme of the Metu-Gambella Transmission line project so as to supply the energy reliably and meet the demands required in the country from the cheap hydro energy coming from the operational hydro power plants and the hydropower projects to come. This will definitely facilitate agro-industrial developments; improve the rural socio-economic structure and living standards of the rural poor.

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