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SMEC INTERNATIONAL PTY LT

UGANDA ELECTRICITY
TRANSMISSION COMPANY LTD

Review and Up date of Environmental and Social Impact Assessment for 137km Kawanda – Masaka 220kV Transmission Line

For: Uganda Electricity Transmission Company Limited

NOVEMBER, 2010

Project Name:	Review and Update Kawanda Masaka 220kV, 137km Transmission Line
Project Number:	5116008
Report for:	Uganda Electricity Transmission Company Limited

PREPARATION, REVIEW AND AUTHORISATION

Revision #	Date	Prepared by	Reviewed by	Approved for Issue by
Revision 0	29/11/2010	Mr. Alfred Tumusiime & Team	Dr. Michael Clarke	Munesu I. Dizamuhupe
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TABLE OF CONTENTS

CERTIFICATION

We certify that this Environmental and Social Impact Statement was conducted under our direct supervision and based on the Terms of Reference provided to us by Uganda Electricity Transmission Company Ltd. We hereby certify that the particulars given in this report are correct and true to the best of our knowledge.

Table A0: ESIA Review Team

Resource	Designation	Signature
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Mr. Paul Buyerah, ESIA Coordinator, M/s Georgina Kugonza, Legal Council, Mr. Achaye Godfrey, Ag. Coordinator Albertine Range; Mr. William Nkemba, M/s Ziria Tibalwa Principal Planning Officer, Mr. John Othieno Principal Environment Officer and the whole Project Team of UETCL as well as all LC Executive of all the villages affected is acknowledged.

Gratitude is also due to the community in the project area who were very responsive for which the team is grateful.

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune-Deficiency Syndrome
AOI	Area of Influence
CAOs	Chief Administrative Officers
CBD	Convention on Biological Diversity
CGV	Chief Government Valuer
DEO	District Environment Officer
CMS	Conservation of Migratory Species of Wild Animals
EHS	Environment and Health Safety Policy
ESIA	Environmental & Social Impact Assessment
EMF	Electro-Magnetic Fields
EMP	Environment Management Plan
ERA	Electricity Regulatory Authority
GOU	Government of Uganda
IBA	Important Bird Areas
IESA	Integrated Environmental Strategic Assessment
IUCN	World Conservation Union
HIV	Human-Immune Virus
KM	Kilometer
kV	Kilo Volt
LCs	Local Councils
MoEMD	Ministry of Energy and Mineral Development
MoLPP	Ministry of Lands and Physical Planning
NEMA	National Environment Management Authority
NEA	National Environment Act
NFA	National Forestry Authority
O&M	Operation and Maintenance
OSH	Occupational Safety and Health
PAPs	Project Affected Persons
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
ROW	Right Of Way
SESIA	Social and Environmental Impact Assessment
SMEC	Snowy Mountains Engineering Corporation
UETCL	Uganda Electricity Transmission Company Limited
UEDCL	Uganda Electricity Distribution Company limited
UEGCL	Uganda Electricity Generation Company limited
KARI	Kawanda Agricultural Research Institute
WB	World Bank
WWF	World Wide Fund for Nature

DEFINITION OF KEY WORDS AND TERMINOLOGIES USED

The Right of Way (RoW) of a transmission Line is a strip of line that may be used to construct, operate, maintain and repair the transmission line facilities. The Line usually follows the centre line of the RoW.

A Wayleave is a corridor maintained under the transmission line mainly for maintenance and safety reasons. It normally extends beyond the RoW.

Compensation means cash or in-kind payments at replacement value for an asset or a resource acquired or affected by the Project at the time the asset is replaced.

Project-Affected Household (PAH) means a household that includes one or several Project-Affected Persons as defined above. A PAH will usually include a head of household, his/her spouse and their children, but may also include other dependents living in the same dwelling or set of dwellings, like close relatives such as parents and grandchildren.

Project-Affected Area means an area, which is subject to a change in use because of the construction or operation of the Project

Project-Affected Person (PAP) means any person who, as a result of the implementation of the Project, loses the right to own, use, or otherwise benefit from a built structure, land (residential, agricultural, pasture or undeveloped/unused land), annual or perennial crops and trees, or any other fixed or moveable asset, either in full or in part, permanently or temporarily. PAPs may include:

- Physically Displaced People, i.e. people subject to Physical
- Displacement as defined hereunder,
- Economically Displaced People, i.e. people subject to Economic
- Displacement as defined hereunder.

Physical Displacement means loss of shelter and assets resulting from the acquisition of land associated with the Project that requires the affected person(s) to move to another location.

Economic Displacement means loss of income streams or means of livelihood resulting from land acquisition or obstructed access to resources (land, water or forest) caused by the construction or operation of the Project or its associated facilities.

Transmission corridor means area measuring up to 40 meters in width and 137km in length that will be acquired for the establishment of the 220kv line from Kawanda (Wakiso district) up to Masaka substation.

EXECUTIVE SUMMARY

Background

As part of its strategic growth and energy planning, GoU through UETCL proposes to construct the Kawanda – Masaka 220kV electricity transmission line. The line will evacuate the power generated from the Bujagali hydro power station and other planned hydropower stations on the River Nile from Kawanda to Masaka for supply to the Western Uganda. The electricity from this source will used to connect Uganda and Tanzania under the regional inter-connection project.

The first feasibility study for the Kawanda-Masaka 220KV power line was carried out by Norplan in 2006 and recommended a 135Km route. In 2009, UETCL re-defined the route and came up with another option which was 142 km slightly longer than the Norplan route by 7km. An optimization study was carried out by SMEC in 2010 and recommended a final route of 137km. During feasibility, several route options and designs were considered. A number of factors influenced the decision taken on routing options and these include; the need to avoid highly built up areas, forests reserves, wetlands, institutions among others.

The proposed transmission line will transmit power from Kawanda 220/132/33kV substation to Masaka West substation from which the load centres of Masaka and Mbarara shall be supplied with power. In accordance with the Government of Uganda (GOU) plan for the transformation of the country from a peasant society to a modern one, electricity access to all parts of the country is a priority. In order to achieve this plan, GOU plans to increase electricity access from the current 5% to 15% by 2015. This will be achieved by expanding the electricity generation facilities as well as increasing the coverage of the high voltage grid in the country.

In addition, the countries of the great lakes have agreed to create a power pool amongst their countries. In accordance with this plan, the countries have agreed to interconnect their countries with high voltage grids to facilitate the sale of electricity amongst the countries. The interconnection of the power grids will enable the countries to trade in power based on the supply and demand balances among them. Hence, the Kawanda-Masaka 220 kV line will be linked to Rwanda and Northern Tanzania. The line shall form part of the ring around Lake Victoria as recommended by the East African Power Master Plan.

Project Description

The proposed 220kV Kawanda – Masaka transmission line traverses 10 sub-counties in the three districts of Wakiso, Mpigi and Masaka covering a distance of about 137 km. It passes through 1 sub-county in Wakiso (Wakiso), 6 Sub-counties in Mpigi District (Kiringente, Mpigi, Kamengo, Budde, Buwama, and Nkozi) and 3 sub-counties in Masaka District (Mukungwe, Lukaya Town Council, and Bukulula,).

It is proposed that, the transmission line tower will be constructed on steel lattice towers although monopoles are recommended for areas in the wetlands and forest reserves. The steel lattice towers are the commonly used type in Uganda and worldwide. Tension towers will be used at angle points, dead end points, at points where the local topography demands it, and at intervals of approximately 5 km along straight stretches of line. They are recognizable because the insulators are to be mounted horizontally. They will be designed to take horizontal and vertical loads and thus, are heavier than the other type of towers, which are known as suspension towers.

Concrete pad and chimney foundations shall be used for the towers though raft foundations may be required for some locations. Climbing guards shall be installed on all towers in attempt to reduce vandalism and the risk to the public safety. The towers will be about 30-33 m in height, although the specific height of the towers may vary depending on the topography. The distance between towers will vary between 200-400 m. The way leaves for the 220 line is 40 m. Where lines run in parallel, UETCL requires an additional 5 m of separation between the way leaves. No permanent structures, such as buildings will be allowed to remain or be constructed within the way leaves. Growth of crops will be permitted, but limited to a height of 1.8 m or less, thus most annual crops and low growing perennial crops such as tea will be permitted.

The transmission line is a development project that will lead to involuntary population displacement, both physical and economic. People within the project area will be affected either directly or indirectly. The directly affected households will bear physical loss due to the construction of the transmission line. The indirectly affected households are those that will lose their economic earnings and the host communities. Acquisition of the way leaves involves 100% payment and acquisition of the Right of Way of 5metres and a percentage payment for restricted use of the Way leaves for activities above 6 feet high. For this system, Way leaves will be 17.5 meters on both sides of the right of way. The detailed Resettlement action Plan (RAP) study for the project is covered by a separate report.

The Need for ESIA

Several activities will be undertaken during the construction of the 220KV Kawanda-Masaka 137km power line. The proposed construction of the planned transmission line will involve among others, the following activities, acquisition of the right of way for the power line; survey and mapping of the routes which will involve detailed Line route survey (line profiling, soil studies, pegging and tower spotting). All the towers on the transmission line will be constructed prior to the installation of conductors. Tower foundations will vary according to the prevailing geology. Detailed engineering will include completion of geotechnical and engineering surveys to provide detailed information needed for, placement/location of towers, design of foundations, design of towers, and the sub-station design.

The implementation of the above activities will result in a number of environmental impacts that require an Environmental Impact Assessment (ESIA). Furthermore, the third schedule of the National Environment Act Cap 153, lists projects to be considered for environmental impact assessment. In section 19 (10b), of the Act, there is a need for an ESIA for electrical infrastructure establishment including Transmission lines. The project is a category I project which requires a detailed Social and Environmental Assessment (SEA) as required in O.P 4.01.

Study Approach

The ESIA update team studied the environmental conditions in the project area taking into consideration environmental and socio-economic receptors (such as communities, and settlements, and land-use,), and natural resources. The study covered both ecological and socio-economic aspects of the environment in the project area. The existing project (baseline) conditions were compared with what would arise when the project is implemented.

A detailed review of the existing literature on the former studies by Norplan in 2006 was done to put the project into context and to familialise with the kind of environment that would be impacted by the proposed development. Literature review helped the study team put the environmental issues in the project area into perspective regarding the magnitude and potential impacts. Other documents reviewed included the former and current Feasibility Report on the line by Norplan and SMEC respectively, biodiversity reports of the Mpigi, Wakiso and Masaka forest reserves and wetland systems, District State of Environment reports for Wakiso, Mpigi and Masaka, World Bank Environmental and Social Safeguard policies, The legal and institutional frame work system of Uganda among others.

The ecological investigations were undertaken using a combination of site investigations for the indicator biodiversity groups (plants, mammals, birds, butterflies,) and biodiversity comparison in terms of types, species composition and general ecological importance (endangered, rare, vulnerable) were used.

In order to perform the least cost analysis of the proposed line, the physical implications of clearing the transmission line way leaves were first computed. Engineering and environmental cost implications of the line diversion and technology combinations were then estimated using various valuation methodologies.

Stakeholder consultations and sensitization were essential in eliciting information on local knowledge, project appreciation, involvement and the acceptance by the stakeholders and ownership of the proposed project. Stakeholder consultation also helped decipher stakeholder concerns about the planned development. Rapid rural participatory techniques such as interviews with local administration (including local LC leaders) and consultations with local communities along the planned transmission line were used to gather the required information.

Stakeholder consultations were aimed at generating their understanding of the project; gauging the local expectations and the fears/reservations over the project, characterizing potential environmental, socio-economic impacts; developing effective communication mechanisms between the developer and the stakeholders. Stakeholder consultation also contributed to the development of mitigation recommendations.

Policy, Legal and Administrative Framework

The proposed project is expected to comply with Ugandan legal requirements as well as Development Partner safeguard policies. Legislations and institutional frameworks relevant to the current project are detailed in this report. This updated ESIA report has been prepared in conformity with the legal, policy and environmental framework relating to transmission lines.

Bio-physical and Socio-Economic Environmental Conditions

The transmission line passes through 3 districts of Wakiso, Mpigi and Masaka. The terrain traversed by the transmission line is generally flat to gently rolling savannah with scattered shrubs or trees and a few forested sections especially in Mpigi district. The line passes through several wetland systems such as Mayanja, Lubigi, Kageye, kalungu, Kafu/lwera, Nakayiba, Nabajuzi among others. Through the 137 km

stretch from Nakyesanja LC I, at Kawanda Substation, to Masaka West substation, the proposed transmission line traverses sixty seven villages, including Trading Centers and Towns.

From Nakyesanja to Masaka, the settlements are typical village setting characterized by scattered settlements with footpaths. The compounds are composed of a group of houses accommodating members of an extended family. However, from Kawanda to Kkoba swamp settlements are mainly of the scattered nuclei settlement with various permanent structures which are concentrated along the roads while semi-permanent and mud and wattle houses are found as one goes deeper in the villages. The set up of structures and settlements along the proposed Transmission Line corridor can be categorized as;

- Permanent brick buildings, mostly commercial (shops) and residences. The commercial structures are mostly concentrated within a single locality and generally in linear formation
- Institutional structures, mainly schools built of permanent brick material
- Semi-permanent buildings, mostly residential with support structures such as latrines, kitchens and livestock structures
- Temporary structures, mostly of mad and wattle and typical of rural setting

The land is mainly used for small-scale agricultural production. Crops grown are mainly food crops like bananas, cassava, sweet potatoes, maize, beans, and vegetables such as tomatoes. However, cash crops like coffee, vanilla, moringa are also grown. Eucalyptus and Cyprus plantations too fall within the transmission line corridor. Livestock farming is also practiced within the transmission line corridor with mostly goats, pigs, rabbits and poultry being reared. For households that rear cows the number does not exceed three. Other types of land use include stone quarrying, sand mining and brick making. The area of the proposed transmission line corridor is shown in Map A.1.

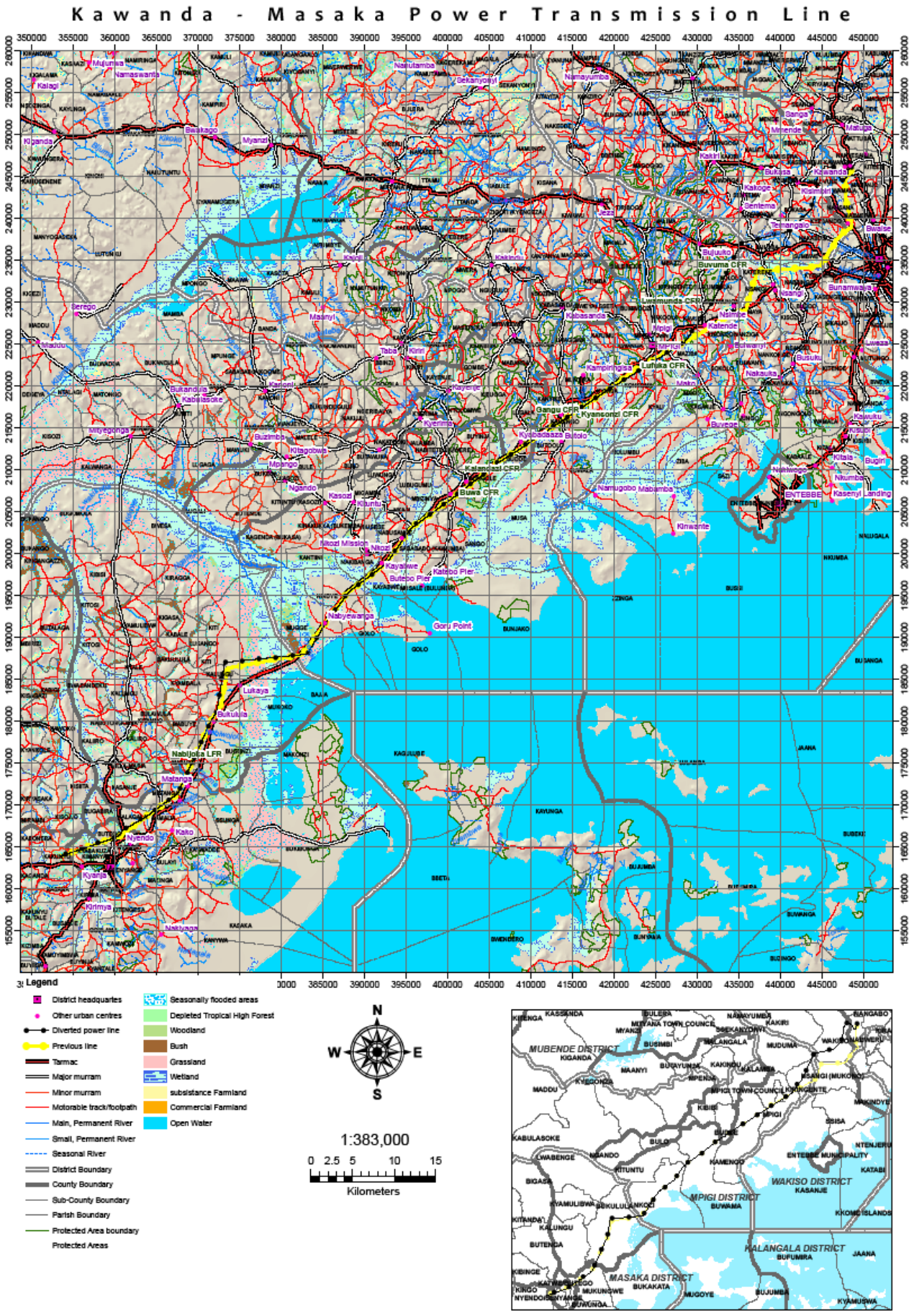


Figure A1. Project Area map

Table A1: Summary of Project Impacts and Mitigation plan

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
Loss of crops within construction corridor	• Farmers should be notified in advance • Restrict movement of equipment • Compensate affected persons	• Number of sensitization workshops conducted per village. • Level of media involvement • Evidence of a thorough RAP • Evidence of reasonable compensation of the affected people • Magnitude of conflicts and disputes arising • Absence of intimidation by UETCL and contractor to the affected people	USD 8,000	• District Environment Officers • District Agricultural Officers • Local Council leaders • Crop owners/PAP • UETCL • Sub-county Chiefs • Councilors	• 3 months before commencing the project and then Continuous until the power line is commissioned.
Spot alteration of agricultural land use, grassland and wetlands by Tower sports	• Tower shifting should be used to minimize adverse impacts of the tower sites • Compensate affected persons	• Attitudes of the local population towards the contractor and staff • Number of complaints brought up against the contractor on destruction of crops, trees • Contractors' relationship with the district and local leaders • Absence of intimidation by UETCL and contractor to the affected people	USD 10,000	• District Environment Officers • District Natural Resource officers • Sub-county and Local environmental committees • UETCL • Local Council • Leaders	• Continuous until the power line is commissioned.
Loss of Land to the power line in the corridor	• UETCL to work with district and local council committees and sensitize all people to be affected on the intentions of land acquisition	• Level and number of stakeholder involvement from the village level up to district level • Presence of evaluation and dispute management committees. • Evidence of a detailed RAP • Magnitude of conflicts and disputes	Detailed in RAP report	• CAOs,Town Clerks • District, Town, Planners • District, and Town Land Boards • Land Officers • Councilors	• 6 months before commencing the project and then Continuous until the commissioning of the power line.

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	• UETCL to conduct a RAP	arising • Absence of intimidation by UETCL and contractor to the affected people		• RDCs	
Displacement of built up structures (homes, Kiosks, commercial buildings, latrines) by the Right of Way and Wayleave	• UETCL to work with local district council committees • UETCL to a conduct a detailed Resettlement Action Plan (RAP) in accordance with World Bank Group and its Safeguard Policies • All sorts of compensation to be effected at least 6 months before structures are demolished.	• Number of sensitization workshops conducted per village • Level and number of stakeholder involvement from the village level up to district level • Presence of evaluation and dispute management committees from village level to district level • Evidence of reasonable compensation of the affected people 6 months to project implementation • Magnitude of conflicts and disputes arising during and before project implementation	Detailed in RAP report	• Structural and Land Owners • District, and Town Planners • District and Town Land Boards • Land Officers • RDCs • Government Valuers • UETCL • ERA • Local Council Leaders	6 months before commencing the project and then Continuous until the commissioning of the power line
Psychological impacts such as stress, trauma, shock and fear associated with displacement and resettlement	• Sensitize affected people in advance using all forms of media • Compensate the affected people in compliance with Ugandan legislation, IFC's Performance	• Level of awareness depicted by the local people in regard to the project. • Extent of curiosity expressed by the locals and the affected people. • Presence of intimidation • Proper understanding of the routing order by the affected authorities	Detailed in RAP report	• UETCL • LC5 Chairmen • District Environment Officers • Community Development Officers • Councilors • Local Council Leaders • RDCs	• Continuous until the commissioning of the power line and for sometime after commissioning

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	Standard 5 and WB OP 4.12.	• Willingness to talk about and criticize the project by the affected people. • Number of conflicts and disputes from the affected people on the project			
Loss of vegetation and animal habitats by vehicle traffic, clearing of Wayleaves and access roads.	• Restrict movement of equipment to designated path ways • Adjust tower intervals to avoid ecologically sensitive areas • UETCL to make financial and or material contribution towards local environmental programs. • UETCL to offset the biodiversity lost	• Number of access roads constructed and mitigation measures undertaken. • Attitude of the local people towards the contractor and UETCL. • Number of ecologically sensitive sites spared. • Movement pattern of the contractor. • Magnitude of vegetation cleared. • Evidence that UETCL supports afforestation programs in affected sub-counties and that money was received by project implementers • Number of trees planted by implementing agencies • Level of involvement of UETCL in tree planting project .	USD 15,000	• UETCL • District Environment Officers • District Natural Resource Officers • Local Environment Committees • Local Council Leaders	• Throughout the construction phase and Continuous for some time after commissioning of the power line
Generation of solid waste during demolition of built up structures, Construction camp residues and construction waste.	• All waste to collected from the Wayleaves and the line corridor by the contractor	• Absence of any sort of waste abandoned at campsites and or from the transmission corridor. .	USD 30,000	• UETCL • District Environment Officer • The Contractor • Local Council Leaders	• Throughout the construction period and slightly after commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
Disturbance and degeneration of wetland ecosystems	• Increase spacing between towers so as to reduce the number of towers in wetlands. • Use low ground-pressure construction equipment during construction and use raft foundations	• Number of towers within the wetlands. • Number of access roads and pattern of movement within wetlands. • Level of involvement of local leaders. • Presence of Wetland permits from WID.	USD 120,000	• District Environment Officer • District Natural Resource Officers. • UETCL • Local Environment Committees • Local Council Leaders	• Throughout the construction period of the power line
Child labor	• All children below 18 years should not be involved.	• Number of children involved in activities related to the construction of this 220KV power line	5000	• District Labor Officers • District Environment Officers	• Continuous until the commissioning of the power line

A detailed environment management plan is presented in chapter 9. Based on the ESMP given in this chapter, the Contractor will need to prepare his own ESMP. The contractor's ESMP shall be detailed enough to include mitigation measures for all identified impacts, measurable monitoring indicators as well as the responsibility and the schedule of implementation. This ESMP shall form part of the Bidding documents so as to allow the Contractor to adequately comply with the recommended mitigation measures. The Supervising Engineer (or his appointed environmental officer) will review and approve the CESMP and will have the responsibility to supervise adequately implementation through a contractual agreement. This will be stated in the bidding documents. An Environmental Audit shall be carried out before commissioning to check if the contractor has complied with his own ESMP.

Monitoring Program

Environmental and social monitoring ensures that mitigation measures for potential impacts are implemented and followed up. Moreover, environmental and social monitoring will enable response to new and developing concerns. Activities and indicators for monitoring are well documented.

Environmental monitoring will ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented. The contractor shall employ an officer responsible for implementation of social/environmental requirements. The person will maintain regular contact with the UETCL Principal Environmental Officer and the local District Environmental Officers. The contractor and UETCL have responsibility to ensure that the proposed mitigation measures are implemented properly.

The environmental monitoring program will operate through the preconstruction, construction, and operation phases. The responsibility for mitigation monitoring during the operation phase will lie with the Environmental Section in UETCL. UETCL will provide NEMA with reports on environmental compliance during implementation as part of their annual progress reports and annual environmental auditing reports.

Depending on the implementation status of environmentally sensitive project activities, NEMA will perform occasional environmental reviews to ensure that environmental concerns raised by the project are addressed. The summary of the environmental monitoring plan is in table A2.

Table A2: Summary of the Environmental Monitoring Plan

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
Pre-Construction Phase						
1. Archaeological sites.	Prevention of damage or destruction to cultural resource during construction.	Tower locations where the foundations will be excavated and the substation construction footprint.	Pre-construction	- The Contractor will ensure that cultural sites likely to be disturbed during construction will be examined by an archaeologist and reported to the Department of Antiquities, who will advise on measures to be taken to ensure their preservation.	Contractor	5,000
3. Noise from vehicles and trucks	Nuisance or excessive noise	Adjacent to wayleave and substations.	Pre construction	Collect base line ambient noise measurements	Contractor	12,000
5. Construction of access roads	Health, Safety and environment	Along wayleave and routes to wayleave	During construction	Ensure the Contractor and its subcontractors abide by the Health, Safety and Environment management Plan and the Traffic Management Plan	Contractor	15,000
6. Air dust pollution	Environmental Quality	Emissions from dusty Roads	During construction and post construction	Sprinkle with water to minimise dust emission	Contractor	20,000
7. Waste disposal and handling of hazardous materials during operations.	Health, safety and environment	Wayleave and at substations	Periodic depending on activity	Contractor should comply with relevant Ugandan regulations for waste disposal and handling of materials defined as hazardous waste and as outlined in the respective management plans.	Contractor	10,000
8. Work safety and health effects during operations.	Worker safety.	Wayleave rights of way and at substations.	Periodic depending on activity	Ensure EPC Contractor compliance with relevant Ugandan safety and occupational health requirements as indicated in the Health and Safety	Contractor	40,000

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
				Management Plan.		
9. Accidental contact with lines.	Public safety	Along wayleave and substations.	Periodic depending on activity	EPC Contractor to ensure warning signs posted with appropriate text and graphics. Educational programmes in schools and communities to educate people of hazards and safe practices when playing and working near high voltage power lines.	Contractor	5,000
10. Climbing and Electrocution Risk	Public and workers safety	All transmission towers and substation sites	Periodic depending on activity. Annual during Operations.	Ensuring that all towers are fitted with warning signs and anti-climbing devices. Sub-stations to be fenced.	Contractor	10,000
11. Hydrological function of wetlands	Normal functioning of the wetland	Wetlands	Periodic depending on activity	Visual inspection and water quality assessment.	Contractor	20,000
12. Watercourse crossings and erosion susceptible areas	Successful rehabilitation	Steep slopes and watercourses along wayleave rights of way.	Annual and Prior to Construction Completion Certificate	Visual inspection and water quality assessment.	Contractor	10,000
13. Agricultural soils.	Successful rehabilitation of agricultural soils.	Agricultural areas along wayleave rights of way and substations.	Annual and Prior to Completion	Visual inspection of crop and soils by agronomist.	Contractor	10,000
14. Loss of trees and vegetation in particular through CFRs.	Ensure reestablishment of vegetation and success of re-plantings by UETCL through the CFRs or other designated areas.	CFRs and other designated natural areas traversed along wayleave rights of way	Annual	Visual inspection by forestry expert	Contractor	10,000

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
15. Planting programme in CFRs along wayleave.	Ensure successful re-plantings through CFRs and other designated areas.	CFRs traversed along wayleave rights of way and other designated areas.	Annual	Visual inspection by forestry expert	Contractor	500,000
16. Wildlife in CFR	Monitor recovery of amphibians and reptiles.	CFR adjacent to wayleave	Annual	Visual inspection by biologist	Contractor	10,000
17. Birds in seasonal wetlands.	To assess success of conductor reflectors in preventing bird mortality	In wetlands and other seasonal wetlands.	Annually for 2 years post construction during breeding bird season.	Visual inspection by a wetland ecologist/ ornithologist	Contractor	10,000
18. Pollution of water sources	To minimise pollution of water sources resulting from soil erosion and subsequent deposition	Water courses along the wayleave	During construction and post construction	Water quality assessment	Contractor	10,000
19. Excavation and Levelling	To minimise soil Erosion and compaction	Construction activities along a wayleave and access roads	During construction	Visual Inspection	Contractor	100,000
20. Vehicular Emissions from vehicles and trucks	To minimise air, soil and water pollution	Construction activities along a wayleave	During construction	Visual Inspection	Contractor	15,000
21. Poor storage of lubricants, solvents, fuels, & oils	To avoid pollution of soil and water	Storage sites	During construction	Visual Inspection	Contractor	20,000
22. Clearing part of wetlands along the proposed corridor	To minimise loss of fauna and flora and abstraction of water flow	wetlands in the proposed corridor	During construction	Visual Inspection	Contractor	15,000
23. Visibility of tower and conductors	Change in aesthetics of the area	Wayleave	During and post construction	Visual Inspection	Contractor	10,000

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
24. Employment	Local communities may be deprived of employment opportunities	Project sites	During construction	Inspection of employment records	Contractor	5,000
25. Public Health problems from construction sites and imported and labour	To minimise incidences prostitution, lead to poor sanitation and personal hygiene	Project sites	During construction	Visual inspection and interviews	Contractor	10,000
26. Health and safety	Accidents that may arise from collisions with equipment on site	Project sites	During construction	Incident reports and interviews	Contractor	10,000
27. Poor Traffic Management	To minimise accidents	Project sites	During construction	Incident reports and interviews	Contractor	20,000
Total						**902,000**

1 INTRODUCTION

1.1 Project Background

The Electricity Act of 1999 liberalized the power sector by breaking up Uganda Electricity Board that had monopoly for power generation, transmission and distribution, into three companies responsible for generation (UEGCL), transmission (UETCL) and distribution (UEDCL) of electric power in Uganda. The Act authorized the licensing of independent power producers (IPP), to generate, distribute and sell power. UETCL has the responsibility of high voltage power transmission, bulk purchase from IPP and bulk sale to independent power distributors.

As part of its strategic growth and energy planning, GoU through UETCL proposes to construct the Kawanda – Masaka 220kV electricity transmission line. The line will evacuate the power generated from the Bujagali hydro power station and other planned hydropower stations on the River Nile from Kawanda to Masaka for supply to the Western Uganda. The electricity from this source will used to connect Uganda and Tanzania under the regional inter-connection project.

This feasibility report was formerly prepared by Norplan, now Newplan, and submitted to the client UETCL which later forwarded it to the financier The World Bank for review before approval. After the review, it was recommended that a diversion be made between Kawanda and Kitende to avoid the heavily congested areas of Nansana, Bulenga, Kyengera up to Maya in addition to updating the information gathered in 2006. The World Bank requested UETCL to engage an independent consultant to carry out, review and update the feasibility study report, prepare designs and update the tender documents prepared by M/S NORPLAN in association with Statnett for 220 Kv Kawanda–Masaka. It is upon this background that UETCL engaged SMEC International to review and update the feasibility report and incorporate information from the diversion.

The proposed Kawanda-Masaka 220 kV transmission line traverses the districts of Wakiso, Mpigi, and Masaka. The 137 km line traverses Wakiso and Mpigi districts. The line starts from Kawanda-Substation in Nakyesanja parish at coordinates N 448663, E 46126, Wakiso district and joins the former route in Maziba parish in Mpigi district at coordinates N 428545, E 25270. The line cuts across 13 villages in Wakiso district, 43 in Mpigi and 11 in Masaka district.

1.2 Line Routing

The proposed 137km Kawanda-Masaka 220 kV transmission line traverses the districts of Wakiso, Mpigi, and Masaka. The line starts from Kawanda-Substation at Nakyesanja parish, in Kawanda village at coordinates N 448663, E 46126, Wakiso district and stretches for a distance of 354 metres at an angle of 256^0 after which it crosses the Bombo Road between Kagoma and Kawanda trading centre. Within this distance, it passes over banana plantations, and a few gardens of cassava and sweet potatoes. Few homesteads exist within the first half of this stretch before it joins Mayanja wetland towards the end of the stretch. Mayanja wetland meets its dead end on the high way where the line cuts across to join Kawanda Agriculture Research Institute (KARI). The line cuts across several villages and 12 parishes.

In Wakiso district, the line passes through 5 parishes including Kawanda, Naluvule, Kasengegye, Kayunga, and Bukasa. In Mpigi district, the transmission line traverses 6 parishes which include Buloba, Lugyo, Kololo, Sekiwunga, Kavule and Maziba parishes. It then turns Southwards through Mpigi crossing Masaka Road at Kkoba swamp in Kavule - Maziba villages and finally joining the old alingnment at N 428545, E 25270 near Crown City St. Lawrence High School. The line routing has been adjusted to avoid traversing over this school completely.

From this point the line runs parallel to Kampala – Masaka highway where it maintains a distance of about 1 Km from the highway, in some places going as far as 5km deep in the villages. At Lukaya, instead of the line going to West South West, it moves more to the west going behind Lukaya town by about 2km away to avoid the Army Air strip, the Eucalyptus wood lot and some settlements. It then crosses straight though Kitante swamp, Nakayiba swamp then Namasenene village up to Kyabakuza substation. At Lukaya, an adjustment has been made to avoid the line traversing Eagle's children village.

Parallel to the highway, the line passes through villages with subsistence farming and small trading centres, wetlands, natural forests and tree plantations alternatively.

The line is planned to go through several permanent wetlands including Namaya, Kiyanja, Lutindo, Kalungi, Nawandigi, Kibukuta, Katonga and Kafu where it crosses the highway on to the right side at Kamunga village. At this point, the line runs parallel to the road passing behind Lukaya town through Kitante/Kadugala then Nakayiba east of Masaka Town and finally Nabajjuzi wetland.

In the wetlands, murram bands are likely to be constructed to gain access and act as base for pylons. This statement is hanging because this section is for route description.

The proposed line will also cut through several forest reserves in Mpigi District e.g. Lufuka, Mpanga, Kasa, Gangu. After Nabajjuzi wetland, the line will finally be terminated in the existing Masaka West substation which is also proposed for extension at the adjacent plot.

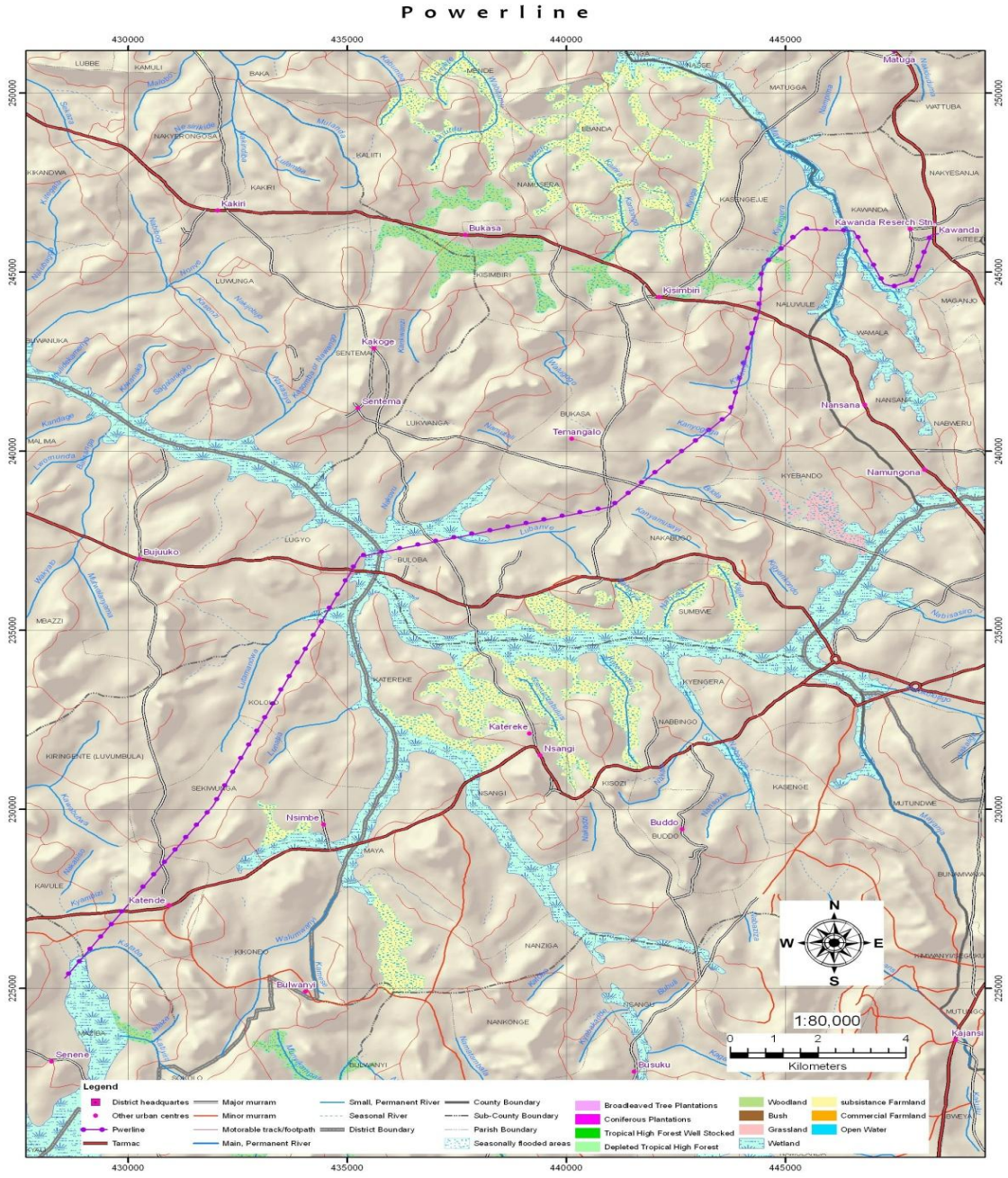


Figure 1.1 The 34km transmission line diversion from Kawanda to Mpigi

This diversion is part of the main transmission line from Kawanda to Masaka. Initially, feasibility studies and ESIA for the entire Kawanda-Masaka route (137km) had been conducted by Norplan Company in the year 2006. After review by both The World Bank and UETCL, it was recommended that a diversion be made to avoid the heavily built-up areas. The map of the transmission line corridor in the diversion is shown in Figure 1.1 while the final complete route is shown on Fig 1.2

Table 1.2: Summary of the Line route system for the 34km Kawanda Masaka 220KV Diversion

	Grid	UTM						
	Datum	ARC 1960						
No.	AP No.	Coordinates	Cumulative Distance	Section distance	Bearing	Deviation Angle	Parish	District
		Eastings & Northings						
1	AP001	36 N 448663 46126	0 m				Nakyesanja	Wakiso
2	AP002	36 N 448319 46043	354 m	354 m	256°		Kawanda	Wakiso
3	AP003	36 N 447918 44792	1.7 km	1.3 km	198°	58 L	Kawanda	Wakiso
4	AP004	36 N 447461 44603	2.2 km	495 m	247°	49 R	Kawanda	Wakiso
5	AP005	36 N 447246 44672	2.4 km	226 m	288°	41 R	Kawanda	Wakiso
6	AP006	36 N 446558 46157	4.0 km	1.6 km	335°	47 R	Kawanda	Wakiso
7	AP007	36 N 445383 46208	5.2 km	1.2 km	272°	63 L	Naluvule	Wakiso
8	AP008	36 N 444470 45170	6.6 km	1.4 km	221°	51 L	Kasengejje	Wakiso
9	AP009	36 N 444405 43990	7.8 km	1.2 km	183°	38 L	Kayunga	Wakiso
10	AP010	36 N 443735 41058	10.8 km	3.0 km	193°	10 R	Bukasa	Wakiso
11	AP011	36 N 441014 38451	14.6 km	3.8 km	226°	33 R	Bukasa	Wakiso
12	AP012	36 N 435278 37058	20.5 km	5.9 km	256°	30 R	Lugyo	Mpigi
13	AP013	36 N 431930 30095	28.3 km	7.8 km	206°	50 L	Sekiwugo	Mpigi
14	AP014	36 N 428545 25270	34.2 km	5.9 km	215°	9R	Maziba	Mpigi

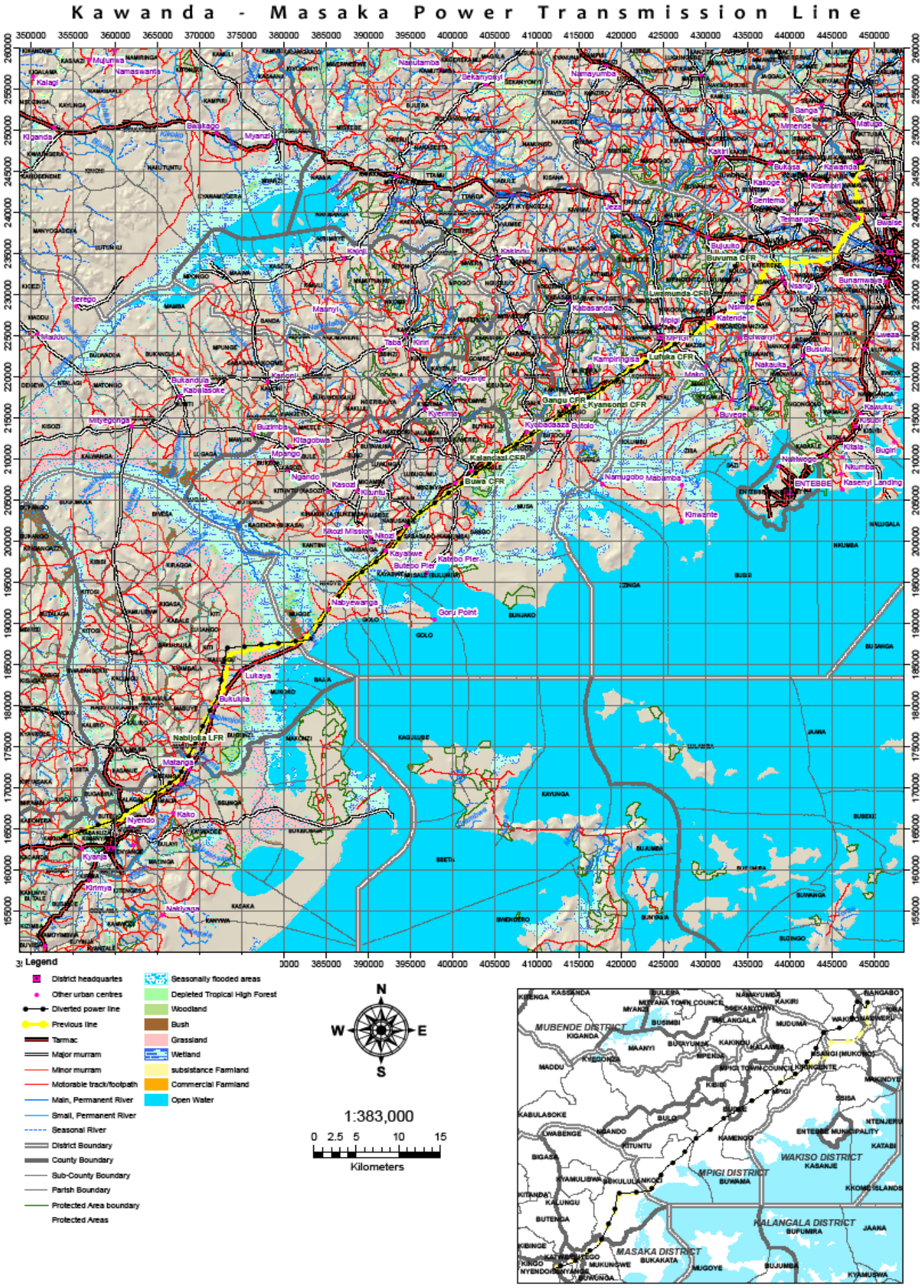


Figure 12. Project Area map

1.3 The Project

The feasibility study and Environmental Impact Assessment (ESIA) were finalized in 2006 while the Resettlement Action Plan (RAP) Kawanda–Masaka 220 kV line in October 2010. At the time, the project could not achieve financial closure with the financing agency.

The Government of Uganda has recently requested World Bank (IDA) to finance the project under the Electricity Sector Development Project (ESDP). The old feasibility, ESIA, and RAP documents have been handed over to the IDA for review. The Bank reviewed the documents and provided comments to guide the update of the documents to meet the IDA requirements.

The IDA has recommended that 34 km Kawanda-Mpigi section of the transmission line corridor should be redesigned to traverse areas that are less encumbered by settlements. UETCL has therefore made preliminary field reconnaissance to re-route the transmission line corridor from the heavily settled areas as recommended by the IDA. The RAP report is prepared by a separate Consultant.

1.4 Project Location

The proposed Kawanda-Masaka 220 kV transmission line traverses the districts of Wakiso, Mpigi, and Masaka. The 34 km line diversion only traverses Wakiso and Mpigi districts. The line starts from Kawanda-Substation in Kawanda parish at coordinates N 448663, E 46126, Wakiso district and joins the former route in Maziba parish in Mpigi district at coordinates N 428545, E 25270. The line cuts across several villages and 12 parishes. In Wakiso district, the line passes through 5 parishes including Kawanda, Naluvule, Kasengegye, Kayunga, and Bukasa. In Mpigi district, the transmission line traverses 6 parishes which include Buloba, Lugyo, Kololo, Sekiwunga, Kavule and Maziba parishes.

The 34 km diversion starts from Kawanda substation at Nakyesanja parish, Kawanda village and stretches for a distance of 354 metres at an angle of 256^0 after which it crosses the Bombo Road between Kagoma and Kawanda trading centre. Within this distance, it passes over banana plantations, and a few gardens of cassava and sweet potatoes. Few homesteads exist within the first half of this stretch before it joins Mayanja wetland towards the end of the stretch. Mayanja wetland meets its dead end on the high way where the line cuts across to join Kawanda Agriculture Research Institute (KARI) land. Within KARI land after the Kampala-Gulu highway, the line deviates at 58^0 to the left at an angle of 198^0 and stretches for a distance of 1.3km within KARI land. For the first part of this distance near the road, it passes over gardens of cassava mostly intercropped with maize, some banana plants, and yams among others. These gardens exist within KARI land with most of it unutilized with scattered eucalyptus trees. As the line continues within this stretch, it passes over KARI demonstration farms and gardens, eventually to staff quarters. At the staff quarters, other trees exist including mango, jack fruit, avocados and scattered vegetation.
The line makes several deviations all within KARI land after the above distance, namely;

- 490 to the right at an angle of 2470 for a distance of 495metres,
- 410 to the right at 2880 for a distance of 226metres

Near the KARI area, the lines pass over mainly private farm land. Few homesteads (KARI staff quarters) and crops such as jack fruit, avocado, mangoes and many others exist though scattered.

In the second deviated distance, it passes over farm land characterized by short plantation cover. It is used for animal rearing/grazing. The section has no residences.

In addition, within the KARI farm land, the line makes another deviation of 47^0 to the right at an angle of 335^0, to run along Mayanja wetland for a distance of about 1.6 km. The wetland is mainly characterized by papyrus, and other water logged loving plantation. Towards the end of this stretch, within Mayanja wetland, the line crosses the Kawanda-Kayunga road before making another a turning. Few scattered tall trees and other plants exist. Animals are grazed along and within this wetland. At the end of this stretch, along Mayanja stream, some gardens of sweet potatoes, sugar cane, yams and brick making are identified.

The line is running to the South West crossing Nabiwekecro swamp after which it runs through farmlands, before climbing Katende Hill and dropping down to cross Kampala-Masaka road and joins the original alignment at Crown city before turning south and towards, crossing the farmlands, Maya swamp and again the main road Kampala – Masaka. After crossing the main road, it is also crosses a 33 kV and a 132 kV line. From here, the line generally follows the main road on the south side until the Lukaya area where it crosses the road and shift to the north side.

From this point, the 220 kV line runs parallel with the existing 132 kV line across Kasenso swamp, woodland and farmlands from where it crosses Katonga and Lufuka forest besides farmlands and small swamps. It passes the hilltop before it crosses the Lutindo swamp and traverse farmlands adjacent to some woodland along the Kampala – Masaka road i.e. the Kasa forest and the Gangu forest. The line is placed as close as possible to the road to minimize the environmental impacts on the forest.

The line crosses some farmland areas before it crosses the Nawandigi swamp, the Kazikati River and then crosses the Kibukuta and Katonga swamps. This area is characterized by farmland, grassland and uncultivated land. The line crosses the Kitante swamp, and climbs another hill before crossing the Nakayiba swamp. In this area, farmland and uncultivated land can be found. It again passes through Kitante and the Nakayiba and Kamugumbwa swamps before reaching Masaka substation.

1.5 Project Justification

The proposed transmission line will transmit power from Kawanda 220/132/33kV substation to Masaka West substation from which the load centres of Masaka, Mbarara shall be supplied with power. In accordance with the Government of Uganda (GOU) plan for the transformation of the country from a peasant society to a modern one, electricity access to all parts of the country is a priority. In order to achieve this plan, GOU plans to increase electricity access from the current 5% to 15% by 2015. This will be achieved by expanding the electricity generation facilities as well as increasing the coverage of the high voltage grid in the country.

In addition, the countries of the great lakes have agreed to create a power pool amongst their countries. In accordance with this plan, the countries have agreed to interconnect their countries with high voltage grids to facilitate the sale of electricity amongst the countries. The interconnection of the power grids will enable the countries to trade in power based on the supply and demand balances among them. Hence, the Kawanda-Masaka 220 kV line will be linked to Rwanda and

Northern Tanzania. The line shall form part of the ring around Lake Victoria as recommended by the East African Power Master Plan.

The proposed construction of the transmission lines is associated with:

- Construction of line structures, accessories and conductors;
- Construction of the 220kV double circuit transmission line from Kawanda substation to Masaka West substation,
- Construction of the Masaka West substation extension to cater for the 220kV line bay
- Clearing of right-of-way as necessary
- Construction of access roads as necessary
- Construction of workers camps and storage facilities for the project materials

1.6 The Need for ESIA

Several activities will be undertaken during the construction of the 220KV Kawanda-Masaka 137km power line. The proposed construction of the planned transmission line will involve among others, the following activities:

- Acquisition of the right of way and wayleaves for the power line;
- Survey and mapping of the routes which will involve detailed Line route survey (line profiling, soil studies, pegging and tower spotting).
- Construction of towers will be done prior to the Installation of conductors. Tower foundations will vary according to the prevailing geology.
- Detailed engineering will include completion of geotechnical and engineering surveys to provide detailed information needed for, placement/location of towers, design of foundations, design of towers, and the sub-station design.

The implementation of the above activities will result in a number of environmental impacts that require an Environmental Impact Assessment (ESIA). Furthermore, the third schedule of the National Environment Act Cap 153, lists projects to be considered for environmental impact assessment. In section 19 (10b), of the Act, there is a need for an ESIA for electrical infrastructure establishment including Transmission lines.

These activities will lead to social and environmental impacts, both negative and positive. Impacts such as restriction on land use, landscape impairment and visual amenity, habitat encroachment, water resource contamination, flora, fauna and social disruption are likely to arise from the implementation of the project.

These impacts require identification, quantification and mitigation before the project is implemented. Most importantly to make the project meet the World Bank requirements, people who are likely to be affected by the project need to be consulted so that their views and suggestions are incorporated in the project design as appropriate.

Purposes and Objectives of the ESIA

The purpose of conducting this ESIA was to;

- examine the existing environmental character of the proposed 137 km transmission line and the area likely to be affected by establishing the proposed power line;

- investigate the likely impacts of the proposed project on the biophysical and social-economic environment of the affected landlords in the power corridor together with the villages, parishes, districts and surrounding areas of influence;
- Promote environmentally sound and sustainable development through the identification and implementation of appropriate enhancement and mitigation measures.
- Provide the public, NEMA, World Bank and Lead Agencies and other stakeholders with information for decision-making on the environmental consequences of proposed construction of the 137 km power line and the associated substations.

The specific objectives of the ESIA were to;

- Improve the environmental design of the project;
- Ensure that resources are used appropriately and efficiently;
- Identify appropriate measures for mitigating the potential negative impacts of the project; and
- Facilitate informed decision making, including setting the environmental terms and conditions for implementing the power line construction.

All these objectives shall be applied to both 137 km Kawanda-Masaka transmission line as well as all substation works that are identified as part of the scope of this work. This includes the substation works at Kawanda, Masaka and Mbarara. This ESIA document therefore will govern both the construction of the proposed transmission line and the substation upgrades at Kawanda, Masaka, and Mbarara.

1.7 The ESIA Process

The ESIA report is designed to meet requirements of the GOU as well as the policies and guidelines of the World Bank, and the various International Financial Institutions (IFIs) that are expected to finance the construction of the 220KV Kawanda-Masaka transmission line diversion.

The ESIA was conducted following the terms of reference (TORs) that were prepared by UETCL and approved by NEMA. The ESIA process involved review of existing ESIA report for the entire Kawanda-Masaka (137 km), ecological surveys along the proposed power corridor, social surveys and consultations with the relevant stakeholders including potentially affected persons.

This ESIA report is organized into 8 main chapters, namely;

- Chapter 1, this one provides the background to the power line project and the ESIA procedure
- Chapter 2 describes the proposed project, including its construction and operation activities;
- Chapter 3 describes the legislative, regulatory, and policy requirements for the project;
- Chapter 4 describes the baseline biological, physical and socio-economic environments in the power corridor and the project area;
- Chapter 5 describes the public consultation and disclosure program undertaken for the project;
- Chapter 6 provides an analysis of project alternatives and the preferred project option;
- Chapter 7 provides impact identification, management and monitoring; and,

- Chapter 8 provides the framework for the Social and Environmental management and Action Plan to be mitigated and the likely impacts during project implementation
- Other chapters include References, and Appendices

2 PLANNED PROJECT ACTIVITIES

2.1 Transmission Line Design

It is proposed that, the transmission line tower will use the lattice tower type except in the wetland areas. The steel monopole will be used in the wetland areas to reduce the footprints in these areas and minimise wetland degradation. This has been explored in the alternatives.

2.1.1 Steel Lattice

The steel lattice towers are the commonly used type in Uganda and worldwide (Figure 1.1). Tension towers will be used at angle points, dead end points, at points where the local topography demands it, and at intervals of approximately 5 km along straight stretches of line. They are recognizable because the insulators are to be mounted horizontally. They will be designed to take horizontal and vertical loads and thus, are heavier than the other type of towers, which are known as suspension towers.

Fig. 2.1 Foundation Excavation complete

Fig.2.2 Pillar positioning and anchoring

Fig. 2.3 Pad and chimney Foundation for dry areas

Stabilization of the foundation with concrete

Figure 2.4(b): Construction of Lattice Tower pillars

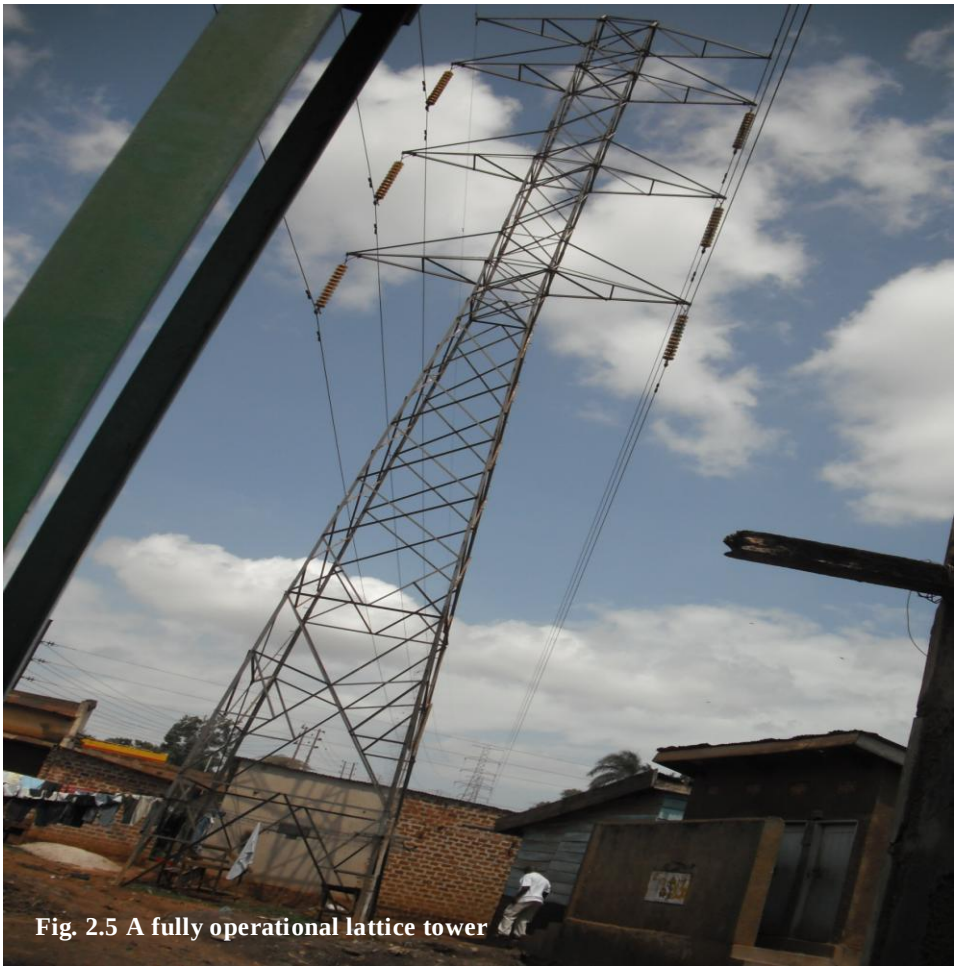


Fig. 2.5 A fully operational lattice tower

Concrete pad and chimney foundations shall be used for the towers though raft foundations may be required for some locations. Climbing guards shall be installed on all towers in attempt to reduce vandalism and the risk to the public safety. The towers will be about 30-33 m in height, although the specific height of the towers may vary depending on the topography. The distance between towers will vary between 200-400 m. The way leaves for the 220kV line is 40 m. Where lines run in parallel, UETCL requires an additional 5 m of separation between the way leaves. No permanent structures, such as buildings will be allowed to remain or be constructed within the way leaves. Growth of crops will be permitted, but limited to a height of 1.8 m or less, thus most annual crops and low growing perennial crops such as tea will be permitted. It is important to note that before the project construction activities begin, there are important pre-construction activities such as materials sourcing e.g. stone products (aggregates etc); murram materials which are vital for tower foundations works are all important sources of impacts on the project.

2.1.2 Steel Monopoles

Whereas the developer has indicated that only lattice towers will be used, we provide information on the steel monopoles as an alternative required in the ESIA process. The steel monopoles are proposed for power transmission through sections of the wetland areas. The transmission conductors are supported on modular steel monopole structures ((Figure 1.2). The optimum

recommended above-ground pole height for a steel monopole is 22 m (providing about 3m buried in the foundation) to enable line spans of 250 m.

The Advantages of the Steel Monopoles include:

The monopole structures have advantage in that, they are not easily as susceptible to theft as the common lattice steel towers (pylons). In addition, the steel monopoles have a smaller footprint requirement (about 1 square meter) compared to lattice steel structures (5x5 meter). The steel monopoles provide for a safe clearance (ground to conductor) which is of an advantage because it is not easy for wildlife to grasp onto them easily.

The poles will be designed to be as compact as possible and at the same time have adequate spacing between conductors to prevent mid-span clashing and allow maximum span lengths. Steel monopoles will normally need facilities for climbing both during construction and for maintenance. Climbing bolts will readily be fitted during climbing and removed when not in use to avoid unauthorized personnel climbing the towers.

Steel monopoles can be either buried directly in the ground (typically up to 20% of the height in the ground) or bolted on a concrete foundation. These would be grouted and cemented into place as required under the circumstances. Steel monopoles would normally be coated with an epoxy covering to eliminate corrosion at ground level. Steel poles can also be either (i) set on an excavated concrete foundation with protruding bolts to lock a lower welded steel flange into position, or (ii) set on a section of pole driven into the ground fitted with a steel flange plate welded to the top of the buried pole section.

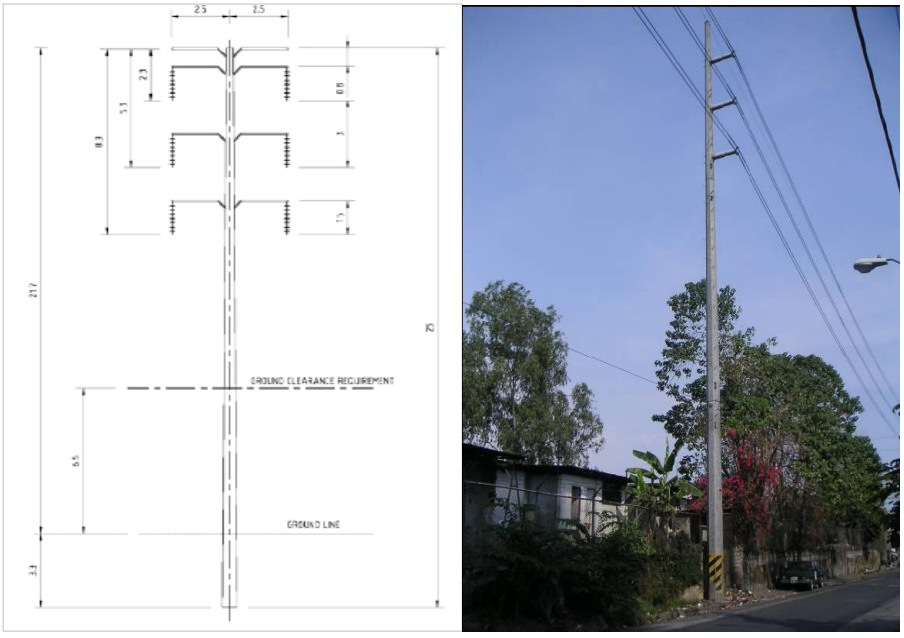


Figure 4: Illustration of Steel Monopole

2.2 Project Construction and maintenance

During construction it will be necessary for the contractor to provide temporary road access for each pole structure on the line. However, there will be need to acquire permanent access which will be compensated after the values are established through the planned Resettlement Action Plan (RAP) study.

Substation Lay out

The substations designed for expansion will include the installation of double circuit transmission lines together with provision for onward connections to future grid substations. All substations are designed for a conventional outdoor, air-insulated 220 kV switchyard with a substation building housing 33 kV indoor metal enclosed switchgear and control, protection, communication and auxiliary equipment.

Figure 5: Kawanda Sub Station Under construction

2.3 System Protection and Communication

a) Communication

New transmission line ground wires will be fitted with optical fibres to facilitate future development of a high speed SCADA and communications systems to the remote parts of the power system. The fibre optic system will be installed as the main communication link for data and speech transfer with a power line carrier based telecommunication link or microwave communication links installed as a backup. The fibre optic link, which has a much higher reliability, capacity and speed, shall facilitate remote control of substations from the load dispatch centre at Kawanda Substation in Wakiso as well as provide for telephone communication.

b) Protection

To ensure overall line and power system integrity, protection systems shall be multi-functional microprocessor-controlled. Equipment protection provisions are given below for each category of equipment.

i) Line Bays

The overhead lines shall be protected with distance protection, auto reclosing with settable auto reclose cycles and fuse failure/trip monitoring features, with at least 3 independent settable zones as the main protection system. For trip signaling purposes, the distance protection relays at each end of a line will need to communicate with each other via the proposed fibre optic communication links between substations. The back-up line protection system shall consist of a non-directional over-current and a directional earth fault with two stages, one working with communication to remote device and the other independent.

ii) Transformers

In addition to gas detection, oil temperature, winding temperature, pressure release and oil level relay devices, transformers shall be equipped with current differential protection and restricted earth fault on two or more windings where applicable as main protection. As back-up protection, transformers shall have non-directional over-current protection and restricted earth fault on all windings.

iii) Busbars

Busbar protection shall consist of an intelligent low-impedance current differential scheme with back-up breaker failure protection.

2.4 Construction Activities

2.4.1 Over view

The construction activities are divided into two separate components: Procurement, Manufacturing and Transport; and Construction which is further divided into the three distinct sections of transmission line. The procurement, manufacturing and transportation component is broken down into five tasks. The first task (engineering) involves the design and specification of all transmission line components. The remaining tasks involve the actual procurement of these components, and the logistics of transportation to Uganda. Detailed engineering will include completion of geotechnical and engineering surveys to provide detailed information needed for, placement/location of towers, design of foundations, design of towers, and the sub-station design.

Engineering and detailed design will commence upon award of the Contract. At this stage, minor adjustments may be made to the route to allow the Contractor to optimize the design including number of towers and span distances between towers, foundation designs, and number of heavy angle towers. The 220 kV Kawanda-Masaka transmission line will be 137 km. The proposed construction of the planned transmission line will involve among others, the following activities, acquisition of the right of way for the power line; survey and mapping of the routes which will involve detailed Line route survey (line profiling, soil studies, pegging and tower spotting).

2.4.2 Construction of Transmission Lines

All the towers on the transmission line will be constructed prior to the installation of conductors. Tower foundations will vary according to the prevailing geology. For the majority of towers, pad and chimney foundations will be used, which will be excavated mechanically. By this method, a concrete pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After 48 hours, the form work will be removed, and the excavation will then be back-filled to original ground level and compacted.

In areas that may be prone to seasonal flooding and wetland areas, a raft foundation for transmission line towers will be used. The raft foundation is similar in concept to the pad and chimney foundation, except all four feet of each tower will be set on a single raft of concrete. If the tower is sited upon hard rock, a minimal foundation only is required. Any required excavation of rock will be carried out by drilling, barring, wedging or use of compressed air tools. It is not anticipated that blasting will be necessary. Upon delivery of the steelwork from the storage yard to the tower location, erection of the transmission towers will proceed using a winch and gin pole. Typically, the gin pole will be supported on one leg of the tower while the sections are bolted on. The gin pole will then be lifted to a higher attachment point to repeat the process.

Once the towers are erected, the conductors and shield wires will be strung and tensioned with specialized equipment to achieve the designed sag. Stringing is carried out first by hanging a pilot wire from each tower, connecting the pilot wires together, and then using the pilot wire to draw the conductor along the insulators. This is normally done in sections of six to seven km at a time. Guard structures will be used when installing the conductor over highways, main roads, waterways, railroads or any overhead power or communication lines to ensure the conductors do not cause a hazard to the public or the construction staff.

Compression dead-ends and splices will be used to secure the conductor to certain towers and join sections of conductor. After the conductors and shield wires are attached to the insulators or clipped to supports the lines will be sagged to the proper tensions, and fitted with vibration dampers. A number of tests will be undertaken to ensure that the line performs to specification. During testing, line ground clearance will also be thoroughly checked. Once construction of the transmission line is completed, the soil along the right-of-way will be assessed for problems such as erosion or compaction, and corrective action will be taken as appropriate. Areas of bare soil will be seeded with native cover crops to stabilize the soil, reduce erosion and prevent invasion by undesirable plant species.

No chemical use (e.g. curing agents, plasticizers, cable oils or pesticides) will be required on site during construction. Curing of concrete foundations will be executed by means of wet jute bags. It is expected that the EPC Contractor will carry out the works simultaneously. The timing and schedule will be confirmed following selection of the EPC Contractor during civil works there will be the construction of the line structures, accessories and conductors.

Substation works

Detailed technical analysis and power system studies have been carried out to determine the scope of work. Based on the power system studies, the line scope is proposed to comprise the following:

1. Extension of Kawanda 220kV Substation with the addition of 2 x 220kV line bays for the two Kawanda – Masaka 220kV transmission line circuits;
2. Construction of a new Masaka 220/132kV substation equipped with 2 x 220/132kV, 60MA transformers and 2 x 220kV line bays for the two Masaka – Kawanda 220kV transmission line circuits;
3. 2 x 15 MVAr, switched shunt reactors and associated equipment at Masaka and Mbarara substation; and
4. 1 x 15 MVAr, switched shunt reactor and associated equipment at Kawanda Substation.

2.4.3 Access Roads

To the extent feasible, access to the transmission line way leaves will be gained largely by use of existing public highways and access roads. Where the planned transmission line follows the existing transmission line, the existing access tracks within such way leaves will be used. Access to the new tower locations will be gained via a short 'spur' from such way leaves.

However, where there are no existing access tracks, an access track of approximately 5 m width will be cut through vegetation along the way leaves following the centerline of the way leaves. Clearance for housing and other buildings will be maintained by local adjustment of the route. Cut trees will be left for use by the local owners and in case they are of timber type and ready for harvest and do occur outside the park, the landlords will be given notice to harvest such trees before the start of project work.

To the extent feasible, in areas of the way leaves outside the access tracks, clearance of vegetation will be minimized. Only huge trees close to the line will be cleared i.e. those that can potentially damage the transmission line in case they fall off (typically large trees within 30 m of the transmission line). All clearance of vegetation will be done by hand and with no use of heavy machinery. Where soil is exposed in the process, the soil will be backfilled to reduce erosion concerns.

2.4.4 Equipment

The storage yard for the planned transmission line construction is expected to be the base for a fleet of standard vehicles characteristic of the anticipated project works. It is anticipated that the following vehicles and equipment will be required:

- One large crane for handling goods within the storage yard;
- Trucks of various sizes, some fitted with Hiab or Atlas-type hoists for unloading materials and equipment at each tower site;
- Mobile cranes;

- Tractors with winches;
- Cable stringing pullers;
- Pilot line winders;
- Cable stringing tensioners;
- Cable reel carriers;
- Truck/trailer mounted water tanks;
- 4-wheel drive vehicles;
- Compressors with pneumatic equipment such as rock drills; and
- Concrete mixers.

No equipment storage yards and camp sites will be established inside the protected areas.

2.4.5 Labour Force

For the transmission line works, the number of staff required during construction could include; project managers, supervisors, and other technical categories and unskilled workers who can be recruited locally. Semi-skilled and unskilled workers will be trained by supervisors prior to the commencement of construction. Local people will be recruited as unskilled labourers from the villages traversed by the transmission line, where possible. On average, an estimated 100 people are anticipated to constitute the workforce on the power line. While in many cases the workers will arrive at the site on foot, some pool transport can be provided as necessary to bring workers to the way leaves. Expatriate staff will be housed in existing accommodation preferably, modest private houses which can rented by the expatriates within the nearby towns. Construction workers' camp sites will be required for some staff. The entire recruitment process for the workers will be managed by the contractors in accordance with Uganda labor laws.

2.4.6 Operation and Maintenance (O & M)

Once the transmission lines are constructed there is relatively little ongoing maintenance required. The key maintenance activities will involve surveillance of the condition of the transmission line and way leaves; emergency maintenance and repairs; and vegetation maintenance activities. Vehicular access to sections of the way leaves during O&M will be for supervision, monitoring and to carry out line repairs when needed. Outside agriculture areas or otherwise cleared areas, undesirable vegetation within the way leaves will be controlled by cutting. Herbicides will not be used in vegetation control. The vegetation clearance in the weaves will take place in accordance with UETCL's existing way leaves clearance programme which allows it to be done once annually.

As for the substations, their normal operations will generally be manned by 2-3 operational staff whose work will be to monitor and guard the installations. There will be modest public health facilities to serve such staff in the substations. The majority of traffic to and from the substation will be light vehicles, i.e. no regular loads greater than two tonnes, and should be no more than five vehicle movements per day. The transmission system will be almost free from noise, and emissions will be limited to a low hum. This will not be noticeable from within buildings outside the substation site. The substations will be nearly maintenance-free. Maintenance will be limited to annual cleaning and checking of circuit breaker connections, and will require a team of approximately five engineers and

semi-skilled workers, for approximately one week. Regular/routine changing of transformer oil will not be required.

2.4.7 Decommissioning

It is anticipated that the transmission facilities will be continuously maintained and repaired, and will be operated for several decades. Because of their long useable life the circumstances under which, they might ultimately be decommissioned are difficult to foresee at this stage. Thus, only a site construction decommissioning approach can be considered at the moment in this study. Therefore, the practical decommissioning will for now involve the following:

- Restoration the sites through levelling and re-vegetation measures;
- Removal of obsolete equipment and associated equipment parts;
- Demobilization and return of imported labour force after the project;
- Grievance management mechanisms with the host communities before site closure;
- Repairs of damaged roads and restoration of access routes and rout deviations;
- Removal of construction debris and unused materials.

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

This Chapter provides analysis of the policy, legal and institutional framework within which the proposed 220KV Kawanda-Masaka 137km line is expected to operate. This Chapter covers relevant Ugandan and Development Partner policies, legislations and guidelines. Key Ugandan legislations governing the conduct of ESIA are the National Environmental Act (Cap 153) and the Environmental Impact Assessment Regulations (1998). The National Environmental Act established the National Environment Management Authority (NEMA), and entrusts it with responsibility to ensure compliance with the ESIA process in planning and execution of development projects

3.2 Policy Framework

Policy framework is critical in planning and implementation of development projects. In regard to the ESIA of the 220KV Kawanda-Masaka 137km line, policies related to energy sector and environment are important. These policies can be looked at national or development partner levels.

3.2.1 National (Ugandan Policies)

The key Ugandan policies relevant to the proposed project include;

- The National Energy Policy, 2002
- The National Environment Management Policy, 1994
- Vision 2025

There is currently no policy on land but the Government of Uganda recognizes the right of persons to own property and be compensated for loss of property. The right to own property and be compensated for loss is derived from various sections of the 1995 Constitution, Local Government Act 1997 and Land Act 1998. Furthermore, the GOU recognizes the World Bank Operation Safeguard Policy OP 4.12 (2001) on involuntary resettlement.

The National Energy Policy, 2002

The goal of the energy sector in Uganda is to meet the energy needs of the Ugandan population for social and economic development in an environmentally sustainable manner. The National Energy Policy objectives include:

- establishing availability, potential and demand of the various energy resources in the country
- increasing access to modern and reliable energy services as a contribution to poverty eradication
- improving energy governance
- stimulating economic development; and
- managing energy related environmental impacts

In pursuit of these objectives, the Government of Uganda (GOU) will therefore ensure that environmental considerations are given priority by energy suppliers and users to protect the

environment and will put in place a monitoring mechanism to evaluate compliance with established environmental protection guidelines.

The National Environmental Management Policy, 1994

The National Environment Management Policy for Uganda (1994) is the cornerstone of the country's commitment to social and economic development that is environmentally sustainable and brings the benefits of a better life to all. The National Environment Management Policy gives the overall policy framework, which calls for sustainable development that maintains and enhances environmental quality and resources productivity to meet human needs of the present generation without compromising ability of future generations to meet their own needs.

The framework points out cross-sectoral guiding principles and strategies to achieve sustainable socio-economic development. The policy sets a guiding principle that Environmental Impact Assessment should be required for any activities, which cause significant impact on the environment.

The National Environment Management Policy 1994 supports and promotes the proposed 220KV Kawanda-Masaka 137 km line activity under its energy sector objective, "To meet the national energy needs through increased use of hydropower...."

Vision 2025

Vision 2025 is a set of goals that the Uganda government set to achieve for the common good and economic development of the country by the year 2025. The goals cover political, economic, social, environmental, and cultural aspects of life.

Key in the environmental goal is the desire by Ugandans to have a sustainable socio-economic development matched with environmental quality and ecosystem resilience. In order to achieve a sustainable socio-economic development, government prioritized industrialization (value addition) as the key factor. To this end, Rural Electrification program was established to catalyze the socio-economic development of the rural areas of the country.

In order for the people in Masaka and the surrounding regions of Uganda to benefit from the rural electrification program, reliable grid power is one of the key ingredients. The proposed 220KV Kawanda-Masaka power line will go a long way to meeting this mission.

Development Partner Policies

Development partners or their agencies fund most development projects in developing countries, Uganda inclusive. Most development partners require either the World Bank (WB) or African Development Bank (AfDB) guidelines as a basis for funding development projects. Therefore, the 220KV Kawanda-Masaka power line diversion ESIA addresses the WB social and environmental safeguard policies. The following World Bank operational guidelines and procedures are relevant to the 220KV Kawanda-Masaka power line.

3.2.2 World Bank Operational Policies

The Operational Policies provide basis on which the World Bank screens proposed projects to determine the appropriate extent and type of EA to be undertaken. The Bank classifies proposed projects as Class A, B, C or F1 depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. The project sponsor is responsible for any environmental due diligence required by the Safeguard Policies.

There are ten 'Safeguard Policies' that the Bank regards as critical to ensuring identification, minimization and mitigation of potential social and environmental impacts of development projects, they are;

- Environmental Assessment (EA)
- Cultural Property
- Disputed Areas
- Forests
- Indigenous Peoples
- International Waterways
- Involuntary Resettlement
- Natural Habitats
- Pest Management and,
- Safety of Dams

The discussion below presents the Safeguard Policies relevant to the 220KV Kawanda-Masaka power line. Safeguard policies on Safety of Dams and International Water Ways are not discussed since the proposed project does not involve dams or international waterways. Other than the policy on ESIA, Involuntary Resettlement, Natural habitats, Cultural Property and Forests, the other WB policies are not being triggered by the proposed 220KV Kawanda-Masaka power line.

O.P. 4.01, Environmental Assessment

This is the umbrella policy for the World Bank's safeguard policies and requires an environmental impact assessment carried out before implementation of category A projects. Category A projects are ones that are likely to have significant adverse impacts and irreversible environmental impacts. Conversely, category B projects are those with limited impacts that can be mitigated, and require an initial environmental evaluation or project appraisal document with an EMP covering all negative impacts.

O.P. 4.12, Involuntary Resettlement

This is the guiding policy when a project results in involuntary resettlement. OP 4.12 describes the detail and elements that a resettlement plan should include. These include objectives, potential impacts, socio economic studies, legal and institutional framework, eligibility, valuation and compensation of losses, resettlement measures, relocation planning, community participation, and grievance redress procedures, implementation schedule, costs and budgets, and monitoring and evaluation. This report conforms to the WB policy requirement on contents and structure. Elaborated below are sections relevant to the 220KV Kawanda-Masaka power line.

WB OP 4.12.(6a) requires institution of measures to ensure that displaced persons are (i) informed about their options and rights, (ii) consulted on, offered choices and provided with technically and economically feasible resettlement alternatives, and (iii) provided prompt and effective compensation at full replacement costs

WB OP 4.12 (8) requires that particular attention be paid to the needs of vulnerable groups among those displaced such as those below the poverty line, landless, elderly; women and children and indigenous peoples and ethnic minorities.

WB.OP 4.12 (13 a) stipulates that any displaced persons and their communities and any host communities receiving them should be provided with timely and relevant information, consulted on resettlement options and offered opportunities to participate in planning, implementing and monitoring resettlement.

WB OP 4.12 (12a) states that payment of cash compensation for lost assets may be appropriate where livelihoods are land-based but the land taken for the project is a small fraction (less than 20%) of the affected asset and the residual is economically viable.

WB OP 4.12 Para (6 b & c) state that in case of physical relocation, displaced persons are provided with;

- assistance (such as moving allowances) during relocation; and
- residential housing, or housing sites, or as required, agricultural sites for which a combination of productive potential, location advantage, and other factors are equivalent to the advantages of the old site
- support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living
- development assistance in addition to compensation measures such as land preparation, credit facilities, training, or job opportunities

WB OP 4.12 Para 13 (a) requires that appropriate and accessible grievance mechanisms are established to sort out any issues arising.

These frameworks will be relevant in mitigating adverse socio-economic impacts associated with 220KV Kawanda-Masaka power line project.

O.P 4.04, Natural Habitats

This policy guideline require infrastructure development to take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. O.P 4.04 prohibits projects, which would lead to significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats, which are legally protected, officially proposed for protection, or unprotected but known to have high conservation value.

The ecologically important natural habitats traversed by the proposed project are the Mayanja wetland system. There are no gazzeted natural forests within the proposed transmission line

corridor. The ESIA process took into consideration of these guidelines. The mitigation measures suggested in the EMP address foreseeable impacts on the wetlands.

O.P 4.11, Cultural Property

This policy gives guidelines for the preservation of cultural property and seeks to avoid their elimination, otherwise mitigation activities be undertaken to limit the adverse impacts as far as possible.

Whereas there are no serious cultural properties along the transmission line apart from graves, and the cultural rock at Buwama, chance findings could be encountered during the construction of the proposed steel structure transmission line. Detailed in the EMP are measures to mitigate impacts on cultural properties. Details of these and other World Bank guidelines can be obtained from their site, www.worldbank.org.

The World Bank Group Environmental, Health and Safety Guidelines of 2007

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. These guidelines emphasize and spell out key parameters to consider under Environmental, Occupational Health and Safety, Community Health and Safety, Construction and Decommissioning. Therefore the construction and decommissioning of the proposed 137km power line will be undertaken with due consideration to these guidelines. The World Bank Group Environmental, Health and Safety Guidelines of 2007 shall apply to this project and will be referred to during project implementation and monitoring.

3.3 Legal Frame Work

There are a number of legislative and regulatory instruments in Uganda that address environmental management in both general and specific terms. Among these is the 1995 Constitution of the Republic of Uganda and a number of Acts. The Acts and Regulations of particular relevance to the proposed 220KV Kawanda-Masaka power line are;

- National Environment Act CAP 153
- The constitution of the Republic of Uganda, 1995
- Environmental Impact Assessment Regulations, 1998
- The National Environment (Control and Certification of Environmental Practitioners) Regulations, 2001
- The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999
- The National Environment (Waste Management) Regulations, 1999
- The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2001
- The Land Act, 1998

- The Electricity Act, 1999
- The Uganda Wildlife Act, 2000
- The Historical and Monuments Act, 1967
- The Water Act, Cap 152

Other regulations that deem consideration, depending on the particular project and project location include;

- The National Environment (Delegation of Waste Discharge Functions) Instrument, 1999
- The National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001
- The National Environment (Noise Standards and Control) Regulations, 2003
- The National Environment (Management of Ozone Depleting Substances and Products) Regulations, 2001
- The Fisheries Act Cap 197
- Worker's Compensation Act
- National Forestry and Tree Planting Act

The Constitution of the Republic of Uganda, 1995

The most important instrument and supreme law in environment management and legislation in Uganda is the 1995 Constitution of the Republic of Uganda. The Constitution provides for the right of every Ugandan to a clean and healthy environment. The Constitution puts the duty to maintain a clean and healthy environment on the Parliament of the Republic of Uganda. It stipulates that Parliament shall provide measures intended to protect the environment from abuse, pollution and degradation.

The 1995 Constitution provides for:

- matters pertaining to management of land, natural resources and the environment, and the sustainable development thereof (Objective XXVII), including energy resources;
- the right of every Ugandan to a clean and healthy environment (Article 39);
- the responsibility of government to enact laws that protect and preserve the environment from degradation and to hold in trust for the people of Uganda such natural assets as lakes, rivers, wetlands, forest reserves, game reserves and national parks [Article 237(2)]; and
- the right of every Ugandan to fair and adequate compensation in instances of the compulsory acquisition of land

National Environmental Act, CAP 153

The main law relating to the protection of the environment in Uganda is the National Environment Act (NEA), Cap 153. This Act states the duty to protect and preserve the environment and provides for the establishment of measures to manage the environment for sustainable development and

promotion of environmental awareness. The NEMA was created under the NEA and is mandated with the responsibility to oversee, coordinate and supervise environmental management in Uganda, including the review of environmental impact assessments carried out for various projects.

The Act outlines the principles of environmental management and the rights to a decent environment. Furthermore, the Act sets out principles for:

- institutional arrangements
- environmental planning
- environmental regulations
- environmental standards
- environmental restoration orders and easements
- records, inspection and analysis
- financial provisions
- offences
- judicial proceedings and
- international obligations

The third schedule of the Act lists projects requiring environmental impact assessment. The schedule specifies that any development that involves electrical infrastructure including (electrical generation stations; electrical transmission lines; electrical substations and pumped-storage schemes) must be subjected to an Environmental Impact Assessment. It is therefore on the above basis that an ESIA for the 220KV Kawanda-Masaka power line has been conducted.

The Environmental Impact Assessment Regulations, 1998

Environmental Impact Assessment Regulations, 1998 provide for implementation of the NEA. These Regulations require that all projects listed in the third schedule of the NEA should be subjected to an impact assessment before implementation. Electrical infrastructure is identified as a Category III listed activity requiring a full ESIA. The ESIA process goes through three major stages: Screening, the ESIA study, and decision-making. Initially, UETCL had carried out ESIA in 2006 for the entire Kawanda-Masaka power line but because some years have passed, the ESIA needs updating since the situation on the ground has changed. Therefore, , a fresh ESIA report had to be prepared to incorporate the new environmental issues in the ground that had not been earlier assessed.

The National Environment (Control and certification of Environmental Practitioners) Regulations, 2001

Regulation 16(1) states that no person shall conduct an ESIA or carry out any activity relating to conduct of an environmental impact study or environmental audit as provided under the Act, unless that person has been duly certified and registered in accordance with these regulations. These Regulations apply to all persons certified and registered under the regulations as Environmental Practitioners, and corporate persons and partnerships registered under the regulations to co-ordinate

individually registered persons to conduct environmental impact assessments or environmental audits. They also deal with those who wish to conduct ESIAs in Uganda.

The regulations set out the procedures of the application for certification and the code of practice and professional ethics. The practitioners have to pay prescribed fees (Fourth Schedule) before they can be fully registered.

This is a relevant provision since meant to professionalize the ESIA practice in the country so that the findings of an ESIA study are authoritatively used in decision-making. This ESIA report has been prepared by Registered and Certified Environmental Practitioners.

The National Environmental (Standards for Discharge of Effluent into Water or on Land Regulations), 1999

These regulations provide standards for effluent discharge. Section 6 (2) detail maximum permissible limits for 54 regulated contaminants, which must not be exceeded before effluent is discharged into water or on land. The materials used in the re-construction of the transmission line may have some of the regulated contaminants in which case the provisions become relevant in designing the EMP.

The National Environment (Waste Management) regulations, 1999

These regulations provide for the management of waste. Regulation 4 describes the sorting and disposal of domestic waste and provides that the generator of domestic waste may, without a license issued under these regulations, dispose non-hazardous waste in an environmentally sound manner in accordance with by-laws made by a competent local authority.

The Regulations also directly mention the application of cleaner production as a means to minimize production of wastes. Regulation 5 (1) states that a person who owns or controls a facility or premises, which generate waste, shall minimize the waste generated by adopting cleaner production methods. These include the improvement of production processes through;

- Conserving raw materials and energy
- Eliminating the use of toxic raw materials
- Reducing toxic emissions and wastes
- Monitoring the product cycle from beginning to end by:
  - identifying and eliminating potential negative impacts of the product
  - enabling the recovery and re-use of the product where possible
  - reclamation and recycling and
  - incorporating environmental concerns in the design and disposal of a product

These provisions apply to the proposed 220KV Kawanda-Masaka power line diversion / transmission line. During the upgrade process, domestic waste, construction material waste and those related to the decommissioning of the old line will be generated. Management of this waste should comply with provisions of this regulatory standard.

The National Environment (Wet Land, River Bank and Lake shores Management), Regulations 2001

These regulations provide for the management of wetlands, river banks and lake shores. Regulation 17 (1) states every landowner, occupier or user who is adjacent or contiguous with a wetland shall have a duty to prevent the degradation or destruction of the wetland and shall maintain the ecological and other functions of the wetland.

Section 12 (1) of the regulations provides that 'subject to the provisions of these regulations, a person shall not carry out any activity in a wetland without a permit issued by the Executive Director (of NEMA).

Section 23 (1) (a) of the regulations require a person who intends to 'use, erect, reconstruct, place, alter, extend, remove or demolish any structure or part of any structure in, under, or over the river bank or lake shore;' to make an application to the NEMA for Environment Impact Assessment before any such activity takes place.

The wetlands, river banks and lake shores regulations in section 34 provide that 'a developer desiring to conduct a project which may have a significant impact on a wetland, river bank or lake shore, shall be required to carry out an environmental impact assessment in accordance with sections 20, 21 and 22 of the National Environment Act'.

The proposed 220KV Kawanda-Masaka power line diversion will traverse Mayanja wetland system mainly. For the intended project to comply with this regulation, the developer (UETCL) is required to secure a permit from NEMA before construction of the transmission line through these wetlands can be effected. However, this ESIA report adequately cover the provisions of section 23 (1) (a) and will serve the purpose for the application of a permit.

The Electricity Act Cap 145

The Electricity Act 1999 provides for the need to protect the environment during consideration, development and operation of Electricity supply projects. The Act, established the Electricity Regulatory Authority (ERA), as a statutory body mandated to regulate all aspects of the electricity industry in Uganda. Section 10 of the Electricity Act, 1999, clearly defines ERA's mandate as regulator and comprises 19 specific functions.

S.50 (2) makes it a condition to follow procedures laid down in the National Environment Act, 1995 (CAP 153 of the Laws of Uganda) during removal of installations considered inappropriate for further operations of the plant/activity.

Furthermore, Section 68 of the Electricity Act, 1999 outlines procedures and conduct of licensee during placement and maintenance of any electricity supply lines in, over or upon any land. Subsection (3) requires the licensee to make as little damage as possible to land and to the environment and should ensure prompt payment of fair and adequate compensation to all interested persons for any damage or loss sustained by the placement and maintenance of any electricity

supply lines in, over or upon any land. The Electricity Act, 1999 gives adequate guidelines for the conduct of a licensee and recognizes the need to make good any damage and notice to those who may be affected by the project activities.

The proposed 220KV Kawanda-Masaka power line ESIA adequately covers these provisions. The mitigation measures for foreseeable impacts are detailed in the EMP.

The Land Act Cap 227

The Land Act, Cap 227 provides that the Government or the local government shall hold land in trust for the people and protect natural lakes, ground water, natural streams, wetlands and any other land reserved for ecological purposes for the common good of the citizens of Uganda.

A local government may, upon request to the government, be allowed, to hold land in trust for the people and the common good of the citizens of Uganda. Section 40 (1) points out issues to be addressed during acquisition of land. It spells out that, no person shall:

- sell, exchange, transfer, pledge, mortgage or lease any land;
- enter into any contract for the sale, exchange, transfer, pledging, mortgage or lease of any land; and give away any land, or enter into any other transaction in respect of

  - land on which the person ordinarily resides with his or her spouse, and from which they derive their sustenance, except with the prior written consent of the spouse;

  - land on which a person ordinarily resides with his or her dependent children of majority age, except with the prior written consent of the dependent children of majority age;

  - land on which a person ordinarily resides with his or the children below the age of the majority, except with the prior written consent of the Committee; and

  - Land on which ordinarily reside orphans below majority age with interest in inheritance of the land, except with the prior written consent of the Committee.

Sections 43, 44 and 45(1) and (2) of the Land Act (1998), provides that national or local government may acquire land in accordance with the provisions of Article 26 and clause (2) of Article 237 of the Constitution of the Republic of Uganda.

The Act furthermore requires any person who owns or occupies land to manage and utilize it in accordance with the National Environment Act Cap 153 and any other laws binding.

Enforcement of the Land Act guidelines is through the Land Regulations (2001). The Regulations give details on matters such as application for Certification of Occupancy, converting leasehold into freehold system, formation of Community Land Associations, procedures for paying annual ground rent.

Part III sections 43, 44, and 45 specifically address the utilization of land in accordance with the various statutes and acts of environmental concern, which include the National Environment Act, The

Water Act, and any other law passed by a competent authority. In addition, section 45 addresses the control of environmentally sensitive areas.

The relevant provisions of this act are very crucial under the proposed 220KV Kawanda-Masaka power line because, several individuals are likely to be displaced and/or inconvenienced during the construction and operation of the project. Furthermore, amongst these communities are women and children whose rights to family land have to be protected. The mitigation measures in the EMP adequately cover possible impacts.

The Uganda Wildlife Act, Cap 2000

The main objective of the Uganda Wildlife Act, Cap 200 of 2000 is to protect wildlife resources and enable derivation of benefits. The need for sustainable management of wildlife resources is captured within the framework of effective planning and stakeholder participation. The Act allows local community involvement and opens up wildlife management to the non-governmental/private sector by making it possible for the private sector to manage protected areas / wildlife and provide services.

The Uganda Wildlife Act provides for, *inter alia,* the sustainable management of wildlife, and establishes the Uganda Wildlife Authority (UWA) as the body mandated with the co-ordination, monitoring and supervision of wildlife management. It does so in partnership with neighboring communities and stakeholders. It was established as a result of a merger between the Uganda National Parks and the Game Department.

Wildlife is defined by the Act to mean any wild plant or wild animal or species native to Uganda and includes wild animals that migrate through Uganda.

Considering that much of the line will go through remote section of the countryside involving clearing of vegetation, and excavation of land to create holes etc, this Act is quite relevant, and relevant provisions should be complied with.

The Act in S.15 (1) & (2) requires that any developer desiring to undertake any project which may have significant impact on any wildlife species or community undertakes an ESIA in accordance with the National Environment Act. This ESIA is meant to make the reconstruction of the 220KV Kawanda-Masaka power line compliant to this Act. Any IUCN listed plant, animal species identified and relevant mitigation measures have been suggested to conserve them.

Historical and Monument Act, 1967

The existing law relating to archaeological sites in Uganda is the Historical and Monuments Act, 1967, which the Commissioner for Antiquities and Museums has currently placed under review.

The Act provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical, and traditional interest. Under this Act, the minister responsible may cause any of the aforesaid objects to be declared as preserved objects.

The Act prohibits any person from carrying out activities on or in relation to any object declared to be preserved or protected. Section 10 of this Act spells out the procedures and requirement to declare and inspect newly discovered sites that may have archaeological, palaeontological, ethnographical, historical and traditional significance for purposes of protection.

Whereas there were no sites of archaeological, palaeontological, ethnographical, historical and traditional significance identified in the power line corridor, chance findings may be encountered. Moreover, along the proposed route corridor there exist graves, which are revered traditional sites. The developer is urged to exercise due diligence where historical property is discovered in any way during construction of the 220KV Kawanda-Masaka power line and other related activities

Occupational Safety and Health Act, 2006

The Occupational Safety and Health Act of 2006 consolidate, harmonize and update the law relating to occupational safety and health and repeals the Factories Act of 1964. The Act provides for the health, safety, welfare and appropriate training of persons employed in work places.

During the construction and operation of the proposed transmission line, safety, welfare and training will be of paramount importance. Precautionary measures on Occupational Safety and Health have been stipulated in the EMP.

Public Health Act Cap 281

Section 7 of the Public Health Act Cap 281 provides local authorities with administrative powers to take all lawful, necessary and reasonable practicable measures for preventing the occurrence of, or for dealing with any outbreak of, any infectious communicable or preventable disease in order to safeguard and promote the public health.

Section 105 of the Public Health Act (1964) imposes a duty on the local authority to take measures to prevent any pollution that is dangerous to the health to enter any water supply that the public has a right to use for drinking or domestic purposes. The Act further details the location of waste disposal facilities such as solid waste skips and septic tanks in relation to settlements and food points.

During the construction and operation of the proposed 220KV Kawanda-Masaka power line, some activities may lead to contamination of the water supplies or spread of communicable diseases. Appropriate mitigation measures have been suggested in the EMP

Workers Compensation Act, 2000

The Workers compensation Act, 2000 provides for the provision of financial compensation for work related injury or illness.

Employment Act 2006 and Other related Acts

The Employment Act 2006 shall be the governing legal statutory instrument for the recruitment, contracting, deployment, remuneration, management and compensation of workers. The premise of

Employment Act 2006 is the provisions of Article 40 of The Constitution of Uganda. The Act mandates Labor Officers to inspect regularly the working conditions of workers to ascertain that the rights of workers and basic provisions are provided and workers' welfare is attended to. The Act also provides for the freedom of association of workers permitting workers to join labour organizations. This provision is also supported by the Labour Unions Act 7, 2006, which provides elaborate guideline and regulation for membership.

Other laws related to workers' safety, social security and protection worth noting include:

- the Labour disputes (Arbitration and settlement) Act, 2006
- the Workers' Compensation Act, Cap 225
- the National Social Security Act Cap 222, and
- The Labour Unions' Act, 2005.

3.4 International Legislations

Uganda has signed and/or ratified a number of international agreements relating to the environment, both regionally and globally. Conventions, which Uganda has ratified, include:

- the Ramsar Convention on Wetlands of International Importance, UNESCO;
- the Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – UNESCO;
- the Convention on Biological Diversity (CBD) – United Nations;
- the African Convention on the Conservation of Nature and Natural Resources – OAU;
- the Convention for the Protection of the Ozone Layer and its Montreal Protocol;
- the Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (Basel Convention);
- the Bamako Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa – OAU;
- the Framework Convention on Climate – United Nations; and
- The Convention relating to the Preservation of Flora and Fauna in their Natural State.

Adequate provisions have been put in the EMP to ensure that this ESIA report meets the requirements of these conventions.

3.5 GAP analysis

In order to ensure that the ESIA for the proposed 220KV Kawanda-Masaka power line meets the environmental and social policies and guidelines of development partners, gap analysis was carried out on the relevant Ugandan and development partner policies, legislations and guidelines.

The legislations detailed above cover most of the lender policy environmental guidelines however; there are gaps in the socio-economic requirements.

Under the Ugandan laws the affected persons are monetarily compensated, and that the affected persons are only eligible for compensation if they have legally recognized rights to the subject land, but the World Bank requires that all affected persons should be compensated, regardless of their occupancy status. WB policy provides for alternative land where compensation on land for land basis, compensation in kind and goes beyond monetary compensation by specifying that income must be restored at full replacement cost. In addition, perennial crops must be compensated for in cash at an established rate and annual crops shall be compensated in accordance to World Bank Safeguard Policy OP4.12.

Table 3.1 below gives a comparison of relevant Ugandan policies and regulations with those of the development partners. Since the World Bank requirements stipulate adoption of the more stringent measures, strategies that the developer (UETCL) will use to make the project meet the more stringent guidelines have been included.

Table 3.1 : GAP Analysis of Relevant National and International Regulations and Guidelines

Requirement	Guideline	Relevant Uganda Legislation	Action Taken to meet Stringent Requirement
Environmental & Social Impact Assessment (ESIA)	WB OP 4.01	Comprehensively covered by the National Environment Act, Cap 153 and Environmental Impact Assessment Regulations, 1998	ESIA subject of assignment as documented herein. UETCL is committed to further developing, appropriate management programs, organizational capacity, training, community engagement, monitoring and reporting
Natural Habitats	WB OP 4.04	Covered under the National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2001 and the Uganda Wildlife Act, Cap 2000	No major natural habitats traversed, except for Mayanja wetland system. UETCL will commit to mitigation measures included in the EMP
Forests	WB OP 4.36	Relevant provisions contained in the Forest Act and National Forest and Tree Planting Act	No forests traversed by the project thus not significant conversion or degradation of critical forest areas or related critical natural habitats
Community Health, Safety and Security	No WB or AfDB Guideline but IFC Performance Standard 4	Community health covered by the Public Health Act, Cap 281 Employee health, safety and security by the Occupational Safety and Health Act, 2006	UETCL will reduce worker and general public's exposure to vector borne diseases, STDs and construction and operation related safety hazards as indicated in EMP.
Pest Management	WB OP 4.09	Relevant provisions covered by the Public Health Act, Cap 281 and the Occupational Safety and Health Act, 2006	UETCL is will control pests using a combination of environmental design (avoid creating vector breeding habitat),

Requirement	Guideline	Relevant Uganda Legislation	Action Taken to meet Stringent Requirement
			mechanical control (i.e., bed nets), use of medications and prophylaxes, and limited use of approved, non persistent pesticides such as pyrethrum sprays
Pollution Prevention and Abatement	No WB or AfDB Guideline but IFC Performance Standard 3	The National Environment Regulations (Waste Management, 1999; Standards for Discharge of Effluent into Water or on Land, 1999; Noise Pollution, 2004	UETCL and EPC Contractor will comply with the mitigation measures detailed in the EMP
Indigenous Peoples	WB OP 4.10	No Specific law but right to belong to an entity covered by 1995 Constitution	No indigenous peoples as defined by the World Bank Group are in the project area
Cultural Property	WB (IDA) OP 4.11	Comprehensively covered by the Historical and Monuments Act, 1967	No known cultural properties exist except graves UETCL will adhere to mitigation measures in EMP to handle chance discovery of unknown artifacts during construction
Involuntary Resettlement	WB (IDA) OP 4.12	No specific law but the 1995 Constitution and Land Act provide for fair and adequate compensation Compensation not at market value	UETCL will carry out comprehensive Resettlement Action Plan An uplift will be included in compensation so that those affected are not worse off as a result of the Project

Requirement	Guideline	Relevant Uganda Legislation	Action Taken to meet Stringent Requirement
Public Consultation and Information Disclosure	WB OP 4.01	No specific provision	Stakeholders and PAPs were consulted in both English and local languages as appropriate. UETCL will make available project information locally and nationally

3.6 Environmental Performance Analysis

Proposed development projects must meet social and environmental performance requirements if they are to qualify for funding. A detailed performance analysis (Table 3.2) shows how the proposed 220KV Kawanda-Masaka power line fits into the environmental standards and guidelines of the World Bank Group (WBG) and Uganda (NEMA). The project benchmarks recommended in this ESIA to guide UETCL and the EPC Contractor during project implementation take into consideration the WB guidelines of the more stringent between the in-country environmental standards and the WBG guideline taking priority.

Table 1.2: Performance fit of the proposed construction of the 220kv Kawanda Masaka 137km Power line relevant WB and NEMA Guidelines

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
Right-of-Way Alignment			
Minimizing environmental impacts	All new rights of way should be aligned taking environmental factors into consideration, in a manner which will minimize, to the extent possible, the need for physical alteration and the impact on sensitive natural environments, cultural resources, agricultural lands, and residential and commercial areas	Transmission lines subject to ESIA process Generic checklists provided for determining project impacts, but no specific guidance for transmission lines	All new rights of way aligned taking into consideration environmental factors, in a manner, which will minimize, to the extent possible, the need for physical alteration and the impact on sensitive natural environments, cultural resources, agricultural lands, residential and commercial areas
	Environmental impacts of proposed projects should be minimized through such measures as visual impact considerations in setting and design, restricting right-of-way use by non-authorized persons, erosion and sediment control during and after construction, and use of low-impact maintenance procedures.	Generic checklists provided for determining project impacts, but no specific guidance for managing aesthetic and "access" impacts of transmission lines	Environmental impacts of the proposed project minimized through visual impact considerations in spotting and design, restricting use of right-of-way by non-authorized persons, erosion and sediment control during and after construction, and use of low impact maintenance procedures
Land acquisition	Land acquisition must be carried out in accordance with World Bank resettlement guidelines, which require identification and quantification of any impacts on land-based livelihood, and	Criteria for screening influence human settlements, including displacement available but procedures for addressing these impacts not prescribed.	UETCL will carry out a detailed RAP to address this requirement

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	compensation to landowners and people relying on the land for their livelihood		
Environmentally sensitive areas	Where rights-of-way are to be established though remote and currently inaccessible environmentally sensitive areas, the potential impacts on the natural environment, indigenous populations, population immigration and natural resource exploitation must be assessed and measures adopted to minimize these impacts	Criteria for screening impacts on biological resources (including ecologically sensitive areas) provided, but procedures for addressing these impacts not provided	This ESIA considered and documented potential impacts on the natural environment, indigenous populations, population immigration and natural resource exploitation. Appropriate mitigation measures spelt out in the EMP to be followed by UETCL and EPC Contractor
Electrocution			
De-energizing of equipment	Strict procedures for de-energizing and checking of electrical equipment must be in place before any maintenance work is conducted Electrical installations must be designed, constructed and maintained to eliminate fire or explosion hazards and risks to employees	None stated	UETCL has in place and adheres to strict procedures for de-energizing and checking of electrical equipment before any maintenance work is conducted
Maintenance of energized equipment	Where maintenance work has to be performed on energized equipment, strict safety procedures must be in place and work must be performed	None stated	UETCL has in place and adheres to strict safety procedures where maintenance work has to be performed on energized equipment

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	under constant supervision. Electrical installations must be designed, constructed and maintained to eliminate fire or explosion hazards and risks to employees		
Prevention of electrocution by electrical equipment	Electrical equipment should be grounded, well insulated and conform with applicable codes Electrical installations must be designed, constructed and maintained to eliminate fire or explosion hazards and risks to employees	All electrical apparatus, fittings and conductors shall be sufficient in size and power for the work and shall be constructed, installed, protected and maintained to prevent danger, as far as is reasonably practical	EMP provides for grounding of electrical equipment, proper insulation and conformance with applicable codes UETCL adheres to these guidelines
Revival Techniques	Personnel training must be conducted in revival techniques for electrocution Electrical installations must be designed, constructed and maintained to eliminate fire or explosion hazards and risks to employees	None stated	Personnel training in revival techniques for electrocution which UETCL/EPC Contractor will adhere to EMP
Environmental Health and Safety			
Sanitary facilities	Sanitary facilities should be well equipped with supplies (e.g., protective creams) and employees should be encouraged to wash frequently,	In any building where work goes on, sufficient and suitable sanitary conveniences shall be provided, maintained and kept clean.	UETCL is committed to implementing sanitary guidelines of facilities being well equipped with supplies and encouraging employees particularly

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	particularly those exposed to dust, chemicals or pathogens. All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations Periodic monitoring of workplace air contaminants relative to worker tasks and plant operations is required. Workplace air quality monitoring equipment should be well maintained Facilities must include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. Water supplied to areas of food preparation or for the purpose of personal hygiene must meet drinking water quality standards.		those exposed to dust, chemicals or pathogens to wash frequently as in the EMP
Medical examinations	Pre-employment and periodic medical examinations should be conducted for	The Minister may require a medical supervision or medical examination of a	Pre-employment and periodic medical examinations to be conducted for all

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	all personnel, and specific surveillance programs instituted for personnel potentially exposed to toxic or radioactive substances. All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations. When extraordinary protective measures are required, the employer shall provide appropriate and relevant health surveillance to workers prior to first exposure and at regular intervals thereafter	person or any class of persons employed where in any workplace there may be risk of injury to the health of the workers in the workplace as a result of any process or from any substance used or handled	personnel, and specific surveillance programs instituted for personnel potentially exposed to toxic or toxic or radioactive substances
Prevention of mechanical injuries	Shield guards or guard railings should be installed at all belts, pulleys, gears and other moving parts. Floors should be level, even and non-skid. Heavy oscillating, rotating or alternating equipment should be located in dedicated buildings or	Every dangerous part of any machinery, other than a prime mover and transmission machinery shall be securely fenced unless it is in a position or of such construction that it is safe for every person employed or working on the premises, as it would be if it were securely fenced.	Shield guards or guard railings should be installed and maintained to eliminate human contact with moving parts, or hot or cold items

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	structurally isolated sections. Appropriate shields, guards or railings must be installed and maintained to eliminate human contact with moving parts or hot and cold items.		
Climbing towers	Employees involved in climbing towers must be provided with non-slip footwear, gloves, helmets, face protection, leggings and other necessary protective equipment Hand, knee and foot railings must be installed on stairs, fixed ladders, platforms, permanent and interim floor openings, loading bays, ramps etc. Openings must be sealed by gates or removable chains Covers if feasible shall be installed to protect against falling items.	The staircases on premises inside and outside a building shall have handrails and guard rails which, shall be properly maintained at all times	Employees involved in climbing towers must be provided with nonslip footwear, gloves, helmets, face protection, leggings and other necessary protective equipment
Prevention of falling Injuries	Elevated platforms and walkways, and stairways and ramps should be	The staircases on premises inside and outside a building shall have handrails	Elevated platforms and walkways, and stairways and ramps should be

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	equipped with handrails, toe boards and non-slip surfaces. Hand, knee and foot railings must be installed on stairs, fixed ladders, platforms, permanent and interim floor openings, loading bays, ramps etc. Openings must be sealed by gates or removable chains Covers if feasible shall be installed to protect against falling items	and guard rails which, shall be properly maintained at all times	equipped with handrails, toe boards and non-slip surfaces
Site Drinking Water	Water supplied to areas of food preparation or for the purpose of personal hygiene must meet drinking water quality standards.	An adequate supply of wholesome drinking water shall be provided and maintained at suitable points in a workplace, conveniently accessible to all workers	Water supplied to areas of food preparation or for the purpose of personal hygiene must meet drinking water quality standards
Safety program	A safety program should be established for construction and maintenance work All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations.	It is the responsibility of an employer to take as far as is reasonably practical, all measures for the protection of his or her workers and the general public from the dangerous aspects of an employer's undertaking at his or her cost	UETCL shall implement a safety program, which includes fire drills for construction and maintenance work.

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	Periodic monitoring of workplace air contaminants relative to worker tasks and plant operations is required. Workplace air quality monitoring equipment should be well maintained The employer is responsible for planning, implementing and monitoring programs and systems required to ensure OHS on its premises.		
Protection from dust and hazardous materials	Personnel should use special footwear, masks and clothing for work in areas with high dust levels or contaminated with hazardous materials Precautions must be taken to keep the risk of exposure as low as possible. Work processes, engineering and administrative control measures must be designed, maintained and operated to avoid or minimize the release of hazardous substances to the working environment The employer must ensure adequate	Where toxic materials or substances are manufactured, handled, used or stored the Commissioner may serve upon an occupier or employer, a notice requiring him or her to provide additional bathing facilities including showers, where practical; arrange for periodical medical examinations and, provide additional protective clothing	Personnel should use special footwear, masks and clothing for work in areas with high dust levels or contaminated with hazardous materials

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	and competent supervision of the work, work practices and the appropriate use of PPE.		
Handling, storage and labeling of hazardous materials	All ignitable, reactive, flammable, radioactive, corrosive and toxic materials must be stored in clearly labeled containers or vessels All hazardous (reactive, flammable, radioactive, corrosive and toxic) materials must be stored in clearly labeled containers or vessels Hazardous materials must be packaged in a manner that keeps them from interacting with each other or with the environment or from being tampered with, either purposefully or otherwise. Packaging labels must comply with standards acceptable to IFC. Unless otherwise specified by national regulations, it should contain the corresponding UN number preceded by the letter "UN" on each package. All chemicals and hazardous materials present are labelled and marked	An employer shall ensure that the packages of a hazardous chemical delivered to a workplace are labeled and that the appropriate chemical safety data sheet is delivered to the workplace	All hazardous (reactive, flammable, radioactive, corrosive and toxic) materials must be stored in clearly labeled containers or vessels

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	according to national and internationally recognized requirements and standards International Chemical Safety Cards (ICSC), or Material Safety Data Sheets (MSDS) or equivalent data/information in an easily understood language must be readily available to exposed workers and first aid personnel. The employer must ensure adequate and competent supervision of the work, work practices and the appropriate use of PPE.		
Waste Management			
Recycling/reclamation of wastes	Where possible, solid waste materials are to be recycled or reclaimed	Generic checklists for considering effects of a project's solid waste management exist, but no specific standards or guidelines for solid waste recycling/reclamation	Solid waste materials are to be recycled or reclaimed where possible
Disposal of wastes	Where recycling or reclamation is not practical, solid wastes must be disposed of in an environmentally acceptable manner and in compliance with local laws and regulations Places of work, traffic routes and	Generic checklists for considering effects of a project's solid waste management exist, but no specific standards or guidelines for solid waste management	Where recycling or reclamation is not practical, solid wastes must be disposed of in an environmentally acceptable manner and in compliance with local laws and regulations

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	passageways shall be kept free from waste and spillage, regularly cleaned and maintained.		
Hazardous waste materials	All hazardous materials, process residues, solvents, oils, and sludge from raw water, process wastewater and domestic sewage treatment systems must be disposed of in a manner to prevent the contamination of soil, groundwater and surface waters Where appropriate disposal options are not available, the EA process for the project must address appropriate alternatives for the handling and disposal of hazardous waste and propose a reasonable solution for handling and disposing of hazardous waste.	Generic checklists for considering effects of a project's hazardous materials management exist, but no specific standards or guidelines for hazardous materials management	All hazardous materials, process residues, solvents, oils, and sludge from raw water, process wastewater and domestic sewage treatment systems must be disposed of in a manner to prevent the contamination of soil, groundwater and surface waters
Ambient Noise			
Construction period	No employee may be exposed to a noise level greater than 85 db (A) for	NEMA requirements specify 75 dB LAeq daytime 65 dB LAeq night time	UETCL shall adhere to 75 dB LAeq daytime 65 dB LAeq night time

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	duration of more than 8 hrs per day. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB. The use of hearing protection must be actively enforced when Laeq,8h reached 85 dB, the peak sound levels 140 dB or the Lamax, fast 110dB.		guidelines
Operational Period	55 dB(A) in the day and 45 dB(A) in the night in residential/ institutional or educational areas; 70 dB in the day or night in industrial or commercial areas; or a maximum increase in background levels of 3 dB No employee may be exposed to a noise level greater than 85 db (A) for duration of more than 8 hrs per day. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB. The use of hearing protection must be actively enforced when Laeq, 8h reached 85 dB, the peak sound levels 140 dB or the Lamax, fast 110dB.	NEMA guidelines specify 75 dB LAeq daytime 65 and dB LAeq night time	UETCL will use 55 dB in the day and 45 dB in the night in residential/institutional or educational areas; 70 dB in the day or night in industrial or commercial areas; or a maximum increase in background levels of 3 dB
Control measures for workplace	Feasible administrative and	None stated	Feasible administrative and

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
noise	engineering controls, including sound-insulated equipment and control rooms should be employed to reduce the average noise level in normal work areas		engineering controls, including sound-insulated equipment and control rooms should be employed to reduce the average noise level in normal work areas
	Plant equipment should be well maintained to minimize noise levels.	None stated	Plant equipment should be well maintained to minimize noise levels
Training			
Harmful materials	Employees should be trained on the hazards, precautions and procedures for the safe storage, handling and use of all potentially harmful materials relevant to each employee's task and work area All employees working with hazmats should be trained in hazard identification, safe operating procedures, appropriate materials handling procedures special hazard unique to their job The employer shall ensure that workers prior to commencement of new assignments have received adequate training and information enabling them	The provision of adequate and appropriate information, instructions, supervision and training necessary to ensure as far as is reasonably practical, the safety and health of the employees, and that the application and use of occupational safety and health measures, taking into account the functions and capabilities of different categories of workers in an undertaking	Employees should be trained on the hazards, precautions and procedures for the safe storage, handling and use of all potentially harmful materials relevant to each employee's task and work area

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	to understand the hazards of the work and to protect their health from hazardous ambient factors that may be present The training must adequately cover: a) knowledge of materials, equipment and tools; b) known hazards in the operations and how they are controlled; c) potential risks to health; d) precautions to prevent exposure, and; e) hygiene requirement; f) wearing and the use of protective equipment and clothing; and g) appropriate response to operation extremes incidents and accidents.		
Material Safety Data Sheets	Training should incorporate information from the Material Safety Data Sheets (MSDSs) for potentially harmful materials Training should incorporate information from MSDSs for hazmats being handled. The sponsor must produce an Emergency Preparedness and Response Plan	The provision of adequate and appropriate information, instructions, supervision and training necessary to ensure as far as is reasonably practical, the safety and health of the employees, and that the application and use of occupational safety and health measures, taking into account the functions and capabilities of different categories of workers in an	Training should incorporate information from the Material Safety Data Sheets (MSDSs) for potentially harmful materials

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	The employer shall ensure that workers prior to commencement of new assignments have received adequate training and information enabling them to understand the hazards of the work and to protect their health from hazardous ambient factors that may be present. The training must adequately cover knowledge of materials, equipment and tools;	undertaking.	
Environmental health and safety	Personnel should be trained in environmental, health and safety matters including accident prevention, safe lifting practices, the use of MSDSs, safe chemical handling practices, and proper control and maintenance of equipment and facilities Training should incorporate information from MSDSs for hazmats being handled. The sponsor must produce an Emergency Preparedness and Response Plan. The employer shall ensure that workers	The provision of adequate and appropriate information, instructions, supervision and training necessary to ensure as far as is reasonably practical, the safety and health of the employees, and that the application and use of occupational safety and health measures, taking into account the functions and capabilities of different categories of workers in an undertaking	Personnel should be trained in environmental, health and safety matters including accident prevention, safe lifting practices, the use of MSDSs, safe chemical handling practices, and proper control and maintenance of equipment and facilities

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	prior to commencement of new assignments have received adequate training and information enabling them to understand the hazards of the work and to protect their health from hazardous ambient factors that may be present. The training must adequately cover: a) knowledge of materials, equipment and tools; b) known hazards in the operations and how they are controlled; c) potential risks to health; d) precautions to prevent exposure, and; e) hygiene requirement; f) wearing and the use of protective equipment and clothing; and g) appropriate response to operation extremes incidents and accidents		
Emergency response	Training should also include emergency response, including the location and proper use of emergency equipment, use of personal protective equipment, procedures for raising the alarm and notifying emergency response teams, including local and regional hospitals, and proper response actions for each foreseeable emergency situation	The provision of adequate and appropriate information, instructions, supervision and training necessary to ensure as far as is reasonably practical, the safety and health of the employees, and that the application and use of occupational safety and health measures, taking into account the functions and capabilities of different	Personnel should be trained in emergency response, including the location and proper use of emergency equipment, use of personal protective equipment, procedures for raising the alarm and notifying emergency response teams, including local and regional hospitals, and proper response actions for each foreseeable

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	The sponsor must produce an Emergency Preparedness and Response Plan The employer shall ensure that workers prior to commencement of new assignments have received adequate training and information enabling them to understand the hazards of the work and to protect their health from hazardous ambient factors that may be present. The training must adequately cover appropriate response to operation extremes incidents and accidents	categories of workers in an undertaking.	emergency situation
Records & Reporting			
Occupational health and safety monitoring	The project sponsor is required to maintain a record of air emissions, effluents, and hazardous wastes sent off site, as well as significant environmental events such as spills, fires, and other emergencies that may have an impact on the environment. The information should be reviewed and evaluated to improve the	It is the duty of an employer to keep and maintain of the medical examination information in a format and for a period prescribed by the Minister and to avail these records for epidemiological and other research	Safety features, ambient working environments and OHS indicators should be reviewed and monitored. The information collected shall be processed and findings reported to national authorities as required. The compiled information and any corrective measures taken shall be applied in a continuous process to

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	effectiveness of the environmental protection plan Measuring and monitoring records must be made available to employees handling hazmats and their representatives as appropriate. Records should be kept for IFC review and reports on hazmat management should be submitted regularly to IFC – at least one a year as part of the sponsors Annual Monitoring Report (AMR) Safety features, ambient working environments and OHS indicators are subject to regular monitoring and review. The information collected shall be processed and findings reported to national authorities as required. The compiled information and any corrective measures taken shall be applied in a continuous process to improve the OHS management system		improve the OHS management system
Environmental/occupational health and safety records and reporting	The project sponsor is required to maintain a record of air emissions,	There shall be kept available for inspection in every workplace, in the	The sponsor should maintain records of significant environmental matters,

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	effluents, and hazardous wastes sent off site, as well as significant environmental events such as spills, fires, and other emergencies that may have an impact on the environment. The information should be reviewed and evaluated to improve the effectiveness of the environmental protection plan The sponsor should maintain records of significant environmental matters, including monitoring data, accidents and occupational illnesses, and spills, fires and other emergencies. This information should be reviewed and evaluated to improve the effectiveness of the environmental, health and safety program. An annual summary of the above information should be provided to IFC Measuring and monitoring records must be made available to employees handling hazmats and their representatives as appropriate. Records should be kept for IFC review	prescribed form, a General Register. The General Register and any other register or record shall be preserved and kept available for at least five years or such other period as may be prescribed for any other class or description of register or record after the date of the last entry in the register or record	including monitoring data, accidents and occupational illnesses, and spills, fires and other emergencies. This information should be reviewed and evaluated to improve the effectiveness of the environmental, health and safety program.

Environmental Concern	WB Guidelines	NEMA ESIA Guidelines	Project Bench Marks
	and reports on hazmat management should be submitted regularly to IFC – at least one a year as part of the sponsors Annual Monitoring Report (AMR). Employee monitoring data (originals) must be saved for a period of 5 years or longer if required by national regulations		

4 BASE LINE PROJECT AREA (BIO-PHYSICAL ENVIRONMENT)

4.1 Wakiso-Mpigi district

4.1.1 Transmission corrodor characteristics

Corridor characteristics (Kawanda area)

The Kawanda-Masaka 220kv diversion starts from Kawanda substation at Nakyesanja parish, Kawanda village and stretches for a distance of 354 metres at an angle of 256^0 after which it crosses Bombo road between Kagoma and Kawanda trading centre. Within this distance, it passes over banana plantations, and a few gardens of cassava and sweet potatoes. Few homesteads exist within the first half of this stretch before it joins Mayanja wetland towards the end of this first stretch. Mayanja wetland meets its dead end on the high way where the line cuts across to join Kawanda Agriculture Research Institute (KARI) land.

Fig.4.1 Kawanda Substation under construction

Fig.4.2: Access road in Mayanja wetland to be decommissioned by UETCL

Fig.4.3 A section of Bombo road that will be crossed by the transmission line at Kawanda area

Within KARI land after the Kampala-Arua highway, the line deviates at 58^0 to the left at an angle of 198^0 and stretches for a distance of 1.3km within KARI land. For the first part of this distance near

the road, it passes over gardens of cassava mostly intercropped with maize, some banana plants, and yams among others. These gardens exist within KARI land with most of it unutilized with scattered eucalyptus trees. As the line continues within this stretch, it passes over KARI demonstration farms and gardens, eventually to staff quotas. Amidst staff quotas, other trees exist including mango, jack fruit, avocados and scattered vegetation.
The line makes several deviations all within Kawanda land after the above distance, namely;

- 49^0 to the right at an angle of 247^0 for a distance of 495metres,
- 41^0 to the right at 288^0 for a distance of 226metres

Within the above range of distances, the lines pass over mainly private farm land. Few homesteads (KARI staff quotas) exist within the first deviated distance and fruit plants for jack fruits, avocadoes, mangoes and many others exist though scattered. For the second deviated distance, it passes over farm land characterized by short plantation cover. It is used for animal rearing/grazing. The last part of the distance rarely has residences.

Still within the KARI farm land, the line makes another deviation of 47^0 to the right at an angle of 335^0, to run along Mayanja wetland for a distance of about 1.6 km. The wetland is mainly characterized by papyrus, and other water logged loving plantation. Towards the end of this stretch still within Mayanja wetland, the line cuts across Kawanda-Kayunga road before making another deviation. Few scattered tall trees and other plants exist. Animals are grazed along and within this wetland. At the end of this stretch, along Mayanja stream, some gardens of sweet potatoes, sugar cane, yams and brick making are identified.

Corridor characteristics (Kasengegye parish)

At the end of Mayanja wetland, the line deviates at 51^0 to the left at an angle of 221^0 and covers a distance of about 1.4km to Senge village. Within this distance, it passes over several scattered homesteads and several gardens of crops exist within this residential setting. Mostly identified are gardens of cassava, sweet potatoes, and banana plantations. Most land is privately owned farm land and animals are grazed within this land. Relatively tall trees and plants exist within the gardens and banana plantations. This section starts from low lying Mayanja wetland rising to relatively higher level.

Fig 4.5 A portion of Mayanja wetland and Kawanda Senge road

From Senge, a further distance of about 1.2km emerges at a deviation of 38^0 to the left making an angle of 183^0 to Kasengejje village. Most part of this stretch is through private farm land with very few residences. Vegetation for the first part is short grass with short plants and trees. Towards the last portion of the stretch, the line passes through a tree park with relatively taller eucalyptus.

From Kasengeje village, the line makes a bend at a deviation of 10^0 to the right making an angle of 193^0 for a distance of approximately 3.0km to Kayunga village. This stretch passes through several homesteads with some houses either wholly or partly affected that will need resettlement. A big portion of land in this area is usable for agriculture for crops like banana, coffee, sugar cane and many others. The line crosses Gombe road within this distance and some scattered trees species of avocado, mangoes, jack fruits, and many others are seen. However, a certain portion of land in this section is not cultivated.

Fig.4.6 Mayanja wetland and sections of Senge village that will be crossed by the Transmission line

From Kayunga village, a stretch of 3.8km at a deviation of 33^0 to the right follows up to Kawoko Village making an angle of 226^0. Within this stretch, the line will cross Hoima road. The biggest part of this distance is sited within the bush land with barely any residences. No major agriculture activity is seen within this setting especially for the first portion of this distance. Along this stretch in Kawoko village, the line crosses through Mayanja wetland. Private farm lands with shrubs, thickets and scattered trees are mostly evident in the last portion of this segment. Still along this coverage, the line passes through private land with gardens mainly of cassava, beans, and sweet potatoes, among others. However, some houses/settlements are found within the line corridor. Around several homesteads, the vegetation is thick and has shrubs.

Corridor characteristics (Bukasa parish)

The above distances end in Kagoma village (Bukasa Parish) where another deviation of 30^0 to the right is made at an angle of 256^0 for a distance of approximately 5.9km. Some families have their residences affected or their gardens. Most gardens are of cassava, sweet potatoes, coffee plantations, and sugar canes. Most of the land is privately owned. Few tall plants and trees also exist some within the power corridor and others outside it. Most of these trees are fruit trees like mangoes, jack fruits, avocadoes, e.t.c. Still within Bukasa parish in Nakabugo village, the line will pass through Nakabugo wetland, and cross the Nakabugo-Bukasa road. The wetland comprises mainly papyrus with no major tall trees or plants. Other part of the wetland has thickets and shrubs and the land belongs to National Social Security Fund (NSSF).

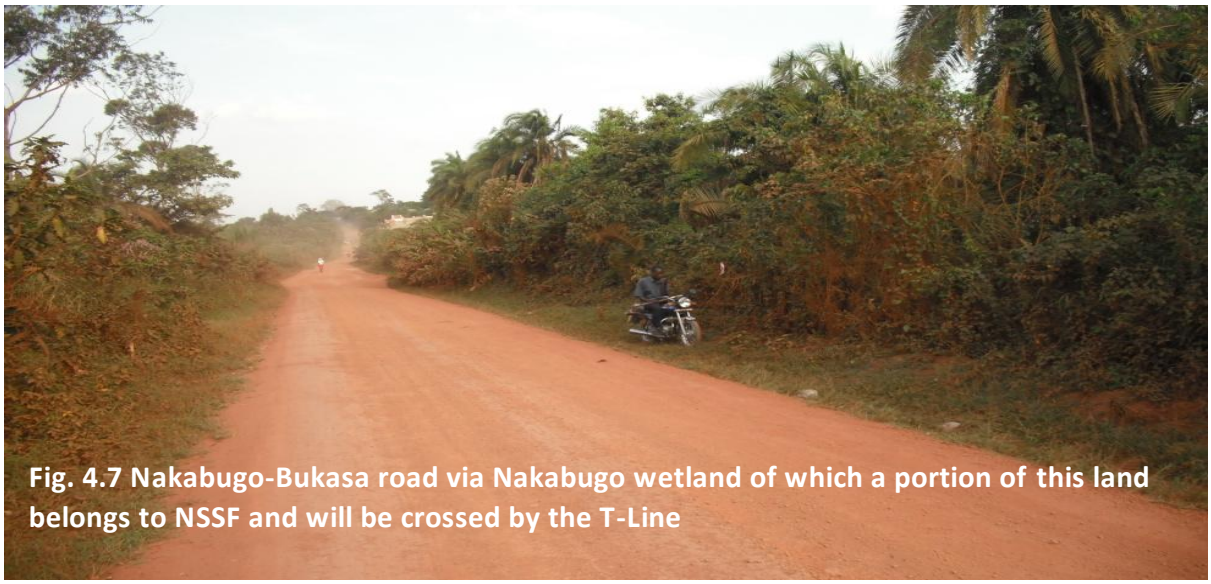


Fig. 4.7 Nakabugo-Bukasa road via Nakabugo wetland of which a portion of this land belongs to NSSF and will be crossed by the T-Line

Within Buloba village, most homesteads are avoided. The line passes through private farm lands with scattered trees mainly eucalyptus, and *Ficus spp.* After Buloba village, the lines pass through a wetland with mainly papyrus and eventually to grass land with scattered trees and plants. Few residences exist within this part of the corridor. This status continues till it again joins to Mayanja wetland along Mityana Road. No major houses are affected and the vegetation along this portion of the corridor is short grass.

Corridor characteristics (Kavule and Maziba parish)

From Buloba village, the line deviates at 50^0 to the left at an angle of 206^0. This deviation makes the longest stretch of about 7.8 km running up to Kavule village along Kampala-Masaka high way. Most part of this stretch has private farm lands with scattered residences. It finally makes a deviation of 9^0 to the right at an angle of 215^0 and runs for a distance of about 5.9km up to Maziba parish. The environment is similar to the previous stretch with private farm lands and scattered residences.

Fig. 4.8 Mayanja wetland as viewed from Mityana road & will be crossed by the transmission line

Kawanda-Kavule section

The vegetation of the section (Wakiso and Mpigi Districts) is very varied. It ranges from medium altitude evergreen forests through medium altitude moist semi- deciduous forests, savannas/thickets, swamps, and communities on sites with impeded drainage to agro-system/cultivation communities. Of these the dominant habitat is the cultivated and settlement.

The noticeable wetlands affected by the transmission right of way are Mayanja (Kawanda-Maganjo), Lubigi, Mayanja-Kato and Namanya/Kasenso. The dominant wetland vegetation include *Cyperus papyrus* swamps associated with *Ottelia scabra*, *Miscanthidium violaceum*, *Cyperus latifolius, Typha australis, Phragmites mauritianus, Cissampelos micronata, Dissotis rotundifolia, Dryopteris striata, Leersia hexandra, Phoenix reclinata and Polygnum salicifolium.* Some shrubs include *Vernonia amygdalina, Ficus ovata,Sesbania sesban, Pycnanthus angolensis, Raphia farinifera, Mitragyne robrostipulata, Mitragyne stipulosa* and *Amaranthus species.*

Some portions of wetlands have been reclaimed and put under intensive cultivation of crops such as beans, cabbages, potatoes, maize, yams, etc for instance around Mayanja swamp in Kawanda/Nakisanja villages, Kageye swamp (Katoke/Kibwa/Nansana East 2 villages) and Lubigi swamp (Nansana West 2, Ganda and Bulenga villages) are partly degraded and some settlements, agricultural crops, especially sugar cane, have replaced much of the original vegetation providing important source of livelihood for the majority of households. There is rapidly increasing use of wetlands is the provision of clay for brick making with haphazard excavation of clay pits evidenced along the transmission corridor especially in Kawanda, Katoke, Nansana and Ganda. Worse still is the demand for fuel wood for firing the kilns and for domestic use, which has

led to uncontrolled cutting of trees and swamp vegetation. The woodland vegetation has been grossly modified over the last four decades as a result of repeated clearance for cultivation, cutting of wood fuel and annual fires.

Kavule - Kayabwe section

In this section many swamps exist in alternate with natural high forest cover, wooded thickets on private mailo lands and agricultural systems. The largest numbers of affected forest reserves are found in Mpigi District, Mawokota County. The natural high forests include Lufuka, Mpanga, Kasa, Gangu, Kalandazi, Kasozi (central reserves), Katonga (Kkoba), Kasenso swamp forest, Kazikake (local forest reserves); and private wooded thickets/forests on private mailo lands such as Nabutyeri. The common tree species were *Albizia, Chlorophora, Melcia species* while the grasses were *Pennisetum purpureum*, and *Imperata cylindrica, Hyparhania rufa, Imperata cylindrica and Cymbopogan species.*

Most of these forest reserves have the valuable trees like *Lovoa, Mitrygna, and Musizi* that are on high demand. The most significant central forest reserve is Mpanga of all the forest reserves. Mpanga forest reserve faces least pressure from illegal activities such as pit sawing, charcoal burning and agricultural encroachment. It is an eco-tourism site maintained by EEC. However, some people sneak into the forest and cut trees for making drums, which are sold along the main road. Local people are allowed to get firewood and poles, usually head bundles for domestic consumption. Illegal activities such as pit sawing and charcoal burning were reported to have depleted the commercial tree species. Forests outside protected areas comprising both natural and planted forest are mainly found on mailo land.

Landscape (Wakiso and Mpigi district)

The landscape in Mpigi and Wakiso is a typical representation of Wayland's Peneplain II. " Peneplain " is a concept of landscape evolution that, through a long period of weathering and erosion, an original highland is worn down to a low land plain of low relief). It is a plateau and is part of the mid-Tertiary period (2-7 million years back).

As a result of these changes an elevated and dissected plateau consisting of a series of flat topped hills and intervening valleys was formed by the middle of the Tertiary period. The remnants of these hills are still well preserved particularly in the northern part of Wakiso and central parts Mpigi. Here, the level rises between 1,200 to 1,500 meters above sea level.

Drainage and Water Resources (Wakiso and Mpigi)

Mpigi–Wakiso area belongs to what can be termed as Buganda surface topography. Thus, the main elements of its drainage system are old. Their establishment is controlled by the underlying rock structure. This has been subsequently modified by post Karroo earth movements such as uplifting, faulting and warping. These processes eventually led to the formation of Lake Victoria which occupies about 10% of the two districts.

The area is drained by numerous rivers and streams. Generally there are two drainage directions. The major one is to the south into Lake Victoria. Most of the rivers drain in this direction. For example, due to reversal drainage River Katonga which used to drain into Lake George before up warping now flows into Lake Victoria. The other drainage is to the north into Lake Wamala which is in Mubende District.

The drainage network displays a mature stage of development with low gradient and sluggish water movement in the wide valleys. This is due to structural tilting and alluvial aggradations. However, a sinuous watershed separated drainage into Lake Victoria from streams which flow northwards into Lakes Wamala and Kyoga.

One common characteristic of the three districts is that drainage has been impeded. This has resulted into both seasonal and permanent *papyrus* swamps in the broad valleys.

Mpigi and Wakiso area is generally endowed with water resources. It has adequate surface and subsurface water reserves and thus there are few cases where people have to travel long distances in search of water. Nevertheless, the distribution is such that some parts of North East Mpigi and North of Wakiso (Kyadondo) experience water shortage.

In the south east lies Lake Victoria. It is a mass of fresh water of 63,000 sq. Kms lying at an altitude of 1134 meters above sea level.

The numerous streams, rivers like Mayanja and wetlands both permanent and seasonal which drain into minor valleys indicate how rich in surface water reserves the districts are. Minor valleys such as those which occur in Kamengo sub-county have distinct seasonal swamps and rivers which contain water especially during the wet season. The water table along these swamps is quite high. They are suitable for sinking shallow wells.

Sub-surface water reserves occur in fissures and aquifers of the rocks. This is indicated by the number of boreholes, spring wells, tube wells, shallow wells which have been drilled to harvest water for domestic supplies.

According to the 1995 Water and Sanitation Survey, there were 272 boreholes, 49 spring wells, 19 shallow wells, 32 tube wells and 205 hand pumps distributed throughout Mpigi district before separating Wakiso District off. Boreholes are located near social infrastructures such as housing estates, health centers, schools, farms etc.

Soils (Wakiso and Mpigi)

Soils are a product of the action of climate and living things on parent rock materials under the influence of relief and drainage over a period of time. The area is mainly underlain by ferrisols and ferrallitic soils. Ferrisols are on the whole the most fertile and productive because they are relatively young and possess adequate nutrient reserves. On the other hand, ferrallitic soils are in a more advanced stage of weathering. There are also hydromorphic soils along the southern lake shore region.

Distribution

This classification is both genetic as well as morphological since it takes into consideration intrinsic chemical properties as well as field characteristics. Taking a rough estimate of the aerial coverage it will be noted that Buganda catena is the most dominant soil type. This accounts for 70 % of the entire area. Mirambi catena, which surrounds Buganda catena, is the second. Following Mirambi are Lwampanga series, Kabira catena, Kaku and Kifu series etc. in this order. For purposes of this study, Buganda catena, Mirambi, Kabira and Lukaya that are common in the project area have been discussed.

Buganda catena: Buganda catena is the most dominant soil mapping unit. These areas are highly susceptible to erosion. Their loamy character becomes clayey down slope to form brown ferruginized soils.

Mirambi catena: This soil type is associated with strongly dissected remnants of the Buganda surface. It occupies Gomba, Mawokota and Kyadondo counties. Mirambi soil is slightly acidic and slightly leached but has all the major nutrients. It supports coffee, bananas, potatoes and beans plus a wide range of other crops but has continuously been cultivated due to population.

Lukaya Catena: This catena occurs on gentle rolling ridges with crests ranging from 1200 to 1300 meters above sea level. There are occasional isolated peaks like Kaga and Koba in Kyadondo County. The summits are flat and contain boulders of relic ironstone. The slope of Lukaya catena consists of brown to yellow-brown loams. There is laterization in the lower sections of the slope and weathering. This has turned these soils to pale pink and grey with yellow micaceous and schistose meta-sediments. This soil has medium to low fertility and therefore is better suited for the production of crops such as coffee, cotton, tobacco and ground nuts.

Kafu series: Kifu series occurs in Mawokota and Butambala counties. It occupies the valley bottoms and is filled with swamps of *papyrus* and *miscanthidium spp.* Specific examples are Nawandigi and Kiwololwe permanent swamps in Kamengo Sub-county, Mawokota County. It has a relatively high content of clay and silt in top soil. There is presence of fibrous peat and raw acid humus. It is extremely acidic and this acidity increases with soil depth. It is unsuitable for cultivation.

Kaku series: In the project area Kaku series occurs in Mawokota counties. It occupies into Nawandigi swamp in Kamengo Sub-county, Mawokota County. The series has remained under permanently waterlogged conditions. This soil is strongly acidic due to excessive amounts of organic acids.

Papyrus peat: Peat soil covers major swamp valleys along the Lake Victoria region. It is common in both Busiro and Mawokota counties. They are alluvial soils of loam sandy type influenced by papyrus peat. This soil type is significant in terms of environmental implications and therefore development. This is because of the increasing evidence of its sensitivity and questions about its productive sustainability once reclaimed.

4.1.2 Project area Flora and fauna (Wakiso and Mpigi)

The proposed transmission line will traverse some forest reserves (Both Central and local forest reserves). Table 4.1 and 4.2 presents a list of forest reserves that will be affected.

Table 2.1: Forest Reserves (Central and Local) likely to be affected by the proposed Kawanda-Masaka 220 kV Transmission Line

Name of Forest Reserve	Area (ha)	Boundary Length	Length of wayleaves through the reserve (Km)	Area of forest to be cleared (Ha)	Percentage of forest reserve affected by power line
Lwamunda CFR	4696		0.76	3.04	0.06
Lufuka CFR	267	10.06	1.07	4.28	1.60
Kyansozi CFR	704	27.25	1.18	4.72	0.67
Gangu CFR	1054	32.28	1.76	7.04	0.66
Kalandazi CFR	137	6.75	0.85	3.40	2.48
Buwa CFR	352	16.80	0.79	3.16	0.89
Nabijoka LFR			0.37	1.48	
TOTAL			**6.78**	**27.13**	

Table4.2.: Local Forest Reserves likely to be affected by the proposed Kawanda-Masaka 220 KV Transmission Line

Name	Nearest Village	Forest Areas(m^2) to be affected	Forest Area(ha) to be affected	District
Local				
Katonga (Koba)	Kavule/Katende	32,000	3.2	Mpigi
Kasenso swamp forest	Maya	37,200	3.6	Mpigi
Kazikake	Btn Mbizinya and Buyaya -Kitojo	8,000	0.8	Mpigi
Total		**77,200**	**7.6**	

Note:
Central Forest Reserves (CFR) are forests that are managed by National Forestry Authority (NFA) and they are normally 100 hectares and above except where a forest has a specific conservation status that makes it very sensitive.

Local Forest Reserves are forests that are below 100 hectares and mainly managed by the district local government. However, when a reserve has special conservation status, it's then managed by National Forest Authority.

In terms of functions, both Local and Central Forest Reserves can be managed for biodiversity conservation, timber production, water catchment or research or any other function. The two don't have any difference in terms of management options.

Woodlot Plantations

The Transmission line traverses one Local forest reserve plantation and some private woodlot plantations (such as Vuma etc) dominated by *Eucalyptus grandis* and *Eucalyptus saligna*. The notable woodlot plantations reserves are Nabijoka (54 Ha) in Bukulula sub-county. Many individual and institutions have got plantations along the proposed corridor.

Table 4.3: Wood Lot Plantation

Wood lot Plantation	Nearest Village District	Areas m^2	District
Kawanda S.S.S	Kawanda S.S.S	20,000	Wakiso
Nansana East 2	Nansana East 2	2,000	Wakiso
Nansana West 2	Nansana West 2	2,000	Wakiso
Ganda	Ganda	3,000	Wakiso
Katonga/Nindye/		5,000	
Lubanga	Lubanga	18,000	Masaka
Bukulula Parish	Lukuli	4,000	Masaka
Vuma	Vuma	12,000	Masaka
Nabijoka	Lutengo	16,800	Masaka
Lwanda-Butare	Lwanda	33,200	Masaka
Kalagala-Masaka	Kalagala	3,000	Masaka
Sub-total		**122,000**	**12.2 Ha**

The vegetation value of forests and wood plantations is **high** because all the forests mentioned are either Central or Local Reserves which are protected areas.

Habitat Types

The proposed transmission line will pass through forest reserves, wetlands, thickets/woodlands and cultivated or settled areas. On the ornithological point of view the sensitive ecological zones are the forest reserves and the wetlands since the woodlands and settled areas are already modified

by human activities therefore no bird species of ecological importance are expected to occur in such habitats. Nevertheless, during the study, ornithological surveys were carried in all the habitat types traversed by the line.

Natural Forests

Uganda has about 49,500 km^2 of forests consisting of tropical high forests and woodlands (99%) and plantations (1%). The western region of the country has more than 60% while the central region has a little more than 20%.Uganda's tropical forests are very rich in biodiversity. They contain 427 species of trees, 329 species of birds, 12 species of diurnal primates and 71 butterfly species, among others (NEMA, 2000).

However, Uganda has lost large areas of forest cover and official estimates of conversion of forestland in 1994 ranged from 70000 ha (Ministry of Agriculture World Bank) to 200,000 ha (Ministry of Finance, Planning and economic development). To address the loss of biodiversity in forest and savannah woodlands, the 2001 Nature Conservation Master Plan, proposes to designate up to 50% of the area of natural forests as strict nature reserves where no consumptive use will be allowed. A buffer zone constituting up to 20% of the forests will be created around these reserves where limited non-destructive uses will be permitted. The remaining 30% of the forests will be designated production zones where sustainable management practices will be undertaken. Collectively, these measures should check the rate at which biodiversity is being lost from forests and savanna woodlands.

The proposed Kawanda-Masaka transmission line will traverse 8 Central Natural Forest Reserves found in Wakiso, Mpigi and Masaka districts. These reserves are Lwamunda, Kyansozi,, Lufuka, Gangu, Kalandazi, Nabijoka, Buwa and Kyansozi. A few of the reserves are fairly intact (e.g. Mpanga which is also strict Nature Reserve) but majority of them are degraded although some contain fairly extensive stands of trees which rarely contain large trees and merge into bush. Mpanga will not be affected by the proposed transmission line. Some of the forest reserves are small patches or forest remnants that border swamps and heavily modified by encroachment for agriculture, brick making and fuel wood.

Fig. 4.9 A fairly intact forest like Mpanga and 1 b) one which are degraded by brick making.

Forest location and management planning

The affected Central Forest Reserves which include Lwamunda, Buvuma, Lufuka, Kyansozi, Gangu, Kalandazi, Buwa and Nabijoka are under the Management of National Forestry Authority. These reserves are grouped together in one Forest Management Plan (FMP) for Mpanga Sector and are located in the three sub-counties of Mawokota, Butambala and Gomba in Mpigi district on the western shore of Lake Victoria in Mpgi district. These reserves are geographically located between Latitude O°O and O°30N and between Longitude 31°45 and 32°30E. Although the Mpanga forest sector comprises 27 central forest reserves scattered with in Mpigi district, only 8 forest reserves will be crossed by the proposed power line. The rest of the reserves that will not be impacted by the power line include Degeya (241 ha),Navugulu (2,714 ha), Katabalalu (1225 ha), Nakanga (277 ha), Nawandigi (3,766 ha), Kavundu (140 ha), Nakalele (684 ha) and several others. The table below shoe the central forest reserves that will be affected by the proposed 220 Kawanda-Masaka power line.

Rights, Responsibilities and Privileges in respect of the affected Central forest reserves

The National Forestry and Tree Planting Act (NFTPA), 2003, Section 52(1) created National Forestry Authority as a body charged with the responsibility to improve Forest Management of CFRs which are held in common good of all Ugandans in line with the Constitution of Republic of Uganda. Since 2004, NFA has taken over the Management of all CFRs. However, involvement of stakeholders in management of the forests through partnerships and other legalized procedures is emphasized under the new policy and legislative framework for forest management in the country. The NFTPA (2003) sections 32 and 33 respectively grants any person to take, work or remove forest produce or use land for grazing, camping, planting or cultivation of crops in accordance with the FMP or accordance with the license granted and local communities access in reasonable quantities to firewood and other non-wood forest products like Bamboo for domestic use.

Forest Soils and Geology

The bigger part of Buganda region, are covered by ferralistic soils which have been described as soils of very high-to-high productivity (state of environment report for Uganda, 1996). The soils under the Mpanga forest sector are associated with pre-caribean rock and recent alluvials. Their nutrient status indicates a high content of humus in the topsoil and high exchangeable bases. Their topsoil pH is 6.0 or below. The soil nutrient status is moderate to good depending on previous cultivation history and amount of accelerated erosion in the past. The geology is described as Buganda-Tooro system. Its formed from predominant rocks found in Uganda which were formed between 3000 and 6000 million years ago in the Pre-caribean era, (State of Environment report for Uganda, 1996).

Forest drainage

FR like Luwafu and Lukolo found on L.Victoria islands have rivers that flow through them, eventually draining directly into Lake Victoria. Others have seasonal streams that also drain directly into the lake. The streams include Binyomo, Nakito, Kyekokoto in Wabinyomo, Wamasega and Nakalele FR respectively.

Forest climate

Mpanga Sector FMA falls within the Lake Victoria climatic zone which extends 48-64 km from the lake shores. It displays comparatively small variations of temperature humidity and wind throughout the year. The area experiences two rainy seasons in the year. The first one begins March-May followed by September-November seasons. There is a relative dry season between December-March and another one in June and July. These dry seasons are however interrupted by thunderstorm leading to a regime with rainfall well distributed through the year. The rainfall received in this area is estimated at 1500-3000 per annum. This annual rainfall is heaviest in the reserves like Lukolo, Luwafu which are near the lake compared to forest reserves far away from the lake. There is a marked gradient of 30mm per km as you move from the open lake to the island. The temperatures vary in rainy and dry seasons. The temperatures are greatly affected by the evaporation rates and the temperatures are generally low during wet seasons and high during the dry season. Its estimated that the evaporation rates during rainy season fall between 10-20% during the rainy season.

The highest maximum temperature of 27^{o}C tend to occur during January to March. This is normally a dry season. The lowest minimum temperatures of 22^{o}C normally occur in August. This phenomenon also coincides with the cold weather in the Southern Hemisphere. The daily variation in temperature is of the order 11^{o}C-13^{o}C for the whole region of Southern Buganda.

Forest biodiversity status

All Forest reserves in Mpanga Sector are part of the former Mpigi FR which include those found in the current Wakiso District before it was created from Mpigi. According to the Forestry Nature Conservation Master Plan (Vol 1) Mpigi FRs rank 18th in the overall importance with a score of 13.4. They are ranked 7th in terms of species diversity but 40th in terms of species rarity, presumably because many of the species are shared with other Lakeshore tropical forests along L. Victoria basin. These forests support two species unique to the area which include *Brucea antidysenterica* and *Psychotria Saculenta,* and one species *Rhytigynia benensis* which are endemic to the Albertin rift. Mpanga forest alone ranks 4th in terms of species diversity but 40th in terms of species rarity. *Crotolaria rectal* and *Ficus wildemaniana* are the only species unique to this forest reserve. The power line has been designed to bypass Mpanga forest reserve. It should be noted however that in the recent years, Mpanga Sector FRs were over exploited and this might have reduced their biodiversity.

Table 4.4: Summary of Biodiversity Values for Mpigi Group of Forests

Criterion	Trees	Birds	Mammals	Butterflies	Months	Over all
Total N$_o$ of species known	305	158	12	61	26	562
No of restricted range spp (Known <5 forests)	14	1	0	1	0	16
Spp unique to the forest (list)	*Brucea antidysenterica Psychotria sucalenta*	None	None	None	None	2
Uganda endemic (list)	None	None	None	None	None	None
Albertin Rift endemic (list)	Rytigyria Beniensis	None	None	None	None	1
Species diversity (Score & rank)	9 (3)	6.1 (31)	48 (52=)	6 (41=)	7.2 (11)	7.4(7)
Species rarity (Score & rank)	7.2 (29=)	5.5 (27=)	4.3 (43=)	4.2 (47=)	3.8 (58=)	60 (40=)

Source: Forestry Nature Conservation master Plan (Volume 1)

Table 4.5: Summary of Biodiversity Values for Mpanga Forest Reserve

Criterion	Trees	Birds	Mammals	Butterflies	Months	Over all
Total No of species known	205	141	8	78	94	526
No of restricted range spp (Known <5 forests)	6	None	None	3	4	13
Spp unique to the forest (list)	*Crotolaria recta, Ficus wildemaniana*	None	None	None	None	2
Uganda endemic (list)	None	None	None	None	None	None
Albertin Rift endemic (list)	None	None	None	None	None	None
Species diversity (Score & rank)	9.6 (2)	5.4 (40)	2.8 (61)	6 (41=)	8.5 (3)	7.7 (4)
Species rarity (Score & rank)	7 (35=)	5.3 (27=)	4.3 (43=)	4.2 (47=)	6.1 (26=)	6.0 (40=)

Over all biodiversity score = 13.5
Source: Forestry Nature Conservation master plan *(Volume 1)*

Forest ecological function and carbon sequestration

The Forest Reserves in this Management Plan Area are found within the shores of L. Victoria, hence play a big role as water catchments. They are important in stopping soil erosion from the steep slopes. If the forest cover is reduced, there will be increased water runoff from these slopes into the water bodies in the vicinity of the forests, leading to increased sediment loading into and pollution of the rivers, streams and Lake Victoria. In Navugulu CFR for example, there is Mpondwe hill, which stands above the general landscape in the valley. Such areas when preserved would stop soil erosion. Such areas should not be considered for timber production. Lukolo and Luwafu are within the islands and therefore play important water catchment roles.

Forest Wetlands, River/Stream Banks and Lakeshores

The Mpigi group of forests are blessed with streams and rivers. Some of the Streams are seasonal while others are permanent. The table below shows some of the rivers found in various FR.

Table 4.6: Permanent and Seasonal Rivers in Mpanga Sector

Forest Reserves	Permanent Rivers	Seasonal Rivers
Katabalalu	Muyobozi, Namusisi, Katabalalu, Kyezinze Busajja and Bwankuba	Wabulongo
Gangu	Kalungi,Busongola, Langu	Bugalula
Nakaziba	Nakaziba	2
Kavunda	Zilaje	2 unnamed seasonal rivers
Makokolero	Kyalwa	-
Nakalele	Nakalele	-
Kabuye	Gonza	One unnamed
Lufuka	Lufuka Kyanja	1 unnamed seasonal river
Navugulu	Makonge,Kisiiu, Bibira & Other 2	3 seasonal rivers
Kyansonzi	Walugogo, Kalungulu, Namata Kasa	
Wabinyomo	Binyomo	
Wamasega	Nakito and Kasafuba	

Wetlands are a common occurrence especially Nawandigi, Katabalalu and Navugulu forest reserves are partly wetlands. However a number of other forest reserves boarder with wetlands. These

include Gangu, Nakalele, Lukolo, Wamasega and Kagongo. Most of the wetlands have papyrus *spp* as the dominant species and are permanently wet.

Vulnerable/ Ecologically Fragile Areas pertinent to forest ecosystems

Mpondwe hill found in Navugulu has been identified as one of the steep slopes that need protection from both legal and illegal harvesting. It stands above the general landscape in the valley. Its destruction therefore could destabilize the ecology of the lower parts of the same forest. The central part of Nawandigi (7km^2) and the central part of Navugulu 7km^2) that represent the wetland ecosystem of the forest are ecologically fragile areas. They should be protected from encroachment and any other land use that may reduce the forest cover there by tampering with the drainage system. Luwafu and Lukolo FRs that fall within Bunjako island in Lake Victoria are very vulnerable due to illegal activities from pit sawyers. Fortunattely, noneof these reserves will be affected by the proposed Kawanda-Masaka power line.

Forest Social-cultural Sites

With the establishment of Mpanga Eco-tourism site in 1999, both international and national tourists have used Mpanga site as a place for recreation. Forest adjacent communities around Mpanga, however, rarely visit this place. A few educated ones visit this site for relaxation. In the past, most of the forest reserves in Mpanga sector were homes of gods for some people but this culture has since died away. Today, the communities are more interested in commercial gains than cultural gains. Currently, both local and primary schools visit the site for the purposes of exposure and conservation education.

Forest management objectives

The vision of managing the Mpigi group of forests under the current management plan is ' to attain 'Well managed, rich forests in a prosperous community'. The management goal aims at 'sustainable management of the forest resources for present and future benefits of the local, national and international community'.

In order to contribute to the attainment of the vision and achievement of the management goal indicated above, the FMP has the following objectives:

- Restore the integrity of the forests.
- To conserve the biodiversity of the forests and their ecological conditions.
- To enhance corroborative management of the forests with communities, starting with organizations already receiving grants from NFA as entry points.
- To produce high quality forest products like timber on sustainable basis.

Working Circles and Management Zones

To achieve the above management objectives outlined above, the management activities of the forests are organized in clusters of three Working Cycles of Conservation, Production and Collaborative Forest Management.

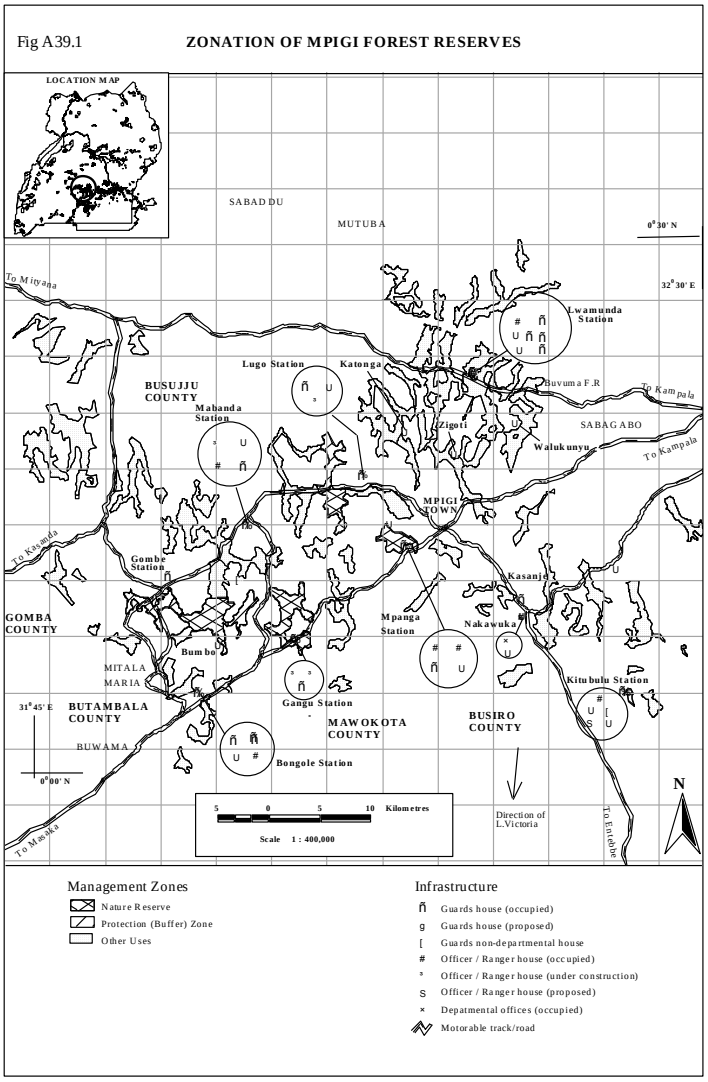
Conservation Working Circle

The conservation WC with 4 zones of Strict Nature Reserve (SNR), Buffer Zone (BZ), Recreation zones and Research Zone constitute an area of 8,552 ha. The zonation and constitution of the zones is as follows:

The Strict Nature Reserve (SNR) Zone in the conservation-working circle consist of 24.54 km^2, an equivalent of 2454 ha zoned out of the whole of Gangu CFR (1054 ha), central parts of Nawandigi (700ha) and Navugulu (700ha) CFRs. The remaining part of Nawandigi and Navugulu CFRs totaling to 5,080 ha forms the Buffer Zone (BZ). The recreation Zone consists of Mpanga, Lukolo and

Luwafu forests. This totals to 1018ha. The Research Zone will occur concurrently with recreation in Mpanga forest reserves. The CFM WC covers 2450ha and comprises of Katabalalu, Degeya, Lufuka, Kalandazi, Wabinyomo and Nanfuka CFR.

Below is a map showing zones of the FRs, together with the rest of the former Mpigi Group of FRs as per the Uganda Forestry Nature Conservation Plan (2002).



Source Mpanga Sector Management plan, 2010

4.1.3 Forest biodiversity surveys on small mammals, birds, butterflies and large moths

Although biodiversity survey on small mammals, birds, butter flies and large moths for the Mpigi group of forest reserves was not done in respect of the proposed Kawanda-Masaka power line, an earlier biodiversity survey had been conducted which presented the first systematic work to document the biological diversity represented in Uganda's major reserved forests which Mpanga and Mpigi forest reserves were considered as one block. Surveys were carried out by the Forest Department in 1995 for Mpanga, Mpigi group of forest reserves and Zika forest and aimed at listing

the trees and shrubs; birds; butterflies; moths; and small mammals of the country's 65 most important conservation forests. The purpose of this work was to provide necessary data on the biological value of different forests and establish clear priorities for the designation of new forest Nature Reserves and other conservation areas. This data is still being used although a series of changes have occurred in some of the reserves due to encroachment, fires and illegal activities. The Biodiversity Report Series demonstrates Uganda's commitment to biodiversity conservation and makes a major contribution towards addressing the country's obligations under the International Convention on Biological Diversity, signed in Rio de Janeiro in 1992 and ratified by the Uganda Government in September 1993.

Birds

When the forests are looked at as a single unit, 27% of the species recorded there are forest-dependent specialists (FF) representing 25% of the country's total, and 28% are forest-dependent generalists (F) representing 39% of the country's total. This means that 55% of the species present are forest dependent (FF + F), 31% of the Uganda total for this group. A further 23% are forest non-dependent visitors (f), 46% of the country total for this group. Six lowland and one highland species were recorded. A combined total of 119 bird species was recorded in the forest complex which when combined with previous records produces a total of 176.

The ecological characteristics data are consistent with a relatively undisturbed, moist tropical high-forest environment, containing a high proportion of forest-dependent species. One restricted-range species has been recorded, Spotted Greenbul (*Ixonotus guttatus*), a forest-dependent specialist known from four other forests in Uganda. Other species of note include Bat Hawk (*Macheiramphus alcinus*), Shining-blue Kingfisher (*Alcedo leucogaster*), Uganda Woodland Warbler (*Phylloscopus budongoensis*) and Pink-footed Puffback (*Dryoscopus angolensis*). No globally threatened species have been recorded (Collar *et al.*, 1994). The avifauna shows some similarity with that of Mabira, a nearby forest of a similar type. A species list has been attached in appendix 5.

Small Mammals

The small mammals were sampled using a combination of breakback, Sherman and pitfall traps. A total of 2408 trap-nights were set, and 200 animals were captured. A total of 16 small mammal species (5 shrew and 11 rodent) was recorded, with six species from Mpanga, 11 from Mpigi (Lamwunda, Gangu and Mpanga combined) and 8 from Zika. A further 5 species are known from old records. The list did not include any restricted-range or particularly notable species.

A total of 21 small mammal species (5 shrew and 16 rodent) are now known from Mpanga, Mpigi (Lamwunda, Gangu and Mpanga combined) and Zika. A high proportion of the recorded species list (approximately 50%) of these were forest-dependent species. The list includes *Malacomys longipes*, believed to be one of the most sensitive indicators of forest disturbance, although the Mpigi forests are largely of a secondary nature. No restricted-range were recorded.

Butterflies

The butterflies of Mpanga, Mpigi and Zika were sampled through the systematic use of sweep nets and baited traps for a total of 10, 8 and 11 man-days respectively. Species lists were compiled for each reserve and basic analysis performed. In Mpanga, 79 species were registered; 4 Papilionidae, 11 Pieridae, 4 Lycaenidae, 56 Nymphalidae and 4 Hesperiidae. A relatively high proportion (68%) of the total were forest-dependent butterflies and 3 restrictedrange species, recorded from no more than five forests during the programme, were noted. In Mpigi, 51 species were registered; 1 Papilionidae, 4 Pieridae, 2 Lycaenidae and 44 Nymphalidae. A relataively high proportion (63%) of

the total were forest-dependent butterflies and just 1 species was of restricted-range. In Zika, 51 species were registered; 4 Papilionidae, 4 Pieridae, 5 Lycaenidae 34 Nymphalidae and 4 Hesperiidae. A relataively high proportion (63%) of the total were forest-dependent butterflies and 8 species were of restricted-range. For the combined Mpigi-Mpanga forest complex, some 101 species were recorded; 5 Papilionidae, 13 Pieridae, 5 Lycaenidae, 74 Nymphalidae and 4 Hesperiidae.

Of the species recorded in Mpanga and Mpigi, those of particular interest included a number of closed forest specialists such as *Euryphura plautilla*, *Bebearia carshena* and *Euphaedra ruspina*, the latter two of which were claimed to only extend onto western Uganda (D'Abrera, 1980). In addition, *Euptera elebontas*, though having a wide distribution from Sierra Leone to western Kenya is always found sparingly, and is considered to be rare (Larsen, 1991).

In conclusion, the forests of the Mpigi archipelago and Zika, although mostly very small in size may be considered rich in terms of their butterfly fauna, supporting a high percentage of forest-dependent species. Zika, however, though excessively sampled in terms of man-days per km2 would require further work with baited traps for a realistic and comparative diagnosis to be made. All sites accommodate a few species recognized as uncommon and/or of restricted-range in Uganda. The data are consistent with medium-rich, moist forest environment. Aspeecies list has been attached in appendix 5.

Large moths

The moths were sampled with a mercury vapour light trap at one site in Mpanga, two sites elsewhere in Mpigi, and one site at Zika. Long-term sampling was carried out at Mpanga and Zika, with 87 nights of sampling at Mpanga and 379 nights at Zika, over a period of one year. Seventeen nights of work was undertaken by inventory team personnel at the four sites. Altogether 8231 hawkmoths (Sphingidae) of 66 species, and 2948 silkmoths (Saturniidae) of 43 species were captured. These were predominantly common, widespread species and those characteristic of closed canopy forest. The long-term sampling at Zika was carried out at the same site as an earlier study of Saturniid moths by A. McCrae, providing unparalleled comparative data are a 20-year period: nine out of 46 species recorded previously were not encountered, and there were no additions to the fauna. Twelve restricted-range species were recorded (including old records), including one hawkmoth (*Temnora hollandi*) and one silkmoth (*Imbrasia oyemensis*) known only from the Kampala/Entebbe area in the East African parts of their ranges.

Twelve restricted-range species recorded, of which seven are hawkmoths and five silkmoths. Of these, six hawkmoths and five silkmoths are records from Zika, reflecting both the intensity of sampling carried out there, and the fact that four out of five of the restricted-range silkmoths are known only from old records. At Mpanga, two restricted-range hawkmoths and two silkmoths were recorded. Aspecis list has been attached in appendix 5.

Grassland and Wooded thicket

Bushed and wooded grasslands were part of habitats that were covered during the study. Cultivation, if left untended gradually reverts to this type of habitat. Some of the thicket habitats encountered in the study were abandoned coffee plantations that naturally regenerated into thickets like the ones found in Betake Nabingo Village. Some of these patches were dominated by *Maesopsis emini* which is a valuable timber tree. A few of the patches occurred around termite mounds and consisted largely of woody shrubs and small trees. Cutting for fuel wood concentrated

on these thickets, which are often cut right back until the area is almost cleared. However, the rate of regeneration of such thickets is fast and they quickly recover.

Fig.5.0: Grassland and thicket habitats in the study area. The thickets are major sources of fuel wood.

4.1.4 Wetlands

Although many swamps have been drained in the districts of Wakiso, Mpigi and Masaka for cultivation, industrial development, settlement and resource harvesting there are still extensive swamps. The proposed line will pass through the following wetlands: Mayanja, Lubiji, Kageye and Mayanja-Kato in Wakiso district; Kiyanja, Lutindo, Kalungi, Nawandagi, Kibukuta in Mpigi District and Kafu/Lwera, Kitante/Kadugala, Nakayiba, Kamugombwa and Nabajuzi in Masaka District. Majority of the swamps are *Cyperus papyrus* with few *Miscanthidium* swamps. Most of the papyrus swamps are dense with very few breaks in the cover unless it is burnt like Lutindo Swamp.

Fig.5.1: A fairly intact wetland with one which is burnt.

Wetlands in central Uganda are being degraded by burning, illegal resource harvesting and settlements.

4.1.5 Settled and cultivated areas

These are agro-system communities /farm land and settlements. This forms part of the forest-grassland-cultivation mosaic and forms major part of the study area. Crops most often grown are banana, cassava, beans which are interspersed with fruit trees like Avocado, mangoes, Jack fruit and pawpaw. These built up places or settlements attract certain specific species as nesting sites and feeding grounds near the dumping grounds but most of such species are not affected by disturbance instead they benefit from it.

Fig.5.2: Habitats in the settled areas

4.2 Kalungu-Masaka district

4.2.1 Transmision corridor characteristics

Geomorphology

In terms of relief, the District lies at altitude of 1066m to 1524m above sea level (a.s.l); and characterized by plains and undulating landscape.

Overall, the geomorphology of the District is dominated by remnants of lowland surface, and punctuated by areas of in-fill and remnants of upland surface. These lowland surfaces are represented by extensive branching valley floors (formerly described as etch-plains), which resulted primarily from rejuvenation and drainage incision. Remnants of upland surface can be found in parts of the land area stretching from Bukulula sub-county through Mukungwe to Masaka Municipality.

Basing on earlier studies/surveys, the geomorphology of the District (reflection of topography/relief), gives a range of degree of slope of land. The dominant feature is gently undulating landscape covering an estimated area of1, 745.4 sq.km and fringed by rolling hills (representing about 49% of the area surveyed). *Ministry of Finance and Economic Planning (MFEP) / Japan International Cooperation Agency (JICA) : The Master Plan Study on the Integrated Agricultural and Rural Development Project in Central Uganda. Progress Report, December, 1993.*

The areas of in-fill resulting from effects of regional tilting are quite pronounced, and are associated with the river courses. These areas form some kind of dendritic pattern (of finger-like projections)

that extend towards the central part of the District, such as west of Lukaya, and along rivers Kakinga, Katonga and Kyogya.

Soils

There are two dominant categories of soils in Masaka district, namely, ferralitic (those with dominant colour yellow and red, respectively), and hydromorphic soils. The largest area of the District is covered by ferralitic soils, with the yellowish types being dominant. The soils with dominant colour red are limited to the area stretching to the north, east, and south of Masaka Town (for example, at Kalungu)

Ferralitic soils usually represent the final stage in tropical weathering. Although there is limited differentiation of the soils into well defined horizons, they are usually deep and possess a fine granular structure often moulded into larger, weakly coherent clods which are very friable and porous. The clay minerals are all of the 1:1 lattice type (kaolinite) associated with significant quantities of iron oxides and to some extent hydrated oxides of aluminium. The heavier soils tend to be more fertile. The saturation of the exchange complex is usually below 40%.

The hydromorphic (in this case, mineral hydromorphic soils) are developed under seasonal or permanent water-logging, hence, associated with wetlands (swamps) such as those found along River Katonga.

The main or dominant soil types are as outlined below:

- Mirambi Catena Koki Catena
- Buganda Catena
- Mawogola Catena
- Katera Series
- Kifu Series
- Kabira Catena
- Sango Series
- Tolero Series
- Mulembo Series

However only Kabira Catena (Soils Associated with Strongly Dissected Remnants of the Buganda Surface) and Buganda Catena (Soils Associated with Extensive Remnants of the Buganda Surfacea). Series exist along the proposed route. Kabira Katena is to the South and East of Masaka Town, Mirambi Catena is in the areas associated with R. Nabajuzi e.g. Kalungu, Butenga and Kibinge sub-counties.

Wetlands

Masaka district records prior to the creation of Sembabule district, the area under both open water bodies and wetlands/swamps was about 1 ,593.9km^2 (representing about 22.7% of the total area of the Masaka District)). The area under open water is given as 1,147.6km^2, while permanent wetlands occupy about446km^2 and seasonal wetlands, about 978.2km^2; and out of which the area with papyrus vegetation (papyrus swamp) is about 115.3km^2.

There are a few rivers existing in the Masaka District, but the main river systems are River Katonga (along its border with Sembabule and Mpigi districts), Nabajuzi, and Kyogya. For purposes of our study, we shall consider Nabajuzi and its tributary (Nakayiba and Kitante. The proposed line will cross Nabajuzi its two tributaries. Nabajuzi drains to R. Katonga.

The prominent swamps in Masaka district are associated with the Lake Victoria shores and Lake Nabugabo, while smaller ones are associated with rivers, for example, Nakayiba and Nabajjuzi wetlands/swamps. The plains are more prominent with wide aggraded major valleys and low interfluves. Stream channels are generally indistinct or absent. *[Adapted from "Pan African Regional Meeting" Report of 6th-10th July, 1998].*

Nabajjuzi Wetland (Water Supply for Masaka)

This wetland is located on the western side of Masaka Town. It occupies a long, wide valley, along the Nabajjuzi River, which flows northwards, and eventually west-wards into Katonga wetland system.

The key function of this wetland, that warrants strict protection, is that it is the only economically viable source of water supply for Masaka Town. Lakes Victoria and Nabugabo are expensive alternatives. Without a secure water supply (and that means a well protected and well managed wetland) the future of Masaka in terms of expansion and development will be bleak.

The purifying function of the extensive *Loudetia*/papyrus vegetation cover contributes to the wetlands maintaining both water quality and quantity at the water-works abstraction point. The Wetlands Division in collaboration with the Masaka Municipality authorities, developed an Action Plan for sustainable use of Nabajjuzi wetland and its catchment, especially up-stream of the water-works.

Nakayiba Wetland (Tertiary Sewage Treatment for Masaka)

This wetland is located on the eastern side of Masaka Town. Its river flows northwards and eventually drains into Nabajjuzi wetland, down-stream of the Masaka Municipality water-works. This wetland was originally dominated by papyrus, *Loudetia* sp., and *Miscanthus* sp. Of recent, however, agricultural crops, especially sugar-cane, have replaced much of the original vegetation.

Part of Nakayiba wetland is being utilised by the Municipality to further purify its treated sewage; and the sewage is passed through a one hectare grass plot, before it enters Nakayiba River.

All these indicate how rich the project area is in water resources. The value therefore is regarded as low because it is available. However because of its characteristic impeded drainage coupled with availability of water resources, drainage and water resources for the project area has been assigned a **low - medium** as represented in

Kayabwe/ Lukaya Town

The stretch is dominated by agricultural systems, wooded thicket grassland (Katonga) with area of impended drainage isolated seasonal /permanent swamps and area of open grazing grassland. Kafu/Lwera and Katonga wetlands contain rivers. Some agriculture is practices are being practiced but the soils are predominantly sand.

Lukaya to Masaka/Kyabakuza

The habitat types along Lukaya to Masaka/Kyabakuza section include the woodland thickets, wetlands, woodlot plantations, and agricultural systems communities. The dominant natural habitats are the woodland thickets and the wetlands. The common plant species are the herbaceous plants, crops and fruit trees. There is no natural high forest reserve traversed in this section of the proposed line route . Only traces of natural forest trees species of gazetted forests are found growing in woodland thickets and gardens along the line right of way and include *Piptadeniastrum africanum, Pcynanthus angolence, Anthiaris toxicaria, Maeosopsis eminii, and Fantumia elastica.*

There are three tributaries of great Nabajuzi in section viz: Kitante, Nakayiba and Kamugombwa. The swamps' prominent vegetation is *Cyprus papyrus, Ph*oenix *reclinata, Sesbania sesban* and grass species of *Loudetia, Miscanthus and Typha*. Nabajjuzi swamp is a source of water supply for Masaka municipality with Loudetia/papyrus vegetation cover contributes by maintaining both water quality and quantity.

Encroachment and over-harvesting

The influx of pit sawyers and increased consumption of timber due to construction, charcoal and fuel wood has led to the loss of elaborate valuable trees like Melcia excelsa, Antiaris toxicaria, Chlorophora excelsa (Musizi) Lovoa spp, Mitrygna spp).

There is also significant clearing of natural vegetation for agriculture and often covered by various post-cultivated vegetation communities. The commonly exploited tree species include *Milicia excelsa, Lavoa brownii, Entandrophragma angolense, Pipteniasstrum aftcanum, Borassus aethiopum, Canarium schweinfurthii, Terminalia and Albizia coriaria and some Ficus species.*

Some of wetland vegetation like *Phoenix reclinata* is being over-harvested for poles and palm leaves and is disappearing. Some agricultural crops, especially sugar cane, *Eucalyptus* plantations and yams have replaced some of the original wetland vegetation. Nakayiba wetland is tertiary sewage treatment site for Masaka municipality.

In the savanna grasslands/wooded thickets, a lot of charcoal burning and firewood collection is taking place.

4.2.2 Wetlands /Swamps

There are numerous wetlands in the project area broadly categorized as permanent swamps and those that experience periodic inundation. Wetlands develop adaptive vegetation like shrubs, grasses and *Phoenix reclinata* trees. *Cyperus papyrus* swamps communities are on sites with impeded drainage and have less tree cover with perennial grasses and sedges. The three vegetation communities found in these include the *Echinochloa*, *Sorghastrum, Alchomea cordifolia, Sesbania sesban, Ficus con gensis, Thelypterus extensus, Thelypterus Dentata, Merramia subcordata, Miscanthus species* and *Typha latifolius*, *Typha domingesis* is among dominating species.

Most of the swamps are surrounded and bordered by narrow belts of fringing forest consisting of small trees with a dense impenetrable thicket comprising of woody shrubs and thorny climbers. Some of the forests and thickets surrounding swamps have been or are being depleted for fuel wood and for other domestic uses. These vegetation communities; *Cyperus papyrus, Typha domingesis, Cyprus articulata, Cyperus latifolius, Phoenix reclinata and Cladium jamaicense, Raphia farimifera* are used extensively for building materials, matting, roofing, basket making, fencing and other handicraft.

***Cyperus papyrus* swamps**; Permanent *Cyperus papyrus* swamps include, Lutindo, Kalungi, and Nawandagi. The dominant species of vegetation in all these swamps is *Cyperus Papyrus*, which occurs on permanently, waterlogged peat and the common associates are *Cissampelos micronata, Dissolis rotundifolia, Dryopteris striata, Leersea hexandra and Polygonum salicifolium and Sesbania sesban.*

Miscanthidium swamps; Miscanthidium swamps include Kiyanja, and Kibukuta. The dominant species of vegetation in all these swamps is dominated by the violet inflorescences of *Miscanthidium violaceum* and are mostly situated between the *Cyperus papyrus* swamps and dry land the common associated species being *Dissotis incaria, Leersia hexandra and the Lypteris squamulosa*.

Table 3: Wetlands Affected

Wetland	Village of Location	Length of the wetland in the Right of way (m)	District
Mayanja	Kawanda/Kisimu	300	Wakiso
Lubigi	Ganda/ Nakuwadde/ Bulea	1,550	Wakiso
Kageye (degraded)	Kibwa/Nansana East 2	0	Wakiso
Mayanja-Kato	Bulenga/Masand Nabaziza-Bataka Nakitokolo-Mangya	600	Wakiso
Namaya	Maya/Katereke	450	Wakiso/Mpigi Border
Kiyanja	Maziba/Katonga FR	500	Mpigi
Lutindo	Mpambire/Nambi	750	Mpigi
Kalungi	Budee-Kiyonsa	900	Mpigi
Nawandagi	Kabuye-Ntayi/Kasozi FR	1,800	Mpigi
Kibukuta	Buyaya-Kitojo/Kwaba	1,700	Mpigi
Katonga	Jandira/Lubanga	650	Mpigi
Kafu/Lwera	Nalyewanga/Lukaya Town	1,500	Masaka
Kitante/Kadugala	Kadugala/Kyalusolwe	350	Masaka
Nakayiba	Kayirikiti/Kalagala (Mmlity)	400	Masaka
Kamugombwa	Namasenene/Kamugombwa	150	Bulenga
Nabajuzi	Kyabakuza/Masaka	700	Masaka
TOTAL		[1 2,300*40]=492,000m^2	

The vegetation value in wetlands is put at **medium** because some of it has been degraded and Nabajjuzi wetland is presently of local conservation value.

4.2.3 Vegetation communities on sites with impeded drainage

There are vegetation communities on sites with impeded drainage this consist of seasonal/periodic inundation swamp/grasslands (profile water logging"), which is dominated by *Echinochloa* and *Sorgha strum* grasslands and grasses *Hyparrhenia/ Themeda* dominate along River Katonga/Kafu/Lwera area:

Sorghastrum grassland; Sorghastrum grassland is dominated by *Sorghastrum rigidifolium*, *Cyperus diloloensis, Fimbristylis dichotoma*, *Hyparrhenia lintonii*, *Hyparrhenia rufa, Loudetia kagerensis* and traces of *Cyperus papyrus.* The soil surface may be under water during the rains, while in the dry season soils become extremely dry. Severe water logging prevents the growth of savanna trees while the length of the dry season is unfavourable to forest species, only thicket clumps of trees are found at the edges of anthills including *Erythrina abyssinica*, *Acanthus arborea, Euphorbia candelabrum*, *Accasia abysinica* and *Accasia gera*dii. The common grasslands consist of tussock grass of *Sorghastrum rigidifolium, Loudetia arundinacae* with other species of *Cyperus diloloensis, Hyparrhenia lintonii and Hyparrhenia rufa, Echinochloa pyramidalis, Cyperus dives* and *Cyperus Latifolius.*

The vegetation value of communities on sites with impeded drainage in wetlands is low because this vegetation is very wide spread in most areas of the three districts and thus of low conservation value.

4.2.4 Mammalian Fauna

Kawanda –Maya.

The line in Wakiso will run through a number of villages from Kawanda up to Maya where Mpigi District starts. The area from Kawanda where the proposed substation will be located to Ganda is heavily settled thus the large animals have disappeared leaving antelopes as a dominant group. Most of the valleys that were covered by thickets and wetlands between Kawanda and Nansana are now covered by crops (e.g. yams) and brick making activities. Monkeys, squirrels and common snakes are found in Wamala opposite Kawanda. In Nansana, the line crosses Hoima road runs parallel to Lubigi swamp for about 3 km in a built up area and then crosses Lubigi towards Ganda. Lubigi swamp then joins the wetlands of R. Mayanja which the line will also traverse. Lubigi supports a few animals because most of its part has been replaced by car washing and cultivation of wetland crops e.g. yams. Mayanja wetlands still support a number of animals which are dominated by antelopes. Hunting activity is still common in this wetland. However hunting is mainly for home consumption.

The line crosses through Nabingo where it enters a regenerating natural forest of about 400 m wide (formally with coffee plantation) before running parallel to Mayanja swamp again and crossing through settled in villages to Namaya Swamp in Maya area.

Animals that were identified in this section of the line route during our field visits and through discussions with the local community include: Bush back, Sitatunga, Otta, Black and White colobus, Vervet Monkeys Obuwewo, squirrels, Mangoose, Bush pig etc

Maya – Lukaya

This line route section lies in Mpigi District. Mpigi is endowed with many swamps and tropical high forests. In this section therefore the line will cross through swamps and forests reserves (both Central and local) as shown in Table 4.1

Most of the mammals found in these swamps are similar to those of R.Mayanja wetlands. Antelopes and squirrels are the most common in swamps. Most of these swamps have suffered degradation through sand mining and cultivation and back filling some parts for car washing bays which have reduced habitat for some of the animals. The different human activities carried out in this area including hunting have contributed to loss of fauna biodiversity in these wetlands.

Mpigi is very rich in natural forests although some have been degraded to some extent. More plantations especially eucalyptus are being added. The animals found in the above forests and in the peripheral of the forest include: Vervet monkeys, wild pigs, Bush bucks, Edible rats, skunk, Red bucks, Turtles, Snakes, Lizards, Geckos, Chameleons and birds. Forests are mainly dominated by the monkeys. Most of these forests have been encroached on by cultivators and charcoal burners as a result, a number of mammals have either migrated or been exposed to the hunters. According to residents of the area, the fauna biodiversity has reduced as compared to the early 1970's when forests were still intact. It was also reported that Leopards were common in the 1970's but know they are only as a rumour.

Lukaya - Kyabakuza

This stretch is in Masaka District. Wetlands are again a common feature and number of them will be traversed by the proposed line. These include: Katonga(3/4km), Kafu (1 1/2 km) in Rwera, Kitante (1/4km), Nakayiba (1/2 km) and Nabajuzi (3/4 km) after Masaka Town. Most of these swamps have been degraded to some extent especially Kafu which appears to be a seasonal wetland. Degradation of these wetlands is mainly due to back filling to create more space for buildings, car washing, burning, cultivation, prolonged drought and overgrazing for the case of Rwera. Most of these swamps are narrow with a width of less than 1km.

Animals in most of these wetlands have either been hunted or scared off by encroachers leaving **Vervet Monkeys, and squirrels** as the most common.

However Nabajuzi swamp near Masaka town has had minimal disturbance and is an important habitat for the Sitatunga (which is of interest to Wetlands Division and Nature Uganda) and Otter. Sitatunga and Otter live in Nabajuzi wetlands in relatively large numbers; whereas hippos occasionally appear in the down-stream part of the wetland. Cat-fish and lung-fish are present. Cranes and ducks are also abundant.

Settled-in areas cover much of the line route. The line will cross through a number of grazing chunks of land. Examples are: a diary farm in Kibwa Village Nabweru Sub-county and another one in Bulenga near Mityana Road, and other grazing lands in Rwera near Lukaya. Otherwise some families in the project area have 1or 2 cows which are normally tied with a rope to the bush as well as some few goats.

With a number of tropical high forests and other sensitive areas like swamps, fauna biodiversity is still fairly high although some habitats have been degraded. However, no endangered species have been identified along this line route. The only mammal of conservation status is Sitatunga which has a local status. The value of Mammalian fauna biodiversity and conservation status therefore has been assigned a **medium value**

Table 4:Wet Land Fauna Bio diversity

Name of Wetland	Animals present
Kalungi	Sitatunga,Bushbuck,andmany monkeys in the swamp forest
Kibukuta	Bushbuck and monkeys
Lutindo	Sitatunga, Bushbuck and monkeys
Mayanja - Kato	Large numbersof Sitatunga, Bushbuck and many red tailed monkeys in the swamp forest fringes
Namaya-Kasenso	Sitatunga, bushbuck and many red- tailed monkeys
Katonga	Sitatunga, Otter, crocodiles, bushbuck, monkeys, fish, cranes and many wetland birds
Kitante	A few monkeys in swamp forest
Wakayiba	Degraded, cranes present
Nabajjuzi	Large numbers Sitatunga, plenty of cranes and ducks, catfish and lung fish. Hippos occasionally appear downstream in wet season.

4.2.5 Avifauna (Birds)

Forest Birds

The forest reserves in central Uganda support the Guinea-Congo forest biome species and a few species of regional importance. However, none of the 10 globally threatened species associated with forest habitats were recorded during the study. The total list of all bird species recorded in the study is given in Table 4.5 Those species that are associated with forests are designated as FF (forest specialist), F (forest generalist) and f (forest visitor).

Table 5:Bird Species recorded during the study that were either regionally threatened or are of regional responsibility in the forest reserves

Common name	Habitat category	Threat/RR category
Grey Parrot *Psittacus Erithacus*	FF	R-NT
Shrike Flycatcher *Megabyas flammulata*	FF	R-NT
Weyns'Weaver *Ploceus Weynsi*	FF	R-VU

R-NT = Regionally Near threatened R-VU = Regionally Vulnerable

F=Forest generalist *f =forest visitor*

The value of forest birds in the project area is therefore regarded as **low - medium.**

Wetland Birds

According to the National Wetlands Management Programme's inventory on biodiversity there were 159 species of birds recorded as associated with wetlands out of which 35 species are of conservation concern. The swamps around Lake Victoria support unique bird species known as the Lake Victoria biome species. These swamps are also habitat to papyrus endemics like the Papyrus Gonolek, White-winged Warbler, Carruthers's Cisticola, Papyrus Canary and Papyrus Yellow Warbler. The Grey Crested Crane (Uganda's national emblem) breeds in some of these swamps. There are 10 species that are globally threatened and associated with wetland habitats in Uganda. During the study only the Shoebill and the Papyrus Gonolek was recorded but two others: the Madagascur Pond Heron and Papyrus Yellow Warbler are reported to be present in some of these wetlands. Bird species recorded in the wetlands that were either globally and regionally threatened or are of regional responsibility are given in Table 4.6 below.

Table 6: Bird Species recorded during the study that were either regionally threatened or are of regional responsibility in the wetlands

Common Name	Habitant Category	Threat/RR Category
Crown crane *Balearica pavonina*	W	R-NT
Shoebill *Balaeniceps rex*	W	G-VU/R-VU
White – winged *warbler Bradypterus carpalis*	W	R-RR
Carruthers' Cisticola *Cisticola Carruthersi*	W	R-RR
Papyrus Gonolek *Laniarus mufumbiri*	W	G-NT/R-NT/RR
Red – cheated sun bird *Nectrinia erythroceria*	W	R-RR

R-NT = Regionally Near threatened R-VU = Regionally Vulnerable

R-RR = Regional Responsibility *VU = Globally Vulnerable*

W = Water bird specialist f =forest visitor

The wetland birds can be assigned **medium value** Grass Thicket

Although birds designated as F and f could also be found in these types of habitats, majority of species found here are common and widely distributed in the country therefore no species of conservation importance were recorded in the grassland/thicket habitats. Therefore the value of birds in this habitat is **low**

Conservation Areas

A number of conservation areas exist in the project area. These are mainly forest reserves as already highlighted in section 4.2.2. Nabugabo wetland which is planned to be included in 'Ramsar' sites is far away from the project area. Another wetland of interest is Nabajjuzi wetland near Masaka Town. Nabajjuzi wetland has been surveyed under the Important Bird Area Programme where 10 wetlands have been covered. A bird list is being prepared for publishing.

Nabajjuzi wetland is presently considered as a conservation area. It has a substantial population of Sitatunga yet it's near an urban centre. This wetland also is near a Kampala Mbarara highway which takes the highest number of tourists in the country. In this area therefore a site for eco-tourism has been selected and Masaka Municipality has provided space for this site. Already, there is a feasibility plan in place for this ecotourism site. Nabajjuzi is the only source of water for Masaka Municipality therefore of concern to the district. Furthermore, Department of Wetlands and 'Nature Uganda' are working together to make sure that Nabajjuzi wetland is recognised as a 'Ramsar' site.

Other animals

Termites are very common along the proposed route as exemplified by the mulch they have destroyed in some banana plantations. Furthermore a number of termite mounds were identified especially in the Rwera plains. These mounds were very close to each other indicating that the termite population is quite high.

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5 SOCIO – ECONOMIC ENVIRONMENT

This section describes the broad socio economic characteristics of the project area of the proposed transmission line.

5.1 Administrative boundaries

The proposed 220kV Kawanda – Masaka transmission line traverses 10 sub-counties in the three districts of Wakiso, Mpigi and Masaka covering a distance of about 137 km. It passes through 1 sub-county in Wakiso (Wakiso), 6 Sub-counties in Mpigi District (Kiringente, Mpigi, Kamengo, Budde, Buwama, and Nkozi) and 3 sub-counties in Masaka District (Mukungwe, Lukaya Town Council, and Bukulula,). The transmission line is a development project that will lead to involuntary population displacement, both physical and economic. People within the project area will be affected either directly or indirectly. The directly affected households will bear physical loss due to the construction of the transmission line. The indirectly affected HHs are those that will lose their economic earnings and the host communities.

The directly affected HHs may bear partial or full impacts. The fully affected HHs are the ones which lose all their land and structures (i.e. houses, etc) whereas the partially affected only lose part of their land or structures. The latter are those in the way leaves whereas the former fall within the ROW.

Acquisition of the way leaves is involves 100% payment and acquisition of the Right of Way of 5metres and a percentage payment for restricted use of the Way leaves for activities above 6 feet high. For this system, Way leaves will be 17.5 meters on both sides of the right of way.

The totality of activities leading to acquisition of the way leaves and right of way are outlined in the final Resettlement Action Plan (RAP) currently under update by SMEC International Pty Ltd.

5.2 Population

According to the 2002 Population Census the population of the affected districts was Wakiso 908,000, Mpigi 407,800 and Masaka 770,700 people. However the Transmission line is not going to affect all the population in the districts but to only the mentioned sub-counties below table no. 5.1

Table 5.1: Estimated number of affected Households per district

No.	Districts	Number of Sub countries	Number of House Holds
1.	Wakiso	1	826
2.	Mpigi	6	1167
3.	Masaka	3	722
Total	**3**	**10**	**2715**

5.3 Socio – economic characteristics of the PAPs

5.3.1 Household Size

On average there are 8 people in each household with the largest household having 25 people and the smallest 1 person. This is slightly higher than the 2002 Population Census which had 6.6 persons per household in the Central Region. The large household size can be attributed to high number of dependants, polygamous practices, early marriages, high fertility rates and low levels of education.

5.3.2 Age Distribution

Age is one of the important factors to consider when devising policies and plans for resettlement. Dependency and intergenerational differences play a big role in mitigating impacts of displacement.

A high elderly dependency ratio means livelihood restoration programs must take into consideration the unique needs of the aged who are out of the labor force. Likewise, a relatively younger population may have substantially different demands than the older population. Moreover, a younger population is expected to adapt quickly to new environments since their attachments to previous conditions may be less strong.

A significant proportion (22%) of the household members is children less than 18 years old and between 35 – 55 years.

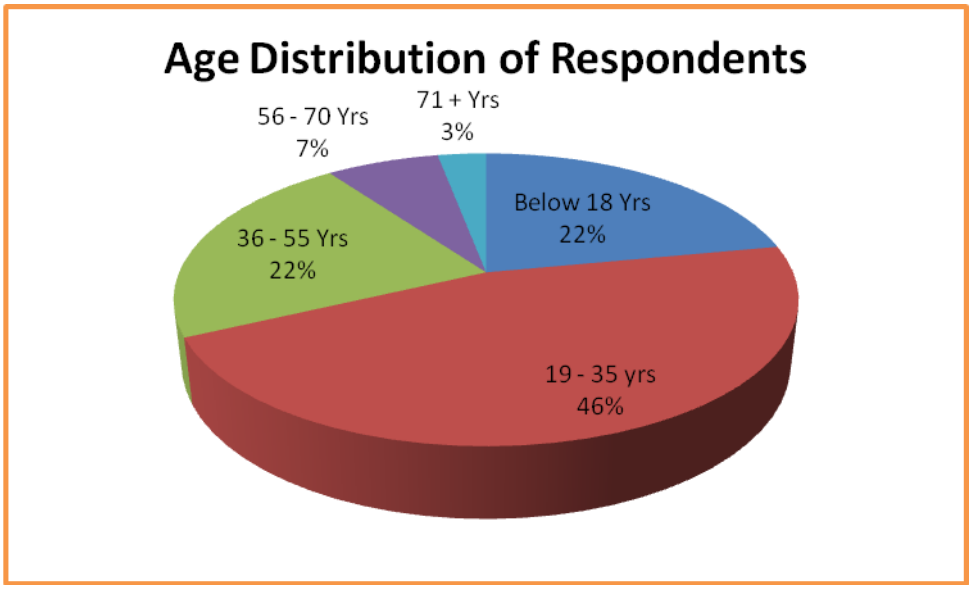


Figure 6.2 Age distribution of respondents

Never the less a considerable number 46% are in the youthful age of 19 – 35 years. Only 10% are very old thus 56 + years of age. With the majority of the population being in the productive age bracket the dependency ratio is expected to be low.

5.3.3 Education Levels

The schools existing in these villages are mostly primary schools under UPE program and a few are Secondary Schools. There are no vocational institutions in the area, which is their major concern as a community. It means that the majority of the labour that can be supplied by the people will be in the form of unskilled labour because there are few people with skills and training.

The level of education attained by an individual is an indirect measure of the coping ability during hardships. Highly educated populations are known to devise better strategies to mitigate risks. This can be true in situations of displacement. Moreover, the type of education, formal or vocational, makes one easily adapt to host communities. Income restoration strategies and mitigation measures should therefore take into account education level as the capacity building and development of social capital depends, among other things on the education level of the beneficiary.

A large proportion (56%) of PAPs attained primary school education with fewer than half this (20%) enrolled for secondary education. Most of the women did not enroll because factors like early marriages, low priority on girls' education and lack of means to pay for school fees for secondary education. Just 8% of the PAPs attained tertiary education.

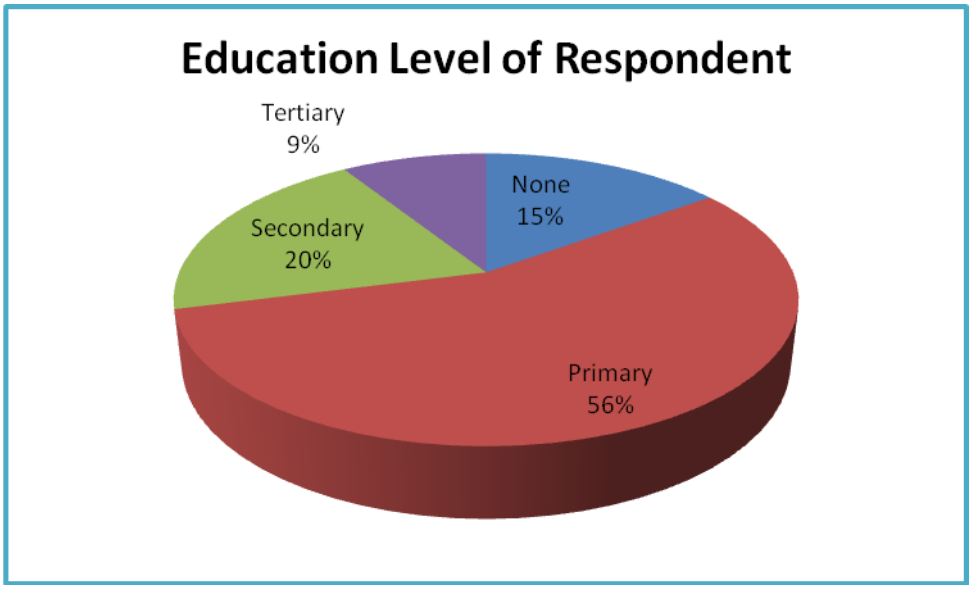


Figure 6.3 Literacy levels of project affected people

The low levels of literacy in the area implies that any information and awareness programs to be designed for the people in the project area should not rely only on written texts but use illustrations

and other suitable information media. Furthermore, low education levels means few PAPs have skills that are required in the construction of the transmission line. Therefore majority of them may be employed as casual labourers.

Furthermore, since many of the PAPs are students in primary and secondary school, it is important that any resettlement area should have educational facilities to cater for the increase in enrolment or else the project helps the host communities expand the educational facilities.

5.3.4 Health Status

In the three districts covered during the survey, it has been noted that there is too much pressure on the existing health facilities that are mainly Health Centre II (HC II), drug shops, clinics and traditional birth attendants. In most parishes people rely on these facilities, which are poorly facilitated (staff, drugs, and modern diagnostic facilities). Because of that, patients have to be referred to HC VI e.g. Wakiso or even Mulago hospital (Kampala).

The majority of the people in the project area use health centers (43%), clinics (28%), and drug shops (20%) for the management of their health. A mere 6% visit hospitals

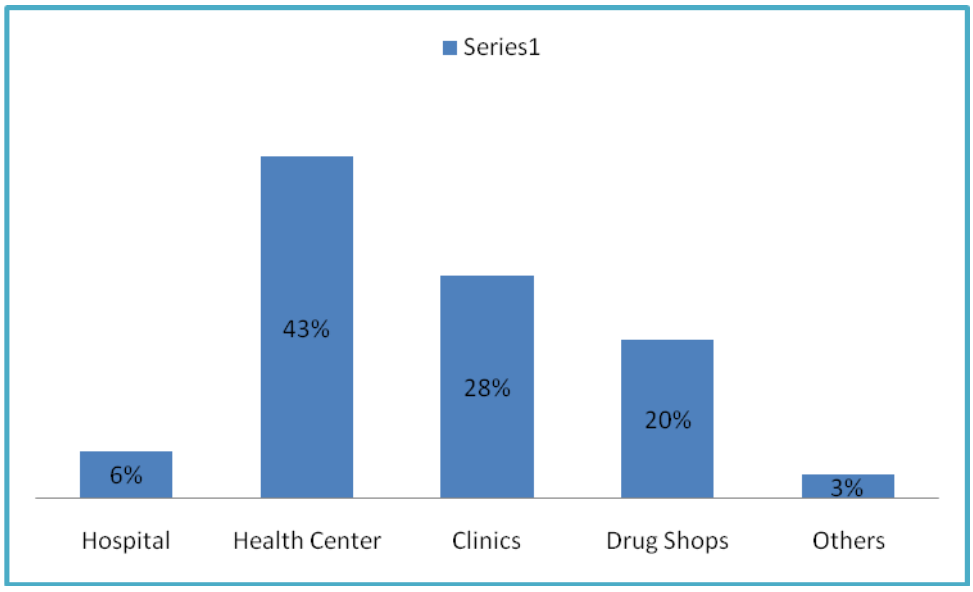


Figure 5.4 Health facility visited by people in the project area

The existing health facilities are mainly health centers of Grade II and III offering services limited to Out Patients, laboratory and maternity for normal delivery. Inpatient services are only for minor complications.

Overall, facilities are overstretched and inadequate as they are characterized by inadequate stock of drugs, lack of or no qualified medical personnel, and lack of modern facilities for proper diagnosis. Any unplanned increase in patients will greatly affect service delivery by these facilities.

The health facilities can be assigned **medium value** because they are poorly facilitated but with good structures.

5.3.5 Ethnicity and Religion

The dominant ethnic group in the project area is the Baganda (88.4%). Other tribes such as the Bakiga, Banyankole, Banyoro, Bateso and Batooro stay in the project area especially around the trading centers. The population within the project area is largely Christian (80%) with Catholics (51%) dominating. However, traditional beliefs are strong among the respondents.

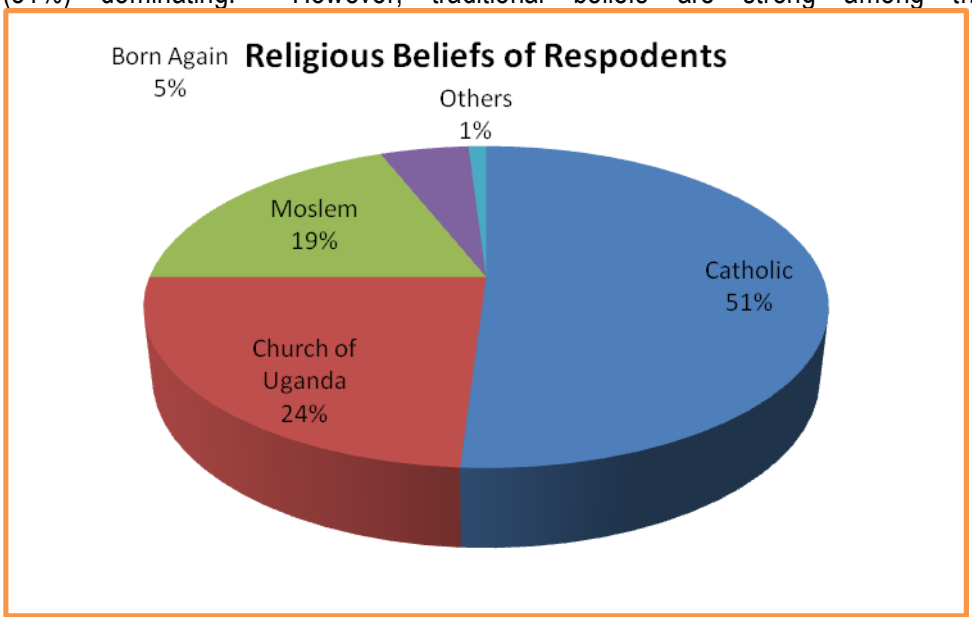


Figure 5.5 Religious beliefs of the affected people

Ethnicity and religion are key considerations in designing and implementing resettlement policies and strategies since most people would prefer staying close 'their' own.

5.3.6 Length of Residency

Sixty four percent of the affected people have stayed in the area for over 15 years, 20% had stayed in the area for 6 -14 years while only 14% had stayed in the project area for less than 5 years. Most of these people are tenants on the land on which they live. This hampers their development. On the whole, the level of vulnerability of this population may be described as **high**.

5.3.7 Settlement and Land Use

Through the 137 km stretch from Nakyesanja LC I (where Kawanda Substation is located) to Masaka West substation, the proposed transmission line traverses sixty seven villages, including Trading Centers and Towns. From Nakyesanja to Masaka the settlements are typical village setting characterized by scattered settlements with footpaths. The compounds are composed of a group of houses accommodating members of an extended family.

However, from Kawanda to Kkoba swamp settlements are mainly of the scattered nuclei settlement with various permanent structures which are concentrated along the roads while semi-permanent and mud and wattle houses are found as one goes deeper in the villages. The set up of structures and settlements along the proposed Transmission Line corridor can be categorized as;

- Permanent brick buildings, mostly commercial (shops) and residences. The commercial structures are mostly concentrated within a single locality and generally in linear formation
- Institutional structures, mainly schools built of permanent brick material
- Semi-permanent buildings, mostly residential with support structures such as latrines, kitchens and livestock structures
- Temporary structures, mostly of mad and wattle and typical of rural setting

The land is mainly used for small - scale agricultural production. Crops grown are mainly food crops like bananas, cassava, sweet potatoes, maize, beans, and vegetables such as tomatoes. However, cash crops like coffee, vanilla, moringa are also grown. Eucalyptus and Cyprus plantations too fall within the transmission line corridor.

Livestock farming is also practiced within the transmission line corridor with mostly goats, pigs, rabbits and poultry being reared. For households that rear cows the number does not exceed three. Other types of land use include stone quarrying, sand mining and brick making.

This type of land use is maintained almost up to the end of Mpigi District. Mpigi land use is in such a way that the settled in lands are interspersed with forest reserves and wetlands.

In Masaka district, through Lwera (Kafu swamp) up to Lukaya, the settlements are sparse and of the rural type. Land is mainly used for substance farming, grazing and brick making. The structures are mainly semi-permanent as well as mud and wattle. In Lukaya, settlements are

concentrated within the Town Council with nearby villages practicing mainly substance agriculture, poultry keeping and livestock .

Along the road, there are a few trading centres in a semi-urban setting with permanent and semi-permanent structures due to the facilities like electricity, schools clinics and accessibility to the main road.

In summary the project area has various land uses. In most areas, the settlements are dotted along the road with structures that are semi-permanent small retail shops and kiosks. Away from the road, settlements are scattered and cultivation of crops on small scale is common though poultry and cattle keeping is also done. In view of the above, the value of land use and settlements is **low - medium** because presently there is no land use policy in place for the whole country and the structures are not unique.

5.3.8 Land tenure

The land tenure system along the whole stretch of the line is either mailo or leasehold. Mailo tenure is the most dominant in the project area. It involves the holding of land in perpetuity, permits the separation of ownership of land from the ownership of developments made on land by a lawful or bona-fide occupant (generally known as Tenant). Additionally, the holder can only exercise transactions on the land subject to the rights of those persons occupying the land.

Leasehold tenure on the other hand is where someone other than the owner holds land for a specific period, for rent conferred by the state or private individual. This system offers the advantage of enabling the government to specify how a given land holding could be developed, and environmental conditions attached to it. This category covers areas occupied by civic centers like the District Headquarters, county headquarters, town boards, government schools, resettlement schemes and forest reserves.

Sixty eight percent of people to be affected by the project are tenants, 30% are registered leasehold landowners, 1.2% are registered landowners and the rest are licensees. A majority (80%) of these people have official documentation (land titles, land agreements and wills) showing ownership of their land.

The vulnerability of the land tenure system is **medium- high** because a big percentage of the land area is under a weak system.

5.3.9 Agriculture

Land is mainly used for agricultural purposes on a small-scale level for domestic purposes. This is because of the size of the plots of land under cultivation, the agricultural practices characterized by poor farming methods, poor soils which produce very low yields due to over cultivation over a long period of time.

Crops mainly grown in these areas include food crops like cassava, potatoes, maize, bananas, beans, tomatoes, rice, tomatoes ginger, ovacado vegetables, watermelon groundnuts and cash crops like vanilla, coffee, moringa trees and tobacco and eucalyptus.

Livestock farming is also practiced within the project area but done on a small scale with most households not keeping more than 3 cows and 5 goats except Muzinda Womens Group –Bagala alina which rears pigs on medium scale. The most common livestock are goats, pigs, cows, rabbits and poultry. Another livestock farmer keeping about 40 Frisian cows was found in Kibwa in Wamala Parish and a number of cows found grazing in Lwera near Lukaya. .

Because of the subsistence agricultural economy in the project area, as is the case in most of Uganda, agriculture assumes a high intrinsic value since without it the communities would perish. The crops are sold in their raw form which makes it difficult for a farmer to access regional markets (better prices). On the other hand there is a high potential for increasing the agricultural export value (commercial Agriculture) through modernization of agriculture. In general, the agricultural production and potential is valued as high. Although soils in this area are o

medium fertility, Plan for Modernization of Agriculture (PMA) would improve on the potential. Thus agricultural value is **medium**

5.4 Economic Activities

Income, especially the disposable portion is vital in the coping ability of the affected populations. Persons, even when they are disabled or old would still be able to hire labor and skills required for survival. The major income sources of the PAPs were identified from their own declarations. The income streams of the PAPs can be summarized into;

- regular earnings (salaries and wages)
- agricultural activities (farming, livestock, poultry keeping, etc)
- income from property rental
- public transportation (boda bodas, etc)
- others

Agriculture is the major source of income, with 65% of the respondents stating that they rely on sale of agricultural products such as Bananas (Matooke), Maize, Cassava, Sweet potatoes, Tomatoes, pumpkins, Yams, Onions, fruits like Water Melon, Pineapples, Oranges, Passion, sweet Bananas and poultry, pigs goats and cows. This is expected since agriculture is the main stay of the Uganda economy. Moreover, a large proportion of the PAPs are rural based. In the urban areas however, salaries and wages form key sources of income.

Figure 6.6 Kikunyu Roadside Market in Kamengo Sub-county one of the major income sources mainly employing Women

In Mpambire village, drum making is the main economic activity mainly by men. Other sources of domestic income included transportation (boda boda), fishing (areas in Lwera up to Lukaya), and handcraft work, casual labour mainly in form of masonry, digging and fetching water. Although most people are engaged in income generating activities, their monthly incomes are not stable, some are seasonal and still very low and thus fragile.

The value for economic activities in the project area is therefore regarded as **low-medium.**

5.5 Employment

There are very few opportunities regarding employment for the residents of the rural areas of the project area. It was noticed that many residents had not received training in any skills. The few trained in the community-included teachers, health workers, tailors and carpenters. It was observed that on average the highest level of education attained is Senior Four, while most of the children drop out of school after Primary Seven mainly because of lack of school fees.

5.6 Current Infrastructure

5.6.1 Roads

The project area crosses three high ways and then runs along Kampala - Masaka highway for most of its part but at some areas it goes off for over 5 kms into villages.

The roads leading to these villages are seasonal characterized by poor network system and road surface with potholes. Some of the villages were not easily accessed due to the geographical set up especially in the swampy areas where roads were too narrow and impassable. The value of road infrastructure is therefore **medium**.

5.6.2 Water supply

Most of the water sources are along the swampy areas or within the valleys. It was observed that unprotected springs were the main source of water supply. A few water taps for National Water and Sewerage Corporation and boreholes were identified in villages of Kikaya, Bubule, Jandira, Nabusanke, Buku, Kyanja, Kiswa, Buyaya, Lubanda, Baja, Kayunga, Kayirikiti and Kitenga some of which were still working and others out of function due to poor maintenance. In Kasubo village, there are no water sources in the area due to the terrain and it was reported that there are many mineral salts underground, which affects the water quality even of the borehole.

In general availability of the water is not a problem but the quality. Therefore value of water supply in the project area is **low-medium**

5.6.3 Cultural Property

A number of cultural sites were identified along the proposed route. The most common of these include Shrines, grave yards, and trees of spiritual value found in Nambi village. The two commercial shrines are found in Maziba-Mulole and in Buwama B village. Several graveyards were also spotted to be falling in the ROW of the T-line for example in Maziba-Mulole village there are three different areas that is at Mr. Kagwa Edward, Mr. Mugamba Kalori and Mr. Mugerwa Wilson's land. In Bukooza village there is a major Ngoge clan burial site with over 108 graves falling directly under the proposed T-line.

All the above sites are highly valued by the communities for various reasons such as; problem solving agents, guiding in decision making, protection against epidemics, enemies and cultural prestige as gods.

From the public consultation it was established that this site can never be tampered with because of the spirits. Consultation on the best way to handle these cultural properties should be thoroughly made during the RAP.

Most people in the project area believe that spiritual aspect of the cultural property influence their daily life. Therefore value of cultural property is therefore regarded as **high.**

Figure 6.7: Ngoge Clan Burial Site with over 108 graves at Bukooza Village directly affected by T-line

6 PUBLIC CONSULTATION AND DISCLOSURE

6.1 Introduction

The World Bank and NEMA guidelines require the people likely to be affected by a development project to be consulted so that their views and fears are incorporated in planning. Community perspectives are important for project planning and implementation. Knowledge of what the community perceives will go a long way to help during the compensation and resettlement action plan. Therefore, during the EIA process, consultations need to be conducted with relevant stakeholders, including potential beneficiaries, affected groups, Civil Society Organizations (CSOs) and local authorities about the project's environment and social aspects and their views considered.

To meet this requirement, the EIA team held public consultations in areas that were considered hot spots (areas with high settlements and heavy encroachments) along the existing power line. These included Ssenge village, Kayunga village, Kawoko village, Kigoma village and Kagaba-Nanuwojo village, Buwama, Kayabwe and several others.

During the field study, the EIA team was interested in gathering views about community perceptions and fears about the proposed transmission line project in order to build consensus and support for the project. The main issues of socio-economic concern were cultural and communal property, cultural and social cohesion, and community mobilization for the project, community participation in identification of resettlement alternatives and identification and protection of the interests of vulnerable groups. During the consultation meetings issues discussed included socio-economic impacts that might arise due to the project, how to minimize these impacts and compensation modalities.

6.2 Stakeholder Analysis

6.2.1 Stakeholders Consulted

Stakeholders are groups of people connected to one another through formal or informal ties, which have something to gain or lose from a proposed development initiative. Stakeholders in any project will include various social groups, formal and informal agencies in public and private sectors and NGOs/CBOs. NGOs/CBOs are particularly beneficial for the development plans when they work together in coalitions, pooling their resources and lobbying efforts.

A number of key stakeholders were involved in the community participation component of the EIA baseline study. Consultations were done through Village meetings, focus group discussions, key informant interviews and socio-economic surveys.

Consultations were carried out with four groups of stakeholders, namely;

- Directly affected persons
- Indirectly affected persons
- Government Agencies
- Non-Government Organizations

Directly Affected Persons

The directly affected persons are the people who reside in or derive their livelihood from the zone of direct impact (ROW & Way Leaves). The directly affected persons were consulted about relocation, livelihood and income restoration possibilities. The directly affected persons will be the core target of the socio-economic census during the resettlement action plan.

Indirectly affected Persons

This group included persons who reside near the project area or rely on resources (such as water, pasture land, wetlands etc) likely to be affected by the project. This group of stakeholders will have to change or adjust their living patterns when the construction of the transmission line starts.

Government Agencies

Under the present arrangement of decentralized system of governance, power belongs to the people and therefore, the role of the local communities in decision-making is critical. Most importantly, the Local Council II now best handles land issues. The LC system will facilitate easy identification of genuine owners of property likely to be affected.

The Local leaders, mainly LCIs and LCVs of the districts of Wakiso and Mpigi were consulted. Other officials consulted were District Environment Officers, RDCs, District Engineers, District Natural Resources Officers, Community Development Officers (CDOs), District Land Boards, Buganda Land Board and Chief Administrative Officers.

Central, Local government and private agencies responsible for ensuring a healthy environment were also consulted. The agencies consulted were;

- National Environment Management Authority
- Local Government Departments
- Wetlands Inspection Division
- National Social Security fund
- Kawanda Agricultural Research Institute
- Uganda Electricity Distribution
- Ministry of Energy and Mineral Development
- Electricity Regulatory Authority
- National Forestry Authority

Non-Government Organizations and Private Institutions

NGOs and Private Institutions operating in the districts through which the proposed transmission line passes were consulted about their experience on implementing projects within the community. The NGO opinions on restoration strategies and fund handling during compensation were of particular interest. These institutions include Buganda Land board, National Social Security fund and others.

6.3 Stakeholder Engagement

Project stakeholders include communities, groups, individuals and organizations likely to be affected directly or indirectly or may exert positive or negative influence on the project. The community

perspectives study was done using Focus Group Discussions (FGDs) with men, women, the elderly, youth, widows/orphans and disabled persons along the transmission line corridor in the two districts.

Other methods used by the EIA team include key informant interviews/meetings held with key stakeholders throughout the transmission line corridor and household survey questionnaires with a sample of household heads of the directly affected households.

Before the meetings were convened, members of the EIA team visited a Local Council I leader to introduce the subject and assist to mobilize the community, who own land along the transmission line corridor, for a meeting. Letters of introduction were issued by UETCL to all Local Councils and District authorities for the purpose were given. Others in attendance include Local Council executives, the community affected persons, local councillors, opinion leaders, and other residents of the area who may be interested. Annex 3 of the report gives a full list of people consulted.

6.3.1 Approach and Thematic Areas

Community consultation and sensitization involved a participatory approach in which the EIA team described the pre-, during, and post- construction activities planned and informed the community about the compensation and resettlement issues as well the schedule of activities. Then the community was given opportunity to respond by asking questions or making comments about the planned project activities.

The following emerged as key themes of the consultations;

- Community sensitizations
- Cultural and Communal Property
- Community Participation in the Project
- Compensation and Resettlement Alternatives
- Entitlement Cut-Off
- Vulnerability
- Grievance Redress

Community Sensitizations

During the meetings, community members were informed that this activity (EIA process) was mandatory and a legal requirement by the laws of Uganda. They were informed that projects of this magnitude had great impact on their livelihood therefore their views were vital.

In all the meetings, a majority of the participants were aware of the project but expressed fears that they were subjected to threats of forceful eviction without compensation in the previous consultations. Participants emphasized that proper community consultation by professionals should be carried out if this project is to progress with minimum interruption to the community. The quotation below summarizes the mood of some of the affected persons

""Am stressed and am living under fear. I don't know what to do because I have been told that they are going to demolish my house. I have been told not to add anything thing to the house because they took its pictures. I need to know when construction of the power line will begin and when compensation will be effected" said Mr. Mutai Mpoza of Kigoma village, Wakiso district.

The district officials also emphasized the need for clear and proper information dissemination because most rural community members are illiterate. The District Natural Resources Officer Wakiso district indicated the need for massive sensitisation of people in the affected areas about the project procedures and its associated activities. Sensitizations could take the form of workshops for local leadership and radio talk shows and spot messages for the general communities. The district leaders however pledged to help in the mobilization and sensitization of the communities. The quotations below capture some of the districts stakeholders' views.

"There is need for massive sensitisation of the communities on all social impacts associated with resettlement using all the available media like TVs, Newspapers, Radios, e.t.c. The community needs to know what is happening and why" Mrs. Rebecca Ssebaganzi, the District Natural Resources Officer Wakiso District stated.

"UETCL needs to involve our offices and any other relevant Local Government Offices like the RDC and the lands department in all stages of the project implementation especially during sensitisation since the community finally runs to us whenever things go wrong" said Mr. Sekagiri Frank , Wakiso district Senior Community Development Officer.

The Chief Administrative Officer for Mpigi District observed the need to make the communities aware of the whole process. *"The communities need to be sensitized about the whole project process especially on compensation issues"* she said.

6.4 Compensation and Grievance Redress

The EIA team highlighted to the community the available compensation packages and the issues pertaining to each. The land for land compensation and the cash for land options were discussed. They were further informed that the World Bank compensation guidelines require the former to be used as well as helping the affected persons with resettlement. The option of paying land for land was discussed with the community and it was found out that it is associated with looking for land, negotiating for a price with willing sellers, before it can be transferred to the affected persons. The method is expensive because land prices will increase and will lead to project delays. The EIA team therefore asked the community to accept the cash for land. The community agreed on condition that the developer will provide adequate and fair prices for the land. In order to achieve this requirement, it was agreed that a third party will review the disputes that the parties will encounter during the actual compensation process.

Moreover, to ensure cash compensation paid is not wasted, they were also informed that a local Non Governmental Organization will be engaged to sensitize them on how to gainfully utilize the money paid to them. This is so because in most cases community members have tended to misuse the money only to end up being in worse situation than before the project was implemented.

Another issue of contention is the timing of compensation. Communities expressed unhappiness with the way compensation is handled in Uganda.

"I got information from my colleagues that they may value property and take long before payment or any form of resettlement is done which will not give us ample time to prepare. I therefore want

UETCL to bring everything to light so that we are educated about the whole process and how it will be managed" Mr. Mayanja Freddie of Kayunga Village said.

The community members were further informed that during the compensation exercise, agreements will be signed between the two parties to ensure smooth compensation process, which is transparent. Each of the landowners shall sign on the verification form and witnessed by the LC1 Chairperson of the respective village. The LC1 Chairperson shall counter sign a certificate of completion.

They were however concerned about the absentee landlords and some family members who may not be available during the compensation period. The team informed them that all efforts will be taken to ensure that the right full owners or family members are contacted before the compensation is finalized. They were also informed that the whole process takes some time to be complete so they were advised to inform their landlords and relatives about the proposed developments early enough.

Vulnerability

Community members, local leaders and district technocrats expressed concerns about what would be done to people who may be affected more by the project. From the discussions, the potentially vulnerable in the project area include the elderly, widows/widowers, single mothers, disabled persons, and child headed families. The number of the vulnerable groups will be fully identified during the RAP. The concern of this group of PAPs is getting in-kind compensation since they may not have the energy to establish new homes by themselves. A quote from one elder below summarizes their concerns.

Cultural and Communal Property

The communities were requested to identify cultural and community properties (such as cultural sites and graves) in or near the transmission line corridor that could be affected by the project. From the meetings it emerged that some graves are located within the transmission line corridor. Some of the graves are cemented therefore are easily visible wherever they are located. Other properties may be cultural sites used for cultural ceremonies and traditional healing although these were not identified during the EIA. The communities were informed that they will be asked to relocate these sites to places of their choice and the costs involved will be determined in a detailed RAP study that is in separate document.

6.5 Community Participation in the Project

The EIA team outlined to the community the procedures on how they will participate and get involved in the proposed project. They were informed that at each stage of the project, the community would be informed through their Local Council leaders. They were further informed that in the detailed RAP to be carried out and that there would be more consultations, identification and valuation of property.

Community members were requested to participate in the RAP study since it is from that study that the basis of compensation and other issues will be addressed. The findings of the RAP study would be disclosed to them through subsequent community meetings.

The communities proposed that when the project starts, they should be given the first opportunity and priority to work as semi skilled or non skilled laborers. Local Council (LC) officials in the project area also emphasized the need for the Contractor to recruit unskilled labor from the communities along the transmission line routing. Communities expressed concern that project implementers import even unskilled labor, which the locals could provide (see quotations below).

6.6 Entitlement Cut-Off

Members of the communities expressed uncertainty whether they should stop making developments in their land since the project is taking the land. Members were informed that during the detailed RAP studies, all affected property will be identified and counted in their presence. After agreeing on the number, they will be given a letter of notification indicating that any development after that date will not be considered for compensation. The date a person gets the notification will be the cut-off date. However, the developer will take the necessary care to ensure that the names of persons omitted during the field survey are included and undervalued assets are re-valued accordingly.

6.7 Grievance Redress

Community members expressed fear of their property being taken against their terms. Members were informed that whatever payment they get will be determined according to the provisions of the law. If they are not happy with the payments, they can raise the matter with the project developer, which in this case is UETCL. Where they fail to reach mutual agreement with UETCL, they can go to the village committee specifically set up to handle differences of opinion. To ensure transparency, the village committee will comprise of representatives of the project affected persons, Local Council officials of the village, and opinion leaders in the village.

A local NGO/CBO would be incorporated as an independent third party, to advise the developer on the best ways to resolve the compensation grievances. The third party is essential in conflict resolution because both sides of the conflict may not respect the decisions taken by the developer or grievances from the persons affected by the project.

In case disagreements cannot be resolved at the village committee level, the aggrieved party can resort to the existing legal redress mechanism of Land Tribunal (for matters involving land) or a competent court of law. Members were however advised against rushing to courts of law as the process is expensive and time wasting. Emphasis was put on resolving conflicts amicably since the project is for the common good of the people of Uganda. The district leadership was requested to identify legitimate non government organization that will be invited to take up that task of independent third party.

6.8 Public Disclosure Plan

The Ugandan laws and Development Partner guidelines within which this EIA was done require communities consulted to be informed of the decisions made from the study. The views gathered during the EIA process were analyzed and incorporated in this EIA report. The project sponsor (UETCL) will distribute copies of the report to the relevant stakeholders and the communities consulted. Any issues that may have been omitted will be incorporated and dealt with accordingly.

"I want to have a copy of the EIA report so that certain baseline issues are monitored overtime and compared with the existing ones. I would also want UETCL to be accountable for whatever issues that will come up which will not conform to the recommendations" said the Director National Agriculture Research Laboratories-Kawanda, Dr Ambrose Agona.

6.9 Conclusion

The community discussions and stakeholder interviews showed that the community along the transmission line corridor will support the project if the compensation exercise is implemented in a professional and fair manner. The community and the key stakeholders have expressed support for the project since they see it as a way of enhancing electricity reliability in the region in order to promote development as well as employment creation for themselves or their children during construction after because reliable electricity will attract investors.

"It is a welcome exercise by the government. I believe the Ugandan population will benefit from it in one way or the other and their income will be boosted. We need to increase the energy in the country and this is the way to go. I would want to see that whoever person affected is adequately compensated. As the district, we shall work with the government to ensure that the project is in place and implemented as per the legislation and that all people affected are given due consideration" said the CAO, Wakiso district Mr. Joseph Mukwaya.

Notwithstanding the anticipated benefits, the project will lead to negative social and economic impacts. It is recommended that the developer implements all the mitigation measures suggested in the EIA report. To ensure that the project is managed perfectly to a logical conclusion, the developer should make the necessary budgetary provisions to ensure that mitigation commitments in the EIA as well as in the RAP and monitoring programs stated herein are effectively implemented. In addition, public consultation and sensitization shall continue during the disclosure period in order to capture any other issues that could have been left out during the consultation exercise.

7 ANALYSIS OF PROJECT ALTERNATIVES

7.1 Introduction

The first feasibility study for the Kawanda-Masaka 220KV power line was carried out by Norplan in 2006 and recommended a 135Km route. In 2009, UETCL re-defined the route and came up with another option which was 142 km slightly longer than the Norplan route by 7km. An optimization study was carried out by SMEC in 2010 and recommended a final route of 137km. During feasibility, several route options and designs were considered. A number of factors influenced the decision taken on routing options and these include; the need to avoid highly built up areas, forests reserves, wetlands, institutions and access to the power line corridor was also taken care of. The following options were considered during route design;

7.2 Option 1: Divert the former route to the north for the first 34 Km

When a Resettlement Action Plan was conducted in 2008 on the earlier 134Km route recommended by Norplan, 132 institutions were affected by the proposed corridor excluding private residences. Leaving the route as it would attract huge sums on money into compensation and resettlement of the affected institutions and later alone individual homes and families. Therefore to avert costs and the associated negative impacts, an option of shifting the line was conceived and alternative route was created. The essence was to divert it from the highly populated and built up environment of Nansana, Nabweru and other areas of Wakiso district and hence minimize project costs associated with compensation and resettlement.

The 34 km line diversion only traverses Wakiso and Mpigi districts. The line starts from Kawanda-Substation in Kawanda parish at coordinates N 448663, E 46126, Wakiso district and joins the former route in Maziba parish in Mpigi district at coordinates N 428545, E 25270. The line cuts across several villages and 12 parishes. In Wakiso district, the line passes through 5 parishes including Kawanda, Naluvule, Kasengegye, Kayunga, and Bukasa. In Mpigi district, the transmission line traverses 6 parishes which include Buloba, Lugyo, Kololo, Sekiwunga, Kavule and Maziba parishes.

When SMEC revised the RAP of the earlier route in consideration of the 34km diversion, the number of affected institutions reduced tremendously from 132 to 74. Therefore, the 34km diversion was considered a better alternative. It's therefore recommended that this diversion be considered in the final route design. See the appended project map for details of the diversion.

7.3 Option 2: Route the corridor to the South of Kampala-Masaka road up to the Masaka substation.

Another alternative power line corridor was suggested and was intended to route the power line to the right side of Kampala-Masaka throughout to the Masaka substation. In this case, the line would still go through Wakiso, Mpigi and finally to Masaka but would be routed 2-4 kilometers north of the Norplan route and would move parallel to the Norplan route up to Masaka substation. The justification for this alternative was that it would reduce the final route length and possibly reduce on project implementation costs. When this option was analyzed for technical, environmental and financial implications, this option was found to be unrealistic.

There was no justification whatsoever to warrant the consideration of this alternative. The first concern is that this option would greatly affect several forest reserves including Mpanga Forest which is a strict Nature reserve under the current management plan presented by National Forestry Authority. Several other Mpigi group of forest reserves would be affected and the impact would be compounded by the construction of access road across the woodlands. The negative impact on the

forest ecosystems would be more significant especially to Lwamnda, Mpanga, Naludugavu, Gangu, Nawandagi, Kabulego, Buto-buvuma forest reserves and some others. The impact on these reserves would be so great because the power line would cut through the centers of these reserves. Although the current power line corridor recommended by SMEC also crosses some forest reserves, the corridor has been designed to cut the affected forest reserves at their periphery hence leaving the rest of the deeper forest ecosystem unaffected. In addition to the insensitivity of option 2 to the forest ecosystem, the costs of access road construction would be high compared to the current corridor that is likely to advantage of Kampala-Masaka road and save some ecosystems. Therefore, there is no justification to support option 2 and hence should be rejected.

7.4 Option 3: Project option

The project option in consideration entails the current 137km route that was recommended by the feasibility study conducted by SMEC in 2010. The project option is also part of the 34km diversion route that avoids the heavily built up environment of Nansana and Nabweru in Wakiso district and some parts of Mpigi district. Several studies had been carried out on the wider section of this route in 2006 and this ESIA has also been conducted with respect of this route incuding few diversions as presented on the project map (Appendix 6).

This project option has incorporated in several design considerations to achieve technical, environmental and financial benefits. For example the route has been designed to move along side Kampala-Masaka road in order to minimize the impact on vegetation, but also to reduce on the costs associated with access road construction in woodlands, thickets and forests. Although the line cuts across some forest reserves, the transmission corridor has been designed to cut through the periphery of these forests rather than impacting on the wider section of the forest interior.

In addition, a forest valuation study was conducted for the affected forests taking into consideration their conservation status and functions. The assessment of the impact of the transmission line is presented in Appendix 4.

Further, it is recommended that steel monopoles be used in the forest corridors instead of lattice towers in order to minimize the impact of the power line on these affected forest reserves as the monopoles have a smaller footprint and a leaner structure.

The transmission line has also been designed to avoid sensitive forest reserves and other ecosystems like Mpanga, Navugulu and Nawandugi which are managed for recreation and also as strict nature reserves. It should be noted that any further adjustment in route design to avoid all Mpigi group of forest of forest reserves is not technically and environmentally realistic. Any further efforts to shift the line southwards to avoid Buwa and Kabuye forest reserve would bring the power line closer to lake Victoria and the challenge of establishing lattice towers in the Lake Victoria wetland system would be so stiff. Such an adjustment would be economically unrealistic and the impact on the Lake Victoria wetland system would be too immense to mitigate. Therefore judging from an environmental, social and economic dimension, the route option is the most practical and feasible.

The line has been designed to avoid crossing most of the trading centers along the Kampala-Masaka highway making it even a much better alternative in terms of social economic impacts anticipated. Therefore, the project option is highly recommended for funding as the most feasible alternative.

7.5 Option 4: Action and no action (Do nothing and leave the status quo as it is)

Action means constructing the proposed power line and enhancing UETCLs services for the end user of electricity. No Action means forfeiting all positive impacts that the proposed transmission line would provide to the Network users in Masaka, Rakai and Tanzania. In the absence of the proposed

project, there would be benefits lost as well as negative impacts averted. Notwithstanding the identified negative impacts that can be mitigated, the action alternative should be supported to enhance electricity coverage around the country. Uganda needs electricity to develop and reduce on biomass energy use which is rated at 90% (Ministry of Energy 20101). Hydro electrify coverage was at 5% for the entire country but of recent, it risen to 10% due to the establishment of Rural Electrification Scheme under the Ministry of Energy and Mineral development. The above figures reveal a great need for the construction of the proposed transmission line and therefore all effort towards the establishment of the proposed Kawanda-Masaka power line should be greatly supported. In this respect, the Action alternative should be supported.

7.6 Construction Technology considerations.

The developer has chosen lattice steel structures as the design for all areas of the transmission line. However, it is important to note that the steel structure tower is not suitable for wetland areas and it is recommended that the developer should consider the use of steel mono poles as an alternative.

The monopole structures have advantage in that, they are not easily as susceptible to theft as the common lattice steel towers (pylons). In addition, the steel monopoles have a smaller footprint requirement (about 1 square meter) compared to lattice steel structures (5x5 meter). The steel monopoles provide for a safe clearance (ground to conductor) which is of an advantage because it is not easy for wildlife to grasp onto them easily.

The poles will be designed to be as compact as possible and at the same time have adequate spacing between conductors to prevent mid-span clashing and allow maximum span lengths. Steel monopoles will normally need facilities for climbing both during construction and for maintenance. Climbing bolts will readily be fitted during climbing and removed when not in use to avoid unauthorized personnel from climbing the towers.

Steel monopoles can be either buried directly in the ground (typically up to 20% of the height in the ground) or bolted on a concrete foundation. These would be grouted and cemented into place as required under the circumstances. Steel monopoles would normally be coated with an epoxy covering to eliminate corrosion at ground level. Steel poles can also be either (i) set on an excavated concrete foundation with protruding bolts to lock a lower welded steel flange into position, or (ii) set on a section of pole driven into the ground fitted with a steel flange plate welded to the top of the buried pole section.

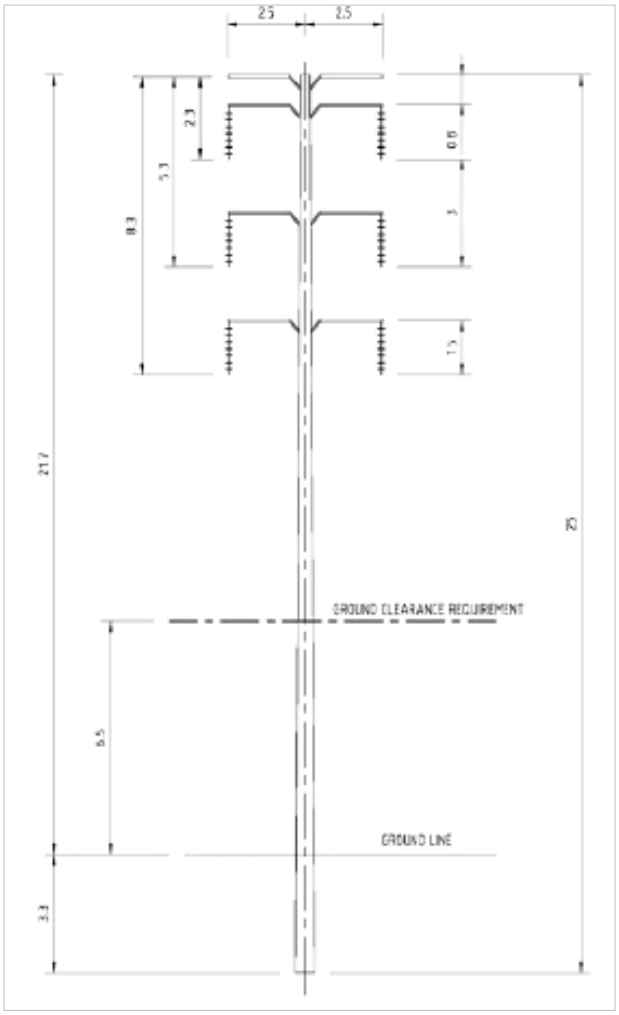


Figure 7.1: Illustration of Steel Monopole

8 IMPACT IDENTIFICATION, MANAGEMENT AND MONITORING

8.1 Criteria for Impact Assessment

To assess the significance of negative environmental and socio-economic impacts, the ESIA team used defined criteria for impact severity and significance of the planned project activities on baseline environmental and socio-economic aspects in the project area. The significance of the risk posed by potential environmental impacts were assessed using the severity criteria developed to determine the scale of the impact and the likelihood of the event. The impact would have a high (H), medium (M), or low (L) significance (Table 8.1).

Health and Safety assessments were done taking into consideration external hazards (e.g. weather), man-made hazards (security, terrorist activity), normal process hazards (e.g. hot surfaces), accidental hazards (e.g. equipment failure, fire and explosion, contingency planning), maintenance hazards (heavy lifting, access requirements), and occupational health risks (exposure to chemicals, noise, heat

Table8.1: Criteria for Impact Assessment

Criteria	Significance Definition	Rating
Compliance	Continuous non-compliance with regulations or IFC's Performance Standard 5 and WB OP 4.12	H
	Potential for non-compliance with regulations and IFC's Performance Standard 5 and WB OP 4.12	M
	In compliance at all times, or no regulations apply	L
Ecosystem	Disturbance of >10% of bio-geographic population of animal species in areas of importance for their breeding, feeding or other parts of the life cycle with no expectation of recovery within 5 years (or 2 generations for long lived animal species). Impairment of the function of 2 hectares or more in an area of critical importance to the life cycle of endangered species, or of 100 hectares or more in other areas, with no expectation of recovery within 5 years. Impairment of forest ecosystem with no expectation of recovery within 20 years. Effect contrary to the objectives of management plans for internationally or nationally protected populations, habitats or sites with no expectation of recovery within 5 years. Environmental changes giving rise to issues of public or international concern. Impacts that harm human health, or damage a site of historic, cultural or archaeological value	H
	Disturbance of populations of species in areas of importance for their breeding, feeding or other parts of the life cycle with expectation of recovery within 1-5 years. Impairment of the function of 2 hectares or more in an area of critical importance to the life cycle of endangered species, or of 100 hectares or more in other areas, with no expectation of recovery within 1-5 years. Impairment of Forest ecosystem with expectation of recovery beginning within 10 years. Effect contrary to the objectives of management plans for internationally or nationally protected populations, habitats or sites with expectation of recovery within 1-5 years	M
	Effects will only cause limited public or international concern. Effects are unlikely to harm human health or damage a site of historic or archaeological value. Impaired function of forest ecosystem with expectation of recovery within 5 years. Ecosystem	L

Criteria	Significance Definition	Rating
	change is within the range of natural variation, but may be detectable; or ecosystem change that is unlikely to be noticed; or change resulting in positive, desirable or beneficial effects on an ecosystem	
Socio-Economic	Damage to social, cultural or economic activity considerably beyond programme lifetime. Long term or life threatening health effects. Activity raises issues of public concern, may affect human health or may damage a site of cultural importance	H
	May adversely affect the economic and social well being of residents for the duration of the programme. May cause short-term interference with business. Raises issues of limited public concern. Minor damage to site with cultural importance.	M
	Beneficial changes to the well being of residents. Negative effect within existing fluctuation of the society or economy	L

The combined grade for the impact was then defined by combining significance grades with the likelihood of the impact happening (Table 8.2).

Table 8.2: Definition of Likelihood for Unplanned Events

Rating	Frequency	Description
<<1	Low frequency	Type of event that would require a freak combination of factors or that is almost unknown in Electricity Transmission Projects
<1	Unlikely to happen	Type of event that happens occasionally in Electricity Transmission projects despite the implementation of mitigation measures
1	Could happen	Type of event that occurs when things that often go wrong during some Electricity Transmission Projects do go wrong
1+	Likely to happen	Type of unplanned event that occurs during most Electricity Transmission Projects

The combined grades were then rated for severity of impact using guidelines in Table 8.3. The severity of an impact is defined in terms of harm to people, damage to assets and damage to UETCL's reputation as defined in Table 8.3

Table8.3: Severity definitions

Ecosystem and Socio Economic Criteria Definitions	Rating
Incident typically requires mobilization of international response - Disturbance of >10% of bio-geographic population of animal species in areas of importance for their breeding, feeding or other parts of the life cycle with no expectation of recovery within 5 years (or 2 generations for long lived animal species). Impairment of the function of 2 hectares or more in an area of critical importance to the life cycle of endangered	4

Ecosystem and Socio Economic Criteria Definitions	Rating
species, or of 100 hectares or more in other areas, with no expectation of recovery within 5 years. Impairment of forest ecosystem with no expectation of recovery within 20 years. Effect contrary to the objectives of management plans for internationally or nationally protected populations, habitats or sites with no expectation of recovery within 5 years. Environmental changes giving rise to issues of public or international concern. Impacts that harm human health, or damage a site of historic, cultural or archaeological value. Damage to social, cultural or economic activity considerably beyond program lifetime. Long term or life threatening health effects	
Incident typically requires mobilization of in-country response equipment - Disturbance of populations of species in areas of importance for their breeding, feeding or other parts of the life cycle with expectation of recovery within 1-5 years. Impairment of the function of 2 hectares or more in an area of critical importance to the life cycle of endangered species, or of 100 hectares or more in other areas, with no expectation of recovery within 1-5 years. Impairment of Forest ecosystem with expectation of recovery beginning within 10 years. Effect contrary to the objectives of management plans for internationally or nationally protected populations, habitats or sites with expectation of recovery within 1-5 years. May adversely affect the economic and social well being of residents for the duration of the program. May cause short-term interference with business. Raises issues of limited public concern. Minor damage to site with cultural importance	3
Incident can be dealt with using equipment on-site – Impaired function of forest ecosystem with expectation of recovery within 5 years. Ecosystem change is within the range of natural variation, but may be detectable; or go unnoticed. Negative effect within existing fluctuation of the society or economy	2
No detectable effects or changes resulting in positive beneficial effects on an ecosystem, or generating useful data. Change resulting in positive, desirable or beneficial effects on an ecosystem	1

Table 8.4: Criteria for Severity definitions

Criteria	Significance Definition	
Harm to People	Potential to cause multiple fatalities or widespread chronic health problems for many people	4
	Potential; to cause fatalities, mutilations or serious chronic health problems for up to 3 people	3
	Potential to cause Lost Time Incidents	2
	Not likely to result in Lost Time Incidents	1
Assets	Extensive damage to infrastructure, possibly including off-site structures, loss of drilling rig or sinking of vessel	4
	Major damage to on-site infrastructure, halting operations and incurring substantial delay to supply replacement equipment	3

Criteria	Significance Definition	
	Minor damage to individual item of equipment for which a spare part or replacement can be quickly mobilized to the development	2
	Damage resolved by on-site reserves, maintenance equipment and on-site personnel	1
Reputation	Incident attracting international negative press coverage causing lasting harm to corporate reputation, or for which the company could be prosecuted and fined a large amount of money	4
	Incident attracting critical reporting requiring the company to take measures to maintain its reputation, or for which the company could be prosecuted and receive a token fine or be required to pay compensation to third parties	3
	Incident attracting local news coverage and complaints, and which involves expense in engaging local communities to apologize, clarify issues and make amends	2
	Incident that does not provoke complaints	1

The overall rating of an impact was determined by combining the likelihood of occurrence and severity using the risk assessment matrix shown in Table 8.5.

Table 8.5: Risk Assessment Matrix

Impact Severity	Likelihood of Occurrence			
	<<1	<1	1	1+
4	M	M	H	H
3	L	M	M	M
2	L	L	L	L
1	L	L	L	L

8.2 PROJECT IMPACTS

8.2.1 Positive Impacts on Environment

Improvement in Power supply

There will be improved electricity supply to the people within the districts of Mpigi, Masaka the neighboring areas. This will boost rural community access to hydro electricity energy which is still limited to 2% country wide. This will positively impact on the population's development through support to both economic activity and social development in sectors such as agriculture and manufacturing. This consequently will improve production in such sectors since it is a major in-put and people's welfare, health and social amenities will considerably be transformed in the long run.

Improvement in Reliability of Power supply

There will be improved electricity supply reliability within the districts of Masaka and to the whole western region stretch. This is because the power line will increase transmission capacity and reduce load shedding often encountered due to high demand. This will reduce losses incurred by the business community in such areas.

Creation of Employment Opportunities

During construction, more than 100 people are expected to be recruited as workers along this Kawanda-Masaka power. These will constitute skilled, semi-skilled and unskilled workers. Skilled personnel will be employed as Managers, Supervisors, and in other Technical positions whereas unskilled laborers will be support staff and perform non technical work. The income accruing from such activities will obviously change their standards of living.

More employment will be created to the local proprietors who will be providing services like food, accommodation, medical care, among other services. This is because most staff will be housed near the places of work.

Generally, Trading centres and townships along the transmission line corridor will benefit from the sale of commodities to the laborers working on the construction of Kawanda-Masaka transmission line. Food vendors and other local traders will also find market for their goods thus increasing incomes among residents of the villages.

The hotels in the nearby towns will house the people working on the project and this will increase revenue for the hotels in towns along the transmission line corridor

Increased Revenue to the government

This power supply will generate revenue to the districts and the country in general. This will be in form of fuel taxes, VAT on electricity, levy on transmission bulk purchases of electricity, license fees and royalties and even foreign exchange earnings where power is exported.

Improvement in social services

The construction of Kawanda-Masaka power line will lead to establishment and improvement of some social services like feeder roads and recreation centers. This is because some of these services especially roads may directly be used by the construction team during the power line

establishment. These have to be maintained in order to be used for future operation and maintenance works. Other services like recreation on the other hand, come into effect as part of social development resulting from energy supply to an area. Such services directly or indirectly benefit the communities and increase service delivery.

8.2.2 Negative Impacts (Biophysical Environment)

Loss of Crops along the Corridor

The proposed construction of the Kawanda- Masaka power line project will lead to destruction of crops that are within and besides the entire corridor. The contractor together with the crew and equipment such as vehicles will cause a considerable destruction of crops during tower and access road construction, stringing and tensioning of conductors and movements.

The proposed power line traverses a series of maize, beans, cassava, bananas, coffee and several other crops in the affected districts of Wakiso, Mpigi and Masaka.

Fig. 10.1 Crops that are found in the ROW and Way Leaves corridor of the Transmission line in Buwama B

The proposed power line whose right of way is 5 metres with 17.5 metres of Wayleave on either side for working space will lead to total destruction of crops along its passage.

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

Conduct a Resettlement and Community Development Action Plan (RCDAP)

UETCL must conduct a thorough Resettlement Action Plan (RAP) to assess the quantity and nature of land under cultivation that will be affected. The RAP must be subjected to NEMA, affected owners and other stakeholders for review before it can be fully approved for implementation. All affected villages and parishes need to establish committees at village and parish levels to work along with the government Valuers and assess the magnitude of damage during the preparation of RAP and during construction.

The construction of the proposed Kawanda- Masaka power line should only commence when all the affected farmers have been fully sensitized of the pending activities. Prior to the construction phase, farmers should be sensitized on the pending project at least 6 months in advance such that cultivation under the line and within the Wayleaves is stopped or reduced. This will give affected farmers ample time to plan in advance so as to avoid going into several negotiations with UETCL at later stage when the contractors have come in to implement the project.

The contractor must be instructed to move in a definite order and the pattern of movement must follow the established corridor as agreed upon by the local government authorities and UETCL. Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated path ways or agreed upon access roads. This must be followed to avoid further destruction of crops by the contractor after compensation has already been effected.

Principles for Compensation and Resettlement

Resettlement and compensation of Project-Affected People will be carried out in compliance with Ugandan legislation, IFC's Performance Standard 5 and WB OP 4.12.

A majority of Project-Affected People (PAP) derive their livelihood from agriculture. Where farmers are physically or economically displaced, they will be offered a resettlement option including the provision of agricultural land of potential equivalent to that of the land they have lost.

UETCL will assist PAPs' in restoring their affected livelihoods, and will provide transitional assistance, as necessary, as long as livelihoods are not restored to their previous level.

The RCDAP implementation and outcomes will be monitored and evaluated as part of a transparent process; and, PAPs and host communities will be informed and consulted during the whole course of RCDAP development, implementation and evaluation.

Spot alteration of land use on agriculture, savanna, grassland and wetlands by tower setting. Tower establishment comes along with a new site plan. Tower construction involves clearing of vegetation, excavation of soil and establishment of a concrete foundation of about 8 x 8m hence covering an area of about 70square meters. The construction of thousands of towers along the 137km corridor will cause permanent spot alteration of land use at various tower sites. Such areas will comprise the new Right of Way (ROW) and will have to be acquired permanently by UETCL. Therefore

establishment of tower needs to be well assessed by the contractor to avoid permanent destruction of sensitive ecosystems and areas of strong cultural significance.

Table 7: Risk Assessment Matrix

		Likelihood of Occurrence			
		<<1	<1	1	1+
Impact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

Depending on the topography and obstacles beneath the line, the tower sites should be as far as the maximum span length is reached. Tower foundation construction should be done in consultation with district and local authorities to ensure that they are established in non controversial areas. Tower shifting should be used to minimize adverse impacts on certain sites. Access to tower sites and stringing of lines should be done with due care to avoid damage to fruit trees, crops and nearby homesteads. All lost or damaged crops or properties at tower sites must be compensated for in accordance with the land law and the World Bank Safeguard Policies.

Loss of land for the power corridor

The 220KV power line diversion from Kawanda to Masaka will necessitate the acquisition of a power corridor worth 40 meter in width for a distance of 137 kilometers. Total land take will be 1.36 km^2 of which 1.19km^2 will be under the Wayleave and 0.17 km^2 will be permanently acquired under the Right of Way.

Most land along the corridor is privately owned with the exception of wetlands which are government owned and institutional land especially that owned by Kawanda Agriculture Research institute, National Social Security Fund in Nakabugo village and a few others. This impact will thus necessitate the resettlement of some families from the corridor and in other cases lead to temporary or permanent abandonment of activities that were being carried out in this corridor, depending on the nature of the activity. This impact will be more pronounced in Wakiso and Mpigi districts where most homesteads will be affected. Acquisition of land in some villages and urban centers such as Senge will also result into significant effects on the affected individual land lords. Therefore approaches to land acquisition in such areas need to be followed and administered cautiously.

Table 8: Risk Assessment Matrix

		Likelihood of Occurrence			
		<<1	<1	1	1+
Impact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

UETCL must work with local council committees, sub-county committees, district land boards, CAOs, RDCs, Politicians and other local leaders to sensitize all people to be affected on the intentions of land acquisition by UETCL. This must be done at least 6 months before the project is implemented to give people enough time for planning and proper assessment.

UETCL must conduct a thorough Re-settlement and Community Development Action Plan (RCDAP) in accordance with World Bank Group and its Safeguard Policies. Land evaluation and Valuation must be done with a Registered Valuer and a Land Surveyor to negotiate with land owners in compliance with local market prices and government rates so as to establish rational figures for compensation and subsequent resettlement.

Displacement of built up structures

The proposed acquisition of the 220KV power line corridor for 137 km will not only pass through private land, but will also encroach on the built up environment. Several structures were observed to be within the proposed ROW and Wayleave of which majority are home stead and others are institutions.

Some structures were identified and they include permanent and semi permanent residential homes, latrines and temporary structures. Such areas include Senge, Kasengejje, Kayunga, Mawoko, Kigoma, Kagaba villages some within Wakiso district and others in Mpigi district and Kalungu district. Such structures will have to be demolished and owners compensated. This impact will be greatly felt in Wakiso district where most villages are affected. Therefore such encumbered areas need to be approached with due care and compensation issues dealt with well in accordance with the law.

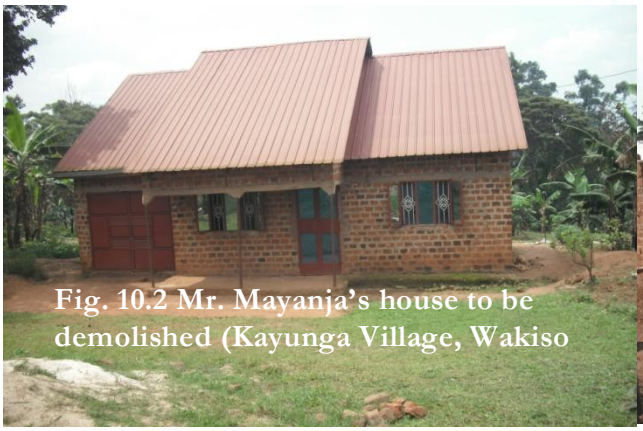
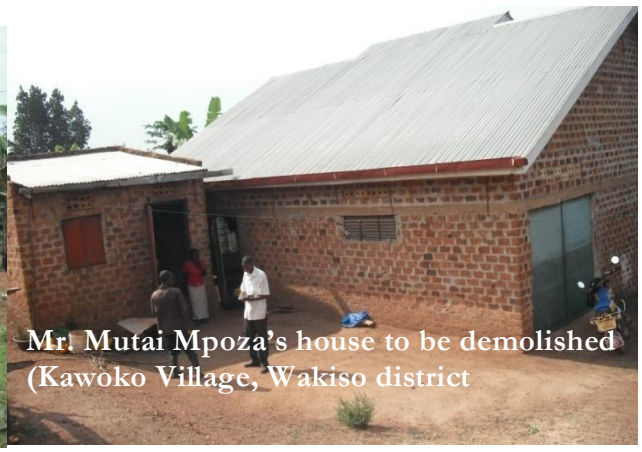
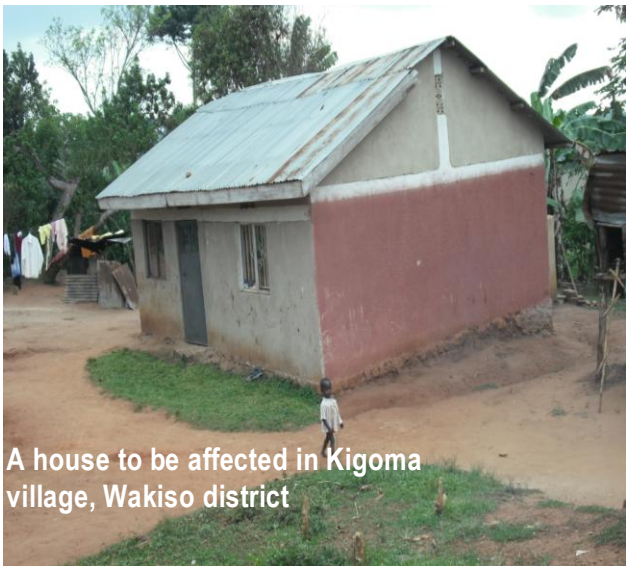


Fig. 10.2 Mr. Mayanja's house to be demolished (Kayunga Village, Wakiso

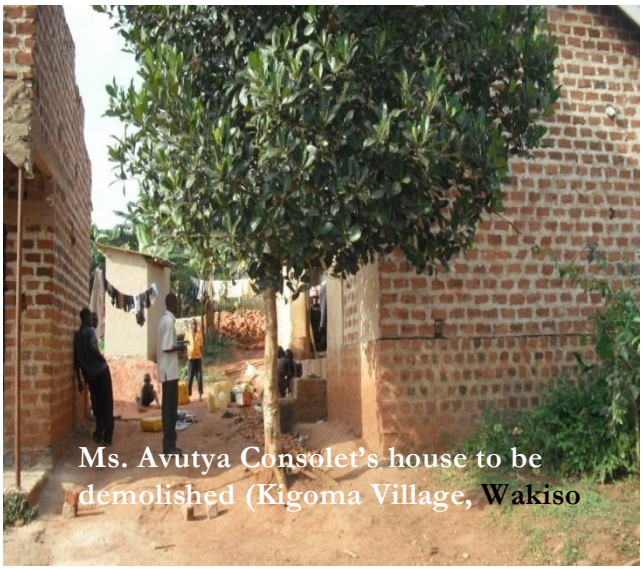


Mr. Mutai Mpoza's house to be demolished (Kawoko Village, Wakiso district

Fig. 10.3Ms. Mary Resty Nasuna's (widow) house to be demolished (Kagoma Village, Wakiso district



A house to be affected in Kigoma village, Wakiso district



Ms. Avutya Consolet's house to be demolished (Kigoma Village, Wakiso

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

UETCL must work with local council committees, sub-county committees, Councilors, district land boards, CAOs, RDCs, Politicians and other local leaders to sensitize all people to be affected on the intentions of land acquisition. UETCL must conduct a thorough Resettlement Action Plan (RAP) in accordance with World Bank Group and its Safeguard Policies. UETCL must send a Valuer and a Land Surveyor to negotiate with land and structural owners in compliance with local market prices and government rates so as to establish rational figures for compensation and resettlement. All sorts of compensation and settlements must be done at least 6 months before structures are demolished. All physically or economically displaced people will be offered an option between either a full resettlement package, including the provision of replacement residential land and a house, or cash compensation.

Past experience in Uganda has shown that cash compensation, although very sought after by many household heads, could be detrimental in the medium term, to other household members, particularly the females and children. The Project will make every effort to promote resettlement rather than cash compensation.

Loss of Vegetation and Animal habitats

The construction of access roads, movement of equipment, clearing of corridor, movement of contractor staff and erection of towers will lead to destruction of vegetation especially the affected Mpigi group of forests reserves and could also lead to destruction of animal habitats. However, the percentage of each forest ecosystem affected is small (between 0.06-2.4percent) See details in table 41. Movements of the contractor and the entire crew may spread invasive species from one locality to another. Such species include paper mulberry, Lantana camara and others.

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Vegetation within the wider section of the corridor consists mainly of savanna grass land and woodlots in home gardens, settlements areas and grazing areas. However, there are few species of hard wood trees that might me impacted. Generally, the power corridor passes through shrubs mixed with grasses. Some of the trees include Combretum spp, *Terminalia spp, Butyrospermum paradoxum subsp. Niloticum, Ficus spp, Vitax doniana* among others. The grasses include *Hyparrhenia filipendula, H.dissoluta, H. rufa, Panicum maximum, Pennisetum spp, Cymbopogon afronardus, Imperata cylindrica* and others. (See Appendix ii on vegetation survey). Corridor clearing will cause considerable loss of vegetation along the power line passage. Such impacts need to be mitigated by replacing vegetation to avoid biodiversity loss.

Fig. 10.4 A wetland that will be crossed by the 220KV T-line, Wakiso district

Fig. 10.5 A wetland that will be crossed by the 220KV T-line, Mpigi district

Mitigation measures

- Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated path ways or agreed upon access roads. This will avoid unintended damages to vegetation and animal habitats. Steel monopole will be used in the affected group of Mpigi forest reserves to minimise on the impact of forest destruction due to a wider corridor that would be created by the lattice towers. The project shall be monitored by district and local authorities to ensure that when unplanned destruction of vegetation occurs during project implementation, UETCL is held accountable and will have to compensate for the loss

appropriately. The contractor should work with National Forestry Authority field staff to map out forest zones with invasive species and to take up precautionary measures to avoid spreading the species to ther zones. In addition, UETCL will compensate National Forestry Authority monetarily in line with the forest valuation report attached (**Appendix4**). UETCL and the contractor must guard against fires arising from campsites because the impact on vegetation and biological diversity can be immense.

- The contractor under the supervision of the local and district authorities shall adjust tower intervals to avoid ecologically sensitive areas such as breeding sites for water fowls, water sources, nesting sites for birds and areas of strong cultural significance to the local people. The cultural rock at Buwama should be skipped by adjusting the tower spots. Likewise, all graves that cannot be relocated should be skipped by adjusting the span of the conductors.
- UETCL shall contribute towards local environmental programs. UETCL shall remit funds towards district and sub-county afforestation projects to compensate for biomass lost during corridor clearing and habitat fragmentation especially where the forests affected are local reserves and scattered shrubs and woodlands.

Access road construction and alteration of landscapes

The construction of towers comes along with other offsite impacts that need to be monitored. Construction of tower foundations require the use of sand, aggregates that will be excavated in identified areas that might be away from the power corridor and tower spots. The construction of access roads will require backfilling of certain areas with murrum and aggregates. These activities may alter certain landscapes within the project area by leaving out gaping holes that could cause accidents and as well as breeding sites for mosquitoes and other disease causing vectors. Excavation pits left may change the entire landscape and become barriers to transport and other local activities. Excavation pits for murrum and other aggregates have an effect on the value of the land as prospective developers may find such areas unfit for certain projects.

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

- The contractor shall liaise with the Districts, Town Councils or town boards to identify appropriate sources of murrum, sand and aggregates for the constriction of access roads and steel tower foundations. All excavation pits shall be restored to the satisfaction and recommendation of the District Environment Officers and District Engineers. All altered sceneries must be restored and open pits must not be left in the project area.
- All access roads needed for tower construction shall be shall be removed after construction finishes and the wetlands affected shall be restored to their original status.

Generation of Solid Waste

The proposed project will come along with waste of various types. Waste will be generated during construction of towers and stringing of conductors. Such waste may include conductors (wires), steel members (Metallic bars), insulators and other accessories associated with transmission lines. Organic waste will also be generated at labour camps such as food stuffs and human excreta. Plastics waste such as mineral water bottles, polythene bags (Kaveera), Jerricans, cups, plates and other plastic accessories may be found at the camps and along the power line corridor. Waste will also be generated from demolition of built up structures. Such waste may include iron sheets, timber, poles, nails, doors, windows, tiles, bricks, concrete, firewood and others. Such waste needs to be handled reasonably and must not remain in the power line corridor.

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

- All sorts of waste regenerated during construction such as conductors, steel and tower members (metallic bars), insulators and other accessories associated with transmission lines shall be collected and handed over to UETCL for proper recycling or disposal. Such waste must not be thrown in the power line corridors.
- All organic waste generated at labour campsites such as food stuffs shall be collected and transported by the contractor to designated municipal and town council landfills within the affected areas.
- All plastic waste regenerated at campsites and in the course of work such as mineral water bottles, polyethene bags, jerricans, cups shall be collected in mobile vans and sold either to the local people for re-using or taken for recycling in respective factories. UETCL must ensure that non biodegradable waste is not abandoned within the power line corridor.
- Human excreta shall be managed using a mobile toilet and then disposed in pit latrines. Human waste must not be littered in bushes and wetlands as this can spark off diseases.
- All waste generated from demolition of built up structures shall be sorted by the contractor and either sold or given to the locals depending on their resell values. Such waste may include iron sheets, timber, poles, nails, doors, windows, tiles, bricks, firewood and others.
- Concrete foundations shall be demolished and all concrete and aggregate waste shall be collected and disposed in designated areas in consultation with district planners and Engineers.

Exposure to health hazards associated with Electric and Magnetic Fields (EMF)

Humans are exposed to a wide variety of natural and man-made electric and magnetic fields. The earth's atmosphere produces slowly varying electric fields (about 0.1 to 10 kV/m), with a product of these fields being lightning. The earth's core produces a steady magnetic field, which ranges in strength from about 470 milliGauss (mG) to 590 mG over North America.

Many childhood toys contain magnets, and many individuals use magnets to hold items onto metallic surfaces. These permanent magnets typically have fields in excess of 100,000 mG. An increasingly common diagnostic procedure, magnetic resonance imaging (MRI), uses fields of 20,000,000 mG on humans and is preferred over X-rays because of its safety. In modern electrified homes and apartments, typical baseline 60 Hz magnetic fields in the middle of rooms range from 0.5 to 2.0 mG. 60 Hz EMFs can also be found in the vicinity of all electrical appliances, which produce magnetic fields of 40-80 mG at distances of about half a meter, although the fields quickly diminish with distance.

Personal electric appliances such as shavers, hair dryers, and electric toys can produce fields in the hundreds of mG in the vicinity of the person using them. In the school and work environment copy machines, vending machines, computer terminals, telephones, wireless telephones, electric lights, tools, motors and heaters are all sources of EMFs. *Electric fields* and *magnetic fields* have different properties (Table 10.2); however, more recent interest and research has focused on the potential human health effects of magnetic fields.

Table8.6 : Comparison of Electric and Magnet Fields

Electric Fields	Magnetic Fields
1. Produced by *voltage* (i.e., lamp plugged in but turned off)	1. Produced by *current* (i.e., lamp plugged in and turned on)
2. Measured in volts per metre (V/m) or in kilovolts per metre (kV/m)	2. Measured in gauss (G) or tesla (T) 1 milliGauss(mG) = 0.1 microtesla (μT) milli (m) = 1 thousandth micro (μ) = 1 millionth
3. Easily shielded (weakened) by conducting objects like trees and buildings	3. Not easily shielded (weakened) by most material
4. Reduced in strength with increasing distance from the source	4. Reduced in strength with increasing distance from the source

Source: National Institute of Environmental Health Services and U.S. Department of Energy.1995. Questions and Answers about EMF. Washington, D.C.

EMFs from electrical transmission lines have extremely low frequencies and thus low energy levels. The energy levels are unable to break molecular bonds and thus are considered non-ionizing. Higher frequency fields, such as microwaves, have sufficient energy to cause heating in conductive materials but are still non-ionizing. The still higher frequencies of x-rays and gamma rays have sufficient energy to cause ionization (breaking of molecular bonds). High-energy ionizing radiation can, therefore, disrupt the molecular structure within cells.

Effects on Human Health

Research on the human health effects of EMF was initiated in the 1960s. Since that time, universities, government agencies, utilities, and other expert bodies at a global level have conducted significant research and review of the potential human health effects of exposure to EMF. Such research has included laboratory studies concerning the effects on cells, tissues and animals, as well as studies on human exposure and epidemiology (Federal-Provincial Working Group, 1998). In the United States, the National Institute of Environmental Health Sciences (1995) has concluded that: "Most recent reviews have concluded that the existing evidence, although suggestive, does not show that EMFs cause cancer. These include national reviews by the U.S. Environmental Protection Agency, the Committee on Interagency Radiation Research and Policy Coordination, the Australian Ministry of Health, the National Radiological Protection Board of the United Kingdom, the Danish Ministry of Health, the French National Institute of Health and Medical Research, and reviews sponsored by the states of California, Texas, Connecticut, Illinois, Maryland, and Colorado."

Available laboratory or human data have not demonstrated what if any, magnitudes of power-line electric and magnetic fields cause human health effects (National Research Council, 1997). Despite the lack of a demonstrated "cause and effect" relationship between exposure to EMF and human health effects, a precautionary approach has been embraced by several governments and organizations through the adoption of guideline limits. This approach provides guidance for the establishment of EMF exposure limits, as discussed below.

Applicable Regulatory Guidance on EMF Health Effects

In Uganda there are no promulgated EMF health and/or safety standards and, consequently, there are no particular levels of EMF that trigger "regulatory action." Regulatory agencies have been unable to identify an adverse health effect against which it is possible to specifically define "safe" magnetic field levels. As discussed below, some non-regulatory guidance has been offered, based on limiting electric currents induced in body tissues to below one-tenth of typical naturally occurring electric currents in the body, even though such induced currents have not been associated with deleterious effects on health.

In the United States, some States have adopted guidelines based on maintaining the *status quo* for EMF exposure. Several States have adopted as guidelines the electric and magnetic field levels that have historically been present at ground level in transmission line corridors. However, none of these guidelines have been based on the conclusion that particular levels of EMF pose a risk to human health, and none have been developed using careful scientific methodologies. The International Commission on Non-Ionizing Radiation Protection (ICNIRP, 1990; 1998) has published interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields. The guidelines are based on analyses of the most recent scientific literature and on earlier review articles published by the World Health Organisation (WHO, 1993). The WHO concluded that no biological effects could be expected for magnetic fields smaller than 50,000 mG. The ICNIRP (1998) guidelines state that occupational exposure continuing throughout the working day should be limited to below 4,167 mG for magnetic fields and below 8.33 kV/m for electric fields. The guidelines also state that exposure for members of the general public should be limited to 833 mG for magnetic fields and 4.16 kV/m for

electric fields. In addition, general public magnetic field exposure between 1,000 and 10,000 mG should be limited to a few hours per day.

Electric and Magnetic Fields for Kawanda Masaka power line diversion Project
Prior to final construction design, the EPC Contractor will calculate the EMF levels generated by the various components of transmission line project. Design changes will be made to ensure levels for the proposed Kawanda- Masaka project will be well below the range suggested by guidelines and also well within the range of EMF generated by other common sources. No adverse effects on human health and welfare can be expected from operation of the proposed facilities, either on the basis of EMF guidelines, or on the basis of conclusions reached by scientific review groups that have examined EMF studies reported in the scientific literature.

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation and Monitoring Activities
The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits. UETCL/Government of Uganda policy for keeping residences and other structures out of way leaves will minimize exposure of the general public to EMFs. The contractor will work with Community Development Officers (CDO) at sub-county levels to sensitise communities with in the vicinity of the transmission corridor. No additional mitigation measures are required. EMF levels will be measured at representative cross-sections of the various transmission lines that are part of the system during initial full load operation. EMF levels are not expected to change with time, so further monitoring is not planned.

Disturbance and degeneration of wetlands and aquatic ecosystems
Several wetlands were identified along the corridor and will be impacted in one way or another during the construction of Kawanda-Masaka Power line diversion. The major wetlands that are partly crossed by the power line include Mayanja wetland in both Wakiso and Mpigi districts, Nakabugo wetland in Wakiso district. The main concern on the Kawanda-Masaka power line diversion project apart from short-term disturbance along the temporary access tracks to tower sites is the effect on the hydrological functions of the wetland resulting from installation of concrete tower pads. The dominant vegetation consists of Phoenix reclinata, Vossia cuspidata, Cyperus papyrus, Polygonum sp., Polyscias fulva, Pistia stratiotes, Nymphea sp. Common fishes may include lungfish, Haplochromis sp, Bagrus sp among othersis.

No significant clearing will be necessary for operation or construction. Thus, no significant biological effects are expected. No Critical Habitat for endangered species will be affected by the project. Exact tower locations will be determined on the ground at the time of construction (and in consultation with WID), to minimize social and environmental impacts.

		Likelihood of Occurrence			
		<<1	<1	1	1+
	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Fig. 10.6 Backfilling of wetlands for access road construction interfered with hydrological processes of this wetland at Kawanda, Wakiso district.(This road has been ear marked for decommissioning by UETCL due to the impact caused)

Mitigation measures

The following mitigation measures will be used to minimize temporary disturbance of the wetland, and avoid permanent intrusion into the wetland areas:

The transmission line will use existing road corridors for construction and operational access wherever possible. The alignment shall use small 'peninsulas' off the existing road causeways, rather than constructing dedicated causeways to new tower sites in the middle of the wetland.

Fine tuning of tower locations in consultation with local communities and the Wetlands Inspection Division will greatly reduce impacts in wetlands. Fine tuning of tower locations will be done in consultation with local communities and WID so that specific effects on these locations will be

minimized. This would include minimizing effects on water sources, and avoiding effects on water fowls and breeding sites within the wetland. The transmission line shall be marked with consipituous colours for important bird areas especially Nabajjuzi wetland.

Footings of towers will be built to address wet season conditions. Towers that are located in seasonally wet areas will be built with raft foundations, rather than the pad and chimney foundation that is normally used on dry sites. The concrete pads that form the base of these towers will have minimaleffect on hydrology. Construction of the raft foundations will require dewatering in the immediate area of foundation excavation. The dewatering will be temporary and localized and is not expected to have any long term effect on flora or fauna.

Use of specialized construction techniques where necessary can also help to reduce such negatie impacts. Where the route requires towers to be located in the swamp and in areas which cannot easily be accessed from existing roads or causeways, specialized construction techniques will be used to access the sites in a way that does not require permanent access ways to be built. It is envisaged that these techniques would include the use of temporary access ways, built from Terramats or similar structures, which would be removed after.

For areas with a large number of water fowls, UETCL shall take reasonable measures to make the conductor more conspicuous. These include the use of reflectors such as balloons placed at intervals along the conductors.

8.2.3 Negative Impacts (Social Economic Environment)

Psychological impacts

Psychological impacts such as stress, trauma, shock and fear are associated with displacement and resettlement. It was discovered that there is a lot of fear and uncertainty associated with the proposed construction of Kawanda-Masaka power line. This was critically expressed by those individuals whose structures are within the power line corridor.

> *"Am stressed and am living under fear. I don't know what to do because I have been told that they are going to demolish my house. I have been told not to add anything thing to the it in terms of repairs because they took its pictures. I need to know when construction of the power line will begin and when compensation will be effected"* said Mr. Mutai Mpoza of Kigoma village, Wakiso district.

Some of the affected people don't seem to be conversant with the land law and consequently compensation guidelines. The affected people seem to be in a state of uncertainty and need to be guided on the law.

		Likelihood of Occurrence			
		<<1	<1	1	1+
Impact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium

	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Fig 10.7 Worried Mr. John Mirundi whose Peaceland Coffee Factory on the Right and Home fall under ROW

> *"After it was confirmed that both my home and factory are to be relocated I developed high blood pressure because I keep wondering why God should punish me like that. But isn't it possible to divert this line at least to avoid the factory because it took me all my life savings to start it and now am old I can't imagine starting afresh, what about all those people who also earn their livelihood from the factory will they also be considered?"* (Mr. John Mirundi PAP Buwama B)

Mitigation measures

- Using several avenues including local and national media such as radio stations, TVs and sensitization workshops, all affected peoples' fears need to be addressed prior to compensation and resettlement.
- The intentions of land acquisition and demolition of structures should be purposed to the construction of 220KV power line from Kawanda to Masaka. This must be the ultimate reason and must be adhered to by the contractor and UETCL.
- All people with property in the vicinity of power line must be sensitized on the routing side that will be taken over by the steel towers.
- UETCL needs to inform the public that Resettlement and compensation of Project-Affected People will be carried out in compliance with Ugandan legislation, IFC's Performance Standard 5 and WB OP 4.12.
- UETCL needs to oversee all the actions involved in the RCDAP and ensure that thorough RCDAP is conducted to help restore peoples' confidence in the whole exercise.

Exploitation of Workers

Projects of such nature are normally labour intensive and need a multidisciplinary team of workers ranging from professionals, semi-skilled and casual labourers. Several workers will be contracted for corridor clearing, supply of aggregates, sand, food staffs, and construction of access roads. Several Engineers (Civil, Mechanical and Electrical) will be contracted during tower establishment and construction. All staff under the contractor or under UETCL need to be procured under well established working procedures and must be protected from exploitation.

		Likelihood of Occurrence			
		<<1	<1	1	1+
mpact severity	4	Medium	Medium	High	High
	3	Low	Medium	Medium	Medium
	2	Low	Low	Low	Low
	1	Low	Low	Low	Low

Mitigation measures

All staff should be procured under a well recognized contract. All contract workers must be paid as per the contract. All casual laborers must receive a fair days pay for a fair days work done. Exploitation of workers and refusal to pay workers is an offence and the contractor must be monitored to ensure that all workers are paid. All workers must be paid promptly and correctly. Workers need to be sensitized of their rights and need to be represented by a mediator in the affected districts through the office of the labour officers.

Loss of Economic Activity

The majority of the people along the proposed route are mainly peasant farmers cultivating small plots of land for domestic purposes. Although the vast majority is involved in agriculture, there are a significant proportion of people involved in non-agricultural occupations in several areas like road side businesses involved in sale of items like drums, round stools, spare parts, retail shops, drug shops, butcheries, brick making and bicycle repairs.

Fig.10.8. A poultry Business and Najjingo Jane's drug shop are some of the economic activities to be lost

Mitigation measure

Economic activities that will be affected by the project activities will be compensated in different ways;

- Structures related to economic activities e.g. piggery house, carpentry workshop, retail shop, Poultry will be relocated.
- Sites like stone quarries will be compensated for loss of incomes and land
- Assess part of compensation packages and community development actions, special programmes for income restoration should be put in place. These include; training, credit facilities, technical advice etc.

Cultural Property

A number of cultural properties as highlighted in section 4.3 exist in the project area. Some of these will be affected and these include: about 10 grave yards, about 8 commercial shrines most of which are in Masanda village and number of possessed trees.

Kingdom and now a tourist site is close to the line route. Also the enthronement site for the Ndiga Clan located in Membe/Mpambire is also very near the proposed route. These cultural properties are highly valued in Buganda.

During the construction stage new people will come to the project area in terms of skilled labour force, from different tribes, religions and cultural practices. These are likely to introduce new norms, cultural practices and behaviours to the community. This practice will dilute/distort the shared beliefs, customs, values and language of the local community. Breakdown in traditional

methods of social control and discipline and social dis-orientation of local population is therefore likely to occur.

In general therefore, the impact on culture and cultural property will be **medium negative** since only a few of the existing cultural property will be affected and the number of new people expected in the area will small.

Fig 10.9 Embunga Ya Nsereko Kalamazi Basajja subi Namwama Ancestral Palace for the Kkobe Clan in Buganda and Mr. Mugerwa, ancestral burial ground that will be affected in Buwama B

Mitigation

During construction, tower foundations should not be directly placed in these sites and maximum care must be taken to avoid direct contact with these sites because relocating them might be undesirable and cumbersome given the numbers involved.

Structures like shrines and graves will be relocated. Loss of incomes shall also be compensated for since the owners may take some time without any income from them as relocation is take place. Details of compensation should also be contained in the RAP.

Sites that are buried may be discovered during project implementation. Such discoveries of archaeological nature are termed as 'archaeological chance finds'. These could be concentrations of pottery, animals and human bones, worked stone etc. World Bank guidelines should be adopted in project design to carter for such discoveries. The following are the procedures:

1. Notification of relevant department of antiquities
2. Request for representative to make a site inspection
3. Cessation of work in the vicinity of the find until the visit of a representative; and decision by department of antiquities on possible salvage or excavation.

Mitigation measures can be turned into opportunities for improved welfare and local economic and institutional development if proper attention is paid to these socio-economic issues from the beginning.

UETCL should make sure that they identify incentives that can be applied so that voluntary resettlement takes place instead of forced displacement. Such incentives include: better agricultural land, secure land tenure, improved social services, access to farm inputs, transport opportunities etc.

To mitigate damage to archaeological resources, it is proposed that the construction foremen will inform construction crew to be aware of the possibility of discovering fossils or archaeological remains, what form these would take (bones, fossils in rock, shards or pottery, arrow heads etc) and the procedure to be followed should be as follows:

- Stop operations in the area where fossiliferrous or archaeological remains are discovered during ground disturbance activities.
- Inform the Commissioner of Antiquities of the occurrence/presence of a fossiliferous /archaeological site.
- Arrange for experts in collaboration with the Uganda Museum to salvage identifiable material and record details of the finds.

Further still, the contractor should develop and implement avoidance procedures. In the event of human remains, there shall be no further excavations or disturbance of the site until the responsible police authorities have been informed.

Power outages due to interference with local power grid

Although the proposed Kawanda-Masaka 220KV power line diversion is not expected to lead to significant power outages, the line will pass over existing low voltage lines at some points along its corridor. This may necessitate unavoidable temporary outages especially during construction as the contractor team works underneath or over the existing low power lines necessitating them to switch off power to avoid short circuiting. Such circumstances were identified along Bombo road where the line will cut across the road perpendicular to the existing low power line and in some other villages like Kayunga. Therefore, places which are directly connected to such lines may experience some temporary outages which will be an inconvenience to them. However, the duration of such outages is not expected to last more than a day and will only be restricted to the time when such a place is being worked upon. The number of outages cannot be predicted at the moment although UETCL will have to ensure that they supply power to UMEME Ltd in accordance with the agreed terms.

Fig. 10.10 A local power line along Mityana road

Inevitable power outages as mentioned in the above paragraph cannot be mitigated at the moment. However the impact of such outages on the consumers can be reduced further if the customers are informed in advance as it has always been done by UMEME Ltd. Therefore UETCL needs to corroborate with UMEME Ltd at all stages of project implementation. Accidental outages resulting from contractor's carelessness can be disastrous and must be avoided. Such outages can be reduced by procuring companies and engineers (contractors) with proven experience in electricity transmission.

Interference with traffic and diminished road safety

The proposed Kawanda-Masaka 137km diversion will cut across several roads including Kampala-Gulu high way, Kawanda-Senge road via Mayanja wetland, Nakabugo-Bukasa road, Mityana road and Masaka road among others. Unless proper mitigation measures are put in place, stringing across these roads could result into critical interference with traffic or accidents.

Mitigation

To minimize interference with traffic, stringing across roads and high ways should be conducted in hours with less traffic preferably at night or on weekends. Conspicuous notices should be well placed on roads and guides on ground should direct traffic in case of diversions or lose/sagging conductors and cables. UETCL will have to notify traffic police in advance and work with it during stringing across high ways and other major roads.

Water Sources

Construction of the transmission line will directly affect some of the water sources along the T-line which include; Buwama B which is one of the major water sources in the areas serving almost the whole community of Buwama B, in Bukasa in Mr. Galiwango's land and on M/s Nakanjako's land in Bukasa B village and one in Senge village in Mr. Ahmend Kawooya's land.. This is because the

proposed line route runs parallel to many wetlands where most springs are located. It is expected that these will be directly affected by the construction activities through pollution and interference of the flow. The people using the 'will be' affected sources may have to look for alternatives. This will in turn affect other water sources indirectly by increase in the number of people using them.

Fig 10.12 Main water source serving majority of Buwama B community affected by the T- Line

Mitigation

The contractor should endeavor to construct alternative safe water sources for the communities. Installation of the tower may affect the 'eyes' of the spring and may end up drying or water quality compromised. In such cases the springs should be closed. In such as case compensation in form of constructing new ones should be effected. If only the impact is from soil pollution, then it can be closed temporarily and be opened after construction.

Health

This project is expected to attract various categories of people who will seek employment on project activities during construction. It is apparent that labour will be procured and housed in workers camps. Some of these will be local labour while others will come from places far away from the project site. Those who will come from far are unlikely to be accompanied by their spouses. Many local people will also participate in providing services to workers. This will cause the establishment of social networks, which can promote the spread of socially transmitted diseases especially HIV/AIDS and other STIs.

During project development, there will be large scale movement of earth material which may cause soil erosion, dust, leading to respiratory infections.

Workers may be exposed to occupational hazard such as physical injuries and maiming by construction machinery etc.

Garbage and human wastes generated by workers, if not properly managed may compromise water quality and may cause water related diseases in the area.

According to the community HIV/AIDS scares the communities most.
Pressure on the existing health services is likely to increase. Although not many skilled workers are expected, the impacts of diseases have a multiplier negative effect. The impact on health services and the health of the residents is likely to be **medium negative**.

Mitigation

- The developer will provide workers with protective gears/wears during construction work to prevent injury;
- Workers will be sensitized on protective behaviour and practices during work.
- The developer will establish a first aid facility at the construction site to treat injury cases whenever they occur.
- The project contractor is also advised to employ services of an independent NGO engaged in HIV/AIDS activities to sensitize and treat both the project workers and the communities around the work site. This should be included in the bill of quantities during procurement.

Noise, Air and water quality

- Earth works are likely to increase dust pollution;
- Construction machinery and vehicular fumes are likely to cause air pollution from their emissions;
- Dust pollution of air and water bodies from earth moving equipment and hauling trucks is a nuisance and can cause dust related diseases such as silicosis to workers and local community.
- Noise pollution by construction machinery and vehicles.

Mitigation

- Water will be regularly sprinkled at the site using bowers and haulage trucks will be covered with canvas to minimise dust emissions;
- Developer shall ensure all vehicles and construction machinery are properly operated and maintained to minimise exhaust emissions;
- Noise from hauling trucks and construction equipment is likely to cause minor impact on the local community and will be mitigated by keeping vehicles and construction machinery properly maintained.

Health and Safety Hazards

Health and safety risks are inherent to transmission line construction. There are concerns relating to site preparation and construction, including injuries to workers and incidences of malaria. The EPC contractor will need to follow international and national safety guidelines as well as proposed action

emphasized in the environmental monitoring and management plan. For the period during project implementation, the EPC Contractor will develop and maintain a HS&E Management System to ensure that project activities comply with regulatory, reporting, operational and document control requirements. A comprehensive HS&E management system will be developed by the EPC Contractor and will include the following components:

- The HSE&S Policy.
- HSE&S target and objectives.
- Organization and responsibilities.
- HSE&S documents and communication.
- HSE&S operation control.
- Training, awareness and competence.
- Management of change.
- Monitoring, compliance audit and corrective actions
- Management review

During the construction period, HS&E management objectives are briefly summarised as;

HS&E Policy

The EPC Contractor should commit to achieving the required standards of health, safety, environment within its operational areas for the construction period. The Employer's needs and expectations for this period are anticipated and will be met through safe and timely operating procedures, actions and solutions that will minimize risk of accidents and harm to people and the environment.

HS&E Documentation and Communication

Documentation and records for this project shall meet the requirements of the contract. Records and documents shall ensure verification of project compliance including training, audits, inspections, incident reports, reviews, meetings, risk management studies and management of change. Where required obsolete documents will be removed or updated in line with the Document Control Procedures.

A communication policy will be developed for effective record keeping and for easy accessibility. All HS&E meetings will be recorded in formal minutes of meetings, which will be made available promptly for review by the Owner. These minutes will record duration, location, attendees, agenda, key findings and agreed actions.

Communication with communities is also important with particular respect to specific issues. The official project language will be English. HS&E signage will be posted in the local language of a particular site where required.

Responsibility

The Project manager and the Construction Manager in conjunction with the Safety Coordinator will be responsible for the implementation of the HSMP. The Project manager and the Construction Manager are responsible for the implementation of the HSMP while the Social and Environment

Manager will have responsibility of verifying its implementation. All supervisors should be sensitised and trained on how to achieve the plan. In implementing the plan, the EPC contractor will:

- Provide adequate resources to facilitate the implementation of the plans
- Identify hazards, assess, and control the risk
- Develop, maintain, implement safe working procedures
- Provide training, information and instruction to employees
- Implement and injury management program

Employee Responsibilities

- Employees must cooperate with the Contractor to implement the HSMP
- Employees must follow the correct work procedures
- All sub contractors either on site or at any location are required to comply with requirements of this HSMP

Safety meetings

There will be safety meetings to review the progress of implementation of HSMP once every week Chaired by Construction Manager. The meeting will:

- Find solutions to any safety issues unresolved during the previous meeting
- Identify problem areas and work out suggestions to resolve them
- To investigate accidents that occurred and plan ways to avoid them in the future
- Review the implementation of the safety plan
- Appraise employees on various specific needs at the work place

Training Plan

The Contractor will ensure:

- HSE Officer conducts safety awareness program for the site supervisory staff before they are deployed on site
- The safety officer will provide induction safety induction to all workers and records
- Weekly toolbox meetings will be conducted as required
- Daily work instruction to the workmen will consist of hazards likely encountered while executing work and precautions to be taken

Tool box talk

There will be weekly briefings on health and safety precautions conducted by supervisors and foremen to their respective workforce. The HSE Officer will maintain a record of the meetings where the job specific hazards and precautions to be taken. Subjects to be covered will include:

- Unsafe working conditions and safe acts noted during the previous week
- Lessons leant from the near misses, accidents if any
- Safety precautions to be taken in the coming week
- Safety systems and procedures to be followed
- Safety checklists
- Role of employees in preventing accidents
- Other precautions include

- ✓ Safe use of scaffolds, ladders, power tools
- ✓ Electrical safety requirements
- ✓ Fire precautions
- ✓ Safe usage of hand tools
- ✓ Safe handling of mechanical materials
- ✓ Safety rules related to housekeeping and tidiness
- ✓ Safety access to the workplace
- ✓ Materials storage and transportation requirements
- ✓ Safety during excavation
- ✓ Working near construction equipment and machinery
- ✓ Emergency evacuation procedures
- ✓ Health hazards
- ✓ Personal Protection Equipment (PPE) use
- ✓ Working at heights
- ✓ Safety while crossing power lines
- ✓ Temporary earthing
- ✓ Guying arrangements of scaffolds
- ✓ Ageing of tools and maintenance

Insurance

The Contractor will secure liability insurance to cover for injuries and ill health to employees. This will include insurance for accidents involving vehicles and third party and building insurance. The costs covered by insurance can include sick bay, damage to plant and equipment, overtime working and temporary labour, production delays, investigation time.

Control and use of Personal Protective Equipment

The EPC Contractor will provide the following Personal Protective Equipment (PPE) to workers:

- Head protection gear
- Goggles for eye protection.
- Muffs for hearing protection.
- Boots for foot protection.
- Gloves for hand protection.
- Mask for respiratory protection.
- Helmets
- High visibility vests.
- Life jackets.
- Heavy lift jackets.
- Shields (i.e. for grinding and welding).

PPE will be supplied free of charge to all EPC Contractor personnel on the project. The EPC Contractor will ensure that PPE is:

- Suitable for intended use.
- Clean and replaced when damaged or no longer effective.
- Properly used and maintained by personnel.

Personnel will be provided with training, information and instruction on PPE use and maintenance and will be supervised to ensure that it is used correctly. Sub-contractors shall also be required to provide appropriate PPE to their workers.

STDs, HIV and welfare of Workers

Prior to the commencement of construction work, hygiene awareness will be carried out. The workers and local community residents will be sensitised on health risks associated with the HIV/AIDS pandemic. Two trained people will be made available at each site. They will be assisted by a site nurse. Enough first aid boxes should be available at site. Other requirements include:

- An emergency vehicle will always be available at site. However, the facilities of the police department or hospital will be called in to handle major injury.
- Temporary facilities should be provided with garbage bins with lids to dispose all waste generated on site
- The accommodation facilities of the workforce will be maintained in an acceptable hygienic condition for the convenience of workers
- Enough toilets and urinals should be installed at assigned locations on site and should be maintained clean and dry. The facilities should be contained to avoid environmental pollution
- Safe potable drinking water will be provided on site and workers will be encouraged to drink enough water during hot weather
- Scrap metal generated on site should be collected in scrap bins
- Flammable wastes such as empty paint containers, insulation glue, adhesives will not be disposed in scrap bins. They will be collected and stored separately for such purposes
- The garbage bins will be removed and disposed off at approved locations
- A skip will maintained on site to dispose all solid waste materials and shall be removed through authorised agencies at regular intervals
- The drainage lines from the offices and washrooms will be connected to the existing drainage lines. Any leakage to the drainage should be attended to immediately. The septic tanks and soak pits will be used appropriately as required.
- All necessary first aid arrangements will be available on site
- Wide awareness on safety, health and Environment should be implemented

Treatment of workers

- A clinic will be set up at various project sites
- A qualified nurse will be on-site and should be provided with adequate first aid supplies to stabilise a patient until transferred offsite to a local medical facility if required
- The Contractor should have a formal contract with a local doctor to support any medical treatment that may be required
- Emergency procedures and communication protocols should be in place prior to construction

Visitors on Site

- All visitors must sign the Contractor/visitor sign-in register on entering sites
- A performance logbook for recording all work performed on site should be on site
- All workers should sign-in and out on each working day
- All visitors should be given safety orientation and should be escorted at all times when on site.

- All sub contractors should adhere to these procedures and should submit their training records
- Visitors should be issued with a visitor's badge on all sites

Fire protection

- The Contractor must provide up to date safety data sheet (MSDSs) for all chemicals used on site or brought onto the site and stored at the site. They must include police emergency contact details
- The Contractor should include all chemicals that they store permanently on the site chemical register. The chemicals should stored in a manner that is:

✓ Secure in position from unauthorised people
✓ Free from risk of falling and being knocked over
✓ Away from food
✓ Appropriately labelled

Scheduling of Works

When an activity included in the scope of the contract has a high risk of exposure to the public or employees, the contractor should schedule the activities outside the site's opening hours. For 24-hour sites, the contractor must arrange to complete high risk activities at off-peak times.

Project Equipment

For all equipment on site the contractor must ensure that:

- The employees to use the equipment are licensed and have competency based training
- No electric operated equipment/tools are used during working hours without permission
- All equipment should be operated without risk to employees or the public
- Equipment should be stored, operated, and maintained in accordance with the national legislation
- Equipment should not be left un attended to and must be out of reach of children
- Noise levels from equipment and working areas should in accordance with Ugandan noise standard

Contractors Management

- The sub contractors should read safety appliances , access equipment inspected by HSE officer or any other responsible person before deploying
- S/he should get all machinery, power tools, safety appliances, access equipment inspected before deploying them
- The entire workforce should be oriented on safety, health and environmental issues
- Details of accidents during work should be maintained separately.

Accidents, incidences and "near-misses Investigation and Reporting

All accidents, incidences and "near-misses" shall be recorded, investigated and reported.
Effectiveness of the reporting system will be ensured by:

- An immediate notification to the Employer and Engineer.
- Investigating an incident to determine the facts and circumstances related to it and determining recommending remedial actions.
- Ensure that all personnel are aware of the reporting protocol.
- Reviewing incident / accident reports to establish trends so that appropriate remedial actions can be taken
- Following up any corrective actions recommended.

Temporary facilities

Hazards including fire, electric shock, and hygiene related hazards should have the following precautions:

- ✓ All electrical connections should be routed through the earth leakage circuit breaker
- ✓ Make shift wiring will not be allowed at any site
- ✓ The platform and walls of the pantry, where the above is located will be covered gypsum boards or steel sheets
- ✓ Fire extinguishers are supposed to be provided in all buildings and will be inspected by the HSE officer every month to keep them in good working condition
- ✓ Disposable wastes which can cause fire will not be allowed close to fire places
- ✓ Dustbins will be provided in the offices, stores, and rest areas to prevent employees from disposing waste materials indiscriminately

Excavation

Hazards including men/material falling into pit, collapse of the sides, breakage of buried service lines, hazards should have the following precautions:

- ✓ Before excavation, necessary approval shall be taken from relevant authorities to ensure that there are no buried services in the area
- ✓ Sides of the excavations must be sloped of casing used to a safe angle not steeper than the angle of repose of the particular soil
- ✓ If the excavations or the earthwork is close to the foundation of any adjoining building, adequate steps should be taken to prevent damage to the existing structure
- ✓ Every accessible part of the excavated pit, into which there is a danger of person falling, shall be suitably fenced with a barrier as close to the edge of the excavation as possible . Warning signs and lamps should also be provided along the fence , if the excavation is a public place
- ✓ No under cutting at the side of excavation shall be allowed
- ✓ All construction machinery used in the excavation should have reverse horn and authorised personnel should operate the
- ✓ Proper de-watering facilities will be ensured at site of evacuating water at the time of drilling

Concreting

Hazards including collapse of casing while pouring concrete, persons falling of working platform, hygiene problems, and environmental threat require the following precautions:

- ✓ All workmen involved in pouring the concrete shall be required to use adequate PPE
- ✓ Delivery hose of the concrete pump or the concrete shall be controlled properly to avoid dumping excess concrete at one location which may overload the shutter

- ✓ Power cables of the vibrator, trowels, should not have any joint and shall be provided with industrial plugs
- ✓ Safe handling of concrete will be ensured with trained workforce
- ✓ Spilling of concrete will be checked and cleaning should be ensured after works

Painting

Hazards including fire hazards, spillage, and fall from height require the following precautions:

- ✓ Painters should use correct working platforms and scaffolds or ladders should be provided. The platforms should be inspected regularly
- ✓ Paint cans should always be closed unless in use
- ✓ Painters should be trained about the above hazards and ways of fire fighting in case there is as fire
- ✓ Empty cans of paints should collected and removed from site and disposed correctly

Painters should be instructed to wash their hands before handling any eatables and should be provided with cleaning solutions, and should use gloves and masks to prevent exposure to paint and its vapours

Scaffoldings

Hazards including collapse, electrical induction to structures, and fall of persons from height require the following precautions:

- ✓ All scaffolds should be inspected every week and records kept. If found to be defective, they would be labelled as such to caution the people not to use it
- ✓ The height of scaffolds should be limited to 3.5m times its minimum base width
- ✓ All workmen in the platform will be asked to get down before moving the working platform
- ✓ Suitable approach in the form of ladders will be provided to the working platform of the scaffolds wherever required
- ✓ Proper anchoring of scaffolds will be ensured and checked
- ✓ Proper lighting should be provided at night

Ladders

Hazards including collapse of ladders and fall of persons and persons from height require the following precautions:

- ✓ All ladders should be registered to ensure that they are inspected at regular intervals. Site made timber ladders will not be allowed on site
- ✓ Technicians should warned about the danger of using the top two rungs and the effect of overreaching while using ladders in the tool box meeting
- ✓ Metallic ladders will not be used where there is a risk of electrical parts contact
- ✓ Portable and extension ladders, if any, will have to be tied at the top and its angle of inclination will not be less than 75 degrees

Tower Erection

Hazards including persons/material falling, failure of lifting accessories, trapping limbs, and being hit by swinging load require the following precautions:

- ✓ The foreman/supervisor should check that slings used should be of adequate capacity in configuration in which it is being used and free from defects. The crane and all lifting tackles should have a valid test certificate

- ✓ The mobile crane should be inspected
- ✓ The tower members loaded in the trailers/trucks will be secured to avoid movement and falling in transit. The vehicle should be checked to avoid overload.
- ✓ During erection all workers should use safety belts, helmets, and safety shoes
- ✓ The cranes should have test certificates and operated by qualified personnel
- ✓ Cranes should be operated when properly levelled and positioned
- ✓ In case of missing member, the incomplete tower will be indicated be red flag at offending item. All vehicles, mobile cranes will carry first aid boxes

Towers will not be released for stringing unless properly tightened

Conductor stringing

Hazards including electric shock, persons/materials falling, injury to onlookers and workmen, damage to public property, require the following precautions:

- ✓ Engineer in charge will ascertain that the necessary permits have been issued and earthing bonds issued where applicable
- ✓ All scaffolds will be securely erected and positioned to required clearances. Scaffolds will be checked for sufficient strength to withstand applied loads and earthed
- ✓ Roadside scaffolds will be provided with warning lights and signs
- ✓ While stringing, both tensioner and puller should be suitably earthed
- ✓ All workmen will use adequate PPE and body harness safety belts
- ✓ Back staying of towers or conductors will be in accordance with approved techniques and checked daily
- ✓ Jumpers will be left disconnected until conductor work of all line is complete, in order to reduce risk of accidents due to lightening strike
- ✓ Adequate communication equipment will be available to warn stringing crew/gang about approaching storm
- ✓ Spacing chairs will be of approved design
- ✓ Conductors will not be left in position without adequate warning signs and lights
- ✓ Onlookers will not be allowed to come near tensioner/puller and under moving stringing and sagging operations
- ✓ Appropriate signalling signs and communications equipment will be used during stringing and sagging operations
- ✓ Periodic checks on all tools will be ensured

Power tools

Hazards including electric shock, hit by rotating object, foreign body falling in the eye, require the following precautions:

- ✓ An identified electrician at site will check all portable power tools before releasing it to the site, and in addition make sure that the power tools are regularly inspected and a record is maintained
- ✓ If a power tool is unsafe to use during the regular inspection, it shall be marked/tagged to that effect and returned to stores for repair and replacement
- ✓ All power cables will be provided with industrial plug and sockets for power distribution
- ✓ The guards provided in the power shall not be removed either by the technicians or by the maintenance electrician

The power tools shall be returned to the stores at the end of the day or shall be stored properly at site to prevent its damage

Hand tools

Hazards including tools falling, hit by sharp edges, hit by flying objects, slipping and falling due to use of worn out tools, require the following precautions:

- ✓ The storekeeper will inspect all the hand tools before issuing it out to ensure that they are in good working condition
- ✓ Defective tools should be identified with reference to broken handles, blunt edges, worn out heads, cracked parts. If found, damaged tools should be removed, returned to store, or destroyed
- ✓ Technicians will be reminded of misuse of tools in tool box meetings and the need to report tool defects
- ✓ Technicians must use goggles while carrying out chipping, hammering and similar operations
- ✓ Use of tools to perform tasks for which they are not made is prohibited

Fire Prevention and fighting

- ✓ Smoking will not be allowed at site and substation or any other prohibited places
- ✓ Fire extinguishers should be installed and maintained on site and stores wherever there is a potential fire hazard
- ✓ Ire surveys will be conducted frequently on site to assess the fire load, type of prevention, and fighting plan required
- ✓ Flammable liquids such as paints, insulation compounds should be clearly labeled and barricaded provided with fireproof walls
- ✓ All used flammable liquid containers should be collected and removed from site
- ✓ Packaging materials should be removed on the same day from site, whenever removed from a consignment
- ✓ Training on use of fire extinguishers shall be conducted to all employees as part of induction session and it will be repeated at the tool box meeting

Alcohol, intoxicants and non prescribed medicine

- ✓ Alcohol, Intoxicants, and Non Prescribed Medicine shall not be permitted on any site
- ✓ While on job, the use of intoxicants (sedatives, tranquilizer) will be not be permitted

House keeping

- ✓ Smoking will not be permitted in site store and office
- ✓ Trash containers will be kept near the rest area and workers advised to dispose lunch, soft drink, bottles in trash containers
- ✓ All materials at site will be neatly stacked in the assigned location provided with suitable enclosures
- ✓ Scrap generated at site will be removed on a day to day basis by the respective personnel at the end of the shift everyday
- ✓ Packaging materials, if any, shall be removed from the site immediately after opening the boxes
- ✓ Gas cylinders shall be kept in the floors in such a way that it cannot be tipped inadvertently
- ✓ Welding cables, power cables will be laid in such a way that they will not cause trip hazard

Table 8.7: Overall Risk Register for the proposed construction of the 137 km Kawanda Masaka Power Line

ID	Risk	Chance	Severity	Overall Impact
Biophysical Environment				
E1	Landscape deterioration that is out of character with the surrounding environment.	Possible	Low	Low
E2	Loss of crops along the corridor during construction	Likely	Low	Medium-High
E3	Spot alteration of land use on agriculture, savanna, grassland and wetlands by tower spots	Possible	Low	Low
E4	Disruption of ecological and evolutionary processes.	possible	Low	Low
E5	Fuel and oil spill contamination of soil and water r during vehicular movements.	Unlikely	Low	Low
E6	Plastic and paper litter not cleared	Unlikely	Very low	Low
E7	Abandonment of metallic waste, insulators and electricity conductors in the corridor	possible	Very low	Low
E8	Abandonment of organic waste (food stuffs) at campsites and along the entire corridor	possible	Low	Low
E9	Possible destruction of biological and ecological integrity of the affected districts	Unlikely	Moderate	Low
E10	De-vegetation and destruction of unique wild-land values.	Possible	Low	Low
E11	Loss of significant land due to the power line	Likely	Moderate	Medium-High
E12	Death and migration of animal biodiversity.	likely	Low	Low
E13	Reduction in preferred and quality forage.	Very Unlikely	Very low	Low
E14	Soil compaction and reduced regeneration potential.	possible	Very low	Low
E15	Displacement of built up structures in certain areas	Likely	Moderate-high	Medium-High
E16	Health hazards from Electro-Magnetic Fields	unlikely	Very low	Low

ID	Risk	Chance	Severity	Overall Impact
E17	Disturbance and degeneration of wetlands and aquatic ecosystems	Possible	Moderate	Low
(Socio-economic)				
S1	Psychological impacts to the communities such as stress, fear and trauma due to displacement and compensation issues.	Likely	Moderate-High	Medium-High
S2	Health and safety hazards relating to site preparation and construction, including injuries to workers	likely	Moderate-High	Medium to high
S3	Exploitation of workers during project implementation	Possible	Low	Medium
S4	Diminished road safety	Likely	Low	Low
S5	Interference with traffic	Likely	Very low	Low
S6	Disturbance due to noise	Likely	Very low	Low
S7	Interference with local power grid resulting in sporadic outages	likely	Very low	Low
S8	Disease transmission (STD/HIV Aids) into the local population by the contractor and staff.	possible	Low	Low
S9	Perceived diminution of scientific value of the entire ecosystem in the affected districts	possible	Low	Low
S10	Lost time due to incident injury to local workers	Possible	Low	Low
S11	Fatal animal attacks on local workers on construction workers.	Very Unlikely	Moderate	Low
S12	Accidental explosion	possible	Very low	Low
S13	Contamination of local drinking water by camp waste	Possible	Low	Low
S14	Interference with cultural sites	Possible	low	Low
S15	Health and Safety Issues	Possible	Moderate	Moderate-High

9 Environmental Management, Mitigation and Monitoring plan

9.1 Environmental and Social Management Plan (ESMP)

The implementation of mitigation measures will involve a number of stakeholders during project implementation. Based on the ESMP given in this chapter, the Contractor will need to prepare his own ESMP. The contractor's ESMP shall be detailed enough to include mitigation measures for all identified impacts, measurable monitoring indicators as well as the responsibility and the schedule of implementation. This ESMP shall form part of the Bidding documents so as to allow the Contractor to adequately comply with the recommended mitigation measures. The Supervising Engineer (or his appointed environmental officer) will review and approve the Contractor's Social and Environment Action (SEAP) and will have the responsibility to supervise adequately implementation through a contractual agreement. This will be stated in the bidding documents. An Environmental Audit shall be carried out before commissioning to check if the contractor has complied with his own ESMP. Below is an environment management plan for the project. The Contractor will also provide staff who will implement the SEAP.

The SEAP will contain the following contents:

- ✓Health and Safety Management Plan (HSMP)
- ✓Waste Management Plan (WMP)
- ✓Hazardous Materials Management Plan (HMMP)
- ✓Traffic Management Plan (TMP)
- ✓Labour Force Management Plan (LFMP)
- ✓Environment Mitigation and Monitoring Plan (EMMP)
- ✓ Pollution Spill Contingency Management Plan (PSCP)

The tables below detail the issues in the proposed plans.

Table 9.1: Environmental Management Plan

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
Loss of crops within construction corridor	Farmers should be notified about start of the project at least 6 months in advance so that cultivated crops are harvested Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated pathways or agreed upon access roads All affected villages and parishes need to establish committees at village and parish levels to work along with the government Valuers and assess the magnitude of damage during the preparation of RAP and during construction. UETCL must compensate appropriately all farmers for crops destroyed by the contractor during construction regardless of proximity to the power line. The RCDAP implementation and outcomes will be monitored and evaluated as part of a transparent process	Number of sensitization workshops conducted per village. Level of media involvement Level and number of stakeholder involvement from the village level up to district level Presence of evaluation and dispute management committees from village level to district level Evidence of valuation of crops Evidence of a thorough RAP Evidence of reasonable compensation of the affected people Magnitude of conflicts and disputes arising Absence of intimidation by UETCL and contractor to the affected people	USD 8,000	District Environment Officers District Agricultural Officers Local Council leaders Crop owners/PAP UETCL Sub-county Chiefs Councillors	3 months before commencing the project and then Continuous until the power line is commissioned.
Spot alteration of agricultural land use, grassland and	Depending on the topography and obstacles beneath the line, the tower sites should be as far as the maximum span length	Attitudes of the local population towards the contractor and staff	USD 10,000	District Environment Officers	Continuous until the power line is commissioned.

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
wetlands by Tower sports	Tower shifting should be used to minimize adverse impacts of the tower sites Accessing of tower sites and stringing of lines should be done with due care to avoid damage to fruit trees, crops and nearby homesteads All lost or damaged crops or properties at tower sites must be compensated for in accordance with the land law and the World Bank Safeguard Policies	Movement patterns of the upgrading team Number of complaints brought up against the contractor on destruction of crops, trees Contractors' relationship with the district and local leaders Absence of intimidation by UETCL and contractor to the affected people		District Natural Resource officers Sub-county and Local environmental committees Community Development Officers UETCL Local Council Leaders Sub-county chiefs	
Loss of Land to the power line in the corridor	UETCL must work with local council committees, sub-county committees, district land boards, CAOs, RDCs, and Town Councils, Politicians and other local leaders to sensitize all people to be affected on the intentions of land acquisition by UETCL UETCL must conduct a thorough Resettlement Action Plan (RAP) in accordance with World Bank Group and its Safeguard Policies	Number of sensitization workshops conducted per village Level of media involvement Level and number of stakeholder involvement from the village level up to district level Presence of evaluation and dispute management committees from village level to district level Evidence of land surveying and	Detailed in RAP report	CAOs Town Clerks District, Town Planners District, and Town Engineers District, and Town Land Boards District Environment	6 months before commencing the project and then Continuous until the commissioning of the power line.

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
		valuation by Registered and Certified Land Surveyors and Valuers Evidence of a detailed RAP Evidence of reasonable compensation of the affected people Magnitude of conflicts and disputes arising Absence of intimidation by UETCL and contractor to the affected people		Officer Land Officers LC5 Chairmen Councillors RDCs UETCL ERA Land Owners Local Council Leaders	
Displacement of built up structures (homes, Kiosks, commercial buildings, latrines) by the Right of Way and Wayleave	UETCL must work with local council committees, sub-county committees, Councilors, district land boards, CAOs, RDCs, Politicians and other local leaders to sensitize all people to be affected on the intentions of land acquisition UETCL must conduct a detailed Resettlement Action Plan (RAP) in accordance with World Bank Group and its Safeguard Policies All sorts of compensation and settlements must be done at least 6 months before structures are demolished.	Number of sensitization workshops conducted per village Level of media involvement Level and number of stakeholder involvement from the village level up to district level Presence of evaluation and dispute management committees from village level to district level	Detailed in RAP report	Structural and Land Owners CAOs Town Clerks District, and Town Planners District, and Town Engineers	

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
		Evidence of land surveying and valuation by Registered and Certified Land Surveyors, Quantitative Surveyors and Valuers Evidence of a detailed RAP Evidence of reasonable compensation of the affected people 6 months to project implementation Magnitude of conflicts and disputes arising during and before project implementation Absence of intimidation by UETCL and contractor to the affected people		District and Town Land Boards Land Officers LC5 Chairmen RDCs Government Valuers UETCL ERA Local Council Leaders	
Psychological impacts such as stress, trauma, shock and fear associated with displacement and resettlement	Using several avenues including local and national media such as radio stations, TVs and sensitization workshops, all affected people's fears need to be addressed prior to compensation and resettlement. The intentions of land acquisition and demolition of structures should be purposed for the construction of 220KV power line from Kawanda to Masaka. This must be the ultimate reason and must be adhered to by the contractor and UETCL. All people with property in the vicinity of power line must be sensitized on the routing side that will be taken over by the steel	Level of awareness depicted by the local people in regard to the project. Extent of curiosity expressed by the locals and the affected people. Significant evidence that the intentions of UETCL are not well understood. Presence of intimidation	Detailed in RAP report	UETCL LC5 Chairmen District Environment Officers Community Development Officers Councilors Local Council Leaders RDCs	Continuous until the commissioning of the power line and for sometime after commissioning

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	towers. UETCL needs to inform the public that Resettlement and compensation of Project-Affected People will be carried out in compliance with Ugandan legislation, IFC's Performance Standard 5 and WB OP 4.12. UETCL needs to oversee all the actions involved in the RCDAP and ensure that thorough RCDAP is conducted to help restore peoples' confidence in the whole exercise.	Level of involvement of politicians in sensitization Proper understanding of the routing order by the affected authorities Willingness to talk about and criticize the project by the affected people. Number of conflicts and disputes from the affected people on the project			
Loss of vegetation and animal habitats by vehicle traffic, clearing of Wayleaves and access roads.	Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated path ways or agreed upon access roads. Adjust tower intervals to avoid ecologically sensitive areas such as breeding sites for water fowls, water sources, nesting sites for birds and areas of strong cultural significance to the local people. The T-Line should bemarked for Important bird areas especially Nabajjuzi wetland. UETCL shall contribute towards local environmental programs. UETCL shall remit funds towards district and sub-county afforestation projects to compensate for biomass lost during Wayleave clearing.	Number of access roads constructed and mitigation measures undertaken. Attitude of the local people towards the contractor and UETCL. Number of ecologically sensitive sites spared. Movement pattern of the contractor. Magnitude of vegetation cleared. Evidence that UETCL supports afforestation programs in affected sub-counties and that money was received by project implementers Number of trees planted by	USD 15,000	UETCL District Environment Officers District Natural Resource Officers Local Environment Committees Local Council Leaders	Throughout the construction phase and Continuous for some time after commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
		implementing agencies Level of involvement of UETCL in tree planting project Presence of a good working relationship between UETCL and the local administrations in affected areas.			
Alteration of landscapes during excavation of Murrum and aggregates.	The contractor shall liaise with the district and Town Councils to identify appropriate sources of murrum, sand and aggregates for the construction of access roads and steel tower foundations. All excavation pits shall be restored to the satisfaction and recommendation of the District Environment Officers and District Engineers.	Level of involvement of district authorities and Town Councils. Evidence of restoration and remediation of excavated sites.	12,000	UETCL District Environment Officers District and Town Engineers and Planners Local Council Leaders	Continuous until the commissioning of the power line
Generation of solid waste during demolition of built up structures, Construction camp residues and construction waste.	All sorts of waste regenerated during construction such as conductors, steel and tower members (metallic bars), insulators and other accessories associated with transmission lines shall be collected and handed over to UETCL for proper recycling or disposal. Such waste must not be thrown in the power line corridors. All organic waste generated at labour campsites such as food stuffs shall be collected and transported by the contractor to designated District and town council landfills within the affected areas. All plastic waste regenerated at campsites and in the course of work	Presence of a power line corridor that is devoid of wires, conductors, oils and sorts of electricity transmission waste Presence of waste bins at campsites Presence of mobile toilets at camps sites Absence of waste abandoned at	20,000	UETCL District Environment Officer The Contractor Local Council Leaders	Throughout the construction period and slightly after commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	such as mineral water bottles, polyethene bags, jerricans, cups shall be collected in mobile vans and sold either to the local people for re-using or taken for recycling in respective factories. Human excreta shall be managed using a mobile toilet. All waste generated from demolition of built up structures shall be sorted by the contractor and either sold or given to the locals depending on their resell values. Such waste may include iron sheets, timber, poles, nails, doors, windows, tiles, bricks, firewood and others. Concrete foundations shall be demolished and all concrete and aggregate waste shall be collected and disposed in designated areas in consultation with District and town planners.	campsites. Level of involvement of district authorities and town councils during demolition of structures Presence of well restored sites after demolition of structures.			
Health hazards associated with Electric and Magnetic Fields (EMF) from the conductors.	Although research has not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a believable biological mechanism by which exposure to EMF could cause disease, Exposure of EMF should be avoided. UETCL must ensure that no settlements are constructed under the power line. All settlements under the power line must be demolished and owners compensated reasonably. People must be sensitized of possible dangers from EMF and consequently evicted from the power line corridors occasionally.	Level of awareness about the effect of EMF by the people living in the vicinity of the power line. Absence of structures under the power line. Absence of structures in the Wayleaves.	10,000	UETCL District Environment Officer Town and District Planners District, , and Town Land Boards	Continuous
Disturbance and degeneration of wetland ecosystems	To minimise disturbance on wetlands ecosystems such as Mayanja wetland, Nakabugo wetland, increase spacing between towers so as to reduce the number of towers in wetlands. Maximum spanning of	Number of towers within the wetlands.	25,000	District Environment Officer	Throughout the construction period of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	towers within the wetland should be done to avoid sensitive areas and surface waters. Use low ground-pressure construction equipment during construction. Try to avoid establishing towers in the smaller wetlands. These can be skipped by adjusting tower intervals respectively. Fine tuning of tower locations will be done in consultation with local communities and WID, so that specific effects of these locations, will be minimized	Number of access roads and pattern of movement within wetlands. Level of involvement of local leaders. Presence of Wetland permits from WID.		District Natural Resource Officers. UETCL Local Environment Committees Local Council Leaders	
Child labor	All children below 18 years should not be involved as workers either directly or indirectly at all levels during the construction of 220KV power line diversion from Kawanda to Masaka.	Number of children involved in activities related to the construction of this 220KV power line	5,000	District Labor Officers District Environment Officers Community Development Officers	Continuous until the commissioning of the power line
Exploitation of workers by the contractor	All staff need to be procured under a well recognized contract. All contract workers must be paid as per the contract. All casual laborers must receive a fair days pay for a fair days work done. All workers must be paid promptly and correctly	Absence of conflicts along the sites and the corridor Absence of conflicts between the contractor and the district authorities	10,000	District Labor Officers District Environment Officers Community Development Officers	Throughout the construction period and Continuous until the commissioning of the power line
Impact on flying objects	Use special low-profile structures, or place lights or other attention-getting devices on the conductors such as lights.			EPC Contractor UETCL CCA	
Occupational Health and Safety hazards					

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
Sanitation	Sanitary facilities should be well equipped with supplies (e.g., protective creams) and employees should be encouraged to wash frequently, particularly those exposed to dust, chemicals or pathogens. All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations Periodic monitoring of workplace air contaminants relative to worker tasks and plant operations is required. Workplace air quality monitoring equipment should be well maintained Facilities must include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. Water supplied to areas of food preparation or for the purpose of personal hygiene must meet drinking water quality standards. Pre-employment and periodic medical examinations should be conducted for all personnel, and specific surveillance programs instituted for personnel potentially exposed to toxic or radioactive substances. All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations. When extraordinary protective measures are required, the employer	Presences of wash rooms for workers. Presence of adequate water for all the workers Presence of adequate safe drinking water Presence of Monthly medical records for all workers. Presence of protective equipment for workers exposed to hazards. Presence of proper toilets (Mobile) and VIP Latrines at various labour camps. Presence of adequate cleaning detergents. Presence of a medical doctor on the team of workers.	20,000	District Health Officer EPC Contractor UETCL District Environment Officer Labour Officer Community Development Officer	Continuous until the commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	shall provide appropriate and relevant health surveillance to workers prior to first exposure and at regular intervals thereafter Shield guards or guard railings should be installed at all belts, pulleys, gears and other moving parts.				
Medical examinations	Pre-employment and periodic medical examinations should be conducted for all personnel, and specific surveillance programs instituted for personnel potentially exposed to toxic or radioactive substances. All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations. When extraordinary protective measures are required, the employer shall provide appropriate and relevant health surveillance to workers prior to first exposure and at regular intervals thereafter	Evidence of medical examination of all workers prior to recruitment. Availability and usage of PPE by all workers. Presence of monthly health inspection records of all workers. Evidence of adequate medical care for vulnerable and sick workers.	15,000	District Health Officer EPC Contractor UETCL District Labour Officer District Environment Officer	Monthly until the commissioning of the power line
Prevention of mechanical injuries	Shield guards or guard railings should be installed at all belts, pulleys, gears and other moving parts. Floors should be level, even and non-skid. Heavy oscillating, rotating or alternating equipment should be located in dedicated buildings or structurally isolated sections. Appropriate shields, guards or railings must be installed and maintained to eliminate human contact with moving parts or hot and cold items.	Presence of safety guards on all moving objects. Presence of Insulators on all hot points Availability and usage of adequate PPE by all staff.	15,000	EPC Contractor District and Town Council Engineers. UETCL	Continuous until the commissioning of the power line and throughout maintenance process
Climbing towers	Employees involved in climbing towers must be provided with non-slip footwear, gloves, helmets, face protection, leggings and other necessary protective equipment	Availability and usage of adequate PPE by all staff. Presence of Hand, knee and foot	5,000	District Labour officer. EPC Contractor	Continuous until the commissioning of the power line and

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	Hand, knee and foot railings must be installed on stairs, fixed ladders, platforms, permanent and interim floor openings, loading bays, ramps etc. Openings must be sealed by gates or removable chains Covers if feasible shall be installed to protect against falling items.	railings on stairs, fixed ladders, platforms and others.		District and Town Council Engineers. UETCL	during maintenance
Prevention of falling Injuries	Elevated platforms and walkways, and stairways and ramps should be equipped with handrails, toe boards and non-slip surfaces. Hand, knee and foot railings must be installed on stairs, fixed ladders, platforms, permanent and interim floor openings, loading bays, ramps etc. Openings must be sealed by gates or removable chains Covers if feasible shall be installed to protect against falling items	Availability and usage of adequate PPE by all staff. Presence of Hand, knee and foot railings on stairs, fixed ladders, platforms and others	5,000	District Labour officer. EPC Contractor District and Town Council Engineers. UETCL	Continuous until the commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
Site Drinking Water	Water supplied to areas of food preparation or for the purpose of personal hygiene must meet drinking water quality standards.	Availability of safe drinking water. Presence of certified water tests that indicate water is fit for human consumption.	15,000	EPC contractor. Labour officer District and Town Council Health Officers Environment Officers	Weekly until the commissioning of the power line
Safety program	A safety program should be established for construction and maintenance work All employees should be provided with suitable PPE, emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre employment and scheduled periodic medical examinations. Periodic monitoring of workplace air contaminants relative to worker tasks and plant operations is required. Workplace air quality monitoring equipment should be well maintained The employer is responsible for planning, implementing and monitoring programs and systems required to ensure OHS on its premises.	Evidence that all workers underwent a thorough approach to safety management and training. Evidence and presence of well implemented and followed up safety measures at all machine centers. Evidence of a proper program on safety and precautions set.	10,000	District & Town Council Engineers. EPC contractor UETCL Labour Officers. RDCs Chief Administrative Officers District Environment Officers	Continuous until the commissioning of the power line
Protection from dust and hazardous materials	Personnel should use special footwear, masks and clothing for work in areas with high dust levels or contaminated with hazardous materials Precautions must be taken to keep the risk of exposure as low as possible. Work processes, engineering and administrative control measures must be designed, maintained and operated to avoid or minimize the release of hazardous substances to the working	Availability and usage of PPE by all workers under exposure to dust and hazardous materials. Evidence of complaints from workers.	5,000	District & Town Council Engineers. District Environment Officers UETCL EPC Contractor	Continuous until the commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	environment The employer must ensure adequate and competent supervision of the work, work practices and the appropriate use of PPE. All waste to be removed by the contractor before decommissioning				
Handling, storage and labelling of hazardous materials	All ignitable, reactive, flammable, radioactive, corrosive and toxic materials must be stored in clearly labeled containers or vessels All hazardous (reactive, flammable, radioactive, corrosive and toxic) materials must be stored in clearly labeled containers or vessels Hazardous materials must be packaged in a manner that keeps them from interacting with each other or with the environment or from being tampered with, either purposefully or otherwise. Packaging labels must comply with standards acceptable to IFC. Unless otherwise specified by national regulations, it should contain the corresponding UN number preceded by the letter "UN" on each package. All chemicals and hazardous materials present are labeled and marked according to national and internationally recognized requirements and standards International Chemical Safety Cards (ICSC), or Material Safety Data Sheets (MSDS) or equivalent data/information in an easily understood language must be readily available to exposed workers and first aid personnel. The employer must ensure adequate and competent supervision of the work, work practices and the	Presence of a hazardous material management store Presence of complaints or accidents from staff. Presence of a hazardous material management specialist.	10,000	UETCL EPC Contractor	Continuous until the commissioning of the power line

Biophysical and Social impact	Proposed Mitigation and Aspects for Monitoring	Monitoring Indicators	Proposed budget	Implementing responsibility	Time Frame
	appropriate use of PPE.				

9.2 Environment Mitigation plan

Table 9.2 below presents and Environment Mitigation Plan

Table 9.2 : Environmental Mitigation Plan

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
Land use in Forest Reserves	Incompatible land use in a designated forest reserves in Central Forest Reserves (CFR)	i. The project routing should avoid the area identified as "Strict Nature Reserve" within CFR. ii. Negotiate with private forest owners iii. Reduce the wayleave to reduce the impacts on forests iv. restrict clearing to areas of the corridor only v. Initiate an offset program with NFA where required vi. Minimize vegetation clearing vii. Instruct all construction workers to restrict clearing in the marked areas and not to harvest any forest products for personal consumption	The wayleave has been surveyed at 40m along the transmission line corridor. UETCL will negotiate with forest owners and NFA on the required offsets and compensation
Aesthetics related to a transmission line in view of ecotourism in the Forest Reserves	Presence of the transmission line might reduce aesthetic values for ecotourism and recreation in the CFRs	viii. 'Greening' the towers as required within the CFR; may require steel monopole to reduce tower footprint ix. Protect the trees outside the ROW from machinery x. Stockpile cleared should be used as brush layer	Contractor
Construction of access roads	(i) Accidents from construction vehicles (ii) Disruption of existing public or communal access routes (iii) Noise from construction vehicles (iv) Loss crops (v) Interruption to utility services	(i) Barricades to be erected along the works and proper signposting to direct users away from the construction sites (ii) Liaising with relevant utilities to obtain as-built drawings, agree construction programmes and arrange for prompt response in case of interruption to services. (iii) Restricting construction activities to working hours of the day and week and switch off engines when not in use (iv) Compensating for the damaged crops in consultation with the Government Valuer. (v) Liaising with relevant utilities to obtain as-built drawings, agree construction programmes and arrange for prompt response in case of interruption to services. (vi) Providing early warning mechanisms including regular communication of traffic	Contractor

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
	(vi) Interruption to traffic (vii) Interruption to commercial activities and/or loss of livelihoods, including social relationships (viii) Accumulation of silt and other excavated materials (ix) Destruction of flora and fauna along the access roads (x) Site clearance resulting in soil erosion and sedimentation of downstream water bodies	interruptions through the mass media and providing alternative traffic routing through diversions and properly marked safety sign-posting (vii) Informing communities about the proposed works well in time (viii) Prompt removal and disposal of excavated materials into designated disposal facility (ix) Restricting clearing to only the portion of the access road and re-vegetating the area after construction (x) Protecting the site against erosion by constructing of barriers (xi) Safe storage procedures to be instituted and keeping record thereof (xii) Removal of access roads leading to the main transmission corridor and restoration of such areas	
Air Pollution	Dust generation from opened up access routes and construction vehicles	(i) Sprinkling with water to minimise dust emission (ii) Vehicles delivering materials shall be covered to reduce spills and dust (iii) Control speed and operation of vehicles	Contractor
Threatened Fauna and Flora	(iv) Clearing of significant vegetation, areas of habitat value, habitat corridors (v) Degraded water quality on fauna and flora	(i) Protecting threatened fauna and flora by looking for an alternative access route (ii) Avoiding polluting water sources by containing pollutants (iii) Prohibit firearms along wildlife corridor, poaching, and wildlife disturbances along the construction corridor (iv) Install reflectors on towers in bird migratory corridors to reduce bird collision (v) Maintain shaded stream areas for aquatic fauna (vi) Access roads through wetlands that are not permanent should be blocked as soon as construction is complete (vii) Limit noise near fauna areas during construction (viii) Where rare animals such as the Sitatunga are present, survey to identify the exact location.	Contractor
Pollution of water sources during tower spotting	(i) Pollution of water sources resulting from soil erosion and subsequent deposition	(i) Locating of tower spots outside water bank tops (ii) A vegetated buffer will be maintained along both sides of all watercourse crossings to control friable soil particles from contaminating water in nearby rivers/wetlands (iii) Avoid placement of pylons in or immediate adjacent to river banks to reduce soil into the stream (iv) Regular maintenance of vehicles and other machinery (v) Prohibit construction vehicles from driving in waterways	Contractor

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
		(vi) Use appropriate waste management strategy for soils and liquids to control soil erosion (vii) Waste petroleum products and oils should be collected, stored, and taken to authorised disposal facilities according to NEMA regulations (viii) Provision of adequate toilet facilities on site (ix) Appropriate septic sewerage system should designed and used on site and its usage enforced on site (x) Train construction workers on site sanitation	
Social expectations and community consultations	Frustration with project works	i) Sensitisation of communities ii) Information to communities about rights to compensation iii) Provision of sufficient project information	Contractor
Compensation and Resettlement	Inadequate compensation leads to court injunctions and disputes with PAPs	i) Adequate and timely compensation to PAPs ii) Information to communities about rights to compensation Provision	UETCL
Training	Inadequate training leads to unsafe working conditions on site	(i) Organise safety, health, and environment training (ii) All sub contractors and Contractor shall attend the training	
Drainage disruption	Flooding in low lying areas	i) Earthworks should not impede drainage ii) In sections along water courses, earth and construction waste should be properly disposed in order not to block rivers and streams iii) Where it occurs, remove backfill from wetland when erection is complete iv) Install culverts or bridges for temporary and permanent roads v) Inspect works and repair failed drains appropriately	Contractor
Drilling Excavation and Levelling	(i) Compacting of soils by heavy trucks (ii) Erosion of spoil and subsequent pollution of water sources (iii) Dust erosion during drilling and transportation of spoil	(i) Using existing tracks or roads where possible (ii) Back filling of top soil excavated from tower spot to reduce drainage impediment during erosion (iii) In wetlands and other ecological sensitive areas, use of laterite imported from other sites to avoid blocking water movement will be encouraged (iv) In wetlands, install appropriate culverts to reduce water impediment between upper and lower areas (v) Movement of vehicles will be restricted in agricultural areas to prevent sub soil compaction during wet seasons (vi) Restoration of any damages will be carried out as soon as tower spotting work is complete (vii) Protect stockpiles of friable material subject to blowing wind by wetting, or with a barrier of vegetation	Contractor

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
		(viii) Covering loads of friable material during transportation; (ix) Watering of roadways to reduce dust when necessary, or use biodegradable (e.g. lignin-based) road sealing compounds (x) Restricting vehicle speed on loose surface roads, to 20 km/h during dry or dusty conditions (xi) Dispose excavated material from substation areas and tower spots in approved areas (no dumping in nearby wetlands)	
Soil erosion &slope instability	Flooding	(i) Install erosion and sedimentation control structures (ii) Avoid access roads along steep slopes (iii) After construction, soil should be levelled off, stabilised for vegetation growth (iv) Limit vegetation clearing on steep slopes (v) Ensure top soil is left in non compacted condition after completion of works; re-vegetation (vi) Where topsoil is eroded on steep slopes, river banks, all exposed soils should be rehabilitated (vii) Strip and save all available topsoil from the ROW and all ancillary sites, including borrow pit areas and re-use it for site rehabilitation	Contractor
Vehicular Emissions from drilling trucks	Air, soil, and water pollution	(i) Routine maintenance of construction equipment in good running condition (ii) Use of well maintained vehicles to avoid smoky conditions (iii) Enforcement of vehicle load restrictions to avoid excess emissions from engine (iv) Switching off engines when not in use	Contractor
Health and Safety Issues		(i) Prepare health and safety plan (ii) Educate and sensitize employees on HIV/AIDS and STDs (iii) Use of child labour prohibited (iv) Contractor should adhere to the national and international labour legislation (v) Adequate use of PPE (vi) Provision of first aid boxes on all sites (vii) Adequate use of warning signs	Contractor
Waste accumulation and burning	Smoke from Waste and cleared vegetation around Forested wayleaves	i) Avoid burning of woody debris and constructing waste ii) Chop Slashed vegetation should be chopped and left as mulch iii) Disposing of other waste in municipal landfills with permission from Local Municipal	Contractor

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
		Authority iv) Implement the waste management plan	
Climbing and Electrocution	electrocution	i) All towers shall be fitted with warning signs, anti climbing devices, and fencing sub stations	Contractor
Clearance approvals and borrow pit permits		i) Only licensed quarries and sand supplies shall be used ii) Obtain written permission for borrow pit operation from landowners iii) Adhere to all permit conditions	Contractor
Noise from vehicles and drilling equipment	High levels of noise in the neighbouring communities	(i) Notification to local council and neighbours about drilling schedules on site (ii) All internal combustion equipment will have properly functioning silencers or mufflers (iii) Restricting noise generating activities that take place near residential or sensitive institutional receptors to day time (i) Scheduling noisy activities near institutions and homes (ii) Regularly servicing the vehicles and equipment. (iii) Operating vehicles only during working hours, (iv) Avoiding leaving vehicles idling	Contractor
Poor storage of lubricants, solvents, fuels, & oils	Pollution of soil and water	(i) Fuels, lubricants, and oils should be stored in containment system for spills control and recycling (ii) Storage areas should be designed such that they will contain 110% of the largest container/vessel stored in the storage area; (iii) Collecting and storing of waste oil for correction and subsequent disposal (iv) Train drilling staff about proper use and disposal of fuels, lubricants, and oils to ensure zero contamination on site (v) Temporary on-site storage of recyclable waste	Contractor
Clearing wetlands in the proposed corridor	(i) Clearing of wetland vegetation and loss of habitat for wetland fauna and flora including the National Bird; the Crested Crane (ii) Birds could collide with the transmission lines and large birds could be electrocuted	(i) Properly design and site of tower pads to minimise loss of wetland vegetation (ii) Design and attach reflectors on transmission lines at intervals within all wetlands crossing points to minimise bird strikes (iii) Site tower pads from main water flow channels within wetland (iv) Channels or culverts to be constructed to allow flow across the murram bund (v) Avoid construction of the transmission lines through the wetlands and span wetlands where possible (vi) Where it is not possible to avoid wetlands, the use of mats and wide-track vehicles when crossing wetlands (vii) Use existing roads for construction purposes	Contractor

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
	(iii) Murram bunds will have to be constructed and might impede water flow		
Acquisition of land for the construction of access roads	(i) Failure to implement compensation leads to denial of access	(i) Work hand in hand with UETCL to record all site complaints related to RAP implementation (ii) Implement all RAP complaints in accordance with UETCL instructions	Contractor
Visibility of tower and conductors	Change in aesthetics of the area	(i) Straight-line runs should be maximised to reduce the need for angle towers during tower spotting (ii) The new line should be located adjacent to existing power lines (iii) The new towers should l be located adjacent to existing towers to minimise visual "clutter" (iv) Existing tracks should be used for survey and drilling activities as much as possible; (v) Where a transmission line runs across a ridge, locate the access track should be located off or across the line to avoid accentuating the route (vi) All temporary construction works, such as borrow pits and contractor's yards, should be restored upon completion (vii) Wayleave should be managed by planting vegetative screens to block views of the line, leaving the wayleave in the natural state at road crossings, creating curved or wavy wayleave boundaries, pruning trees to create a feathered effect, and screening and piling brush from the cleared wayleave to provide wildlife habitat (viii) Replant indigenous trees in areas where vegetation is unnecessarily removed. Short flora and trees will be retained (ix) Landscaping all disturbed areas should be undertaken	Contractor
Solid waste accumulation and poor disposal	Disposal of solid waste and visual impacts	(i) Implement the Solid Waste Management Plan in this document (ii) Waste management training for employees should be carried out (iii) Identification of suitable site for waste disposal in consultation with local authority should be done (iv) In case of burning, only dry clean-burning material should be burnt on site (v) Site material remaining after drilling and way leaves clearance should be sold to public at a fee	Contractor
Archaeological Chance find	Tampering with cultural heritage and beliefs	(i) Any signs of archaeological chance found should be reported to the client and to the department of antiquities immediately (ii) Any graves and cultural sites within the corridor should be notified to UETCL for adequate relocation in accordance with RAP plan	Contractor/UETCL

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
Employment	Local communities may be deprived of employment opportunities	(i) Local authorities should identify local people for non technical work (casual labour) will be encouraged (ii) Investigate the local, regional, and national capacity to supply construction materials, goods, and services to ensure the Contractor to purchase locally	Contractor/LC
Public Health problems from construction sites and imported and labour	Construction activities may attract prostitution, lead to poor sanitation and personal hygiene	(i) Adequate sanitary facilities should be provided at construction sites and offices (ii) Where possible, the number of imported labourers should be minimized, and the use of local labour encouraged. Where not possible, provision of transport for workers from town in the morning and evening hours while carrying out project site activities should be done (iii) Labourers should adhere to basic rules with regard to protection of public health, including most importantly hygiene and disease (HIV) prevention. (iv) Sensitization about HIV/AIDS should be done in the camps and condoms should be supplied. (v) There should be no smoking at work place.	Contractor
Health and safety	Accidents arising from collisions with equipment on site	(i) Personal protection equipment should be provided by the contractor and used by employees. (ii) Hearing protection equipment should be used when working under noisy conditions. (iii) Adequate medical testing and insurance for all employees should be carried out. (iv) Adequate health and safety training of all employees, including training on specific procedures as appropriate to various individual staff groups should be carried out. (v) Medical emergency evacuation plans for different types of incidents and injuries that might occur should be put in place. (vi) Provision of adequate sanitary facilities at construction sites. (vii) Procedures for working with heavy equipment should be put in place. (viii) Procedures for working on and along traffic roads should be put in place. (ix) Procedures for heavy lifting should be put in place. (x) Basic rules with regard to protection of public health, including most importantly hygiene and disease (HIV) prevention should be put in place and enforced. (xi) Site access warning signs for the public should be installed at points within the line corridor to ensure that the public is adequately protected (xii) Demarcation of any excavation areas to restrict entry to prevent accidents when construction not in progress should be done	Contractor

Issue/Impact	Impact	Mitigation Measures	Status/Responsibility
		(xiii) Training of workers in OSH should be done	
Poor Traffic Management	Risk of traffic related accidents	(i) There should be proper parking and on-site traffic movement; minimize road safety hazard and inconvenience to others road users (ii) There should be proper training and testing of heavy equipment (iii) Project buses to transport workers (iv) Equipment and vehicles should be properly maintained (v) Load restrictions should be put in place (vi) Speed limits should be enforced and speed humps put in sensitive places (vii) There should be compliance with all relevant Applicable Laws. (viii) Installation of electric cables over roads and railways should be done during non peak traffic times to reduce pedestrian, cycle, car and rail inconvenience. Schedules should be followed strictly	Contractor
Access roads	Disruption of traffic at access points to access roads	(i) Connection of any upgraded or new access roads to the public highway network should be done in consultation with local authority (ii) Installation of speed limiting structures such as such as speed humps, road signs, warnings, with approval form works ministry, should be done (iii) Damage to structures and road surfaces caused during construction activities should be repaired (iv) Removal of access roads in wetlands	Contractor
Risks, hazards, security		i) Erect warning signs to avoid risks from moving vehicles ii) Erect appropriate number of lightening arrestors	
Electromagnetic fields		i) The line should be designed to ensure that EMF levels are well below acceptable guidelines within the OSH exposure limits ii) To minimise exposure, limit schools and school buildings within the ROW iii) Incorporated the ground wire on top of the line during design to arrest the lightening ions	
Increased population and workforce management		i) Liaise with local communities regarding proposed construction activities ii) Employ residents in the unskilled category iii) Ensure workers act responsibly in the community and do not take personal resources, harvest forest products and wildlife iv) Ensure minimal burning at site	

9.3 Environmental monitoring programme

The general approach to effects of monitoring is to compare the pre- and post- project situations, measuring relevant environmental impacts against baseline conditions. Baseline data establish a reference basis for managing environmental impacts throughout the life of the project. Monitoring process will therefore to be introduced to check progress and the resultant effects on the environment as the construction of building proceeds.

The Contractor and UETCL will undertake the necessary monitoring measures for short- and long-term monitoring programme respectively. However, during monitoring close links should be maintained with other relevant lead agencies.

Much of the work during the construction stage can form part of the contractor's routine inspection activities that will be included in construction contract. The planned mitigation measures indicated in 5.1 should, therefore, be included on the list of contractual items. These should be planned and checked against their effectiveness in reducing the negative impacts/or enhancing the benefits identified in this report.

The process should also include regular reviews of the impacts that cannot be contemplated at the time of doing this Environment Impact Assessment. Action shall be taken in response to the unforeseen changes and subsequently scale up the mitigation and monitoring measures. Monitoring should undertake appropriate new actions to mitigate any negative effects.

To achieve this, a two-stage programme is proposed:

i) Stage I Short-term monitoring programme
ii) Stage II Long-term monitoring Programme

The issues to monitor may include the following:

- Monitoring and supervision of the excavations for tower locations
- Forestation of new land and regeneration of opened up areas
- Monitoring of traffic safety;
- Monitoring the fate of solid waste/debris disposal and other wastes after they have left the site.
- Monitoring resettlement of families
- Monitoring compensation for land, crops, trees, structures etc
- Monitoring of livelihood of displaced persons
- Relocate of water sources
- Water quality

- Behavioural changes
- Occupational health

  The social and Environment Action plan (SEAP) will be prepared by UETCL and handed over to the prospective contractor during bidding. The contractor will review the SEAP document and adopt it for implementation. In addition, the contractor will be required to indicate the financial and human resource for implementation.

Short -Term Environmental Monitoring programme

This programme is aimed at monitoring environmental impacts that will last up to end of construction period. These are:

- Activities associated with planning including resettlement and compensation which are mainly undertaken by the developer (UETCL).
- Actual construction activities which are mainly under taken by the Contractor.

On completion of the ESIA, some activities must be undertaken, and these include but not limited to: Preparation of tender documents that should include environmental issues as identified in this report; these should emphasize that most activities related to implementation of the mitigation measures should be undertaken by contractor since he is a major player in this phase.

Once implementation begins, monitoring also starts. The Contractor (SEO) will carry out daily and weekly readings and assessments which are filled in a form and submits to the Consultant (Environmental specialist – ES) monthly. The Consultant (ES) will work on behalf of the Developer (UETCL) who has the overall environmental responsibility of his project. ES will make regular visits to the site once or twice a month, to cross- check with what has been put down in the forms by the contractor. The ES will make Quarterly reports to be submitted to the NEMA/DEO and the Client.

A mid-term review of environmental issues scheduled at the midpoint of the contract is recommended. This will have the objective of reviewing environmental monitoring and management activities as well as making recommendations for long-term environmental monitoring requirements.

An overall short-term monitoring report should be submitted to DEO, Client and NEMA at the end of the liability period.

Long-term environmental monitoring Programme

This involves long term monitoring and action programme during operation and maintenance of building. Some of the issues will need to be monitored beyond liability period as will have been recommended in the mid-term review or by the Consultant and the compliance team. These issues may include

- Water flow; monitoring flow of water will continue for about 1 year after construction.
- Monitoring of maintenance of the new plantations to replace the forests affected until about 5 years when fast glowing trees are ready for harvesting
- Livelihood; income restoration will have to be monitored beyond liability period because it is a slow process and may require about 5 years to get positive results.

The programme should be drawn in the light of the success of inter-agency cooperation and ensure that there is a suitable master plan which is well coordinated with plans of other organisations.

The first long-term monitoring report is proposed to be submitted 1 year after liability period. A yearly report will be required and an overall long term monitoring report should be submitted at end of 5 years after construction. An environmental Audit shall be carried on completion of the project and before commissioning to verify compliance with the mitigation measures recommended and if the contractor has complied with his Environment Management Plan. Table 9.3 below presents an environment monitoring plan.

9.3 Environmental Monitoring plan

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
Pre-Construction Phase						
1. Archaeological sites.	Prevention of damage or destruction to cultural resource during construction.	Tower locations where the foundations will be excavated and the substation construction footprint.	Pre-construction	- The Contractor will ensure that cultural sites likely to be disturbed during construction will be examined by an archaeologist and reported to the Department of Antiquities, who will advise on measures to be taken to ensure their preservation.	Contractor	5,000
3. Noise from vehicles and trucks	Nuisance or excessive noise	Adjacent to wayleave and substations.	Pre construction	Collect base line ambient noise measurements	Contractor	12,000
5. Construction of access roads	Health, Safety and environment	Along wayleave and routes to wayleave	During construction	Ensure the Contractor and its subcontractors abide by the Health, Safety and Environment management Plan and the Traffic Management Plan	Contractor	15,000
6. Air dust pollution	Environmental Quality	Emissions from dusty Roads	During construction and post construction	Sprinkle with water to minimise dust emission	Contractor	20,000
7. Waste disposal and handling of hazardous materials during operations.	Health, safety and environment	Wayleave and at substations	Periodic depending on activity	Contractor should comply with relevant Ugandan regulations for waste disposal and handling of materials defined as hazardous waste and as outlined in the respective management plans.	Contractor	10,000
8. Work safety and	Worker safety.	Wayleave rights of way	Periodic	Ensure EPC Contractor	Contractor	40,000

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
health effects during operations.		and at substations.	depending on activity	compliance with relevant Ugandan safety and occupational health requirements as indicated in the Health and Safety Management Plan.		
9. Accidental contact with lines.	Public safety	Along wayleave and substations.	Periodic depending on activity	EPC Contractor to ensure warning signs posted with appropriate text and graphics. Educational programmes in schools and communities to educate people of hazards and safe practices when playing and working near high voltage power lines.	Contractor	5,000
10. Climbing and Electrocution Risk	Public and workers safety	All transmission towers and substation sites	Periodic depending on activity. Annual during Operations.	Ensuring that all towers are fitted with warning signs and anti-climbing devices. Sub-stations to be fenced.	Contractor	10,000
11. Hydrological function of wetlands	Normal functioning of the wetland	Wetlands	Periodic depending on activity	Visual inspection and water quality assessment.	Contractor	20,000
12. Watercourse crossings and erosion susceptible areas	Successful rehabilitation	Steep slopes and watercourses along wayleave rights of way.	Annual and Prior to Construction Completion Certificate	Visual inspection and water quality assessment.	Contractor	10,000
13. Agricultural soils.	Successful rehabilitation of agricultural soils.	Agricultural areas along wayleave rights of way and substations.	Annual and Prior to Completion	Visual inspection of crop and soils by agronomist.	Contractor	10,000
14. Loss of trees and vegetation in particular through	Ensure reestablishment of vegetation and	CFRs and other designated natural areas traversed along	Annual	Visual inspection by forestry expert	Contractor	10,000

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
CFRs.	success of re-plantings by UETCL through the CFRs or other designated areas.	wayleave rights of way				
15. Planting programme in CFRs along wayleave.	Ensure successful re-plantings through CFRs and other designated areas.	CFRs traversed along wayleave rights of way and other designated areas.	Annual	Visual inspection by forestry expert	Contractor	500,000
16. Wildlife in CFR	Monitor recovery of amphibians and reptiles.	CFR adjacent to wayleave	Annual	Visual inspection by biologist	Contractor	10,000
17. Birds in seasonal wetlands.	To assess success of conductor reflectors in preventing bird mortality	In wetlands and other seasonal wetlands.	Annually for 2 years post construction during breeding bird season.	Visual inspection by a wetland ecologist/ ornithologist	Contractor	10,000
18. Pollution of water sources	To minimise pollution of water sources resulting from soil erosion and subsequent deposition	Water courses along the wayleave	During construction and post construction	Water quality assessment	Contractor	10,000
19. Excavation and Levelling	To minimise soil Erosion and compaction	Construction activities along a wayleave and access roads	During construction	Visual Inspection	Contractor	100,000
20. Vehicular Emissions from vehicles and trucks	To minimise air, soil and water pollution	Construction activities along a wayleave	During construction	Visual Inspection	Contractor	15,000
21. Poor storage of lubricants, solvents, fuels, & oils	To avoid pollution of soil and water	Storage sites	During construction	Visual Inspection	Contractor	20,000

Parameter to be Monitored	Reason for Monitoring	Monitoring Location	Timing	Monitoring Method	Responsibility	Budget EST. (USD)
22. Clearing part of wetlands along the proposed corridor	To minimise loss of fauna and flora and abstraction of water flow	wetlands in the proposed corridor	During construction	Visual Inspection	Contractor	15,000
23. Visibility of tower and conductors	Change in aesthetics of the area	Wayleave	During and post construction	Visual Inspection	Contractor	10,000
24. Employment	Local communities may be deprived of employment opportunities	Project sites	During construction	Inspection of employment records	Contractor	5,000
25. Public Health problems from construction sites and imported and labour	To minimise incidences prostitution, lead to poor sanitation and personal hygiene	Project sites	During construction	Visual inspection and interviews	Contractor	10,000
26. Health and safety	Accidents that may arise from collisions with equipment on site	Project sites	During construction	Incident reports and interviews	Contractor	10,000
27. Poor Traffic Management	To minimise accidents	Project sites	During construction	Incident reports and interviews	Contractor	20,000
Total						**902,000**

10 CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

The ESIA team recommends that the project should with the following recommendations;

(a) Conduct and implement pre-construction phase mitigation measures include;

- Sensitization of the affected community
- Planning and co-ordination with local authority
- Involving District Environment Officers and Community
- Development Officers

(b) Prepare a Resettlement Action Plan on which actual compensation and resettlement shall be based. This will include:

- Socio-economic Survey of the people who have either been displaced, lost property including land, crops as well as loss of income due to change in business premises {Directly Project Affected Persons};
- Cadastral Survey of the individual peoples' portions of land to be acquired by the project;
- Property Valuation.

(c) During construction phase, the following general mitigation measures should be undertaken and will include but not limited to the following:

- Minimize displacement and impacts on property
- Ensure employment opportunities for the local people
- Ensure health and safety for both workers and the public
- Control reduction of biodiversity

The management and monitoring plan should be attached as a condition of the Kawanda- Masaka 220 kV construction contract so as to make the contractor aware of his environmental obligation before securing the contract and enhance the implementation of the EMP. Overall; this will enhance environmental standards in the whole project.

In case of any archaeological finds during excavation, these should be reported and handed over to the Department of Antiquities in the Ministry of Tourism, Trade and Industry for further follow up.

Provide incentives for resettlement so that the involuntary resettlement turns out to be voluntary for example giving land to displaced persons with secure land tenure. (E.g. titled land)

It is also imperative that UETCL puts in place an institutional arrangement sorely responsible for environmental issues in both planning and project implementation for the present and future projects.

The main conclusion of the Environment Impact Assessment is that there are no significant environmental obstacles to development of this project if the proposed mitigation measures have been implemented. The proposed construction of Kawanda-Masaka 220 kV is therefore a viable undertaking.

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12 APPENDICES

12.1 Appendix 1: Details of stake holder consultations

Interview 1: Held with the Chairman LC I Ssenge village

		Name	Designation
		Mr. Walakira Robert	Chairman LC I Ssenge Village
Purpose of meeting:		To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:		25th September 2010, at his home	
Present:		Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson	
Responses to issues raised by consultant (quoted verbatim)			
1	About the project	We first had community meetings UETCL later sent the surveyors and they surveyed all people's property At the moments, people have no grievances	

Interview 2: Held with Mr. Mayanja Freddie

		Name	Designation
		Mr. Mayanja Freddie	Resident Kayunga village and affected
Purpose of meeting:		To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:		25th September 2010, at his home	
Present:		Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson	
Responses to issues raised by consultant (quoted verbatim)			
1	About the project	I have been informed of the project but I am not always here, so I don't know the progress I am told people filled some forms but I haven't seen them here. I am also told that some people contracted to do this work came though I don't know the company in which they came from.	
2	About the survey	I didn't meet the surveyors but they came and met someone else.	
3	Worries	It's true I have some worries because I really need to be sure of the whole process. I tried to the chairman LC I but I couldn't get him. My other big worry is that they may value my property and by the time they pay us, it has appreciated, so won't I be cheated?	
4	His expectation	I expect everything to be done according to a certain arrangement and procedure. I expected the ESIA team to come first, then the surveyors, LC meetings and others in that protocol but I am not aware of the procedure now!	
5	Issue of time allowed	How much time UETCL give us to prepare? He asked I got information from my colleagues that they may value property and take long before payment or any form of settlement which will not give us ample time to prepare	
6	Final remarks	I would ask whoever is concerned to bring everything to the light so that we are educated about the whole process and how it will be managed.	

Interview 3: Held with Mr. Kiconco Patrick

		Name	**Designation**
		Mr. Kiconco Patrick	Resident Kawoko Village
Purpose of meeting:		To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:		25th September 2010, at his home	
Present:		Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson Nakabugo Safra Barbra Mabutiiti	
Responses to issues raised by consultant (quoted verbatim)			
1	About the project	I know about the project and I have even attended a community meeting. I am not the owner of this home but I represent the owner	
2	About the survey	They first came demarcating the area and the second group came measuring and taking pictures.	
3	Community meetings	It was after one of the groups was chased away by some people with pangas/machetes that they decided to call a community meeting. The land owner was not around to attend but I went there on his behalf.	
4	Any grievances?	Yes like many other people, my boss is not happy with the situation and he is complaining.	

Interview 4: Held with Ms. Mary Resty Nasuuna

		Name	**Designation**
		Ms. Mary Resty Nasuuna	Resident Kigoma Village
Purpose of meeting:		To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:		25th September 2010, at her home	
Present:		Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson Mr. Kizito david (son)	
Responses to issues raised by consultant (quoted verbatim)			
1	About the project	We just hear about it.	
2	About the survey	Some people just came and we saw them inspecting our land. They never informed us.	
3	Community meetings	The people who were inspecting our land informed us that the community meeting would be called but that hasn't happened. I may say there is no sensitisation that has been done yet.	
4	Met any other group?	Yes a group of especially women came and talked to me. They even gave me forms to fill and I filled them.	
5	Final remarks	I could have got a chance to be educated by the group of especially women but many others don't know what is going on. So there is need for clarification.	

Interview 5: Held with Ms. Avutya Consolate

		Name	Designation
		Ms. Avutya Conslate	Resident Kigoma Village
Purpose of meeting:		To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:		25th September 2010, at her home	
Present:		Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson	
Responses to issues raised by consultant (quoted verbatim)			
1	About the project	I know about the project because I have met some people on the same issue.	
2	About the survey	They came here and took measurements like the house but they didn't tell us about the valuation amounts.	
3	Community meetings	They told us that there will be a village/community meeting in the trading centre on 29th of September 2010.	
4	Worries	They told us not to dig in the demarcated area and we do not know how long this will take. This of course affects our day to day work.	
5	Final remarks	We need to be educated on the whole process so that we know what follows what and when.	

Interview 6: Held with Mr. Mubiri Jackson

		Name	Designation
		Ms. Mubiri Jackson	Resident Kagaba Village
Purpose of meeting:		To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:		25th September 2010, at his home	
Present:		Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson	
Responses to issues raised by consultant (quoted verbatim)			
1	About the progress	We held a community meeting but they haven't surveyed and measured the property.	
2	Community awareness	The community was informed about the project and they taught them during the meeting, so they are aware.	
3	Work progress	They have not yet specifically established where the line will pass but we were told that a team will come identifying the exact routes and another one taking pictures and addressing people's complaints.	

Interview 7: Held with Chief Administrator Officer, NSSF

	Name	Designation
	Mr. George Kyarikunda	**Chief Administrator Officer, NSSF**
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	06th October 2010, at his Office	
Present:	Mr. Tumusiime Alfred (OPEP Consult Ltd) Mr. Arinaitwe Johnson	

Responses to issues raised by consultant (quoted verbatim)	
General remarks	We don't want the line to pass through our estate. I will send this letter to the Manager for attention and you will receive the response. We shall officially write to UETCL about the matter. You see Temangalo is a very sensitive area and we would want the issue very well handled. We are not adamant though, we would like development but it should be in amicable way. Finally I can say we shall debate about it and notify you officially.

Interview 8: Held with Environment Officer Wakiso District

	Name	**Designation**
	Ms. Nakafero Anne	Environment Officer Wakiso district
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	08th September 2010, at her home	
Present:	Mr. Arinaitwe Johnson Ms. Takali Sylivia	
Responses to issues raised by consultant (quoted verbatim)		
Comments	I would want to tour the stretch and look at the features at stake and make a proper assessment. You never know there may be some area where the district wants to put up some project and it's hard to relocate, so I would need to know all about it. I wound want UETCL also to handle the whole resettlement process in an acceptable manner. Compensation and re-location should be well handled. I would also want to know the details on how much pylons will be laid in each wetland and how they would be raised. All in all, I would want to tour the area to get the real picture about the project.	

Interview 9: Held with the Chief Administrative Officer (CAO) Wakiso District

	Name	**Designation**
	Mr. Joseph Mukwaya	CAO Wakiso district
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	08th September 2010, at his home	
Present:	Mr. Arinaitwe Johnson Ms. Takali Sylivia	
Responses to issues raised by consultant (quoted verbatim)		
Comments	It is welcome exercise by the government. I believe the Ugandan population will benefit in one way or the other and their income will be boosted. We need to increase the energy in the country and this is the way to go. I would want to see that whoever person affected is adequately compensated. As the district, we shall work with the government to ensure that the project is in place and implemented as per the legislation and that all people affected are given due consideration.	

Interview 10: Held with the Assistant District Engineer Wakiso District

	Name	**Designation**
	Mr. Sendinde Ismael	Assistant District Engineer Wakiso district
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	08th September 2010, at his home	
Present:	Mr. Arinaitwe Johnson Ms. Takali Sylivia	
Responses to issues raised by consultant (quoted verbatim)		
Comments	Our problems would be putting up pylons within the UNRA gazetted area (close to roads). I otherwise believe all the engineering aspects should be handled by recommended engineers and approved and technically we will have no problems. I still believe surveys have been made and all obstacles identified for consideration. So all the project should be as per plan. Any roads in the corridor: All the roads we are working on already exist and I believe none is proposed to pass through this corridor. Finally: when the draft report about the project showing the upcoming bridges if any, roads connection, kind of foundations for pylons e.t.c comes up, we shall be in position to give an informed engineering guidance where we can.	

Interview 11: Held with the Cartographer Wakiso District

	Name	**Designation**
	Mr. Ojera Venansio	Cartographer Wakiso district
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	08th September 2010, at his home	
Present:	Mr. Arinaitwe Johnson Ms. Takali Sylivia	
Responses to issues raised by consultant (quoted verbatim)		
Comments	UETCL should assess the property that will be affected and who is affected and compensate accordingly. If the land remaining after 40m corridor is very small, then UETCL will have to take the plots title. The land and other property value differ and all that has to be put in consideration when valuing people's property. There I great need for sensitisation to the masses since this involves re-location and payment. UETCL will have to submit the property findings and we determine the property ownership. Our role will be to work with the surveyors in field and Valuers to determine the ownership of property and its value.	

Interview 12: Held with Wakiso District Natural Resources Officer

	Name	**Designation**
	Ms. Rebecca Sabaganzi	Natural Resources Officer Wakiso district
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	08th September 2010, at her home	

Present:	Mr. Arinaitwe Johnson Ms. Takali Sylivia

Responses to issues raised by consultant (quoted verbatim)

Comments	Previous activity: UETCL filled the wetland in Kawanda for access road and we requested them to restore the place, the thing they have so far failed to do. That already has set a bad precedence and the communities blame us for non compliance. Sensitisation: There is need for massive sensitisation of the communities on all social impacts like resettlement through all the available media like TVs, Newspapers, Radios, e.t.c. The community needs to know what is happening and why. Tree cutting: They should desist from the habit of cutting down young (immature) trees. That demeans the plants system. They (UETCL) should therefore find a way to address it during the power line construction either by insulating or trimming them. There is need to devise means and methods of having the trees and power lines co-existing. Development: Development is acceptable but we need to come up with a balanced development where no biodiversity is compromised. Other sources of energy: My appeal is that the Ministry of Energy and UETCL should try and harness other sources of energy like Wind, Solar, use of Garbage, and the like to supplement hydro power and reduce on the environmental degradation. Appeal: I would want to call on whoever is involved in this project implementation to try and minimise the wetlands loss and destruction as much as they really can. Protection of corridor boundaries: They should demarcate the corridor boundaries with an acceptable tree species and then allow the local people utilise the space outside the right of way within limits to avoid future confusion as people claim this space since at times corridor checking by UETCL is periodic and not so short. UETCL should allow people utilise the space with full information about the extent of use for non perennial crops.

Interview 13: Held with Wakiso District Senior Community Development Officer

	Name	**Designation**
	Mr. Sekagiri Frank	Senior Community Development Officer
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	11th Octobers 2010, at his home	
Present:	Mr. Arinaitwe Johnson Ms. Takali Sylivia	

Responses to issues raised by consultant (quoted verbatim)

1	About social concerns	Our major concern is on the social impacts on people's livelihood as a result of displacement. People have been lived in their places for a long time and even have burial grounds there. Therefore we are concerned about the tremor associated with such displacements.
2	Valuation	We have information that there is undervaluation of people's property (example from the previous abandoned Nansana line) and I am worried it may be the case with this diversion. So UETCL and other stakeholders need to protect the local members who are affected from such exploitation. Similarly valuation team at times refers to the Local Government rates which are no longer relevant to the current valuation rates.
3	About re-location	Most people who are relocated are sometimes settled on different land tenure system. For example one leaves a lease hold land and ends up on Kabaka's land.
4	Coordination among Offices	Most NGOs hired to do such kind of process are not good enough to handle community issues. Besides they are never available and reachable to answer people's complaints and

		at the end they come to our offices. Those NGOs normally involve our offices for some short time and later ignore us completely.
5	Project schedule	Projects take longer than expected to be implemented and this leaves people uncertain of their future. In most cases people are stopped from using the affected plots even when no compensation has taken Place. This affects their daily running of activities and their incomes also.
6	CDO involvement	The CDO is not directly involved in supervision unless called upon by the project implementers in this case UETCL. They only involve us when they feel they should and that's all.
7	Final Remarks	I want UETCL to involve our offices and other local Government offices where possible at all levels to work alongside the NGOs since the community finally runs to us in case things go wrong. NGOs should also work with the existing government structures

Interview 14: Held with Director National Agriculture Research Laboratories (NARL)-Kawanda

	Name	**Designation**
	Dr. Ambrose Agona	Director NARL-Kawanda
Purpose of meeting:	To obtain comments and input concerning the proposed Kawanda-Masaka 220KV power line diversion	
Date Held & Place:	11th Octobers 2010, at his home	
Present:	Ms. Justine Waibale (Human Resource and Administration Officer-NARO) Mr. Arinaitwe Johnson Ms. Takali Sylivia	

Responses to issues raised by consultant (quoted verbatim)

1	About the project	We have officially been notified by UETCL about it. Surveyors mapped the area and valuation is on going. We have given them the mandate to go ahead but we are still in negotiations for some issues.
2	Who to compensate	They will compensate National agriculture Research Organisation (NARO)
3	Access to UETCL lines	We wish to caution UETCL that freedom of access to their sites any time should not compromise our activities and eventually our security. We of recent found a fence broken down for which we reliably believe they are responsible and we brought it to their attention but they have not acted.
4	Issues	They have not been consulting people about the project and therefore most people are not reliably informed of the proceedings of the project.
5	EMF Radiations and exposure effects	I know people are free to utilise the Wayleave and of course they will use the bordering plots, but my concern is; what are the long term effects of these radiations to such people and the public in general? I would want to have information about this issue so that we can truck changes over time.
6	Baseline information	I want to have a copy of the current baseline of the area so that we can easily monitor changes over time.
7	Final Remarks	I have no problem with project implementation but it shouldn't compromise our activities. Besides, I want to have a copy of the ESIA report so that UETCL is accountable for whatever issues that won't conform to the recommendations.

Interview 15: Held with the Chief administrative officer (CAO)-Mpigi district

		Name	**Designation**
		Mrs. Nabirye Fiida	Chief Administrative Officer, Mpigi district
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		8th/10/2010, At her office at Mpigi District Local Government	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mrs. Nabirye Fiida, CAO Mpigi district	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the affected people	The community needs to be sensitized about all the procedures for compensation. It is important to show us the lists for the people who are going to be displaced and if possible show us the amount of money you are going to pay them. You need to be transparent so that we can also easily work with you because in case the affected people are not fairly treated, they come directly to us. The affected People should be told the procedure of compensation and where to go in case they want to claim for their money.	
2	Other related project in the district	We have a road construction project in the district and it is also displacing many people.	
3	Involvement into the project	We are not directly involved in such projects but the District Environmental Officer and the District Engineer are directly involved.	

Interview 16: Held with the Natural Resources / Forestry Officer, Mpigi District

		Name	**Designation**
		Mr. Polly Birakwate	Natural Resources/ Forestry Officer, Mpigi district
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		8th/10/2010, At his Office in Mpigi	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Polly Birakwate, Natural resources/ Forestry officer	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the affected community	The affected people need to be well compensated to avoid conflicts in future. The affected people need to be sensitized about the ongoing project and the procedure of compensation.	
2	About forest reserves	The 40m width corridor for the transmission line is very big and when it passes through some of our small forest reserves it affects them so much. Most of the affected forests belong to NFA. For us we deal with local forest reserves of which non- will be affected by that project. You need to consult NFA about that issue. When ETCL follows the right procedure, we have no problem with the project since we also need development.	

Interview 17: Held with the District Staff Surveyor-Mpigi District

		Name	**Designation**
		Mr. Ssemugabi Shadrack	District staff Surveyor-Mpigi district
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		11th/10/2010, At his office	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Ssemugabi Shadrack, District staff Surveyor	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the land	As the lands department, we need a map showing all the affected plots. As long as UETCL contracted registered reputable surveyors, we shall back them up and provide all the information they will require. I can only do the monitoring if UETCL facilitates me. There are always conflicts concerning land but as long as you use professional people to carry out the valuation, then nothing can stop the project progress.	
2	About sensitization of the community	The RDC and the lands department will need to go and sensitize the affected people about the project and encourage them to be strong since they will be compensated. If the sensitization is going on well without any objection, then the RDC and the lands department will come in later.	

Interview 18: Held with the Environment Officer-Mpigi district

		Name	**Designation**
		Mrs. Nsereko Patience	Environmental officer-Mpigi district
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		11th/10/2010, At her office	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mrs. Nsereko Patience, Environmental officer-Mpigi district	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the project	All UETCL contractors should work closely with the local leaders to avoid conflicts. The areas where the power line is passing are not densely populated may be schools so it is a bit favourable for the project. We have not encountered serious problems with the previous power line projects	
2	About wetlands	While working in wetlands, measures should be put in place to ensure that the hydrology of the wetland is not interrupted both in the short run and in the long run.	
3	Project monitoring	We are supposed to be working closely with the contractors but in most cases, the developers do not facilitate us and we cannot depend on government funds since they are irregular. I encourage the developers to always put aside funds which are meant for the Environmental officers to monitor the project at different stages	

Interview 19: Held with the Deputy RDC- Mpigi district

	Name	**Designation**
	Mrs. Namujumbi Takia	Deputy RDC- Mpigi district
Purpose of meeting	To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place	11th/10/2010, At her office	
Present	Arinitwe Johnson, Consultant Takali Sylivia, consultant	

		Mrs. Namujumbi Takia, Deputy RDC- Mpigi district
Responses to issues raised by the consultant (quoted verbatim)		
1	About the project	You need to find out the tenants and the landlords You also need to satisfactorily compensate the affected persons

Interview 20: Held with the RDC- Mpigi district

		Name	**Designation**
		Mr. Katenda Luutu	RDC- Mpigi district
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		11th/10/2010, At his office	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Katenda Luutu, RDC- Mpigi district	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the project	Sometimes you give those people little money as compensation. We do monitor such projects and we would like to know where exactly the power line will pass and the affected persons.	

Interview 21: Held with the District Engineer-Mpigi district

		Name	**Designation**
		Mr. Joseph Lukwago	District Engineer-Mpigi district
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		11th/10/2010, At his office	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Joseph Lukwago, District Engineer-Mpigi district	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the design of foundations	You should use different designs in the different soil types. For sloppy areas, measures should be put in place to prevent erosion since it can end up disturbing the stability of the pylon. Check on the lightening protection of the pylons	
2	About the surrounding community	Our people have a habit of looping power. This being a very high voltage power line, sensitization of the community around the project area should be thoroughly done.	
3	Supervision of such projects	We do not supervise such projects because it is not in our mandate according to the local government act. We come in as beneficially stakeholders.	

Interview 22: Held with the Lease Manager Buganda Land Board

		Name	**Designation**
		Mr. Kizito Bashir Juma	Lease manager Buganda land board
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		14th /10/2010, At his office in Bulange	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Kizito Bashir Juma, Lease manager	
Responses to issues raised by the consultant (quoted verbatim)			
1	About Buganda land	We need you to provide us with cadastral maps showing all the blocks and plot numbers of where the power line will pass. This will help us to identify exactly which portions fall under Buganda land or Kabaka's land. As the Buganda land board we only manage the 350	

		square miles (official mile estate). The other part of the so called Buganda land is Kabaka's private land (private mile estate) which is managed under " Nkuluze". The divided land is normally given new block and plot numbers. Later on we sign for them a transfer form and give them titles. We also survey the land to verify the size of the affected land. UETCL contacted us on the initial Bujagali power line through Nansana but for this diversion they had not yet contacted us. Their compensation was done satisfactorily well as we had agreed. We normally lease the Kabaka's land but since government doesn't take leases, it becomes a special case where compulsory acquisition of land is done (compulsory lease).
2	challenges	Last time on that same Bujagali power line project, they wanted us to sign for them their transfer forms yet they had not yet got plot numbers. May be their consulting surveyors did not advise them well. Other than that we have no problem with UETCL previously. Secondly, some procedures in most cases are faulted where people get plots and blocks without numbers which becomes a problem for us.

Interview 23: Held with the Estates Officer "Nkuluze"

		Name	**Designation**
		Mr. Wamala Godfrey	Estates officer "Nkuruze"
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		14th /10/2010, At his office in Bulange	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Wamala Godfrey, Estates officer "Nkuruze"	
Responses to issues raised by the consultant (quoted verbatim)			
1	About Kabaka's land	I do not think there is Kabaka's land in those places where your power line is passing. Kabaka's land is in places like Kireka, Bunamwaya, Bulemezi and Mulago. But before you implement the project, you need to talk to the Landlords and the tenants about the project and agree with them the terms of compensation.	

Interview 24: Held with the Administrative Assistant Buganda Kingdom

		Name	**Designation**
		Mr. Kizito Moses Gambobbi	Administrative assistant Buganda Kingdom
Purpose of meeting		To obtain comments and input in to the Environmental Impact Assessment for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		14th /10/2010, At his office in Bulange	
Present		Arinaitwe Johnson, Consultant Takali Sylivia, consultant Mr. Kizito Moses Gambobbi, Administrative assistant	
Responses to issues raised by the consultant (quoted verbatim)			
1	About Buganda land	We have our local Chiefs in those villages who should be contacted first. At village level we have the "Omutongole wa Kabaka" At parish level we have the "Owomuluka". We have others at sub county level and county level. Issues are handled in ascending order. These people report to us in case of any problem and normally we are the ones who make decisions. We cannot identify Buganda land by just looking at this physical map. We need you people to identify it and then talk to us before the project starts off.	
2	Challenges met before	There are instances where developers commence their projects on Buganda land before consulting us and when they come at a later stage, they end up under valuing the land. When we sabotage them, it becomes apolitical issue so UETCL should take this serious.	

Interview 25: Held with the Environment Officer, Electricity Regulatory Authority (ERA)

		Name	**Designation**
		Mr. Peter Kityo	Environment Officer, ERA
Purpose of meeting		To obtain comments and input into the Environmental Impact Assessment process for the proposed Kawanda - Masaka 220kv power line diversion.	
Date held and place		18th /10/2010, at Electricity Regulatory Authority (ERA) Head Offices, Kampala	
Present		Tumusiime Alfred, ESIA Consultant Mr. Peter Kityo, Environment Officer, ERA	
Responses to issues raised by the consultant (quoted verbatim)			
1	About the role of ERA in pre-establishment of transmission lines	UETCL normally presents to us their development plan. They closely work with ERA because those are licensee activities and the regulator needs to be kept informed of any development in terms of expansion, rehabilitation and operation.	
2	About previous notifications on the Kawanda-Masaka diversion.	I can confirm from my colleague whether notification to divert the Kawanda Masaka line was done. However, I believe it was done.	
3	About monitoring power line construction activities	We monitor their activities through our statutory inspection. We monitor their activities annually. Besides, during construction, they keep us informed of their progress but at least we conduct inspections at least once a year to monitor their progress in such activities.	
4	The role of ERA in monitoring resettlement and compensation activities for PAP	The relationship between ERA and its licences is detained in the licence. Matters within the licence do not take care of such issues. It is assumed that the licensee has the capacity to handle planning, development and operations of such phenomenon. UETCL is supposed to operate and maintain its activities without necessarily getting assistance from us. Issues to do with under valuation of properties, delayed payment of compensation and re-settlement assistance is something to do with government. That's to do with the office of the Chief Government Valuer. I have learnt that one thing we can't do as a regulator is to push another government organ. Where there are grievances to do with land, compensation and re-settlement as a result of transmission line constriction, UETCL needs to liaise with the Chief Government Valuer to meet time guidelines. However, UETCL is supposed to work as per the Electricity Act. We expect that their operations comply with the laws of the country. Unless we get documented evidence against their operation, we assume that they are operating normally.	
5	Concluding remarks about the diversion	For us as long as the feasibility study concluded that its best option, as ERA we can't contest that.	

12.2 Appendix 2: List of people and institutions consulted

Name	Designation	Company/Village	Telephone
Justine Waibale	Human Resource and Administration Officer	NARO	0772-581636 +256414574073
Dr Ambrose Agona	Director	NARL-Kawanda	0772-423245 +256414567649
Ojera Venansio	Cartographer	Wakiso District	0782-335041
Phill Ball	Safety and Systems Manager	UMEME	0772-222300 0312360600
Semugabi Shadrack	District Staff Surveyor	Mpigi District	0392965067
Sekagiri Frank	Senior CDO	Wakiso District	0772-427123
Joseph Lukwago	District Engineer	Mpigi District	0782-470848
Katenda Luutu	RDC	Mpigi District	0772-420288
Namujumbi Takia	Deputy RDC	Mpigi District	0772/0753-647663
Kilabira Paul	District Planner	Mpigi District	0772-424497
Mwanje	CDO	Mpigi District	0772-617104
Nsereko Patience	District Environment Officer	Mpigi District	0772-656218
Polly Birakwate	District Natural Resources/Forest Officer	Mpigi District	0772-426894
Fiida Nabirye	Chief Administrative Officer (CAO)	Mpigi District	0772-635360
Rebecca Sabaganzi	District Natural Resources Officer	Wakiso District	0772-465657
Sendinde Ismael	Assistant District Engineer	Wakiso district	0772-980482
Joseph Mukwaya	CAO	Wakiso District	0772-681724
Nakafeero Anne	District Environment Officer	Wakiso District	0772449163
Kirudde Francis	Project Safety Officer	UMEME	0312-360663
George Kyarikunda	Chief Administrative Officer (CAO)	NSSF	0417-331300
Mubiru Jackson	Resident (PAP)	Kagaba village, Wakiso district	0775-072047
Avutya Conslate	Resident (PAP)	Kigoma village, Wakiso district	0774-998713
Butayi Mpoza	Resident (PAP)	Kawoko village, Wakiso district	0772-394919
Walakira Robert	LC I Chairman(PAP)	Ssenge village, Wakiso district	0759-131681
Mr. Kizito Bashir Juma,	Lease Manager	Buganda Land Board	0752804364
Mr. Wamala Godfrey	Estates Officer	Royal Treasury "Nkuluze"	0772420348
Mr. Kizito Moses Gambobbi	Administrative Assistant	Buganda Kingdom	0752822403 / 0776822403
Mr. Peter Kityo	Environment Officer	Electricity Regulatory Authority	0782448041
Mr. Kirudde Francis	Project Safety Officer	UMEME	0312360663
Mr. Phill Ball	Safety and System Manager	UMEME	0312360663
Mr. Magezi Muhamad	Sector Manager (Lwamunda Sector)	National Forest Authority	0773176204

Summary of people, Institutions consulted (Continuation)

Name	Area of Residence (Village, Parish & Sub-county)	District	Contact
Nakate Sarah	Ziwungwe, Iwanga, Mutubagumu (PAP)		
Byamugisha Fahad	Ziwungwe, Iwanga, Mutubagumu (PAP)	Mpigi	0756001077
Yowana Ntulanyi	Ziwungwe, Iwanga, Mutubagumu (PAP)	Mpigi	
Marium Nambogo	Ziwungwe, Iwanga, Mutubagumu (PAP)	Mpigi	
Meddie Sendawula	Ziwungwe, Iwanga, Mutubagumu (PAP)	Mpigi	O785-810193
Mzee Yusuf Lufunya	Ziwungwe, Iwanga, Mutubagumu (PAP)	Mpigi	
Stephen Byekwaso	Ggoli, Kamengo, kamengo (PAP)	Mpigi	0783-594766
Luyinda Joseph	Ggoli, Kamengo, kamengo (PAP)	Mpigi	0774-601948
JohnBosco Acuti	Forest Supervisor, Mpaga Sector	Mpigi	0776-211038
Okot Micheal	Forest Sector Manager, Mpanga sector	Mpigi	0776416416
Mugabi John	Forest Guard, Gangu forest Reserve	Mpigi	0775-067539
Kitumba John	Forest Guard, Kalandazi forest Reserve	Mpigi	0773-830967
Kato Daniesl	Forest Guard, Mpaga forest Reserve		
Kalinda Francis	Forest Guard, Gangu forest Reserve		
Namuga Maria	Magya, Bongole, Buwama(PAP)	Mpigi	
Katumba John	Magya, Bongole, Buwama(PAP)	Mpigi	0773830967
Nabatanzi Sylivia	Magya, Bongole, Buwama(PAP)	Mpigi	0753001382
Nanfuka Ruth	Kayembwe Jandiira village, Kayembweparish, Kayembwe sub county(PAP)	Mpigi	0783-147400
Matia Kyomya	Kayembwe Jandiira village, Kayembweparish, Kayembwe sub county(PAP)	Mpigi	0392-948964
Serunkuma David	Kayebwe Jandiira village, Kayembweparish, Kayembwe sub county(PAP)	Mpigi	0787-385897
Nakyiboneka Mariserina	Kayembwe Jandiira village, Kayembwe parish, Kayembwe sub county(PAP)	Mpigi	0784-224462
Nanfuka Ruth	Kayembwe Jandiira village, Kayembwe parish, Kayembwe sub county(PAP)	Mpigi	0783147400
Matia Kyomya	Kayembwe Jandiira village, Kayembwe parish, Kayembwe sub county(PAP)	Mpigi	0392948914
Nsubuga Vererian	Mugge village, Nindye parish, Nkozi sub county(PAP)	Mpigi	0789-642778
Nyombi Elias	Lutente village, Lukaya Central ward, Lukaya sub county(PAP)	Kalungu	0788-417639
Namatovu Sarah	Lutente village, Lukaya Central ward, Lukaya sub county(PAP)	Kalungu	
Nyombi Eriyas	Lutente village, Lukaya Central ward, Lukaya sub county(PAP)		
Nasimbi Winnie	Bukulula Masala village, Mukooko parish, Bukulula sub county(PAP)	Kalungu	0715-164247
Nakabubi Oliver	Bukulula Masala village, Mukooko parish, Bukulula sub county(PAP)	kalungu	
Banabas Bukenya	Bukulula Masala village, Mukooko parish, Bukulula sub county(PAP)	Kalungu	0782-953555
Nakati Idah	Kadugala village, Matanga parish, Mukungwe sub county(PAP)	Masaka	0774-838619
Keneth Oherichan	Security Officer, Masaka UETCL substation	Masaka	0788048693

12.3 Appendix 3: list of plant species within and around the proposed transmission corridor

Plant species along the Kawanda-Masaka 220kv Power line corridor as sampled at various points along the proposed power line corridor				
LOCALITY	**HABITAT**	**POINTS**	**SPECIES NAME**	**LIFE FORM**
Nakyesanja	Swampy Bushland	AP1-AP3	*Acanthus Pubescens*	Shrub
			Panicum Maximum	Grass
			Microglossa Pyrifolia	Shrub
			Eriosema Psororaleoides	Herb
			Secamone Africana	Climber
			Tinospora Caffra	Climber
			Conyza Floribunda	Herb
			Aspilia Africana	Herb
			Urena Lobata	Herb
			Pseudarthria Hooheri	Herb
			Vernonia auriculifera	
			lantana trifolia	Herb
			Vernonia amygdalina	Tree
			Hyparrhenia rufa	Grass
			Macrotyloma axillare	Climber
			triumfetta rhomboidea	Herb
			Maesa lanceolota	Tree
			Indigofera arrecta	Herb
			Pennisetum purpureum	Grass
			Monordica foetida	Climber
			Imperata cylindrica	Grass
			Vernonia campanea	Herb
			Desmodium uncinatum	Herb
			Ficus asperifolia	Tree
			Flueggea virosa	Shrub
			spathodea nilotica	Tree
			Zehneria scabra	Climber
			Solanum mauritianum	Shrub
			crossouphalum vitellinum	Herb
Kawanda Research Station	Arable Land	AP4	*Imperata Cylindrica*	grass
			Brachiaria decumbens	Grass
			Psidium guajava	Tree
			Desmodium dregeanum	Herb
			Hibiscus surattensis	Herb
			Vernonia amygdalina	Tree
			Vernonia campanea	Herb
			Glycine wightii	Climber

			Sida rhomboidea	Herb
			Panicum maximum	Grass
			Cynodom dactylon	Grass
			Urena lobata	Herb
			Hoslundia opposita	Herb
			Solanum gilo	Herb
			Microglossa pyrifolia	Shrub
			Desmodium uncinatum	Herb
Mayanja swamp	Swampy bushland	AP5-AP6	*Dovylis macrocalyx*	Shrub
			Clerodendrum rotundifolium	Herb
			Lantana Camara	Shrub
			Acanthus pubescens	Shrub
			Aframonum angustifolium	Herb
			Phoenix reclinata	palm tree
			Phytolacca dodecandra	Herb
			Erythrina abyssinicca	Tree
			Fluggea virosa	Shrub
			Momordica foetida	Climber
			Maesa lanceolata	Tree
			Cyperus latifolia	Sedge
			Sida rhombifolia	Herb
			Cynodom dactylon	Grass
Ssenge	Banana plantation	AP6-AP7	*Musa x paradisiaca*	Tree
			Pittosporum mannii	Tree
			Alchornea cordifolia	Tree
			Flueggea virosa	Shrub
			Ipomoea acuminate	
			Secamone africana	Climber
			Bidens pilosa	Herb
			Galisonga parviflora	Herb
			Senecio discifolius	Herb
Ssenge II	Arable land	AP7	*Stachyrpheta urticifolia*	Herb
			Aspilia africana	Herb
			Sida rhomboidea	Herb
			Hoslundia opposita	Herb
			Desmodium triflorum	Herb
			Microglossa pyrifolia	Shrub
			Urena lobata	Herb
			Spathodea nilotica	Tree
			Markhania lutea	Tree
			Cassia spectabilis	Tree
			Lantana Camara	Shrub
			Cynodom dactylon	Grass
			Sporobolus pyramidalis	Grass

Kayunga	Homesteads Bushland	AP9-AP10	*Artocarpus heterophyllus*	Tree
			Phoenix reclinata	palm tree
			Musa x paradisiaca	Tree
			Coffea canephora	Tree
			Syzygium cuminii	Tree
			Cynodom dactylon	Grass
			Sida rhombifolia	Herb
			Sorgum arundinaceum	Grass
			Sida cuneifolia	Herb
			Ageratum conyzoides	Herb
			Commelina africana	Herb
			Amaranthus dubius	Herb
			Datura stramonium	Herb
			Panicum maximum	Grass
			Hibiscus surattensis	Herb
			Synedrella nodiflora	Herb
			Persea americana	Tree
			siegesbeckia orientalis	Herb
			Triumfetta rhomboidea	Herb
			Ricinus communis	Tree
			Colocasia esculenta	Herb
			Saccharum officinarum	Grass
			Dracaena fragrans	Herb
			Solanum gilo	Herb
			manihot esculenta	Shrub
			Capsicum frutescens	Herb
			Ocimum sauve	Tree
			Mangifera indica	Tree
			Psidium guajava	Tree
			Digitaria abyssinica	Grass
			Centella asiatica	Herb
Kawoko	Arable land	AP10	*Brachiaria decumbens*	Grass
			Musa x paradisiaca	Tree
			manihot esculenta	Shrub
			Sesbania sesban	Shrub
			Pennisetum purpureum	Grass
			Guizotia scabra	Herb
			Ipomoea batatus	Vine
			Panicum maximum	Grass
			Crotalaria natalitia	Herb
			Phyllanthus nummulariifolius	Herb
			Imperata Cylindrica	Grass
			Conyza floribunda	Herb
			Triumfetta macrophylla	Shrub

			Sida rhombifolia	Herb
			Melinis repens	Grass
			Digitaria abyssinica	Grass
			Crotalaria brevidens	Herb
			Vernonia cinerea	Herb
			Hewettia sublobata	Climber
			Emilia ceaspitosa	Herb
			Albizia coriaria	Tree
			Sporobolus africanus	Grass
			Urena lobata	Herb
			Erlangea tomentosa	Herb
			Tephrosia nana	Herb
			Indigifera arrecta	Herb
			Glycine wightii	Climber
			Kyllinga sphaerocephala	Sedge
			Asystasia gangetica	Herb
			Cassia kirkii	Herb
			Desmodium adscendens	Herb
			Physalis peruviana	Herb
Kigoma	Banana Plantation Bushland	AP10-AP11	*Passiflora edulis*	Climber
			Solanum angunivii	Herb
			Artocarpus heterophyllus	Tree
			Musa x paradisiaca	Tree
			Persea americana	Tree
			Markhania lutea	Tree
			Jatropha curcas	Tree
			Spathodea nilotica	Tree
			Mangifera indica	Tree
			Coffea canephora	Tree
			Phoenix reclinata	palm tree
			Maesopsis eminii	Tree
			Lantana Camara	Shrub
			Cassia bicapsularis	Herb
			Saccharum officinarum	Grass
			Pennisetum purpureum	Grass
			Synedrella nodiflora	Herb
			Ipomoea hederifolia	Climber
			Bidens pilosa	Herb
			Sida rhombifolia	Herb
			Euphorbia heterophylla	Herb
Nakabugo	Swampy Bushland	P10-P11	*Phoenix reclinata*	palm tree
			Aframonum angustifolium	Herb
			Maesa lanceolata	Tree
			Acanthus pubescens	Shrub

			Hyparrhenia filipendula	Grass
			Cassia hirsuta	Herb
			Harungana madagascariensis	Tree
			Hibiscus diversifolius	Herb
			Panicum trichocladum	Grass
			Urena lobata	Herb
			Phyllanthus oralifolius	Shrub
			Albizia grandibracteata	Tree
			Vernonia amygdalina	Tree
			Ipomoea cairica	Climber
			Pennisetum purpureum	Grass
			Secamone africana	Climber
Kagoma	Homestead grassland	AP10-AP11	*Imperata Cylindrica*	Grass
			Hyparrhenia rufa	Grass
			Brachiaria decumbens	Grass
			Hyparrhenia filipendula	Grass
			Aspilia africana	Herb
			Erlangea tomentosa	Herb
			Desmodium ganetica	Herb
			Pteridium acquilinum	Fern
			Ipomoea obscura	Climber
			Phyllanthus nummulariifolius	Herb
			Panicum maximum	Grass
			Desmodium adscendens	Herb
			Acanthus pubescens	Shrub
			Sporobolus africanus	Grass
			Urena lobata	Herb
			Desmodium salicifolium	Herb
			Justicia exigua	Herb
			manihot esculenta	Shrub
			Musa x paradisiaca	Tree
			Coffea canephora	Tree
			Mangifera indica	Tree
			Saccharum officinarum	Grass
			Ananas comosus	Herb
			Artocarpus heterophyllus	Tree
			Flueggea virosa	Shrub
			Cassia hirsuta	Herb
			Zornia setosa	Herb
			Solanum aculeastrum	Shrub
			Paspalum scrobiculatum	Grass
			Digitaria abyssinica	Grass
			Solanum gilo	Herb
			Ricinus communis	Tree

			Maesopsis eminii	Tree
			Carica papaya	Tree
			Centella asiatica	Herb
			Sanseviera nilotica	Herb
			Hibiscus subdariffa	Herb
			Hypertheria dissoluta	Grass
Bukasa-Buloba	Homestead Bushland	AP11-AP12	*Markhania lutea*	Tree
			Artocarpus heterophyllus	Tree
			Pennisetum purpureum	Grass
			Coffea canephora	Tree
			Musa x paradisiaca	Tree
			Brachiaria decumbens	Grass
			Mangifera indica	Tree
			Solanum mautitianum	Shrub
			Albizia grandibracteata	Tree
			Monordica foetida	Climber
			Achranthes aspera	Herb
Katende	Homestead Bushland	AP13-AP14	*manihot esculenta*	Shrub
			Persea americana	Tree
			Cyperus rotundus	Sedge
			Bidens pilosa	Herb
			Coffea canephora	Tree
			Artocarpus heterophyllus	Tree
			Erucastrum arabicum	Herb
			Eragrostis tenuifolia	Grass
			Cynodon dactylon	Grass

Locality: Ziwungwe, Luwanga, Mutubangumu subcounty, Mpigi District
Habitat: Homestead

Speies recorded at the site:

Nos.	Species Name	Life form
1	Musa paradisiaca	Banana tree
2	Coffea canephora	tree
3	Artocarpus heterophyllus	tree
4	Carica papaya	tree
5	Colocasia esculenta	herb
6	Saccharum offinarum	grass
7	Zea mays	grass
8	Markania lutea	tree
9	Ricinus communis	tree
10	Jatropha curcas	tree
11	Mimosa pudica	herb
12	Eragrostis tenuifolia	grass
13	Chloris gayana	grass
14	Digitaria abyssinica	grass
15	Sida acuta	herb

Locality: Ggoli, Kamngo, Kamengo, Mpigi Dstrict.

Habita: Homestead

Plant species recorded:

Nos.	Species Name	Life form
1	Entada abyssinca	tree
2	Ficus natalensis	tree
3	Musa paradisiaca	tree
4	Coffea canephora	tree
5	Mangifera indica	tree
6	Saccharum officinarum	grass
7	Nicotiana tabacum	herb
8	Callistemon citrinus	tree
9	Cynodon dactylon	grass
10	Hydrocotyle mannii	herb
11	Dichrocephala integrifolia	herb
12	Sida acuta	herb
13	Kyllinga colorata	sedge
14	Amaranthus dubius	herb
15	Setaria homonyma	grass

Locality: Manja, Bogere, Buwama subcounty, Mpigi District
Habitat: Homestead

Species recorded:

Nos.	Species Name	Life form
1	Coffea canephora	tree
2	Delonix regia	tree
3	Bougainvillea spectabilis	shrub
4	Hibiscus rosa-sinensis	shrub
5	Artocarpus heterophyllus	tree
6	Musa paradisiaca	tree
7	Mangifera indica	tree
8	Desmodium uncinatum	herb
9	Euphorbia heterophylla	herb
10	Digitaria abyssinica	grass
11	Imperata cylindrica	grass
12	Urena lobata	herb
13	Cassia spectabilis	tree
14	Lantana camara	shrub
15	Morinda lucida	tree
16	Casuarina equisetifolia	tree
17	Ricinus communis	tree
18	Ipomea batatas	vine

Locality: Kayabwe, Kayabwe, Nkozi subcounty; Mpigi District
Habitat: Homestead
Species recorded at the site:

Nos.	Species Name	Life form
1	Solanum aethiopicum	herb
2	Carica papaya	tree
3	Mangifera indica	tree
4	Artocarpus heterophyllus	tree
5	Persea americana	tree
6	Sida acuta	herb
7	Boerhavia diffusa	herb
8	Cleome gynandra	herb
9	Oxygonum sinuatum	herb

10	Datura stramonium	herb
11	Urena lobata	herb
12	Sida rhombifolia	herb
13	Clerodendrum rotundifolium	herb
14	Cynodon dactylon	grass
15	Chlorisa pychnothrix	grass
16	Brachiaria decumbens	grass
17	Catharanthus roseus	herb

Locality: Lutente, Lukaya, Lukaya subcounty; Kalungu District.
Habitat: Homestead

Species recorded at the site:

Nos.	Species Name	Life form
1	Musa paradisiaca	tree
2	Manihot esculenta	shrub
3	Mangifera indica	tree
4	Artocarpus heterophyllus	tree
5	Markhania lutea	tree
6	Pennisetum purpureum	grass
7	Cassia hirsuta	herb
8	Bidens pilosa	herb
9	Digitaria abyssinica	grass
10	Chloris pychnothrix	grass
11	Digitaria velutina	grass
12	Eragrostis tenuifolia	grass
13	Siegesbeckia orientalis	herb
14	Commelina benghalensis	herb
15	Asystasia mysorensis	herb
16	Amaranthus dubius	herb
17	Synedrella nodiflora	herb
18	Cynodon dactylon	grass

Locality: Bukulula-Masaba, Mukulula, Mukulula subcounty; Kalungu District.
Habitat: Homestead

Species recorded at the site:

Nos.	Species Name	Life form
1	Artocarpus heterophyllus	tree
2	Mangifera indica	tree
3	Manihot esculenta	shrub
4	Thevetia peruviana	shrub
5	Cassia spectabilis	tree
6	Solanum incanum	herb
7	Eragrostis tenuifolia	grass
8	Urena lobata	herb
9	Lantana camara	shrub
10	Panicum maximum	grass
11	Callistemon citrinus	tree
12	Casuarina equisetifolia	tree
13	Dyschoriste radicans	herb
14	Mimosa pudica	herb

Locality: Kandugala, Matanga, Masaka District.
Habitat: Arable land

Species recorded at the site:

Nos.	Species Name	Life form
1	Cyperus cyperiodes	sedge
2	Bothriocline longipes	herb
3	Urena lobata	herb
4	Hyparrhenia filipendula	grass
5	Brachiaria decumbens	grass
6	Pseudarthria hookeri	herb
7	Aspilia africana	herb
8	Triumfetta rhomboidea	herb
9	Lantana camara	shrub
10	Conyza floribunda	herb
11	Cyperus richardii	sedge
12	Digitaria abyssinica	grass
13	Hibiscus calyphyllus	shrub
14	Desmodium adscendens	herb

Locality: Kimwanyi, Kiterende; Power Station, Masaka District.
Habitat: Mowed grassland

Species recorded at the site:

Nos.	Species Name	Life form
1	Pasplum notatum	grass
2	Brachiaria decumbens	grass
3	Eragrostis tenuifolia	grass
4	Sporobolus africanus	grass
5	Cyperus richardii	sedge
6	Abildgaardia ovata	sedge
7	Solanum incanum	herb
8	Conyza floribunda	herb
9	Aspilia africana	herb
10	Desmodium triflorum	herb
11	Desmodium dregeanum	herb
12	Acanthus pubescens	shrub

12.4 Appendix 4: Detailed Forest valuation report

VALUATION OF THE IMPACT OF THE PROPOSED 220kV KAWANDA- MASAKA TRANSMISSION LINE ON THE LWAMUNDA-LUFUKA-KALANDAZI AND BUWA FOREST RESERVE SYSTEM

1.1. Introduction

The Uganda Electricity Transmission Company Limited recently commissioned a study to value the environmental impacts of the proposed 220 kV transmission line way-leaves through the Lwamunda-Lufuka-Kalandazi and Buwa forest reserve system. The proposed transmission line is 137 km long and will require a
40m wide way leave through the forest system. The affected forest reserves include Lwamunda CFR, Lufuka CFR, Kyansozi CFR, Gangu CFR, Kalandazi CFR, Buwa CFR in Mpigi district and Nabijoka LFR in Masaka district. The proposed study is a forest valuation aimed at determining the lost forest and environmental values due to clearing the way-leaves through the affected forest reserves.

1.2. Approach to the Assignment

The forest valuation was carried out in three phases including a detailed review of literature, review and analysis of field stock assessment data and calculation of standing tree volumes, followed by a monetary valuation of the impact of forest clearance on the stock and tourism potential of the impacted forest reserves. All three phases involved consultations and meetings aimed at building consensus and agreement on a number of conceptual issues and the approach to the assignment.

1.2.1. Literature Review

The detailed literature review involved a study of the Biodiversity report for the Mpanga-Zika and other Mpigi District Forest Reserves and the Forestry Nature Conservation Master Plan for Uganda. The review aimed at informing the study of the nature and condition of the proposed impact areas with a view to identifying the magnitude of the potential environmental impacts of the proposed line routing.

1.2.2. Consultations and Meetings

A number of formal and informal consultations were made in the course of this study. Formal consultations included those with staff of UETCL, the National Forest Authority and other professionals in the disciplines of forestry and nature conservation.

Informal consultations included those with important stakeholders like Uganda Wildlife Society, Advocates Coalition for Development and the Environment, the Environmental Economics Association of Uganda and some staff at the National Environment Management Authority in Kampala. The main objective of the meetings and consultations as already mentioned was to agree on the parameters, approach and scope of the study.

1.2.3. Assessment of Stock

The detailed field assessment of stock involved marking of 10x10m plots along a transect line through the impact forests. Total enumeration of trees in the plots was then done to note a number of tree size parameters including diameter at breast height (dbh), pole height and canopy diameter for diameter classes 10- 20cm, 20-30cm, 30-50cm and greater than 50cm.

The enumeration results were later used to estimate basal area and then volume of standing timber (in m^3 of round wood) per hectare for the impact area. The size of impact area and therefore the size of affected standing volume was estimated using Arc View area calculator.

The individual areas of the forests that are going to be cleared for the way leaves are indicated in the table below.

Name of Forest Reserve	Length of wayleaves through the reserve (Km)	Area of forest to be cleared (Ha)
Lwamunda CFR	0.76	3.04
Lufuka CFR	1.07	4.28
Kyansozi CFR	1.18	4.72
Gangu CFR	1.76	7.04
Kalandazi CFR	0.85	3.40
Buwa CFR	0.79	3.16
Nabijoka LFR	0.37	1.48
TOTAL	**6.78**	**27.12**

1.3. Description of the Forest Reserves

The major natural forests affected by the transmission line have been listed in section 1.1 in the introduction. The forests lie within an altitudinal range of 1150-1190 metres above mean sea level and may be broadly classified as medium altitude moist evergreen Piptadeniastrum-Uapaca forests and medium altitude forest/savvana mosaics especially for Nabijoka CFR. The forests were mostly gazzeted in 1932 as forests of high potential eco-tourism and biodiversity values. They are also important watershed forests, supplying water to local communities and small urban centres. They also protect a number of streams and swamps that feed the Lake Victoria system. The forests are important production forests that supply poles, fuel-wood and various non-timber forest products to the local communities and the surrounding urban centres in Muduma, Bujuko, Entebbe, Kampala and Masaka.

The dominant tree species in the forests include Maesopsis eminii, Ficus sur, Zanthoxylum quetti, Funtumia elastica, Bridgia unijugata, Ficus exasperate, Canarium scwenthusii, Albizzia grandibracteata and Celtis spp among others.

1.3.1. Cost of Standing Biomass (Timber Value)

The volume of standing timber that will be affected by the transmission line was estimated using a simple mensuration formula that takes into consideration the taper and conversion ratio of standing wood into timber in Ugandan forests. The formula was developed by the National Biomass Study of the then Forest Department in 1990s. The following table indicates the volume of timber and associated values of wood that will be affected by the proposed transmission line way-leaves.

The volume of timber and associated values of wood that will be affected by the proposed transmission line way-leaves.

Forest	Line Length (Km)	Area Affected (Ha)	Standing Volume/Ha, m^3	Total Standing Volume m^3	Unit Cost/m^3 ,(USD)	Total Cost (one off)
Lwamunda CFR	0.76	3.04	174	528.96	40	21,158.40
Lufuka CFR	1.07	4.28	174	744.72	40	29,788.80
Kyansonzi CFR	1.18	4.72	174	821.28	40	32,851.20
Gangu CFR	1.76	7.04	764	5,378.56	40	215,142.40
Kalandazi Mawokota CFR	0.85	3.40	174	591.60	40	23,664
Buwa CFR	0.79	3.16	174	549.84	40	21,993.60
Nabijoka LFR	0.37	1.48	174	257.52	40	10,300.80
TOTAL	**6.78**	**27.12**		**8,872.48**	**40**	**354,899.20**

1.3.2. Biodiversity Costs (Option Value of Biodiversity)

Literature review on the biodiversity value of the proposed impact forest reserves indicated that most of the forests in the area are important biodiversity refugia. The forests are core conservation forests of high biodiversity value.

This study consulted and used secondary data from a number of previous studies namely Ruitenbeek (1989) on the Social Cost Benefit Analysis of the Korup Project, Cameroon Ministry of Planning and Regional Development, Cameroon; Pearce and Moran (1994) on the Economic Value of Biodiversity, Earthscan Publications Ltd, London; Howard, Peter (1995) on the Economic Value of Uganda's Protected Areas and Peasah (1994) on Resource and Environmental Accounting Framework for Ghana's Forestry Sector, Unpublished MSc. Dissertation, University of Edinburgh, Scotland.

Pearce and Moran (1994) for example calculated the value of land for biodiversity conservation (particularly for the medicinal value of biodiversity) to be USD 21 per hectare per annum for the upper limit. For a discount rate of 12 percent over a long time horizon (e.g. 25 years), this figure translated to a biodiversity related present value of land of USD 420 per hectare. This translates into biodiversity option values of USD 11,390.40 for the total impact area of the forests. The individual forest values are indicated in the table below:

The individual forest values

Forest	Line Length (Km)	Area Affected (Ha)	Biodiversity Value/ha (USD)	Total Option Value (Discounted) 25y @12%)
Lwamunda CFR	0.76	3.04	420	1,276.80
Lufuka CFR	1.07	4.28	420	1,797.60
Kyansonzi CFR	1.18	4.72	420	1,982.40
Gangu CFR	1.76	7.04	420	2,956.80
Kalandazi Mawokota CFR	0.85	3.40	420	1,428.00
Buwa CFR	0.79	3.16	420	1,327.20
Nabijoka LFR	0.37	1.48	420	621.60
TOTAL	**6.78**	**27.12**	**420**	**11,390.40**

1.3.3. Community Derived Values

A recent report by the National Forestry Authority (NFA) on Managing Central Forest Reserves for the People of Uganda (August, 2008) indicated that most of the impact forest reserves are important sources of fuel wood, water, and various non-timber forest products to local communities and the surrounding urban centres of Muduma, Bujuko, and Mpigi. This section therefore deals with the lost value of community use of the forest once the transmission line wayleaves is cleared through the impact forests.

The lost community use value of the forests was calculated using secondary information on similar forest use patterns in other parts of Uganda .A study on community use of forests in Bwindi in South Western Uganda estimated that local households use up to USD 88.30 per household per year in net annual worth terms. About 1,088 households live within a kilometre of the impact forest reserves (estimates from the National Population and Housing Census, 2002) implying that the total community use value of the forests is USD 96,118. The lost value of community forestry uses therefore is USD361.50 since only 0.38 percent of the total forest area will be cleared for the wayleaves.

If this lost flow of benefits had accrued over a 25 year period (to compare with an assumed 25 year replacement cycle of the transmission line), the implied present value of community use benefits for a discount rate of 12 percent would be about USD 5,228.70 for the total impact area.

1.3.4. Carbon Sink Functions

No attempts have been made to measure the carbon sequestration capacity and therefore the carbon sequestration value of Uganda's forests. The carbon sink capacity of the impact forests is therefore, largely based on secondary information. The Centre for Social and Economic Research on the Global Environment (CSERGE, 1993) put the carbon stocking capacity of tropical evergreen forests at 144.0 tones of carbon per hectare (tC/ha) for total above ground biomass and 66.0 tones per hectare for soil and below ground or a total of 210 tones of carbon per hectare.

The International Pilot Project for Carbon Sequestration and Community Forestry in Chiapas, Mexico estimates that protection of threatened closed forests can prevent emissions of up to 300 tC/ha, while careful management and restoration of tropical evergreen forests could increase carbon storage by around 120 tC/ ha. The pilot project also quotes the average cost of sequestering carbon at around US$ 20 per tC.

If the CSERGE estimates are adopted, the clearing of 27.12 ha of forest to create a 40m wayleaves will extinguish the opportunity to sell 5,695.2 tC equivalent in proto-carbon credits (at US $ 20 per tC). The implied net loss in carbon sequestration value of the impact area will therefore be US $ 113,904. The above costs are one off costs in the first year of the project.

Cost of carbon sequestration

Forest	Line Length (Km)	Area Affected (Ha)	Equivalent Loss (Carbon Credits, tC)	Total Loss (Carbon Sequestration, USD)
Lwamunda CFR	0.76	3.04	638.40	12,768.00
Lufuka CFR	1.07	4.28	898.80	17,976.00
Kyansonzi CFR	1.18	4.72	991.20	19,824.00
Gangu CFR	1.76	7.04	1,478.40	29,568.00
Kalandazi Mawokota CFR	0.85	3.40	714.00	14,280.00
Buwa CFR	0.79	3.16	663.60	13,272.00
Nabijoka LFR	0.37	1.48	310.80	6,216.00
TOTAL	**6.78**	**27.12**	**5,695.20**	**113,904.00**

1.3.5. Incremental Management Costs

The National Forestry Authority will need to commit additional staff time to over see and monitor the activities of way leaves clearance, construction of the way leaves and implementation of the mitigation measures proposed in the project EIS. The cost of additional staff time in the field represents an additional cost to the NFA budget and is therefore a cost of the proposed project.

The incremental management costs were estimated using standard government field allowance rates and the cost of fuel and vehicle maintenance for 2 Forest Officers and a Driver for a period of at least 18 months (based on a 22 day/month working schedule). A total of USD 66,864 which includes USD 42,864 as staff costs and USD 24,000 as cost of fuel and vehicle maintenance will be the total incremental cost to the NFA due to the transmission line project.

1.3.6. Land take (UGX20,000/ha discounted at 12% for 25 years)

The owner or occupier of land that is crossed, or is proposed to be crossed by an electricity line has significant influence on the line development process. This is because electricity companies need to obtain wayleaves or a bundle of rights to construct, use, inspect and maintain their electricity infrastructure. Difficulties in obtaining wayleaves for new lines might cause an electricity company to consider moving the line or changing the transmission technology. The Electricity Act in Uganda requires that transmission line construction is preceded by appropriate easements to land owners.

The costs associated with land take are therefore real costs of the project. For the land take in forest reserves, a standard discounted rate of USD12 has been suggested by the NFA. The USD 12 rate was applied to the total land take of 27.12 ha to generate a project cost of USD325.44 only as a one off payment.

1.4. Summary of Lost Forest Values

The following is the summary of the individual forest values that will be lost due to the proposed project. The summary also includes the implied costs of the project including incremental management costs and the cost of land take.

Summary of individual forest values that will be lost due to the proposed project

Cost Category	Method of Calculation	No of Units Affected	Total Cost Estimate USD
Timber Value	Market Analysis	27.12ha	354,899.20
Option Value of Biodiversity	Benefits Transfer	27.12ha	11,390.40
Community Derived Values	Benefits Transfer	1,088households	361.50
Carbon Sink Values	Market Analysis	5,695.20tC	113,904.00
Incremental Management Costs	Market Analysis	3 staff and 1 vehicle	66,864.00
Land Take	Market Analysis	27.12ha	325.40
TOTAL COST			**547,744.50**

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12.5 Appendix 5: Species list of Birds, Small mammals, Butterflies and Large moths in Mpanga, Zika and Mpigi group of forest reserves

Britton No	Species	Ecological type	Type	Mpanga	Zika	Mpigi
27	*Ardea melanocephala*	Black-headed Heron	W			O
32	*Bubulcus ibis*	Cattle Egret	W		O	O
42	*Scopus umbretta*	Hamerkop	A		O	O
49	*Leptoptilos crumeniferus*	Marabou	W		O	
51	*Bostrychia hagedash*	Hadada	W	O	O	O
70	*Anas sparsa*	African Black Duck	A			O
87	*Neophron monachus*	Hooded Vulture	f	O	O	O
96	*Polyboroides radiatus*	Harrier Hawk	f	O	O	O
111	*Accipiter tachiro*	African Goshawk	F	P	P	P
130	*Lophaetus occipitalis*	Long-crested Eagle	f	O	P	O
135	*Stephanoaetus coronatus*	Crowned Eagle	FF			O
137	*Haliaeetus vocifer*	Fish Eagle	A		O	
138	*Milvus migrans*	Black Kite	W	O	O	O
143	*Macheiramphus alcinus*	Bat Hawk	F	P	P	P
184	*Francolinus squamatus*	Scaly Francolin	F	P	P	O
188	*Guttera edouardi*	Crested Guineafowl	F		O	
213	*Sarothrura pulchra*	White-spotted Pygmy Crake	F	O	O	O
337	*Aplopelia larvata*	Lemon Dove	FF	P		P
344	*Columba unicincta*	Afep Pigeon	FF	O		O
346	*Streptopelia capicola*	Ring-necked Dove	f	P	P	P
350	*Streptopelia semitorquata*	Red-eyed Dove	f	O	O	O
355	*Turtur afer*	Blue-spotted Wood Dove	f	P	O	P
356	*Turtur chalcospilos*	Emerald-spotted Wood Dove	f			O
357	*Turtur tympanistria*	Tambourine Dove	F	O	O	O
358	*Treron australis*	Green Pigeon	F	P	O	O
363	*Agapornis pullaria*	Red-headed Lovebird	f	P	P	P
371	*Psittacus erithacus*	Grey Parrot	FF	O	O	O
372	*Corythaeola cristata*	Great Blue Turaco	F	O	O	O
376	*Crinifer zonurus*	Eastern Grey Plantain Eater	W	O	O	O
377	*Musophaga rossae*	Ross's Turaco	F	O	O	O
384	*Tauraco schuetti*	Black-billed Turaco	FF	P	P	P
385	*Cercococcyx mechowi*	Dusky Long-tailed Cuckoo	FF	P	P	P
388	*Chrysococcyx caprius*	Didric Cuckoo	O		O	O
389	*Chrysococcyx cupreus*	Emerald Cuckoo	F	O	O	O
391	*Chrysococcyx klaas*	Klaas' Cuckoo	f	O	O	O
394	*Clamator levaillantii*	Levaillant's Cuckoo	fM	P	P	P
396	*Cuculus clamosus*	Black Cuckoo	FF	O	O	O
399	*Cuculus solitarius*	Red-chested Cuckoo	F	O	O	O
401	*Ceuthmochares aereus*	Yellowbill	F	P	P	C
405	*Centropus senegalensis*	Senegal Coucal	f			O
406	*Centropus superciliosus*	White-browed Coucal	O		O	
416	*Strix woodfordii*	African Wood Owl	F	O	O	O
436	*Caprimulgus pectoralis*	Fiery-necked Nightjar	F	P	P	O
459	*Colius striatus*	Speckled Mousebird	O		O	
462	*Apaloderma narina*	Narina's Trogon	F	O	P	O

468	*Alcedo quadribrachys*	Shining-blue Kingfisher	FFL	P		P
474	*Halcyon malimbica*	Blue-breasted Kingfisher	F	O	O	O
475	*Halcyon senegalensis*	Woodland Kingfisher	O	O		O
478	*Ispidina picta*	Pygmy Kingfisher	f	C	C	C
479	*Merops albicollis*	White-throated Bee-eater	fM	O	O	O
491	*Merops pusillus*	Little Bee-eater	O	O		O
494	*Merops variegatus*	Blue-breasted Bee-eater	O		C	
500	*Eurystomus glaucurus*	Broad-billed Roller	f	P	P	O
513	*Bycanistes subcylindricus*	Black and White Casqued Hornbill	F	O	O	O
515	*Tockus alboterminatus*	Crowned Hornbill	f	O	O	O
519	*Tockus fasciatus*	Pied Hornbill	F	P	P	O
529	*Buccanodon duchaillui*	Yellow-spotted Barbet	FF	O	P	O
533	*Gymnobucco bonapartei*	Grey-throated Barbet	F	P	P	O
534	*Lybius bidentatus*	Double-toothed Barbet	f	P	P	P
538	*Lybius hirsutus*	Hairy-breasted Barbet	F	O	O	O
548	*Pogoniulus bilineatus*	Yellow-rumped Tinkerbird	F	O	O	O
553	*Pogoniulus scolopaceus*	Speckled Tinkerbird	F	O	O	C
555	*Pogoniulus subsulphureus*	Yellow-throated Tinkerbird	FF	O	O	O
556	*Trachylaemus purpuratus*	Yellow-billed Barbet	F	O	P	O
561	*Indicator conirostris*	Thick-billed Honeyguide	FF		P	
562	*Indicator exilis*	Least Honeyguide	FF	P	P	P
566	*Indicator minor*	Lesser Honeyguide	f	P	P	P
581	*Campethera caroli*	Brown-eared Woodpecker	F	P	O	C
582	*Campethera nivosa*	Buff-spotted Woodpecker	F	P	P	P
585	*Dendropicos fuscescens*	Cardinal Woodpecker	O	O	O	O
592	*Mesopicos xantholophus*	Yellow-crested Woodpecker	FF	P		P
624	*Hirundo abyssinica*	Striped Swallow	W	O	O	O
627	*Hirundo angolensis*	Angola Swallow	W	O	C	O
634	*Hirundo rustica*	Eurasian Swallow	WM			O
636	*Hirundo senegalensis*	Mosque Swallow	W		O	
637	*Hirundo smithii*	Wire-tailed Swallow	W	O		O
639	*Psalidoprocne albiceps*	White-headed Rough-wing	f	P	P	P
645.1	*Dicrurus modestus*	Velvet-mantled Drongo	F	P	P	O
647	*Oriolus brachyrhynchus*	Western Black-headed Oriole	F	O	O	O
649	*Oriolus larvatus*	Black-headed Oriole	f	P	P	P
654	*Corvus albus*	Pied Crow	W	O	O	O
666	*Parus leucomelas*	Black Tit	f	P	P	P
674	*Trichastoma albipectus*	Scaly-breasted Illadopsis	FF			C
675	*Trichastoma fulvescens*	Brown Illadopsis	FF	P	P	C
688	*Campephaga flava*	Black Cuckoo Shrike	f	P	P	P
690	*Campephaga phoenicea*	Red-shouldered Cuckoo Shrike	O		O	
697	*Andropadus curvirostris*	Cameroon Sombre Greenbul	FF		P	C
699	*Andropadus gracilis*	Little Grey Greenbul	FF	P	P	P
705	*Andropadus virens*	Little Greenbul	F	C	C	C
706	*Baeopogon indicator*	Honeyguide Greenbul	FF	P		P
708	*Bleda syndactyla*	Bristlebill	FF	O		C
709	*Chlorocichla flavicollis*	Yellow-throated Leaflove	f		P	
714	*Criniger calurus*	Red-tailed Greenbul	FF	P		O

715	*Ixonotus guttatus*	Spotted Greenbul	FF			P
716	*Nicator chloris*	Nicator	F	O	O	C
718	*Phyllastrephus albigularis*	White-throated Greenbul	FF	C	C	C
719	*Phyllastrephus hypochloris*	Toro Olive Greenbul	FF	P		P
732	*Pycnonotus barbatus*	Common Bulbul	f	C	C	C
734	*Alethe diademata*	Fire-crested Alethe	FF	P	P	C
750	*Cossypha cyanocampter*	Blue-shouldered Robin Chat	F		P	
752	*Cossypha natalensis*	Red-capped Robin Chat	F	C	C	C
753	*Cossypha niveicapilla*	Snowy-headed Robin Chat	F	P	P	P
772	*Neocossyphus poensis*	White-tailed Ant Thrush	FFL	P		P
773	*Neocossyphus rufus*	Red-tailed Ant Thrush	FFL			C
790	*Stizorhina fraseri*	Rufous Thrush	FFL	P	P	C
801	*Turdus pelios*	African Thrush	f	P	O	O
819	*Apalis jacksoni*	Black-throated Apalis	FF	P		P
826	*Apalis rufogularis*	Buff-throated Apalis	FF	P		P
837	*Camaroptera brachyura*	Grey-backed Camaroptera	f	C	C	C
838	*Camaroptera chloronota*	Olive-green Camaroptera	FF	P		C
841	*Camaroptera superciliaris*	Yellow-browed Camaroptera	FFL	P		P
875	*Eminia lepida*	Grey-capped Warbler	f	P	P	P
889	*Hylia prasina*	Green Hylia	F	C	O	C
903	*Phylloscopus budongoensis*	Uganda Woodland Warbler	FF	P		P
908	*Phylloscopus trochilus*	Willow Warbler	fM	P	P	P
911	*Prinia leucopogon*	White-chinned Prinia	F	O	P	O
913	*Prinia subflava*	Tawny-flanked Prinia	f	P	P	O
917	*Sylvia atricapilla*	Blackcap	FM	P		P
918	*Sylvia borin*	Garden Warbler	fM	P	P	P
924	*Sylvietta virens*	Green Crombec	F	O	C	O
936	*Muscicapa adusta*	Dusky Flycatcher	F	O	P	O
938	*Muscicapa caerulescens*	Ashy Flycatcher	F	P	P	P
940	*Muscicapa comitata*	Dusky Blue Flycatcher	F		P	
942	*Muscicapa griseigularis*	Grey-throated Flycatcher	FF		P	C
946	*Myioparus plumbeus*	Lead-coloured Flycatcher	f	P	P	P
955	*Bias musicus*	Black and White Flycatcher	f	P	P	P
956	*Megabyas flammulata*	Shrike Flycatcher	FF	P	P	P
958	*Platysteira castanea*	Chestnut Wattle-eye	FF	P	O	C
960	*Platysteira cyanea*	Wattle-eye	f	P	P	P
963	*Erannornis longicauda*	Blue Flycatcher	f	P	P	P
967	*Terpsiphone rufiventer*	Red-bellied Paradise Flycatcher	FF	P	P	C
968	*Terpsiphone viridis*	Paradise Flycatcher	f	O	O	O
991	*Motacilla aguimp*	African Pied Wagtail	W	O		O
998	*Dryoscopus angolensis*	Pink-footed Puffback	FF		P	

1000	*Dryoscopus gambensis*	Northern Puffback	F	P		P
1003	*Laniarius barbarus*	Black-headed Gonolek	O		O	
1004	*Laniarius ferrugineus*	Tropical Boubou	f	O	P	O
1007	*Laniarius leucorhynchus*	Sooty Boubou	FF	P		P
1013	*Malaconotus bocagei*	Grey-green Bush Shrike	F	P	P	P
1035	*Lanius mackinnoni*	Mackinnon's Shrike	f		P	
1048	*Cinnyricinclus leucogaster*	Violet-backed Starling	f	P	P	P
1058	*Lamprotornis purpureiceps*	Purple-headed Glossy Starling	F	P	P	P
1061	*Lamprotornis splendidus*	Splendid Glossy Starling	F	O	O	O
1063	*Onychognathus fulgidus*	Chestnut-winged Starling	FF	P		P
1080	*Anthreptes collaris*	Collared Sunbird	F	O	O	O
1087	*Anthreptes rectirostris*	Green Sunbird	FF	P	P	P
1094	*Nectarinia chloropygia*	Olive-bellied Sunbird	F	P	P	O
1096	*Nectarinia cuprea*	Copper Sunbird	f	P	C	P
1097	*Nectarinia cyanolaema*	Blue-throated Brown Sunbird	FF	O	O	O
1103	*Nectarinia kilimensis*	Bronze Sunbird	fH	P	P	P
1112	*Nectarinia olivacea*	Olive Sunbird	FF	C	C	C
1120	*Nectarinia rubescens*	Green-throated Sunbird	F	P		O
1122	*Nectarinia senegalensis*	Scarlet-chested Sunbird	f	O		O
1128	*Nectarinia venusta*	Variable Sunbird	f	O	P	O
1130	*Nectarinia verticalis*	Green-headed Sunbird	F	P	P	P
1133	*Zosterops senegalensis*	Yellow White-eye	f	O	O	O
1140	*Euplectes axillaris*	Fan-tailed Widowbird	A		O	
1155	*Malimbus rubricollis*	Red-headed Malimbe	FF	P	O	O
1158	*Ploceus aurantius*	Orange Weaver	f	P	P	P
1165	*Ploceus cucullatus*	Black-headed Weaver	O	O	C	O
1175	*Ploceus nigerrimus*	Vieillot's Black Weaver	f	O	O	O
1176	*Ploceus nigricollis*	Black-necked Weaver	f	P	C	P
1177	*Ploceus ocularis*	Spectacled Weaver	f			O
1186	*Ploceus tricolor*	Yellow-mantled Weaver	FF	P		P
1188	*Ploceus weynsi*	Weyns' Weaver	F	O	P	O
1206	*Passer griseus*	Grey-headed Sparrow	O		O	O
1230	*Estrilda nonnula*	Black-crowned Waxbill	f	O	P	O
1239	*Lagonosticta rubricata*	African Firefinch	O	O	O	O
1242	*Mandingoa nitidula*	Green-backed Twinspot	FF	P	P	P
1246	*Nigrita canicapilla*	Grey-headed Negrofinch	F	O	P	O
1254	*Pyrenestes ostrinus*	Black-bellied Seed-cracker	FL	P	P	P
1259	*Spermophaga ruficapilla*	Red-headed Bluebill	F	O	P	O
1261	*Uraeginthus bengalus*	Red-cheeked Cordon-bleu	O		O	
1265	*Lonchura bicolor*	Black and White Mannikin	f	C	O	C
1266	*Lonchura cucullata*	Bronze Mannikin	W		O	O
1290	*Serinus mozambicus*	Yellow-fronted Canary	O		O	

Key:	FF	Forest specialists	f	Forest visitors	OM	Open habitat migrants
	FF	Highland forest specialists	fH	Highland forest visitors	WM	Widespread migrants

	H					
	FFL	Lowland forest specialists	fL	Lowland forest visitors	FM	Forest generalist migrants
	F	Forest generalists	A	Aquatic/swamp species	fM	Forest visitor migrants
	FH	Highland forest generalists	O	Open habitat species	AM	Aquatic migrants
	FL	Lowland forest generalists	OH	Highland open habitat species	W	Widespread species
	C	Caught	O	Observed (heard and/or seen)	P	Previous record

List of rodent species recorded from Mpanga, Zika and Mpigi group of forests

Species	Ecological type	Mpanga	Mpigi	Zika
Aethomys hindei	O			1
Aethomys kaiseri	O			2
Grammomys dolichurus	f			2
Grammomys rutilans	f			1
Hybomys univittatus	F	3	3	1
Hylomyscus stella	F	3	3	1
Lemniscomys striatus	W			2
Lophuromys flavopunctatus	W	3	3	3
Lophuromys sikapusi	W	3	3	1
Malacomys longipes	AF	2	2	1
Mastomys hildebrandtii	W		2	
Mus minutoides	W	1	3	
Mus triton	O			1
Oenomys hypoxanthus	f			1
Praomys jacksoni	f	3	3	3
Tatera valida	O	1	1	

List of shrew species recorded from Zika and Mpigi group of forests

Species	Ecological type	Mpigi	Zika
Crocidura dolichura	f		2
Crocidura fuscomurina	O	2	
Crocidura luna	W	2	2
Crocidura planiceps	W	2	
Crocidura turba	f		2

Key: Ecological Type

F	Closed forest	FL	Closed forest (lowland)	FH	Closed forest (highland)
f	Forest edge	fH	Forest edge (highland)	A	Aquatic/swamp
AF	Swamp forest	AO	Swamp open habitats	AH	Aquatic/swamp (highland)
AFH	Swamp forest (highland)	O	Open/grassland	OH	Open/grassland (highland)
W	Widespread	U	Unknown status		

Species records 1 Previous 2 Present inventory 3 Previous and present

List of mammal specimens collected from Mpigi group of forest reserves

Specimen No	Species		
1176	*Crocidura luna*		
1177	*Crocidura fuscomurina*		
1178	*Praomys jacksoni*		
1179	*Praomys jacksoni*		
1180	*Praomys jacksoni*		
1181	*Mastomys hildebrandtii*		
1182	*Praomys jacksoni*		
1183	*Praomys jacksoni*		
1184	*Praomys jacksoni*		
1185	*Crocidura luna*		
1186	*Praomys jacksoni*		
1187	*Praomys jacksoni*		
1188	*Praomys jacksoni*		
1189	*Malacomys longipes*		
1190	*Praomys jacksoni*		
1191	*Lophuromys flavopunctatus*		
1192	*Hylomyscus stella*		
1193	*Praomys jacksoni*		
1194	*Hybomys univittatus*		
1195	*Praomys jacksoni*		
1196	*Lophuromys sikapusi*		
1197	*Hylomyscus stella*		
1198	*Praomys jacksoni*		
1199a	*Praomys jacksoni*		
1199b	*Crocidura planiceps*		
1200	*Praomys jacksoni*		
1201	*Hybomys univittatus*		
1202	*Mus minutoides*		
1203	*Crocidura luna*		
1204	*Praomys jacksoni*		
1205	*Praomys jacksoni*		
1206	*Praomys jacksoni*		
1207	*Lophuromys flavopunctatus*		
1208	*Praomys jacksoni*		
1209	*Lophuromys flavopunctatus*		
1210	*Praomys jacksoni*		
1211	*Praomys jacksoni*		
1212	*Praomys jacksoni*		
1213	*Praomys jacksoni*		
1214	*Praomys jacksoni*		
1215	*Praomys jacksoni*		
1216	*Hybomys univittatus*		
1217	*Praomys jacksoni*		
1218	*Praomys jacksoni*		
1219	*Praomys jacksoni*		
1220	*Praomys jacksoni*		
1221	*Praomys jacksoni*		
1222	*Praomys jacksoni*		
1223	*Praomys jacksoni*		
1224	*Praomys jacksoni*		
1225	*Praomys jacksoni*		
1226	*Hybomys univittatus*		
1227	*Praomys jacksoni*		
1228	*Praomys jacksoni*		
1229	*Praomys jacksoni*		
1230	*Praomys jacksoni*		
1231	*Praomys jacksoni*		
1232	*Praomys jacksoni*		
1233	*Praomys jacksoni*		
1234	*Praomys jacksoni*		
1235	*Praomys jacksoni*		
1236	*Praomys jacksoni*		
1237	*Praomys jacksoni*		

1238	*Praomys jacksoni*		
1239	*Praomys jacksoni*		
1240	*Praomys jacksoni*		
1241	*Praomys jacksoni*		
1242	*Lophuromys flavopunctatus*		
1243	*Praomys jacksoni*		
1244	*Praomys jacksoni*		
1245	*Hybomys univittatus*		