NILE EQUATORIAL LAKES SUBSIDIARY ACTION PROGRAM (NELSAP)

ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT OF 400 kV IRINGA – MBEYA TRANSMISSION LINE

Final ESIA

Vol I – ESIA Main Body

OCTOBER 2012

SMEC

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ABBREVIATIONS

Al	Aluminium
a.s.l	Above sea level
BOD	Biological Oxygen Demand
BP	Bank Procedures
CO2	Carbon Dioxide
DA	Director of Antiquities
dBA	A-weighted decibels
DC	District Commissioner
DED	District Executive Director
DFO	District Forest Office
DO	Dioxide
DPLO	District Planning Officer
EA	Environmental Assessment
EAPP	Eastern Africa Power Pool
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EMS	Environmental Management System
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWURA	Energy and Water Utilities Regulatory Authority
FBD	Forest and Beekeeping Division
Fe	Iron
GIS	Geographic Information System
ha	Hectare
IAP	Interested and Affected Parties
kg	Kilogram
km	Kilometer
kV	Kilo Volt
l	Litre
IBA	Important Bird Area
IUCN	World Conservation Union
m	Meter
m^3	cubic meter
MEM	Ministry of Energy and Minerals

MKGR	Mpanga Kipengere Game Reserve
mg	Milligram
MNRT	Ministry of Natural Resources and Tourism
MOW	Ministry of Water
MW	Megawatt
NBI	Nile Basin Initiative
NBS	National Bureau of Statistics Tanzania
NELSAP	Nile Equatorial Lake Subsidiary Action Program
NEMC	National Environment Management Council
NH^{+}	Ammonium
NO_3	Nitrous Oxide
NOx	Oxides of Nitrogen
OP	Operational Policies
OSHA	Occupational Safety and Health Administration
PAP	Potential Affected Persons
PAH	Potential Affected Households
PM	Particulate matter
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RAS	Regional Administrative Secretary
RBWO	Rufiji Water Office
RC	Regional Commissioner
RM	Regional Manager
RoW	Right of Way
SAPP	Southern Africa Power Pool
SMEC	Snowy Mountains Engineering Corporation
SS	Suspended Sediment
t	Ton
TANESCO	Tanzania Electric Supply Company Limited
TANAPA	Tanzania National Parks Authority
TAZAM	Tanzania Zambia Highway
TAZAMA	Tanzania Zambia Pipeline Authority
TAZARA	Tanzania Zambia Railway Authority
TBS	Tanzania Bureau of Standards
TEO	Town Executive Officer
TFS	Tanzania Forest Services
TL	Transmission Line
ToR	Terms of Reference

USD	United States dollars
UMEMARUWA	Uhifadhi na Matumizi Endelevu ya Maliasili Rujewa na Wanging'ombe
WB	World Bank
WCST	Wildlife Conservation Society of Tanzania (WCST)
WEO	Ward Executive Officer
WHO	World Health Organization
WL	Wayleave
WMA	Wildlife Management Area
µm	micrometers

ACKNOWLEDGEMENT

A number of people have made various contributions to this report, including those who were not members of the SMEC Team yet provided valuable input to the Project that are greatly appreciated and should therefore be acknowledged. The ESIA report would not have been possible without the assistance of these people. The team wishes to thank all of them for their generous contributions, expertise and resources that have been used in this report. The information and insight provided by the village people, government officials, agencies and organizations along the route of the proposed transmission line options have greatly been useful in drawing up the report.

The team expresses sincere gratitude to the District Executive Officers, Regional Commissioners, Regional Administrative Secretaries, and Managers of utility companies such as TAZARA, TAZAMA Pipeline Wildlife Conservation Society of Tanzania (WCST) and Game Officers for Mpanga Kipengere Game Reserve for providing the team with valuable contributions on how the project team should plan for the proposed project. Concerns and issues from these stakeholders have been integrated into the report.

The team is also grateful to the village leaders and residents for their support and cooperation during this study. We thank them for the time they spent answering our questions and for comments on various issues that have been taken into account during the preparation of the report.

In addition the ESIA team wishes to express their thanks to, NELSAP CU, TANESCO and its staff for its continual support, the Ministry of Natural Resources and Tourism (Forest and Beekeeping Department and Antiquities), the Ministry of Agriculture and Food Security, Ministryof Energy and Minerals, the Ministry of Land and Human Settlements, Ministry of Labour, Employment and Youth Development (Occupational Safety and Health Authority) and TANROADS, for their comments and suggestions that have enriched this report.

EXECUTIVE SUMMARY

Background

The Government of Tanzania, through Tanzanian Electric Supply Company Limited (TANESCO) developed a power system master plan in 2008 which was updated in 2009 to guide the next 25 years of power system development in Tanzania. The master plan provided a detailed assessment of load demand projections, available options for meeting demand, and requirements for a new higher voltage backbone transmission system for the country. In 2009 TANESCO updated and finalized the master plan whereby the Generation and Transmission Projects for short to long term (2009 to 2033) were identified. As a result the Government of Tanzania, through the Nile Basin Initiative / Nile Equatorial Lakes Subsidiary Action Program (NBI/NELSAP), is currently carrying out a Feasibility Study, Conceptual Design and Preparation of Tender Documents as well as Environmental and Social Impact Assessment and Resettlement Action Plan for the Iringa to Mbeya, 292.2 km long transmission line.

The proposed Iringa-Mbeya transmission line will link with a 400 kV Backbone Iringa to Shinyanga, which will facilitate the smooth power transfer to the northern part of the country and neighbouring countries such as Zambia in the south and Kenya and Uganda in the North.

The objective of this Environmental and Social Impact Assessment (ESIA) is to:

i) Identify a suitable transmission line alignment that best meets project objectives, as well as environmental and social constraints;

ii) Document baseline conditions and determine potential environmental and social impacts resulting from the preferred option; and

iii) Determine measures to prevent, minimize, mitigate or compensate for adverse impacts; and for environmental enhancement to be integrated in the planning and design of the project.

iv) Prepare an environmental and social management plan (ESMP) and monitoring Plan.

The ESIA was prepared in accordance with Tanzanian regulatory requirements, notably the Tanzanian Environmental Management Act CAP 191 (2004) and the Regulations for EIA and Auditing (2005). The ESIA also addressed World Bank requirements for major infrastructure projects.

Options Assessment

During the preliminary phase, four alternative options were thoroughly investigated and analysed with regard to meeting project objectives and environmental and social constraints. Identified options were ranked according to their “pros and cons” and presented to the Client for their review and decision. Accordingly, as per environmental and social impact criteria presented, “Option 4” was chosen by the Client, which forms the basis for this final ESIA.

The Table below presents a summary of the environmental and social impact assessment for all four Options. This was prepared during the preliminary phase and updated for the preferred Option 4 during Phase II.

	Impact	Option 1	Option 2	Option 3	Option 4	Impact phase
Physical	No. of PAHs	369	742	770	1015	c
	Loss of Houses/Structures (number)	155	323	264	21	c
	Dislocation of Graveyards	16	17	17	16	c
	RAP Cost (approximate - USD)	7,164,304.85	10,708,108	10,305,354.	2,232,460[1].	
	National economic benefit in Tanzania	+++	+++	+++	+++	o
Natural Environment	Vegetation Cover	- -	- - -	- - -	- -	c
	Soil Erosion	- - -	- -	- -	-	c
	Climate Change	0	0	0	0	
	Wildlife	-	- --	- --	- - -	c,o
	Landscape Aesthetics	- -	-	-	-	c,o
	Collision of Birds with line	- - -	-	-	- - -	o
	Hydrocarbons	- -	- -	- -	- -	c
	Water Resources	-	-	-	-	c,o
	Waste and waste water	-	-	-	-	c,o
Socio-economic	Land use	- - -	- -	- - -	- -	c
	Housing	- - -	- - -	- - -	- - -	c
	Cultural Property Resources	-	- -	- -	-	c
	Tree Crops	-	- - -	- - -	- -	c
	Access Road and Public Infrastructure	+++	+++	+	++ +	c,o
	Employment	+++	+++	+++	+++	c,o
Health and Safety	Air and dust	-	-	-	-	c
	Noise	-	- -	- -	-	c, o
	Electromagnetic field	-	-	-	-	o
	Safety	-	-	-	-	c,o
	HIV/AIDS	- - -	- - -	- - -	- - -	c

[1] Breakdown of RAP cost are provided in the RAP report

Project Description (preferred Option 4)

The project area is situated in the Southern Highlands of Tanzania and located in Iringa and Mbeya regions (between latitudes 7° 47' 35" S and 8° 54' 35" S) The existing Transmission Line (TL) for the 220kV lines is approximately 352 km long, stretching from Tagamenda substation at Iringa to Mwakibete substation near Mbeya City.

The proposed TL will generally be aligned parallel to the existing 220kV line through wooded grasslands and miombo woodland and will divert to the existing line to avoid densely populated settlements, protected archaeological sites such as Isimila, conservation areas and government plantations. The major project components are wayleave corridors, transmission towers and conductors, substations, access roads, camps, storage and workshops.

Project parameters are:

Line Segment	Total Length (KM)	Tower Total	Angle Tower	No. of Substations
Iringa - Kisada Section	106.1	251	25	2
Kisada – Mbeya Section	186.2	439	43	1
Total	**292.2**	**690**	**68**	**3**

Iringa – Kisada Section

From the Iringa sub-station at 1,566m above sea level (a.s.l) the proposed TL will pass parallel to the existing 220 kV line for approximately 15.2 km. This section is typified by undulating land and low lying hills of Tagamenda and Wenda, which are covered by grassed shrubs and open secondary miombo woodland and rock outcrops.

Kisada – Mbeya Section

From the Kisada substation the proposed TL crosses miombo woodland and farmland. The section of corridor in Kisada, Maduma, Kiponda and Luwango is the most location from the Zambia -Tanzania Highway.

Policy, Legal and Institutional Framework

This report gives an overview of the policy, legal, regulatory and institutional framework of environmental management in Tanzania. The framework focuses on those issues and requirements relevant for the project. Safeguard principles established by the World Bank have also been reviewed and incorporated in the ESIA.

Existing Environmental and Social Conditions

This report describes the existing environmental and social situation in the areas that will be directly or indirectly impacted by the proposed project. Baseline information has been collected based on:

i) Review of literature and internet-based research;

ii) Site visit during the preliminary phase (Phase I)

iii) Interpretation of maps and images;

iv) Detailed field investigations and consultation during Phase I; and

v) Further field investigation and stakeholder consultation during Phase II.

Physical/Environmental

Iringa and Mbeya regions have varying topographic features ranging from the Little and Great Ruaha valleys at about 500-700m a.s.l to the Kipengere and Poroto Mountains above 1500m a.sl. The project's higher elevations will be in Mufindi, Makambako and Uyole uplands.

The temperature around Iringa Town varies between 15°C and 25°C. In Mbeya, average temperatures range from 12°C in Mbeya Mountains to about 25°C in the lowlands. Both regions are typified by a variety of climates ranging from semi-dry areas in Malangali and close to Rujewa town to the high rainfall areas in Mufindi and Uyole.

Soils vary from reddish-grey loam to reddish brown loam. The soils in Iringa region are well drained and highly weathered. In the upper elevations the soils are predominantly leached clay. In the middle elevations moderately drained and leached soils are dominant. The low lying areas are dominated by red brown loam and highly fertile soils. In some areas of Mbeya, the soils are characterized by loam Entisols-Vertisol to clay loam Ultisols with good drainage.

Land use and vegetation cover have been strongly influenced by the climate, topography and population. Trees and perennials grown in the population farms include guava trees and bamboo, which is tapped to produce a local wine. Mikusu (*Uapaka* kirkiana), an indigenous fruit tree species, is retained and conserved on people's land. The dominant agricultural practised in the TL area is sedentary and shifting cultivation. The main crops are maize, sunflower, sweet potatoes, cassava, and groundnuts. In some parts of the project area, such as along the Zambia-Tanzania Highway and along the bank of Ndembera and Ruaha rivers in Iringa and Mufindi districts, large scale commercial farms practice intensive agriculture. Crops cultivated under this system are maize, beans and tobacco.

The forest in the area is consisting of exotic timber species such as *Pinus patula* and Eucalyptus. On private farms people have planted woodlots of timber trees for commercial and local use. The woodlands serve as important resources for beekeeping and the production of honey and wax, which is a major economic activity in the central areas of the project.

Socio-economic

According to the 2002 Population and Housing Census the population of Iringa project region (consisting of Iringa, Mufindi, and Makete districts) is around 650,000, with a projected population of 850,00 (approximately) by the year 2012. Total population in Mbeya region (Mbeya rural, Mbarali and Mbeya districts) is about 800,000, with the population projected to reach over 1 million in 2012.

The dominant ethnic group along the transmission line in Iringa Region is the Hehe, who are mostly found in Iringa rural, and Mufindi districts. The Kinga are concentrated in Makete. The ethnic groups found in Mbeya Region include the Nyakyusa, Safwa and Malila in Mbeya rural. Mbarali district is occupied by the Sangu, Hehe, Kinga, Bena and Nyakyusa, while Mbeya City is occupied by all the above tribes as well as the Wanji, Ndali, Nyika, Sukuma.

Agriculture is a significant source of food and supplementary income for household residents in all districts of Iringa and Mbeya regions. About 90% of the populations in both regions earn their living from agriculture and livestock production. Thus far, the sector has ensured food security and managed to produce surpluses of maize which is the major

food crop grown in both regions. Endowed with fertile soils, good weather and sufficient rainfall, the area is ideal for cultivation of both food and cash crops.

Most of the household members along the transmission line participate in farming activities. Hired labour is also common during peak farming seasons. Labour can be hired for slashing and digging. Some of the households in the project own small shops and kiosks, especially in sub-urban areas. These are very common and serve as the main shopping centres along the existing transmission line. Some villages in Mbeya operate open markets, while Iringa region has few open markets. There are butchers in villages, though animals are also slaughtered and sold as meat at people's homes.

In all rural communities along the transmission line ownership of properties is gender biased. While men own farms and valuable animals, women own utensils and small animals. This makes a big difference in levels of income between men and women. Fertilizers are used to increase production in nutrient-depleted soils nutrients. Those who do not use fertilizers produce small amounts of food and cash crops. In many areas people depend on cash income generated from selling tea grown on small plots or by labouring at tea estates. Potential sectors to invest in include agriculture and agro processing of horticultural, food and cash crops.

According to the household survey, up to 84% of household reported to farming i.e. agriculture or cultivation on their own land, agricultural labor as their main occupation. Landless labour were fewer (3.8%) but these also include households who carry out such activities during non-farm season. Only 1% reported of government service, 3.2% business and 0.5% working in the private sectors. A number of female headed households reported maid servant (0.8%) as their primary occupation while 6.7% fall under unspecific type of employment (others).

Public and Stakeholders Consultation

Extensive stakeholder consultations were undertaken, which included stakeholders in relevant ministries and sectors in Dar es Salaam, the Regions and Districts, and various institutions including NGOs/CBOs operating at the level of the districts and villages. Consultation included discussions with local leaders, public village meetings, meetings and interviews with focus groups and various officials from public and private offices. Project affected villagers were also visited to collect their views and concerns.

Impact Assessment

The main elements of the project causing environmental and social impacts will be the construction of:

i) the transmission line including the way leave with conductors, towers and access ways;

ii) 2 new substations at Kisada and Mbeya with capacitors, transformers, switching facilities and workshops; and

iii) temporary camps with storage areas, workshops and accommodation facilities.

The ESIA assessed that most potential impacts associated with the project are of a temporary nature occurring during Project construction. These impacts can be minimised by good engineering practice and implementation of appropriate safeguards as outlined in the Environmental Management Plan (EMP).

The biophysical impacts of the Project are expected to be minimal and short term. The TL will pass through a portion of Mpanga Kipengere Game Reserve and parallel to the

existing line. Though this section of the reserve has low biodiversity (according to Forest and Beekeeping Division, 2005) but the construction of infrastructures; towers and conductors may impact on wildlife including migratory birds.

Visual scenery will be impacted during construction and operational phases due to the erection of towers in the natural landscape and loss of vegetation as result of corridor clearance. Also, the project construction works may be associated with traffic accidents, dust and noise pollution during construction phase.

The most likely areas for soil erosion are in Malangali and Bumilayinga wards, particularly in the villages of Kisada and Bumilayinga at Mufindi. This may be a threat to the soil in terms of soil loss and degradation as well as affecting the stability of some towers along the existing line.

The most important negative social and economic impact will be the necessary removal of houses affected by the way-leave and associated land acquisition. Adverse impacts are summarized in the table below:

No. of villages affected	54 villages across 6 districts							
Impact on land due to the project	6149 acres							
No. of PAHs/PAPs	PAHs – 1015 and PAPs – 5188							
No. of trees or fruit crops affected	Bamboo	Banana	Orange	Guava	Avocado	Peaches	Mango	Total
	3,852	799	620	250	91	33	1,117	6,762
No. of residential and related structures* impacted	21 structures across 11 villages; total area of 878.81 m^2 of structures All the structures have thatched roof, bamboo walls/non-plastered bricks and mud floors.							
Graveyards	16 across the entire stretch							
Common property	1 water storage tank with gates and semi-constructed cement walls at Nsoniyaga village							

* none were under government institutions, religious groups or community ownership.

Potential impacts are anticipated to occur predominantly during the construction phase with the importation of skilled workers into the area, construction of work camps and temporary access roads, and establishment of the transmission line right of way (ROW). While considerable attention will be focused on loss of income due to temporary disturbance to crops or grazing areas, and on health conditions related to the influx of workers from outside the region (HIV/AIDS being the major concern), positive opportunities to Project Affected People (PAPs) may be presented in the form of temporary employment, as well as through income generated by the sale of food to immigrant workers.

Mitigation measures

The most important environmental mitigation measure is minimizing the extent of clearing natural areas along the wayleave area for construction work and inspection activities. After finalisation of construction work, areas not needed anymore will be replanted and rehabilitated in a manner that does not affect transmission line security.

Compensation will be provided where towers or right-of-way:

i) affects residential dwellings or social services (the loss of which will pose health and safety problems);

ii) fragments cultivated fields and compromises productivity and income; and

iii) involves the removal of fruit-bearing trees and other economically valuable natural resources.

Entitlements shall be as per the legal framework of Tanzania and also as per the World Bank OP 4.12. Details on resettlement and entitlements are provided in the Resettlement Action Plan (RAP).

Other key mitigation measures as proposed are:

i) Mitigation against impact on natural vegetation and tree cutting will include replanting of disturbed sites by use of desirable species and use of selective clearings for vegetation along the proposed corridor.

ii) The width of TL wayleave will be made as narrow as possible in forested areas and corridors will be shared wherever possible. Routing of corridor will be restricted in closed forest or woodland.

iii) Birds' collision will be averted by placing markers on shield wires in areas where collision is potentially high. The developer will attach special devises to conductors/towers to scare climbing animals.

iv) The design shall allow sharing of corridors amongst power and other utilities to allow passage of migratory animals. Other measures to safeguard wildlife are: a) periodic surveillance of wayleave after construction for invasive species; b) limitation of towers in wetland areas and monitoring of avifauna along TL to detect any ecological effects. The developer will need to create awareness about wildlife values among workers. Also, ensure collaboration of key stakeholders regarding alignment of TL inside Mpanga/Kipengere Game Reserve (MKGR).

v) As for Health and Safety mitigation, adequate handling of sewerage and disposal of solid and liquid waste before treatment and safe disposal is crucial. The developer will apply best practices regarding health and safety for, example, fencing and prevention of noise and dust pollution.

vi) Regarding HIV/AIDS prevention, the developer shall carry out awareness about the spread of HIV/AIDS. Such shall be done by engaging specialized NGOs. In addition, use publicity materials and will supply condoms to workers and neighbourhood communities and assist voluntary HIV testing, pre-and post-test counselling.

Environmental Monitoring and Management

The purpose of the environmental monitoring program is to ensure that Project goals on implementation of ESMP are achieved, including maximising benefits to Tanzania and minimising environmental and social impacts. The proposed environmental monitoring program provides guidance for management decisions made during construction and operational phases. The Environmental Management Plan (EMP) provides the basis for evaluating the efficiency of mitigation and enhancement measures and suggests further actions that need to be taken to achieve the desired Project outcomes.

An EMP has been included in this ESIA Report to depict the range of environmental impacts/issues and associated mitigation measures envisaged for this Project. The EMP also identifies responsibilities and indicative cost for implementing the mitigation and monitoring measures.

Conclusion

This ESIA concludes that the proposed TL Project will not cause significant social and environmental impacts. Most adverse impacts will be of a temporary nature occurring during the construction phase and these can be managed to acceptable levels.

Implementation of the EMP will ensure that the overall benefits from the project will greatly outweigh any adverse impacts.

1 INTRODUCTION

1.1 Background

The Government of Tanzania, through Tanzanian Electric Supply Company Limited (TANESCO) developed a power system master plan in 2008 to guide the next 25 years of power system development in Tanzania. The master plan provided a detailed assessment of load demand projections, available options for meeting demand, and requirements for a new higher voltage backbone transmission system for the country. In 2009 TANESCO updated and finalized the master plan whereby the Generation and Transmission Projects for short to long term (2009 to 2033) were identified. As a result TANESCO, through the Nile Basin Initiative / Nile Equatorial Lakes Subsidiary Action Program (NBI/NELSAP), is currently carrying out a Feasibility Study, Conceptual Design and Preparation of Tender Documents for Iringa to Mbeya, 352 km long transmission line.

The proposed Iringa-Mbeya transmission line project will in future link with a 400 kV Backbone Iringa to Shinyanga, which will facilitate the smooth power transfer to the northern part of the country and neighbouring countries such as Zambia in south and Kenya and Uganda in North.

The project (the location map is shown in Figure 1) is in line with other projects currently under implementation, including the 400 kV Iringa - Shinyanga (through Singida under the auspices of TANESCO and the 400 kV Kenya (Nairobi) – Tanzania (Arusha – Singida) under the auspices of NELSAP. In addition, TANESCO is updating the feasibility study of 400 kV Zambia (Kasama) - Tanzania (Mbeya) Interconnection. The project has a regional impact as it will link NBI/Eastern Africa Power Pool (EAPP) countries to Southern Africa Power Pool (SAPP).

Currently the segment between Mbeya and Iringa has a 220 kV transmission line which is a weak link in the national power distribution system that needs to be reinforced. Also, in terms of power quality and reliability issues, most of the power lines in Tanzania suffer from voltage depressions, surges and sometimes total outages. The situation calls for efforts for the construction of new power transmission lines in addition to an improvement in power transferring capabilities.

1.2 Proposed Study

This study consists of a feasibility study, environmental and social impact assessment, resettlement action plan, conceptual design and tender documents of Iringa - Mbeya Transmission Line which is divided into two separate consultancy services, namely:

i) Feasibility study, conceptual design and tender documents; and

ii) Environmental and social impact assessment (ESIA) and resettlement action plan (RAP).

The above studies were carried out by two separate Consultants, namely AECOM/SOGREAH and SMEC International Pty ltd. The former was the feasibility study and design consultant and SMEC was responsible to prepare ESIA/RAP. The studies ran parallel and in a coordinated manner.

Figure 1 Project Location Map

34°0'0"E

35°0'0"E

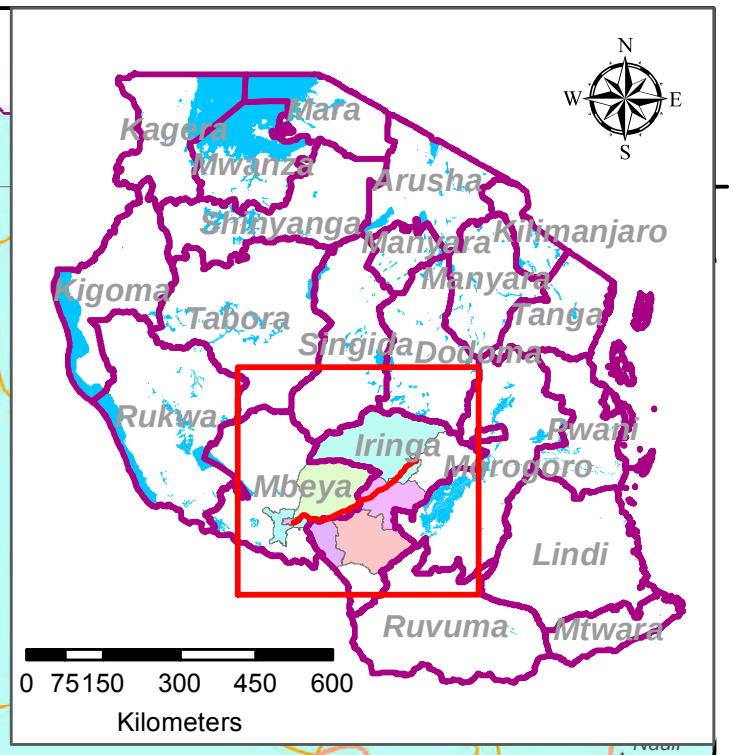
7°0'0"S

8°0'0"S

9°0'0"S

Legend

- Village
- Town
- Substations
- Proposed Transmission Line
- Region Boundary
- Primary Road
- Secondary Road
- Other Road



Musombe
Isenga
Iringa Rural
Ngajira
Iringa Urban
Iringa Substation
Tagamenda Malulumo
Kalenga Ihole 'A'
Ugwachanya
Tosamaganga
Iwenda 'B'
Tanangozi
Kiponzelo
Nemi
Isupilo
Ifunda
Muwimbi
Kibena
Rungemba
Kikombo
Ugute
Isalavan
Mtula
Ulole
Bumilayinga
Makongami
Kisada Substation
Kisada
Maduma
Madibira
Mbarali
Lipagama
Mufindi
Ilpilimo
Tambalang'ombe
Ibatege
Luwango
Ipwani
Matemele
Mkandami
Rujewa
Ihanga
Igomelo
Lugelele
Msosule
Ikovo
Kimani
Muwale
Mfumbi
Mulungano
Isitu
Igurusi
Majenje
Mambi
Kapyo
Ilongo
Ruiwa
Mkuyuni
Iyawaya
Ifunda
Itanjililowa
Imezultewe
Mbeya Substation
Mbeya Rural
Mbaramaziwa
Mufindi
Kasanga
Makambako
Mdandu
Makete
Njombe
0 10 20 40 60 80
Kilometers

Coordinate System UTM 36 South (WGS 1984)	**Source:** NBS, FAO & SMEC	**Client:** NELSAP
Project Name: Environment and Social Impact Assessment and Resettlement Action Plan of 400 kv Iringa – Mbeya Transmission Line		Consultant SMEC International

1.3 Scope and Objectives of Final ESIA

The objective of the final ESIA as outlined in the Contract is: to identify environmental and social impacts that the project will have on the chosen option, as well as to determine measures to prevent, minimize, mitigate or compensate for adverse impacts; and for environmental enhancement to be integrated in the planning and design of the project.

During the preliminary phase, four alternative options were thoroughly investigated and analysed in terms of environmental and social impacts as well and technical perspectives and the options were ranked according to their “pros and cons” and presented to the Client for their review and decision. Accordingly the Client has chosen “Option 4”. This final ESIA study further investigates the chosen option.

Specifically, using the preliminary ESIA data as a starting point, this final ESIA will refine the environmental and social information pertaining to the construction of the transmission line as necessary and recommend appropriate mitigation and monitoring measures in compliance with the World Bank’s safe guard policies as well as relevant national environmental legislations.

The final ESIA intends to achieve the following objectives:

i) Refine the baseline data on the chosen option on social and biophysical environment as identified during preliminary stage

ii) Enhancement and identification of social and biophysical environment impacts including identification of alternatives (including the no project alternative) on the chosen option;

iii) Identification of stakeholders and project affected population related to chosen option and initiation of a public consultation process;

iv) Identification of measures required to prevent, minimise, mitigate or compensate for adverse impacts and for social and environmental enhancement;

v) Preparation of a framework for an Environmental and Social Management Plan (ESMP) that describes in detail mitigation measures to be carried out, costing, scheduling and assigning responsibility for such measures, and a monitoring plan.

The proposed development may be funded by World Bank or other potential financial lenders; therefore this final ESIA has taken into account and addressed (as far as applicable) the safeguard policies (including public consultations) of World Bank defined in their Operational Policies documents, in addition to Tanzanian regulatory requirements.

1.4 Final ESIA Resourcing

The Contract for Consultancy Services was signed on 01 December 2011 between the Client (NELSAP) and the Consultant (SMEC) with the objective to prepare an Environment and Social Impact Assessment and Resettlement Action Plan of the 400 kV Transmission line from Iringa to Mbeya. The cost of services is funded through the World Bank Nile Basin Trust Funds. The revised time period for the Consultancy Services is 8.5 months.

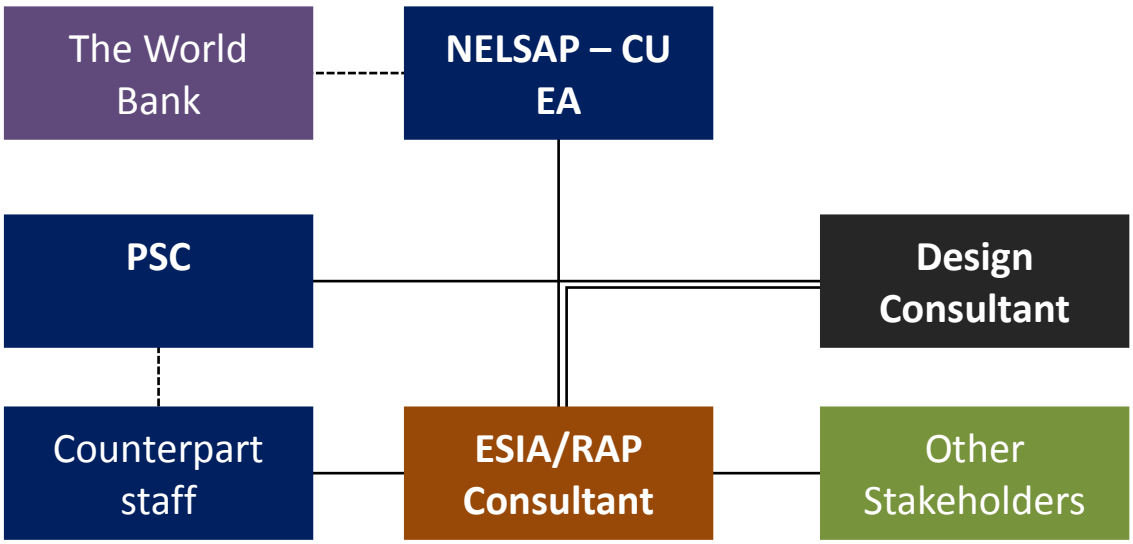
The Nile Basin Initiative (NBI) is the executing agency of the study through its secretariat (Nile-SEC) based in Entebbe (Republic of Uganda). The NELSAP Coordination Unit (NELSAP-CU) is the implementing agency of the study in close coordination with the Project Steering Committee (PSC) composed of members from TANESCO.NELSAP is

responsible for overall management of the study while the PSC is responsible for the technically aspects of the study.

SMEC is supervised by and reports to the project Co-ordinator from NELSAP-CU. However, SMEC works very closely with PSC (TANESCO). TANESCO assigned two counterpart staff: one Social Specialist and one Environmental Specialist to work with the Consultant. A list of the Consultant's staff and their positions is presented in Appendix 2.

The project's organization arrangements are shown in Figure 2.

Figure 2: Project Organization Structure



1.5 Content of Final ESIA

This final ESIA report includes the following:

- Chapter 1: Introduction
- Chapter 2: Description of the Project and its objectives.
- Chapter 3: Outline of the policy, legal and administrative framework for implementation of the Project.
- Chapter 4: Description of baseline data.
- Chapter 5: Details of stakeholder consultation and methods.
- Chapter 6: Social and environmental impacts from the Project.
- Chapter 7: Mitigation measures to minimise any adverse impacts and maximise benefits.
- Chapter 8: Analysis of alternative.
- Chapter 9: Summary of the environmental and social management and monitoring plan
- Chapter 10: Conclusion.

2 PROJECT DESCRIPTION

2.1 Previous Studies

In 2004, TANESCO and interested partners completed studies on alternatives for the transmission line (TL) and the improvement of the network system in Tanzania. The study concluded that the most feasible alternatives were to construct the following lines:

i) Zambia-Tanzania Power interconnector project

ii) Iringa - Shinyanga transmission line

iii) The Tanzania-Kenya transmission line from Arusha to Nairobi.

The proposed Iringa - Mbeya transmission line will eventually link with the 400 kV Iringa to Shinyanga transmission line, which will facilitate the smooth transfer of power to the northern part of the country and neighbouring countries such as Zambia in south and Kenya and Uganda in North.

The Iringa - Mbeya transmission line is complementary to other regional power system projects presently underway including the 400 kV Iringa - Shinyanga (through Dodoma and Singida) Transmission Line under the auspicious of TANESCO and the 400 kV Kenya (Nairobi) – Tanzania (Arusha – Singida) Transmission Line under the auspicious of NELSAP. In addition, TANESCO is updating the feasibility study for the 400 kV Zambia (Kasama) - Tanzania (Mbeya) Interconnection.

2.2 The Current Study

As mentioned on Section 1, this study is divided into two separate consultancy services, namely: i) feasibility study, conceptual design and tender documents; and ii) environmental and social impact assessment (ESIA) and resettlement action plan (RAP).

During the preliminary phase, four alternative options were thoroughly investigated and analysed in terms of environmental and social (RAP) perspectives and the options were ranked according to their “pros and cons” and presented to the Client and stakeholder for their review and decision. Accordingly the Client has chosen “Option 4”. This final stage further investigates and refines the chosen option.

2.3 Project Location

The study area includes Iringa and Mbeya regions and passes through various districts, wards and villages as indicated in the Table 1. Figure 1 in above section depicts the administrative boundaries of the districts.

Table 1Regions, Districts and Villages along the Proposed Transmission Line (TL)

Region	Districts	Total Villages	No. of Villages	Surveyed Villages
Iringa	Iringa	Muwimbi, Ifunda, Ulete, Kibena, Isupilo, Ugwachanya, Ndolezi, Wenda, Tagamenda, Ihemi, Majengo, Rungemba, Tanangozi	13	All
	Makete	Kimani, Mfumbi	2	All

Region	Districts	Total Villages	No. of Villages	Surveyed Villages
	Mufindi	Tambalangombe, Isalanavu, Ipilimo, Kitelewasi, Kiponda, Bumlayinga, Kisada, Maduma, Kikombo, Majengo	10	All
Mbeya	Mbarali	Igomelo, Soniyaga, Lugelele, Ihango, Isitu, Lyambogo, Iganjo, Manjenje, Matemela, Itamboleo, Maduma, Mengele, Maendeleo, Mbuyuni, Itipingi, Uhamila, Isongwa, Mambi, Lunwa, Lusese	20	All
	Mbeya Rural	Iyawaya, Itewe, Isongwa, Luwango, Tembela, Ntangano	6	All
	Mbeya City	Iganjo, Itanji, Ikhanga	3	All
TOTAL			**54**	**All**

2.3.1 Iringa – Kisada Section

From the Iringa sub-station at 1,566m a.s.l, the proposed TL will pass parallel to the existing 220 kV line for approximately 15.2 km. This section typified by undulating land and low lying hills of Tagamenda and Wenda which are covered by grassed shrubs and open secondary miombo woodland and rock outcrops. The hill slopes and bottoms are under subsistence farming and patches of planted and natural trees. The chosen proposed TL diverges from the existing line crossing the Tanzania – Zambia Highway between Ugwachanya and Wenda villages. It then traverses in Sadani and Tanangozi villages on the North part of Zambia-Tanzania Highway. As from Ihemi village the proposed TL enters in semi-intensive and intensively cultivated lands with mix of rainfed and irrigated agricultural land in Ifunda village. Following it passes through the agricultural potential land which is under small scale and commercial farming estates. Makota farm at Ihemi stands at the highest elevation point at 1934m a.s.l along Iringa-Kisada and the entire Iringa Mbeya section. Most large scale commercial farming is under Roman Catholic and foreign investors, in particular in the villages of Ifunda, Muwindi/Ulete, Kibena and Rugemba. These areas lie in the wetlands of Ndembera River. Ndembera is the only permanent river crossed along Iringa –Kisada section. Floriculture and horticulture is taking place in this area. Crops cultivated in this section include flowers, maize, bamboo and onions.

2.3.2 Kisada – Mbeya Section

From the Kisada substation the proposed TL cuts across miombo woodland, and farms. The corridor section in Kisada, Maduma, Kiponda and Luwango is the most remote from Zambia Tanzania Highway along the entire Iringa-Mbeya corridor. In Maduma and Kisada the line crosses Ruaha Stream. From Kisada (1,845m a.s.l), the line altitude descends gradually to the lowest level of 1098m a.sl at Igawa across Mbarali River on Tanzania-Zambia Highway. The corridor section in Madabaga, Mabuyuni and Mfumbi largely passes inside Mpanga Kipengere Game Reserve (MKGR) which is predominantly miombo and acacia woodland. From Mbarali River crossing, the line altitude increases gradually all the way to the proposed substation at Uyole at 1839m a.s.l. At Madabaga the line crosses the tarmac road and remains on the Southern part of the highway up to Uyole substation.

The Kisada-Uyole section has many poorly drained sections which could potentially be used for irrigation farming, especially paddy. Apart from Mbarali, others major rivers which drain this section are Kimani, Ruaha, Chimala, Igurusi and Mlowo. At Igurusi the line crosses potential agricultural land under irrigation schemes, some owned by institutions and people from Mbeya city. Between Imezu and Uyole the line crosses several drainage lines on the slopes of Uyole hill or escarpment which is commonly known as “Mlima Nyoka” or Snake Mountain because of the meandering characteristics of the Tanzania-Zambia Highway up the hill. Streams in this part are Ipatangwa, Kapuo, Ikumbi and Nyuamburu. This section has steep terrain and close settlements such as Imezu, Idunda, Imezu, Ilongo, Itewe, Iyawaya, Shamwengo and Tembela. Intensive farming including horticultural farming under traditional furrow irrigation is common in this area. Subsequently the line enters Itanji Street on Mbeya-Uyole plateau in Mbeya city

2.4 Project Components

Transmission projects normally consist of several components each with specific environmental and social aspects and specific potential impacts. The typical project consists of the following elements:

2.4.1 Wayleave Corridors

The wayleave corridor for a transmission line includes land set aside for the transmission line and associated facilities, land needed to facilitate maintenance, and buffer areas to avoid risks of fires and other accidents. The wayleave corridor provides a safety margin between the high-voltage lines and surrounding structures. The proposed transmission line to be erected will utilize part of the existing 60 m wayleave of the 220kV transmission line from Iringa to Mbeya when running parallel to the existing line (before reaching Tanangozi village). In that case, sharing a common RoW will considerably reduce the overall RoW corridor width of the two lines compared to the situation where each line has a separate wayleave corridor. In defining the wayleave width, due consideration must be made on tower geometry, conductor swing-out, span length, induction interference and tower falling range. Since many of these parameters are not yet known, assessments were made based on an estimated axis distance of 70m added to the existing RoW, where the proposed line runs parallel to the existing 220kV line, and a 90 m axis distance for the wayleave corridor where the proposed lines run through a new area.

2.4.2 Transmission Line, Towers and Conductors

The line of towers will in some cases be a large and dominant feature in the landscape. Their function is to keep the high-voltage conductors (power lines) separated from their surroundings and from each other. Dependent on the design, height and placement in relation to the land form and vegetation the line might be perceived as a visual intrusion in the landscape scenery. The towers and the cables also constitute a hazard for birds and bats.

Conductors are the cables that transport the electrical power from a power station to the consumers. Generally, three conductors for each electrical circuit are strung on a tower. Conductors are fabricated primarily of twisted metal strands, but newer conductors may incorporate ceramic fibres in a matrix of aluminium for added strength with lighter weight. At high voltage levels there can be heard a slight noise and sparkling from the conductors (corona noise). The noise is dependent on the design of the line and can be reduced by appropriate design.

Table 2 Characteristics of the Proposed Transmission Line

Line Segment	Total Length (KM)	Tower Total	Angle Tower	No. of Substations
Iringa - Kisada Section	106.1	251	25	2
Kisada – Mbeya Section	186.2	439	43	1
Total	**292.2**	**690**	**68**	**3**

Source: AECOM's Feasibility Report

2.4.3 Substations

The substations normally consist of an office, storage and workshop buildings and a fenced-in transformer area. Substations vary in size and technical configuration and may cover several acres. They are cleared of vegetation and the fundaments normally consist of gravel or stone aggregates. Substations are fenced to minimize the potential for the accidental electrocution to people and animals and are accessible by a permanent road. Transformers and capacitors are filled with oil. Larger transformers are always placed on a concrete platform to avoid a contamination of ground and ground water from oil leaks. For the construction of proposed new 400kV line the existing area of the substations at Iringa will be expanded while two new ones will be constructed at Kisada and Uyole. The substations will require proper fencing to avoid electrocution of people and animals. Substations may require staff houses if located far from towns/planned settlements.

2.4.4 Access Roads

Some permanent and semi-permanent road reaches will have to be constructed to transport equipment and the work force to the TL. In some cases only short diversions from existing roads will be sufficient in other cases a road will be made in the TL itself. Vegetation clearing and/or re-contouring of land may be required for access road construction. Most of the existing access roads are in a bad condition, which require improvement. As a consequence of line construction planning, clearing of vegetation may be needed for safety and/or access reasons, which could potentially be a severe impact on vegetation and soil stability.

2.4.5 Camps, Storage and Workshops

The detailed layout and organisation of facilities for construction of the line will be the responsibility of the chosen contractor within the framework given in the contract. The technical and timing details are therefore not known at this early planning stage. What can be said about these issues is based on assumptions and normal practise from similar projects.

It will be necessary to establish a number of camps and equipment depots along the planned TL. Normally, such camps will be located in or near townships or larger villages in order to benefit from their infrastructure, such as accommodation, food supply areas, health services etc. Depending on the technical requirements a camp may serve a segment of about 100 km with the camp situated in the middle of that segment. This means that in this project a total of 3 to 4 camps will be established. Each of these camp sites will include storage of materials, maintenance of equipment and vehicles, accommodation and supply services for non-local workers, etc. The materials and equipment needed will be concrete, steel pro-files, isolators, conductors, oil and grease, fuel, etc. The organisation and layout of such camps and workshops will vary considerably.

The total labour force needed for the construction is dependent on the planned construction time and the number of crews or units working in parallel.

2.5 Project Implementation

2.5.1 Mobilization Phase

In line with similar projects implemented in Tanzania, construction is expected to start after contract signing following international competitive tendering. Pre-construction activities associated with design work include soil investigations and detailed survey of the transmission line route and substation location. Actual mobilization for construction work will follow within six months of final design. The mobilization period includes activities for preparation of material storage areas, camps, water, power, communication and other site facilities.

2.5.2 Construction Phase

Construction of the transmission line will then start by preparation of tower foundations, followed by tower erection and conductor stringing. This also includes securing the site and the construction of facilities for the substations and transformers.

The dominant land use along the transmission line route is rain fed agriculture in Mbaraliand crops are normally grown only during the rainy season from January -March. The land is left to fallow and/or used for grazing during other times of the year. Due to the absence of paved roads in some areas it will not be possible to transport material or to carry out construction work during the rainy season. Furthermore, during heavy rains it will be very expensive to properly store building materials, particularly cement.

For these reasons most of the site works are expected to proceed during the dry season April – November/December, when there is no cultivation. This will facilitate construction and reduce impact on crops to a minimum. Working during the dry period will also provide job opportunities for local people after the busy cultivation season. At this stage the overall duration of the project is unknown, but construction will only take place during the dry season.

Machines and manual labour will be involved in the construction phase. Some areas will require preparation of the access roads to bring equipment, workforce and materials to the designated sites. Given the terrain in some of those areas, this undertaking could be time consuming and challenging. The construction duration for different components or elements of the project will be worked out under design and feasibility study. This will assist in determining the duration of impacts. For example, opening up new areas for the wayleave will create a permanent mark that will remain even after construction. The visual impact created by the towers and their potential impact on bird flights will remain after the construction work has been completed. These are some of the residual impacts that the project will create and which will be permanent as there will be no mitigation possibilities.

Unskilled labour forces will be recruited from local communities - especially for simple and manual operations that could easily be accomplished using local skills.

Issues of concern associated with construction work include traffic accidents. It is expected that the contractor must ensure strict adherence to traffic regulations and should also provide sufficient safeguard measures, including warning to drivers and other road users to be careful of heavy trucks moving in their areas. In addition, vibrations are likely to be an issue, especially from blasting and movement of heavy vehicles and machinery.

Other issues/impacts associated with construction include noise and dust, increased cost of living due to increased demand for goods and services (arising from increased

population). Some of the impacts associated with construction could be short term, depending on the site and the specific conditions. However, some impacts will last well beyond the estimated time. For example, the inflated cost of some consumer goods may not come down even after the construction on a particular site has been completed because traders usually do not lower prices easily. In addition, some impacts such as those associated with health effect (HIV/AIDS and other STD), social relationships, pregnancies to school children (may not be noticed during the short duration of the construction period or even longer after the construction work) will prevail beyond the construction work. In addition, visual impacts caused by the sheer size of the towers and loss of vegetation caused by clearing the wayleave will remain as permanent landscape changes well beyond the construction phase.

2.5.3 Operation Phase

During operation, the power line will need periodical inspection and maintenance activities (such as TL clearing) as well as occasional maintenance activities due to technical problems, vandalism, wild fires and natural disasters (especially in flood and erosion prone areas).

2.5.4 Decommissioning

The expected lifetime of a high voltage transmission line may be estimated to at least 50 years. Decommissioning of such an infrastructure is not very likely, but rather a long-ranging repair or exchange of line components.

2.6 Area of Impact

In general the study area will include the following areas which will benefit from the Project, or which may be directly affected in a negative way, by any of the components of the Project. Specifically, the study area will include:

i) The land resources and the people who may be affected by construction activities as these relate to the construction of transmission line, new temporary and permanent roads, and other ancillary work sites including material storage and handling sites, worker camp etc.;

ii) All the local community and commercial activities at Iringa and Mbeya region as well as at the population at the national level will benefit from improved power supply.

2.7 Project Cost

Based on the feasibility study, the approximately cost of the project is USD 81.47 Million USD. It is understood that this will be further finetuned at the final stage.

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 National Policies

The purpose of this chapter is to give an overview of the policy, legal, regulatory and institutional framework relevant to environmental management in Tanzania and specifically the issues and requirements relevant for this study and proposed development.

3.1.1 The Constitution Of Tanzania, 1977-1995

The Constitution of the United Republic of Tanzania (1977 – 1995, Revised 1997) recognizes the basic rights for its people to the protection of their life by the society in accordance with the law.

Article 24 stipulates that every person is entitled to own property and has a right to the protection of his/her property held in accordance with the law. However, there are certain limitations related to the enforcement and preservation of basic rights, freedom and duties.

Article 30(2) speaks about ensuring the defence, public safety, public order, public morality, public health, rural and urban development and the increase and development of property or any other interest for the purpose of enhancing public benefit.

3.1.2 National Environment Policy, 1997

This is the main policy document governing environmental management in Tanzania. The National Environment Policy (NEP) underscores national, natural and social issues arising from environmental issues, and promotes key principles of sustainable development. The NEP has also proposed the framework environmental legislation for coordinating, managing and regulating the various environmental activities in different sectors. In addition, the NEP defines strategic plans for environmental management at various levels and provides an approach for mainstreaming environmental issues for decision-making.

NEP identifies six key environmental management and protection challenges Tanzania is facing:

i) land degradation;

ii) lack of access to good quality water;

iii) environmental pollution;

iv) loss of wildlife habitat and biodiversity;

v) deterioration of aquatic ecosystems; and

vi) deforestation.

Some of the identified environmental challenges are relevant and critical because the proposed development may contribute to them directly or cumulatively. The NEP promotes environmental assessment, use of economic instruments, regulatory tools and precautionary principles in managing the environmental problems. This ESIA is responding to the NEP requirements to ensure environmental concerns are mainstreamed in the decision-making process at the earliest possible time and appropriate mitigation measures are established.

3.1.3 National Forest Policy, 1998

The aim of the National Forest Policy (URT, 1998) is to enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of her natural resources. The main objectives of the Forest Policy includes "sustainable supply of forest products and services by maintaining sufficient forest area under effective management; increased employment and foreign exchange earnings, ecosystem sustainability through forest conservation and enhanced national capacity to manage forest sector" (URT, 1998:14).

A forest reserve is an area of land covered by forest, reserved or used principally for purposes of sustainable production of timber and other forest goods; protection of watersheds, soil conservation and the protection of wild plants; or an area of land covered by forest reserved used principally to protect nature and scenic areas of national or international significance and to maintain and enhance biodiversity and genetic resources in an undisturbed, dynamic and evolutionary state.

Based on the ecological services provided, forest reserves can be classified as production forest reserves, protection forest reserves or nature forest reserves. The identified forest reserves along the Right of Way are used principally for purposes of sustainable production of timber and other forest produce, and thus can be referred to as production forest reserves.

The Forest Policy recognizes that investment in forest areas may cause adverse environmental impacts. The policy recommends environmental assessment as a mandatory requirement in order to avoid or minimize damage to the environment and ensure mitigation measures are established.

3.1.4 National Land Policy, 1997

The main objective of the National Land Policy (URT, 1997) is to address the various and ever-changing land use needs. The Policy aims " to promote and ensure a secure land tenure system, to encourage the optimal use of land resources and to facilitate broad-based social and economic development without endangering the ecological balance of the environment (ibid: 5)". Specific objectives are outlined in the Land Policy.

The proposed development may lead to the following:

i) more land being taken up for the right of way by TANESCO to build the towers and the transmission line.

ii) more people along the right of way will lose land for farming, grazing, settlement and cultural functions (e.g. burials or sacrificial functions).

Consequently, there will be competition for prime land as more people are displaced from their existing lands to give way for the development. This will compound land tenure and land use matters in the villages along the right of way and increase cost of land in the same areas.

3.1.5 National Energy Policy, 2003

The Energy Policy recognizes energy as a critical input for the development of the national economy. The overall policy objective is to provide an input to support the national economic development process. The policy promotes the establishment of efficient energy production, procurement, transportation, distribution and end use, in an environmentally sound manner and with due regard to gender issues. The Energy Policy recognizes the need for synchronizing with other sector policies, plans and strategies. In

addition, it recognizes the need to use energy pricing as an important tool in energy conservation and environmental protection.

The policy is relevant to this proposed project because the goal for construction of the Transmission Line is to improve the efficiency and stability of electricity transmission. The project also intends to improve the availability of energy to the consumers.

3.1.6 The Mineral Policy of Tanzania, 1997

The Mineral Policy of Tanzania (URT, 1997) provides policy guidance in the development of the mining sector in Tanzania by outlining the main objectives of the policy and the strategies of implementing the objectives. The Policy recognizes that Tanzania has a rich and diverse mineral resources base with high economic potential. However, the country has yet to realize a benefiting contribution from the vast mineral endowment" (URT 1997:1). The Policy enumerates the following challenges that it seeks to address:

i) to raise significantly the contribution of the mineral sector in the national economy and increase Gross Domestic Product (GDP);

ii) to increase the country's foreign exchange earnings;

iii) to increase government revenues;

iv) to create gainful and secure employment in the mineral sector and provide alternative source of income to the rural population; and

v) to ensure environmental protection and management (URT, 1997: 8).

vi) several objectives are stated in the Policy.

The proposed transmission line may have no direct implication on mining activities although it will foster the mining sector by securing future power supply.

3.1.7 Water Policy, 2002

The main objective of the National Water Policy of 2002 is to develop a comprehensive framework for sustainable development and management of the Nation's water resources and putting in place an effective legal and institutional framework for its implementation (URT, 2002). The policy aims at ensuring that beneficiaries participate fully in all stages of water resource developments.

The Policy recognizes the fundamental but intricate linkages between water and socio-economic development, including environmental requirements. The Policy expounds on the importance of water for domestic use, agriculture, livestock keeping, mining, energy, fisheries, environment, human health, wildlife and tourism, forestry, navigation and trans-boundary requirements.

Water supply is an acute problem in village along the right of way and some of the wells, shallow wells, boreholes, and water tanks are located within or too close to proposed alignments in various options. This ESIA addressed water supply and availability issues and proposed changes where water sources or distribution points are in danger of being negatively affected by the proposed development.

3.1.8 The Wildlife and Wetland Policy of Tanzania, 2007

The Wildlife Policy of Tanzania promotes the conservation of wildlife as natural resources of great biological, economical, environmental cleaning, water and soil conservation, and

nutritional values (URT, 2007). The long-term goal of the policy is to maintain great biological diversity, which contributes to healthy environment an increased contribution to the national economy. The policy recognizes the implication of human and development activities on wildlife resources inside and outside protected areas, and calls for environmental assessments for proposed development in order to minimize negative impacts.

Wetlands in Tanzania cover 10% of the total land area, of which 5.5% are presently under international protection status as designated Ramsar sites. The Wetland policy promotes conservation and management of wetlands as important natural resources of great biological value playing also an important role in poverty alleviation, water and soil conservation and for nutrition of people.

3.1.9 National Human Settlements Development Policy, 2000

Overall objective of the National Human Settlements Development Policy (NHSDP) is to promote the development of sustainable human settlement and to facilitate the provision of adequate and affordable shelter to all people, including the poor. The policy outlines a number of objectives including environmental protection within human settlements and protection of natural ecosystems against pollution, degradation and destruction.

The NHSDP recognizes planning and management of human settlement areas as one of the broad human settlement issues. Within this regard, the NHSDP identifies environmental protection as one of the strategic issues in human settlement planning and development. NHSDP also addresses the following issues:

i) lack of solid and liquid waste management, leading to environmental deterioration;

ii) emission of noxious gases from vehicles and industrial activities as a major cause of air pollution in urban areas;

iii) encroachment into fragile and hazardous lands (river valleys, steep slopes and marshlands) leading to land degradation, pollution of water sources, etc.;

iv) increasing dependence on firewood and charcoal as a main source of energy in human settlements leading to depletion of forest, environmental deterioration and air pollution; and

v) Unauthorized sand mining in river valleys leading to environmental degradation.

This policy requires the developer to deliberately undertake adequate measures to safeguard settlements, control of soil erosion and sedimentation and avoid displacements of households

3.1.10 Tanzania Development Vision, 2000

Composite Development Goal for the Tanzania Development Vision 2025 (URT, 2000) foresees the alleviation of poverty through improved socio-economic opportunities, good governance, transparency and improved public sector performance. These objectives, not only deal with economic issues, but also include social challenges such as education, health, the environment and increasing involvement of the people in working for their own development. The thrust of these objectives is to attain a sustainable development of the people.

The Vision 2025 seeks to mobilize the people, the private sector and public resources towards achieving shared goals and achieve a sustainable semi-industrialized middle market economy by year 2025. The construction of the of 400 kV power line from Mbeya

to Iringa is aimed at increasing power supply to enable development to take place. Power in needed for industrial development and improvement of livelihoods.

3.1.11 National Strategy for Growth and Reduction of Poverty

The National Strategy for Growth and Reduction of Poverty (NSGRP) or *Mkakati wa Kukuza Uchumi na Kuondoa Umasikini Tanzania* (MKUKUTA) is focusing on promoting economic growth and reducing poverty in Tanzania. The NSGRP is a five year programme from 20005/06 to 2009/10, which addresses the Tanzania Development Vision 2025 for high and shared growth, high quality livelihoods, peace, stability and unity, good governance, high quality education and international competitiveness. In addition, NSGRP is contributing to implementation of the Millennium Development Goals (MGDs).

The main objective of the NSGRP is to stimulate economic growth and reduce poverty, improve quality of life and social well-being and improve good governance and accountability. The strategy recognizes the close linkages between economic growth, good governance, and improved quality of life and social well-being, and poverty reduction. Among the various factors that have been identified to stimulate growth is the improvement of energy generation in order to stimulate economic growth.

3.1.12 Agriculture And Livestock Policy, 1997

The Agriculture and Livestock Policy of 1997 addresses changes that affect the agricultural sector in Tanzania and specifically address restrictions to agricultural practices stemming from the national land use Policy of 1995. The Agriculture and Livestock policy, 1997 also addresses the needs of women in agriculture and the needs for agricultural practices to evolve to ensure protection of the environment. The Policy promotes good husbandry and increased agriculture production. Some of the areas in the proposed right of way are utilized for crop production and changes in land use may reduce crop production and possibly impact on food security. This ESIA addresses the issue of land use changes and its implication on agriculture, especially where there will be a need to acquire land that is also used in agricultural production for annual crops.

In principle, the land TANESCO puts under the wayleave for power transmission becomes wholly owned and managed by TANESCO exclusively for energy uses. No farming, settlement or any other use is permitted on such land. However, in practice cultivation of seasonal crops below the power line is common and TANESCO has not taken a firm stand against such practice. Therefore, the net effect of power lines in agricultural production can be assumed to be minimal if farming is permitted to continue under the lines.

3.1.13 National Gender Policy (1999)

Main objective of this policy is to provide guidelines to ensure gender sensitive plans, programs and strategies in all sectors and institutions. The policy emphasizes gender equality and aims at establishing strategies on poverty eradication through ensuring that both women and men get access to existing resources for their development. It values the role played by women in bringing about development in the society.

The energy sector is also highly committed to gender mainstreaming at all levels, through provision of equal opportunities to both men and women in construction works and related activities.

The policy requires the project management to ensure that gender issues are given emphasis. It also requires that women and men are given equal employment opportunities in the project, whenever possible.

3.1.14 National Policy on HIV/AIDS 2001

The National Policy on HIV/AIDS (2001) was formulated under technical support from the World Health Organization Global Programme on AIDS that led to the establishment of National HIV/AIDS Control Programme (NACP) under the Ministry of Health. However, due to its multi-sectoral nature there was a need to involve all sectors and community participation was found to be crucial.

The Policy identifies HIV/AIDS as a global disaster, hence requiring a concerted and unprecedented initiative at national and global levels. It recognizes HIV/AIDS as an impediment to development in all sectors, in terms of social and economic development with serious and direct implication on social services and welfare. The policy recognizes the linkage between poverty and HIV/AIDS, and that the poor sectors of the society are the most vulnerable.

The policy has also set a number of strategic objectives to deal with specific HIV/AIDS problems such as prevention of transmission of HIV/AIDS, HIV Testing and care for people living with HIV/AIDS.

3.1.15 Community Development Policy 2005

Tanzania Community Development Policy advocates for Tanzanians as individuals or in their families and/or groups/associations to contribute more to the government objectives of self-reliance and therefore bring about development at all levels and finally the nation as a whole.

This policy is relevant to the planned project because it urges those likely to be affected to support the project as their contribution to national development.

3.2 Legal Framework

This section addresses the legal and regulatory framework, which is relevant to the proposed development of the 400 kV power transmission line from Iringa – Mbeya. The legal and regulatory framework provides the various legal aspects that must be adhered to as the project in designed, implemented and later when it is decommissioned.

The following legislative and regulatory guidelines for Tanzania have been reviewed by the Consultant to assist with the identification of potential environmental and social impacts for the project. The National Environment Management Council (NEMC) is in charge of administrating the Environmental Impact Assessment processes in Tanzania. General guidelines for content and procedures have been developed.

3.2.1 Environmental Management Act No. 20 - Cap 191, 2004

Environmental Management Act (EMA) Cap.191 (URT, 2004) provides a range of measures for sustainable management of the environment, prevention and control of pollution and waste management, and directs mechanisms for compliance.

Section 7 (2) states that " the Act provides a legal framework necessary for coordinating harmonious and conflicting activities with a view to integrating such activities into an overall sustainable environmental management system by providing key technical support to sector Ministries"

In line with basic rights emphasized in the Constitution of Tanzania, the Environmental Management Act stresses the right for Tanzanians to live in a clean, safe and healthy environment and to have access to various areas for recreational, educational, health, spiritual, cultural and economic purposes (Article 4 (1) and (2).

Part VI of the Act directs developers to undertake Environmental Impact Assessment (EIA) at their own cost prior to commencement of a project. The types of projects requiring EIA are listed in the Third Schedule of the Act. The EMA prohibits any development to be initiated without an Environmental Impact Assessment (EIA) Certificate from the Minister responsible for Environment.

The responsibilities to ensure implementation of the requirement of the Act with regard to Environmental Impact Assessment are vested with the National Environment Management Council (NEMC). An Environmental Impact Assessment report is submitted to NEMC who will carry out its review and provide recommendations to the Minister responsible for Environment to issue a Certificate. An EIA/ESIA report will not be forwarded by NEMC to the Minister for Certification until NEMC is satisfied with the EIA/ESIA.

3.2.2 Environmental Impact Assessment and Audit Regulations, 2005

The Environmental Impact Assessment and Audit Regulations No.349 of 2005 were made pursuant to Section 82 (1) and 230 (h) and (q) of the Environmental Management Act Cap 191 of 2004. In addition, the regulations provide the procedures and requirements for undertaking Environmental Impact Assessments and Environmental Audits for various types of development projects with significant environmental impacts. The Regulations provides a list of projects that qualify for Environmental Assessment and Audit procedures in Tanzania. Regulation 46(1) classifies projects into two types: (i) Type A Projects requiring a mandatory Environmental Impact Assessment; and (ii) Type B projects requiring a Preliminary Environmental Assessment (PEA)

The First Schedule lists typical examples of Type A and B projects. The proposed development of a 400 kV power transmission line falls under the category of projects that require mandatory Environmental Assessment. Item Seven (i) of the First Schedule refers to energy projects and specifically to production and distribution of electricity, gas, steam and geothermal energy as projects that require mandatory EIA. The steps that must be taken to conduct an EIA are provided in the Fourth Schedule whilst Regulation 16 directs that the EIA study in addition to environmental impacts, also must address social, cultural and economic impacts. Regulation 17 stipulates the need for public participation during the EIA process and Part V, Regulations 18 (1), (2) and (3) directs the content and format of the Environmental Impact Statement. This EIA report responds to the legal requirement as provided in these Regulations.

3.2.3 Forest Act, 2002

This Act provides for the conservation, management and trade of forest products. It aims at improving the ecosystem stability and the quality of natural resources through conservation of forest biodiversity and by water catchment protection.

There are valuable forests resources along the proposed TL. This regulation is thus relevant and a thorough assessment of possible impacts should be undertaken. The Division of Forest and Beekeeping in the Ministry of Natural Resources and Tourism is responsible for this Act.

Relevant provisions of this Act have been addressed during the Environmental and Social Impact Assessment for the proposed construction of power transmission line. The developer must obtain the relevant permits from the Director of Forest and Beekeeping before undertaking any activities in the forest reserve found along the wayleave.

3.2.4 Wildlife Conservation Act (No. 5 of 2009).

Act No. 5 of 2009 provides for the conservation, management, protection and sustainable utilisation of wildlife and wildlife products. In addition, it makes specific provision for the management and conservation of biodiversity, including any species of wild and indigenous animals and plants as well as habitats and ecosystems found on or in land or water. The Act also provides for designation of wildlife TL, dispersal areas, buffer zones and migratory routes.

The presence of valuable wildlife along the proposed TL is considered low. A detailed report is attached in Appendix 3 on Wildlife.

3.2.5 Land Act, 1999

The Land Act, 1999 (No.4 of 1999): provides basic legal requirements in relation to land other than village land, the management of land, settlement of disputes and related matters.

Tanzanian land falls under three categories, namely;

i) Reserved Land is land set aside for wildlife, forests, marine parks, etc., and the ways these areas are managed is explained in the laws that protect each sector (e.g. Wildlife Conservation Act, National Parks Ordinance, Marine Parks and Reserves Act, etc.). Specific legal regimes govern these lands under the laws used to establish them.

ii) Village Land includes all land inside the boundaries of registered villages, where the Village Councils and Village Assemblies are given power to manage. The Village Land Act gives the details of how this is to be done. The Village Land Act is governing this land.

iii) General Land is land which is neither reserved land nor village land and is therefore managed by the Commissioner. The Land Act is governing this land.

The Land Act of 1999 provides for the basic law in relation to land other than the village or reserved lands, the management of land, settlement of disputes and related matters. Since some of the areas where the right of way may pass fall under public lands, this Act is relevant to the proposed development. The Act lays down fundamental principles for occupying and using the land. Among them, is the principle that any land user shall ensure that land is used productively and that any such use complies with the principles of sustainable development.

In addition, and in relation to the proposed power transmission line, the Land Act (Section 151) states that the Minister " may create rights of way which shall be known as public rights of way " to serve for the that purpose for the proposed development. In addition, it defines that a "wayleave" may be any public right of way created for the benefit of the Government, a local authority, a public authority, or any corporate body to enable all such organizations, authorities and bodies to carry out their functions within the designated area.

Furthermore, the Act states that:

i) "a public right of way shall attach to and run with the servient land in respect of which it has been created and shall be binding on all occupiers from time to time of the servient land, any manner they are occupying the land, whether under a right of occupancy or a derivative right thereof, or under customary law or as a successor in title to any such occupier or as a trespasser" ;

ii) "a wayleave shall authorize persons in the employment of or who are acting as agents of or con-tractors for any of the organizations, authorities and bodies enter on the servient land for the purpose of executing works, building and maintaining installations and structures and in setting all such works, installations and structures in the servient land and to pass along that wayleave in connection with purposes of those organization, authorities or bodies."

iii) except where the Commissioner is proposing of his own motion to create a way level, an application from any ministry or department of Government, or local authority or public authority or corporate body shall be made to the Commissioner.

iv) an application shall be made on the prescribed form and shall be accompanied by any information which may be prescribed or which the Commissioner may in writing require the applicant to supply and the Commissioner shall not begin the process of creating a wayleave until all information which may be prescribed or required is submitted to him.

The body or organization that applies for the wayleave must pay compensation to affected persons according to national and international standards. The proposed development will entail compensation, which may call for Tanzania and World Bank guidelines to be applied.

3.2.6 Land Acquisition Act, 1967

The Land Acquisition Act (Act No. 47 of 1967) repealed and replaced the Land Acquisition Ordinance, to provide for compulsory acquisition of land for public purposes and in connection with housing schemes. The Act is however relevant also in cases that are not related to housing schemes. For example, Part II of the Act refers to issues related to compensation and procedures that have to be followed when land is acquired. These procedures are also outlined in the Regulation for the Land Act and include issues of fair and prompt compensation to affected persons. The proposed development will acquire land from the villagers for the purpose of development.

The provisions of this Act and subsequent land laws must be adhered to especially with regard to fair and prompt compensation. In the case of this project, concerns from the Village and District leaders on delays in compensations have been raised. Local leaders are concerned that delays to pay compensations and complaints from affected persons usually affect the relationship between local leaders and the affected persons. Furthermore, delays in paying compensation result in new developments emerging in the proposed wayleave causing further conflicts between developers and local population. TANESCO must therefore ensure compliance with the laws in order to reduce conflicts between local people and the local authorities.

3.2.7 Village Land Act No. 5, 1999

The Village Land Act No. 5 of 1999 (URT, 1999) governs village land and all matters related to land tenure under the Village Councils. Most of the land that will be involved in the power transmission line will be on village land, except for new areas where the wayleave may be in forest reserves or social infrastructure belonging to specific institutions. Section 8 (1), (2) and (3) of the Village Land Act empowers the Village Council to manage all village lands in accordance with the principles of a trustee with the villagers being the beneficiaries. Although the Village Land Act recognizes the role of the Village Councils in management of village land, most of the land in the villages is under individuals through the customary land rights. The right of the individuals to the land must be recognized and respected and development should not take more land than what is necessary for that particular development.

3.2.8 Land Regulation, 2001

Regulation 4 and 10 of Land (Compensation Claims) Regulation (L.N. No. 79) of 2001 stipulates that, compensation shall take the following forms among others:

i) monetary compensation;

ii) plot to plot compensation

iii) replacement of building

The alignment and location of sites should avoid hazardous lands

The basis for the value of any land shall be the market value of such land.

The assessment of the value of land and any improvements needs to be done by a Qualified Valuer and verified by the Chief Valuer of the Government.

The implementation of this regulation lies with the Ministry of Lands, Housing and Human Settlement Development.

3.2.9 Land Disputes Courts Act No. 2, 2002

Every dispute or complaint concerning land shall be resolved in the Court having jurisdiction to determine land dispute in the given area (Section 3).

The Courts of jurisdiction include:

i) the Village Land Council

ii) the Ward Tribunal

iii) district Land and Housing Tribunal

iv) the High Court (Land Division)

v) the Court of Appeal of Tanzania.

The Act gives the Village Land Councils powers to resolve land disputes involving village lands (Section 7). If the Council fails to resolve the dispute, the matter may be referred to the Ward Tribunal as established by the Land Act (1999) and the Village Land Act. If any dispute will arise because of this project, the provision of this Act shall be observed.

Land use conflicts are regularly occurring in many villages along the proposed alignment. For example, conflicts between farmers and livestock keepers, villagers and managers of public social facilities (schools or heath facilities over boundaries) and also there is an impending and latent conflict between TANESCO and the local communities in areas where villages have encroached under the power lines and built houses, established farms or water wells. Land under the power lines is under the custody of the power utility and any land use other than what is designated is illegal. Local people are complaining about the taking of land by public utilities such as TANESCO therefore, taking of land from villagers must be handled carefully to avoid exacerbating land use conflicts elsewhere or within the same villages.

3.2.10 Local Government Act, 2000

The Act requires stakeholders of proposed development projects to be informed about the EIA process.

It states that the local government is responsible for prevention of damages on historical heritage and archaeological sites.

It empowers the local governments to control pollution of water resource and regulation of drainage and sewerage works.

The act is implemented under the auspices of Ministry of Regional Administration and Local Government

3.2.11 Occupational Health and Safety Act, 2003

This Act makes provisions for the safety, health and welfare of persons at work in factories and all other places of work. In addition, it provides for the protection of persons other than those at work against hazards to health and safety arising out of or in connection with activities of persons at work. Relevant sections of the Act are Part IV Section 43 (1) - Safe means of access and safe working place; Prevention of fire; and Part V on health and welfare provisions, which includes provision of supply of clean and safe to workers, sanitary convenience, washing facilities and first aid facility.

3.2.12 Legal Provisions on Waste Management Issues

Tanzania is in the final stages in preparing guidelines for waste management however, Part IX of the Environmental Management Act Cap 191 directs the management of solid waste. Section 114 provides duties of the local government authorities to manage and minimize solid waste and Sections 133- 139 refers to management of hazardous waste.

In connection with the construction of the Iringa - Mbeya 400 kV power line, TANESCO will be required to obtain permission from the District councils for the disposal of waste, and take care of the solid waste that can be hazardous - e.g. sharp metal pieces, nails and wires.

3.2.13 Legal Provisions on Pollution

Several environmental standards are relevant to the proposed development. The legal provisions for these standards is provided in Part X of the Environmental Management Act No. 20 Cap 191, which provides directives on environmental standards and compels the National Environmental Standards Committee of the Tanzania Bureau of Standards to develop, review and submit to the Minister (responsible for Environment) for approval standards and criteria covering:

i) water quality,

ii) discharge of effluent into water,

iii) air quality,

iv) control of noise and vibration pollution,

v) sub sonic vibrations,

vi) soil quality,

vii) control of noxious smells,

viii) light pollution, electromagnetic waves and microwaves, and

ix) any other environmental quality standards.

Standards such as for discharge of effluent into water, control of noise and vibrations, and soil quality are relevant to the proposed development. The Government has issued some of these standards. For example, the Regulations for Soil Quality Standards are made under Section 144, 145 and 230 (s) of the Environmental Management Act Cap 191 and set out minimum standards for soil quality and identifies contaminants of heavy and other metals including liquids such as oils.

The Regulations for Soil Quality compels all developers to ensure they do not emit any substances that may contaminate the soils beyond levels that are specified in the laws. Possible areas of soil pollution from the project activities include vehicle and equipment maintenance yards (from oil spills), metals from construction sites and at the substations where oil spills and metals could contaminate the soil.

The Regulations for Water Quality Standards are made under Section 143, 144 and 230 (2) (s) of the Environmental Management Act Cap.191 to provide for minimum standards of water quality and sets mechanism for the protection of water sources and ground water. The Regulations further prohibit discharge of hazardous substances, chemicals and materials or oil into water bodies and outline procedures that have to be followed in sampling and assessing the quality if water for different purposes and allowable emission from different sources. The proposed development and TANESCO in particular must adhere to emission standards especially during construction and operation by avoiding contaminating sources of water found on the right of away. Several wells and pipes have been identified and in some areas, alternatives locations for the power lines have been proposed as mitigation options.

In addition to provisions in the Environmental Management Act Cap 191 and subsequent Regulations, the Local Government Act of 1982 also empowers the local governments to enact by-laws to protect public health and regulate pollution problems. Other relevant legislation with regard to soil includes the National Land Use Planning Act of 1984, the Town and Country Planning Ordinance of 1961, the Mining Act of 1998 and the Water Utilization (Control and Regulation) Act No.10 of 1981. TANESCO will be compelled to comply with all legal provisions governing environmental issues with respect to this work.

3.2.14 Land Use and Spatial Planning

Important pieces of legislation, which address land use planning, and management are contained in the following laws:

i) the Town and Country Planning Ordinance of 1961, which regulates the use of land in urban areas, beaches and lakeshores. It was established to facilitate land use planning schemes. According to the Ordinance, development is not allowed without obtaining a planning consent. It also provides a specific land-use class for ecologically sensitive areas;

ii) the National Land Use Planning Commission Act of 1984, which covers preparation of regional physical land use plans and formulation of land use policies for implementation by the Government. It specifies standards, norms and criteria for the protection of beneficial uses and maintenance of the quality of land. The Act does not cover urban centres, beaches and lake shores;

iii) the Local Government Act of 1982 enables local authorities to enact by-laws regarding soil protection, agriculture, natural resource exploitation, etc.

These provisions are relevant to the proposed development especially in urban areas of Iringa and Mbeya where power lines and substations will be built.

3.2.15 The Contractors Registration Act Cap 235

The law requires the contractors to ensure that all construction sites abide to the laws of occupational health and safety in the construction sites.

i) to register all accidents and its causes at construction site.

ii) ensure access to fire-fighting equipment and hygienic facilities on site

This Act requires all construction contracts to be executed by registered companies and entitled class in respect to the project size. The responsible Authority is the Contractors Registration Board (CRB).

3.2.16 The Employment and Labour Relations Act, 2004

The Employment and Labour Relations Act No. 6 of 2004 repealed the Employment Ordinance Cap 366. It speaks about restriction of child labour and stipulates the employment age limits. The Act sets the basic minimum age for employment at 12 years of age and requires that 12 to 14 year old child workers receive a daily wage and work on a day-to-day basis. The Ministry of Labour, Employment and Youth Development is responsible for implementation of this regulation.

3.2.17 The Road Act, 2007

The Road Act 2007 serves as a guide to the use of the road reserve. Clause 29 (2) gives provisions for the request and terms of approval for use of the road reserve by utilities like power lines. The Ministry of Infrastructure Development is the authority for this regulation.

3.2.18 Energy and Water Utilities Regulatory Authority (EWURA) Act, 2001.

EWURA is an autonomous regulatory authority which was established in 2001 under EWURA Act, Cap 414. It is responsible for technical and economic regulation of the electricity, petroleum, natural gas and water sectors in the country. The legal obligations of EWURA include, licensing, tariff review, monitoring performance and standards with regards to quality, health, safety and environment. In addition, it is responsible for promoting effective competition and economic efficiency, protecting the interests of consumers and promoting the availability of regulated services to consumers.

As the project intends to improve and stabilize power transmission in the national grid, when construction is completed, the developer shall comply with EWURA requirements including operational permit and to ensure that tariffs comply with EWURA regulations.

3.2.19 The Electricity Act No. 10/08 of 2008

The Electricity Act No. 10/08 of 2008 provides for the facilitation and regulation of electricity generation, transmission, transformation, distribution, supply and use of electric energy, to provide for cross-border trade in electricity and the planning. It also provides for regulation of rural electrification and related matters. The act is relevant to the proposed project as it will involve internal and cross border transmission of power.

3.2.20 The HIV and AIDS (Prevention and Control) Act, No. 28/08 of 2008

The Act provides for prevention, treatment, care, support and control of HIV and AIDS in order to promote public health in relation to HIV and AIDS. It urges appropriate treatment, care and support using available resources for people living with or at risk of HIV and AIDS.

This regulation is relevant to the proposed project as it is expected to have negative effect with respect to HIV/AIDS prevalence. Therefore, the regulation will compel the developer to comply with the provisions in this Act.

3.2.21 The Rural Energy Act, 2005

The Rural Energy Act of 2005 provides for promotion of rural socio-economic development by facilitating access to modern energy services for productive economic uses, health, education, for clean water, civil security and domestic applications.

The Act (No. 8) has established Rural Energy Agency (REA), an autonomous body under the Ministry of Energy and Minerals (MEM). It has been operational since 2007. REA works closely with EWURA which is responsible for technical and economic regulation of the energy and water sectors in Tanzania.

Where possible the preparation mission should see how the proposed project will comply with the provisions in rural energy Act.

3.3 World Bank

The World Bank's Operational Policy 4.01 requires that environmental assessments be undertaken in those categories of projects that have or are likely to have potentially significant impacts on the environment. Under this policy, projects are categorized as category A, B, or C according to type, scale, location and anticipated severity of environmental impacts. The category indicates the scope and detail required for the EIA. These categories are presented in Table 3.

Table 3 Categories for Environmental Assessment

Category	Requirement
A	A full EIA is normally required for projects with significant adverse impacts that may be sensitive, irreversible and diverse. These are mainly new construction projects
B	Impacts less adverse than those of Category A. Impacts usually site-specific, few if any are irreversible, and in most cases mitigation measures can be designed more readily than for Category A.
C	Environmental analysis is unnecessary. It involves projects for education, family planning, health and human resources development

In view of the above guidelines, this project requires the development of new TL and substations in urban and rural environments, thus it is considered to fall into Category A.

The World Bank provides guidance on EIA requirements through the Environmental Assessment Sourcebook (World Bank 1994) which includes sectoral guidelines. In particular, Vol. 2 of the Sourcebook dealing with Sectoral Guidelines for Environmental Assessment of Energy and Water Projects provides a detailed analysis of the potential

environmental impacts associated with transmission lines/structures. It also addresses environmental monitoring and management issues and identifies typical mitigation measures.

The World Bank EIA process is implemented through a set of Operational Policies/Procedures whose primary objective is to ensure that Bank operations do not cause adverse impacts and that they "do no harm". The following WB Procedures and Policies have been considered for the proposed Iringa – Mbeya Transmission Line ESIA as a technical reference.

Table 4TheWB Safeguard Policies that are likely to be triggered

Ops	Description	Comments
OP/BP 4.01 Environmental Assessment (January 1999)	Ensures that appropriate levels of environmental and social assessment are carried out as part of project design. It also deals with the public consultation process, and ensures that the views of project-affected persons/groups and local NGOs are taken into account. It outlines the contents of environmental assessment reports and environmental management plans for Category A projects.	This safeguard Policy is relevant because of the size of the nature and size of the Project and its potential to cause significant adverse impacts potentially including the need for involuntary resettlement.
OP/BP 4.04 Natural Habitats(June 2001)	Supports the conservation of natural habitats and the maintenance of ecological functions as a basis for sustainable development. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.	The zones that may be considered as Critical Natural Habitat (CNHs) in the project area are the existing national parks, forest reserves and game reserves.
OP 4.36 Forests (November 2002)	Aims to reduce deforestation and enhance, through sustainable economic development, the environmental and social contribution of forests. The Bank does not support projects which involve significant conversion or degradation of critical forest areas or related critical natural habitats.	This safeguard Policy is not relevant because the Project does not clear or degrade any protected forest nor does it involve or affect forest management.
OP/BP 4.11 Physical Cultural Resources (July 2006)	Cultural property is defined to include both remains left by previous human inhabitants and unique natural environmental features such as canyons and waterfalls. Also, physical features with spiritual significance, such as sacred trees and groves. The Bank does not support projects that will significantly damage non-replicable cultural property and assists only those projects that are sited or designed so as to prevent such damage.	Numbers of graves have been identified in the project area. Thus this policy is triggered.
OP/BP 4.12 Involuntary Resettlement (December 2001)	The World Bank's involuntary resettlement safeguarding regulations and requirements are triggered when a project leads to the involuntary taking of land resulting in: • relocation or loss of shelter; • loss of assets or access to assets; • loss of income sources or means of livelihood, whether or not the affected persons must move	This safeguard Policy is relevant since the Project will result in loss of land and other private assets and possibly resettlement.

Ops	Description	Comments
	to another location; • the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons. OP 4.12 requires that displaced persons are provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project; provided assistance (such as moving allowances) during relocation; and provided with residential housing or housing sites. The policy also requires that taking of land and related assets take place only after compensation has been paid and, where applicable, resettlement sites and moving allowances have been provided. Livelihoods of project-affected families are to be improved or at least restored to pre-displacement levels.	
BP 17.50 Disclosure	This Policy details the Banks requirements for making operational information available to the public. The Bank reaffirms its recognition and endorsement of the fundamental importance of transparency and accountability to the development process. In addition, timely dissemination of information to local groups affected by the projects and programs supported by the Bank, including nongovernmental organizations, is essential for the effective implementation and sustainability of projects.	This is relevant

3.4 International Agreements and Conventions

Tanzania has signed and ratified several international agreements and conventions relating to the environment. Agreements relevant to the proposed development are briefly mentioned below.

i) The Government of Tanzania has ratified the UN Convention on the Rights of the Child. Consequently, it has ratified the International Labour Organisation (ILO) Convention No. 59 (Fundamental Conventions, 2002) regarding the minimum age for the admission to employment.

ii) The Convention on Biological Diversity (CBD) has been ratified. A major objective of the Convention is to ensure the conservation of biological diversity and the sustainable use of its components.

iii) Tanzania has signed, but not ratified, the Convention on the Conservation of Migratory Species of Wild Animals (CMS). The objective of the Convention is to conserve those species of wild animals that migrate across national boundaries.

iv) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has been ratified by Tanzania. It seeks to ensure that the international trade in species of wild fauna and flora does not threaten survival of species of concern in the wild.

v) Tanzania has ratified the Convention on Wetlands of International Importance especially as Water-fowl Habitat (Ramsar Convention).

Some areas of the wayleave will possess characteristics and features relevant to these conventions or agreements. For example, the line (Option 1) will run close to wetlands. Some areas of the wayleave will possess characteristics and features relevant to these conventions or agreements. For example, the line (Option 1) will run close to wetlands. However, there is no area within its vicinity that is designated as a Ramsar Site. Tanzania has just four recognised Ramsar sites: Malagarasi / Moyovosi (32,500 Km²), Lake Natron Basin (2250 Km²), Kilombero valley flood plain (7,950 Km²) and Rufiji-Mafia-Kilwa (5,969.7 Km²).

The project has to comply with the international conventions and agreements that Tanzania has signed or ratified and ensure the conservation of the environment as per the agreements of the conventions. While most of the issues will be limited to the right of way, clearing of vegetation and construction of towers and power lines may have implications on the movement of animals and birds and may change the habitat for those species.

3.5 Institutional Framework

The Environmental Management Act Cap 191 provides an institutional setup for environmental management with details of responsibilities at national and village levels (including a street or "mtaa" level, which is the lowest administrative level). The institutional setup involves the following main decision making entities:

i) National Environment Advisory Committee;

ii) Minister Responsible for Environment;

iii) Director of Environment (DOE);

iv) National Environmental Management Council (NEMC);

v) Sector Ministries;

vi) Regional Secretariats; and

vii) Local Government Authorities [City, Municipality, District, and Town Councils; Township; Hamlet (Kitongoji); Ward; Street (Mtaa); and Village].

The Vice President's Office (VPO) is the main regulatory organ and responsible for coordinating environmental management in Tanzania. Within the VPO, Division of Environment and National Environmental Management Council are responsible for policy development and enforcement respectively. Similarly, other sector ministries and agencies are equally involved in implementing environmental policy objectives. The Environmental Management Act Cap 191 outlines environmental management processes in Tanzania.

The proposed development will touch several institutions and organizations. This ESIA consulted most of them and have integrated their views and concerns in the report.

3.5.1 National Environment Advisory Committee

The National Environment Advisory Committee is the top advisory body to the Responsible Minister and sector ministries on matters concerning the environment. It is comprised of members from various fields of environmental management from the public and private sector and from civil society. The members are specified in the first schedule

of the EMA (2004). The Permanent Secretary in VPO chairs the body. Other members include:

i) Director of Environment – Secretary;

ii) Director General of NEMC;

iii) Commissioners for Minerals and Energy;

iv) Representatives from the Office of the Attorney General and the Ministry of Community Development;

v) Directors of sector ministries, including Local Government, Disaster Management, Roads, Human Settlement and Health (Preventive Services), etc.;

vi) Chief Government Chemist; and

vii) Representatives from higher learning institutions, civil society and the private sector.

3.5.2 Minister Responsible for Environment

This Minister has the overall responsibility for environmental matters, including policy articulation for promotion, protection and sustainable management of the environment in the country. Other duties include issuing policy guidelines to: sector ministries, government departments, NEMC, National Environment Advisory Committee, Environment Management Committees at lower government levels, and any other public or private institution.

3.5.3 Director of Environment (DOE)

The DOE heads the Office of the Division (Directorate) of Environment under the Office of the Vice President and is responsible for coordination, monitoring and assessment of various environmental activities. He gives early warning on impending environmental emergencies. The Director is responsible for advising the Government on policy and legislative matters and international agreements and conventions.

3.5.4 National Environment Management Council

The Council is responsible for enforcement, compliance, review and monitoring of EIA. It prepares and submits bi-annual reports on the implementation of the provisions set out in the Environment Management Act.

The Director General of NEMC is appointed by the President. The Council and the Board of Directors consist of:

i) A Chairperson appointed by the President;

ii) The Director General – as the Secretary to the Council;

iii) The Director of Environment; and

iv) Seven members appointed by the Minister.

3.5.5 Sector Ministries

The Environment Section in each the sector ministries are responsible for ensuring compliance with the requirements of the EMA (2004). The sections are also responsible for liaising with the Director of Environment and NEMC.

The Sector Environment Coordinator, who is appointed from within the Sector Ministry, heads the Sector Environment Section. The Coordinator is responsible for the coordination of all activities and performance of the functions relating to environment, including prevention and control of any activity likely to cause or bring out environmental degradation and reporting on the implementation and enforcement of environmental provisions of laws falling under the jurisdiction of the sector.

3.5.6 Regional Secretariats

The Regional Secretariats are responsible for environmental coordination of all advice on environmental management in the regions. They liaise with the DOE and the Director General of NEMC on implementation and enforcement of the EMA.

These Secretariats are headed by a Regional Environment Management Expert, appointed by the Minister responsible for Regional Administration. The Expert is responsible for advising the local authorities on matters related to the implementation and enforcement of the EMA. The Expert links the region with the Director of Environment and Director General of NEMC.

3.5.7 Local Government Authorities

Local Government Environmental Management Officers are appointed by each City, Municipal, District and Town Council. Their responsibilities, among others, include:

i) Overseeing the enforcement of the Environment Act;

ii) Advising the Environment Management Committee;

iii) Promoting environmental awareness;

iv) Reviewing by-laws on environmental management and on sector specific activities related to environment; and

v) Reporting to the Director of Environment and the Director General on the implementation of the EMA.

The City, Municipal and District Environment Management Committees are responsible for functions set out under the Local Government Act. In addition, they perform functions as prescribed by the EMA and they may be assigned by the Minister to carry out directives related to the promotion and enhancement of sustainable management of the environment.

The Township Environment Management Committees are responsible for:

i) Management of the environment within their jurisdictions;

ii) Performing duties assigned by the Minister of Councils;

iii) Promoting and enhancing environmental sustainability.

3.5.8 Water Basin Authorities

The Water Basin Authorities such Rufiji Basin and Lake Nyasa are established under the regulation mentioned in section 2.2.14. The Basin Water Offices are under Basin Water Boards. The Boards are chosen by the minister responsible for Water according to Water utilization (control and Regulation) Act No. 42 of 1974 and its subsequent amendments No. 10 of 1981, No 17 of 1989, No 8 of 1997. The roles of the Basin Water Boards include the following:

i) The approval, Issuing and revoking of water rights and permits.

ii) Enforcement of water rights and

iii) Pollution control measures

iv) Coordination of stakeholders.

The Basin Water Boards have autonomous powers and are financed by water user and pollution charges. They are accountable to the National Water Boards which are accountable to the Minister responsible for Water.

3.5.9 Tanzania National Roads Agency (TANROADS)

The Tanzania National Roads Agency (TANROADS) was established on in 2000 under the Executive Agencies Act No.30 of 1997. It is the sole semi-autonomous Government Executive Agency under the Ministry of Infrastructure Development. TANROADS is responsible for the day to day management of trunk and regional roads network. Its primary function includes the maintenance and development of the primary road network to support the economic and social development of Tanzania.

3.5.10 The Tanzanian Government Chemist Laboratory Agency

The Tanzanian Government Chemist Laboratory Agency (GCLA) is Advisor of government on matters such as chemicals management, chemical analysis, coordination of industrial chemicals management and enforcement of industrial and consumer Chemicals Act. It is the implementing authority for the Industrial and Consumer Chemicals (Management and Control) Act, No. 3 of 2003. It is the most sophisticated laboratory facility in the country in terms of testing chemical/food hazards.

GCLA operates under the auspices of Chief Government Chemist. The agency is of some relevance to the proposed project as hazardous or sensitive chemicals may be applicable.

3.5.11 OSHA

The Occupational Health and Safety Authority or OSHA is a legally established Authority in the country which performs the role of inspection and advising the government on matters related to occupational, health and safety at work places (construction sites for bridges, roads, dams and steel structures).

3.5.12 Tanzania Electric Supply Company Limited (TANESCO)

TANESCO is a Tanzanian parastatal organization established in 1964 as a Power Utility Company in Tanzania. It is wholly owned by the Government of Tanzania under the auspices of the Ministry of Energy and Minerals (MEM) which regulates the operations of TANESCO.

Its business include, generation of electric power, power transmission, distribution and sale of electricity to the Tanzanian mainland and bulk power supply to the island of Zanzibar.

TANESCO's operational policy speaks about the importance to operate in secure and sustainable environment. It is committed to mitigate negative environmental and social impacts associated with its projects and activities. In particular, environmental impact assessment studies under TANESCO are carried out for new projects in compliance to EMA 2004 and, EIA and Audit Regulations of 2005. This goes in tandem with implementation of Environmental and Social Management Plan (EMP) to mitigate the negative and enhance the positive ones.

It is the core practice of TANESCO to scrutinize different Project alternatives before finally choosing the best alternative on the basis of technical, environmental and cost effectiveness. This is done purposely to avert serious social and environmental impacts. TANESCO has been conducting Environmental Auditing to old projects which were constructed before EIA and Audit regulation of 2005.

In addition, TANESCO supports the implementation of Environmental Monitoring for new projects during construction and operation phases as required by EIA and Audit regulation (2005). Therefore, environmental matters are well integrated into TANESCO management and organizational structure under the Environmental Unit which has its own Manager. The environmental Unit is well established with sufficient professional capacity. It is staffed with Environmental officers /Engineers (8) including Manager, Social Scientists (3) and Surveyors (3).

3.5.13 Power Utilities

As mentioned the highest power transmission line in the region is the 220kV line from Mbeya to Iringa.

From Makambako sub-station there is a proposed 220Kv line which will connect to Songea and Mbinga. Small towns are connected by 33kV line.

The Tanganyika Wattle Company in Njombe generates power from wood fuel. The power it generates is supplied to its factories and residential community, with excess power supplied to Njombe Township. Other power generating companies include:

i) Artmus of Mtwara for natural gas energy

ii) Kiwira Coal Mines – Thermal.

4 BASELINE DATA

This chapter describes the existing environmental and social situation in the areas that might be directly or indirectly impacted by the proposed project.

4.1 Overall Approach and Methodology

4.1.1 Overview

The following methodologies for collecting baseline information for the Project have been formulated on the basis of:

i) Relevant documents, including World Bank directives, guidelines and other documents; relevant national and local legislation, policy papers and guidelines of Tanzania.

ii) Practical considerations including timeframe for ESIA, and the accessibility of routes by road.

Wherever possible, the Consultant made use of 1:50,000 scale vegetation cover, forestry, topographical and geological maps, soil maps, aerial photographs, satellite imagery etc. This Final ESIA report also makes use of the socio-economic information collected for the RAP investigation.

4.1.2 Environmental Aspect

Source of Information:

i) Review of literature and internet investigations,

ii) Site visit during Phase I;

iii) Interpretation of maps and images; and

iv) Field investigations and consultation.

Data relies on both primary and secondary sources, and includes an environmental factors survey for discussion with selected samples of local residents and project affected persons (PAPs) who have knowledge of the local ecosystem and its exploitation by traditional methods.

Survey Methodology

A more in-depth investigation of the biophysical environment was undertaken during February – March 2012 and April 2012 during the preliminary phase and later on during August – September 2012 on the chosen TL. The services of a team leader and other experts were used to carry out the following tasks:

i) Description of vegetation types

ii) Description of species composition and biodiversity

iii) Listing of any endangered, rare, or vulnerable species

iv) Estimation of the ecological significance of vegetation types at the regional, national and global level (if significant)

v) Assessment of the sensitivity of the ecosystem to the proposed project intervention in order to identify variables which are likely to experience change

vi) Interviewing traditional users of the local natural environment who have first-hand information

Socio-economic information was obtained from the Phase II RAP study.

Data Analysis

The additional data collected was validated by experts in the ESIA team. The main output related to the chosen TL being to:

i) Identify environmentally sensitive areas and assess the area's sensitivity to negative effects from construction and operation of the transmission line and associated structures.

ii) Assess impacts and changes that may be induced by the transmission line, and identify mitigation measures to avoid or lessen the negative impacts.

4.1.3 Social Aspect

Public consultations and extensive stakeholder involvement constituted the main approach for this ESIA. During preliminary phase, extensive consultant was carried out and during Phase II, a further detailed consultation was carried our concentrating on the surrounding areas of the chosen TL. The following approaches were used to collect socio-economic and sociological information.

i) *Existing information:* Existing information like relevant reports, documentations and government publications were revisited. This also included revisiting legal and institutional frameworks as tools for use in data analysis and compensation plan preparation. Data from secondary sources were suitably collected and compiled and helped provide information for the required socio-economic profiles of the study region. These sources of information were used in generating a macro-level socio-economic profile of the region under study for Iringa-Mbeya transmission line. This was mainly done during preliminary phase.

ii) *Field Observation*: Visual observation of the existing environmental and social related issues were used to gather information about, vegetation, cropping, health situation, water facilities, general life style, etc. Efforts were made to gauge the general feelings of the people in the project area. This was done through field study visits along the line corridor during reconnaissance and in connection with consultation meetings.

iii) *Consultation*: Meetings were organised at three levels:

- Meetings with the regional and district leaders in areas that might be impacted by the project.
- Meetings at ward and village level of the chosen TL.
- Meetings with community members in areas of direct impact.

A simple questionnaire was used to ensure consistency and capture of all key issues.

iv) *Village checklist:* A checklist was prepared and used for collecting information about villages, social services that are obtained in the village, main economic activities, village land use, and views of the villagers regarding the proposed power line transmission project.

v) *Focus Groups:* Focus groups were organised to capture the concerns of women who may fail to participate in the presence of men. The meeting aimed at informing community leaders and Project Affected People (PAP) about the project and identify their concerns, expectations and fears on different issues to reduce the negative impact including compensation aspects and resettlement issues.

vi) *Sample survey:* In addition to the above, a sample-based socio-economic household survey was conducted along the proposed routes. The households included in the sample were selected from among the villages and settlements more likely to be affected by the creation of the wayleave. The questionnaire included the following topics:

- Demographics
- House Size and Materials
- Storage Structures
- Agricultural Land and Production
- Livestock Ownership
- Water and Energy Sources
- Location of Graves and Spiritual Sites.

The main results of the household survey are presented in the RAP.

A detailed description of stake holder consultation and methods are described in Section 5.

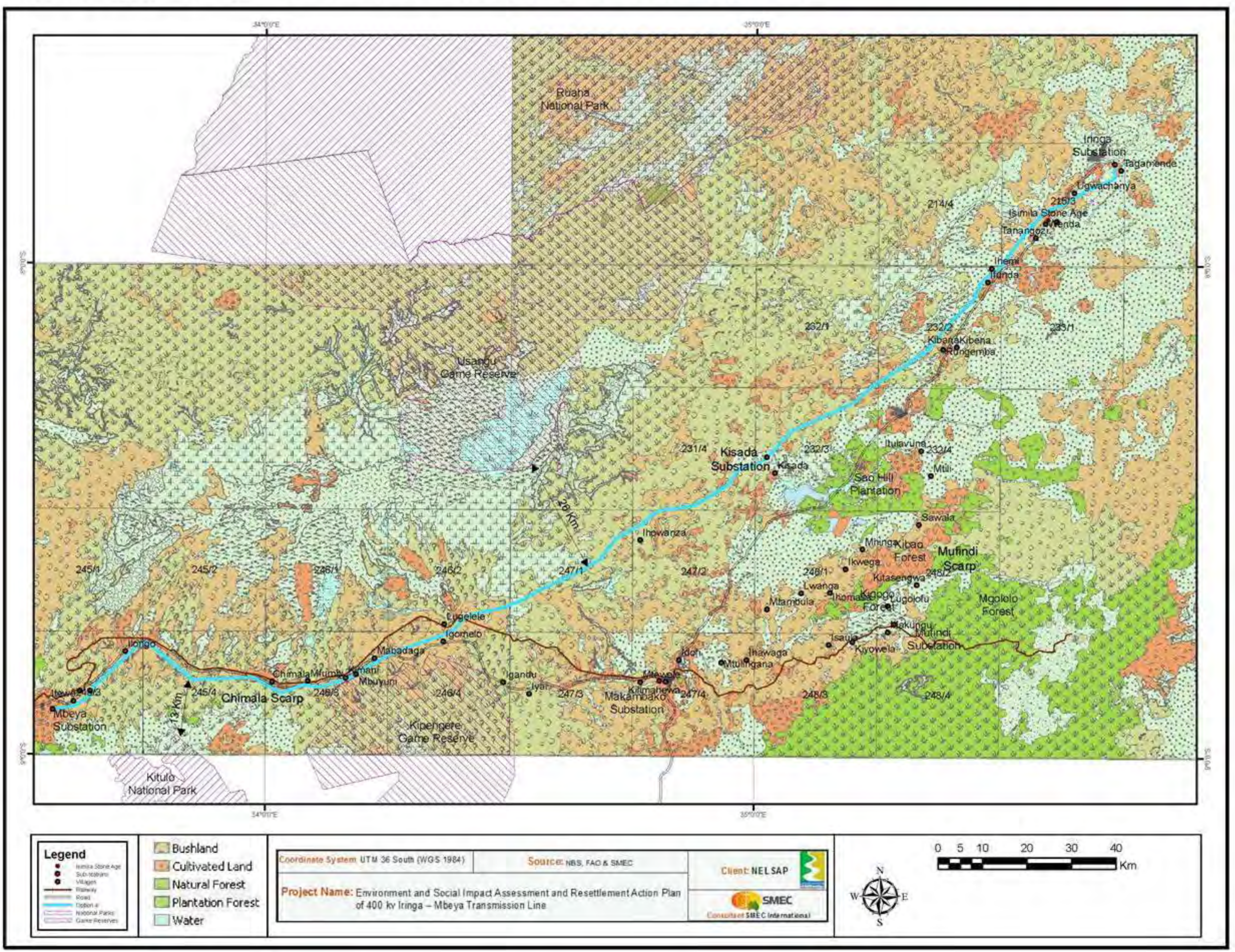
4.2 Physical and Biological Environment

4.2.1 Settings

The project is located between the latitudes 7° 47' 35" S and 8° 54' 35" S in Iringa and Mbeya regions. The project area lies in the Southern Highlands of Tanzania as shown in Figure 1. The existing TL for the 220kV lines is about 352 km stretching from Tagamenda substation at Iringa to Mwakibete substation near Mbeya City.

The chosen TL will pass through villages but avoiding settlement centres or village nuclei. Also the chosen corridor has avoided townships, protected archaeological sites such as Isimila, conservation areas and government plantations. The TL will mostly be passing in areas with scattered cultivation, wooded grasslands and miombo woodland.

Figure 3 Physical & Biotic Environmental Setting along the Transmission Line



Legend

- Isimila Stone Age
- Sub-stations
- Villages
- Railway
- Road
- Option A
- National Parks
- Game Reserves

- Bushland
- Cultivated Land
- Natural Forest
- Plantation Forest
- Water

Coordinate System: UTM 36 South (WGS 1984)

Source: NBS, FAO & SMEC

Client: NELSAP

Project Name: Environment and Social Impact Assessment and Resettlement Action Plan of 400 kv Iringa – Mbeya Transmission Line

Consultant: SMEC International

0 5 10 20 30 40 Km

N W E S

Iringa: Iringa region is situated in the Southern Highlands of Tanzania. It's headquarter, Iringa Town, is located at 36 M 797453 m E and 91 39061 m S at 1626m a.s.l. The town is situated about 500km from the city of Dar es Salaam on the coast of the Indian Ocean. The average altitude of Iringa is 1500m a.s.l. It is a tourist destination because of Ruaha National Park. Its landmasses rise from about 600-700m a.s.l in the semi-arid areas of Idodi and Ruaha Mbuyuni to above 1900m a.s.l in the high rainfall areas in Dabaga Highlands and Mufindi Mountains. The land massif in Dabaga and Kipengere are so cool that they experience frost during the cold months of July and August. In the dry months, especially August to October, the woodlands experience frequent bushfires. The region is characterised by high levels of plant biodiversity that has made forests in the Udzungwa Mountains of the Eastern Arc Mountain Range of global conservation interest according to IUCN.

Iringa is linked to the outside and neighbouring regions by highway and TAZARA railway. The major railway stations are Makambako and Mgololo. The town can also be accessed by air services through Nduli Airport.

Iringa Town is a quickly expanding town with several newly established Universities including Tumaini, Mkwawa and St August.

Mbeya: Mbeya region lies in the south-western corner of the Southern Highlands of Tanzania. Part of Iringa and Mbeya lie in the Great Rift Valley with its eastern and the western arms converging in Mbeya. The Zambia Tanzania Railway (TAZARA) is one of major transport means in the region. Mbeya is also linked to Dar es Salaam port by the Tanzania-Zambia highway. Of late, Mbeya town has rapidly developed economically to the extent that it has been upgraded to city status. The city has developed into an active economic centre in the zone. It is surrounded by high potential agricultural areas under irrigation and rain-fed agriculture. The construction of Songwe airport near Mbeya city is at its final stage of construction.

4.2.2 Administrative Units

Iringa is one of Tanzania's 26 administrative regions. The regional capital is Iringa. The total area is 58,936 km^2, of which land area is 56,864 km^2 and water area is 2,070 km^2. The Iringa region has a population of 1,495,333, according to a 2002 census. Iringa Region is home to Ruaha National Park, Tanzania's second largest park, which has an abundance of wildlife. The region is divided into seven districts: Iringa Rural and Iringa Urban, Kilolo, Ludewa (8,397 km^2), Makete (4,128 km^2), Mufindi (7,123 km^2), and Njombe (10,242 km^2).

Mbeya is one of Tanzania's 26 administrative regions. The regional capital is Mbeya. It is bordered to the northwest by Tabora Region, to the northeast by Singida Region, to the East by Iringa Region, to the South by Zambia and Malawi and to the West by Rukwa Region. Mbeya Region is occupied by several different ethnic groups including the Nyakyusa, Ndali, Nyiha, Nyamwanga, Safwa, Malila, Vwanji (or Wanji), Bungu, Sangu, Wanda and Sichela. According to the 2002 Tanzania National Census, the population of the Mbeya Region was 2,070,046 persons. The Mbeya Region is administratively divided into 8 districts: Chunya, Mbarali, Mbozi, Rungwe, Kyela (which includes the Ikama administrative ward), Ileje, Mbeya Urban and Mbeya Rural.

4.2.2.1 *Iringa Region*

Mufindi District

Mufindi is one of seven districts of the Iringa region with an area of 7,132 km^2 of which 6,177 km^2 is land area and 946 km^2 is water body. The district is mountainous and it's mostly known for its tea plantations.

Iringa Rural

Iringa rural is among seven districts which form Iringa region with a total area of 20,576 km^2 of which 19,897 km^2 is land area and 678 km^2 is water bodies. Out of 19,897 km^2 only 9,857 km^2 is habitable whereas the rest consists of a national park, some forest reserves, Rocky Mountains etc.

Makete

Makete has a total area of 5800 km^2 of which most of the area is mountainous with steep hills, ridges, valleys and escarpment.

4.2.2.2 *Mbeya Region*

Mbarali District

Mbarali district is one among eight districts which form Mbeya region with an area of 16,000 km^2.The district lies between latitude 7^0 and 9^0 South of equator and between longitude 33^0 and 35^0 East of Greenwich.

Mbeya Rural

Mbeya Rural is one among seven districts which form Mbeya region with an area of 2432 km^2.The district lies between latitude 7^0 and 9^0 South of equator and between longitude 33^0 and 35^0 East of Greenwich..

Mbeya Urban

Mbeya Rural is one among 8 districts which form Mbeya region with an area of 2432 km^2. The district lies between latitude 7^0 and 9^0 South of equator and between longitude 33^0 and 35^0 East of Greenwich.

4.2.3 Demographic Profile

Present and projected (2012) population data for districts along the transmission corridor are illustrated in Table 5 below.

Table 5: Population Characteristics in Districts along the proposed Transmission Line

Region	District	Male	Female	Total	Number of households	Average Household size	Population Projections (2012)
Iringa	Iringa	119,082	125,951	245,033	56,682	4.3	274,000
	Mufindi	133,150	148,921	282,071	66,058	4.2	310,000
	Makete	48,377	57,398	105,775	27,762	3.8	107,000
Mbeya	Mbeya rural	118,597	135,472	254,069	-	-	-
	Mbarali	114,738	119,363	234,101	64,986	-	309,945
	Mbeya City	126,679	139,743	266,422	-	-	414,198

Source: The 2002 Population and Housing Census, Government of Tanzania

Urban areas tend to grow faster in total population and population density compared to rural localities. In Iringa region, Mufindi is the leading district in terms of density growth

from 19 people per km^2 in 1967 to 50 people per km^2 in 2012 (Iringa Regional Socio Economic Profile, 2007). This is followed by Njombe and then Iringa district. High population density and growth in Mufindi district could be attributed to immigration in villages around tea estates by individuals in search of jobs at companies such as Unilever Tea Company. Forestry activities in both Iringa District and Mufindi also attract many people. In general good soils, reliable rainfall and income generating activities like forestry in Iringa district and flower production in Njombe, has led to greater population pressure on land as farmers tend to settle permanently in these areas for subsistence and cash crop farming. Mbarali District also attracts many groups for rice production activities.

The population density in Mbeya District is 105 people per km^2, which is considerably greater than the National and Mbeya region average population densities of 39 and 34 per km^2 respectively according the 2002 census. The availability of good infrastructure, labor supply, land, reliable water, reliable electricity, the construction of airport and good governance, has created favourable environment for promoting agricultural production as well as initiation of different investments in the district.

4.2.4 Ethnicity

The dominant ethnic people along the transmission line/corridor in Iringa Region are the Hehe mostly found in Iringa district, Iringa Urban and Mufindi districts. The Bena are most numerous in Njombe while Kinga are in Makete. Some records showed that the Hehe accounted for 43 per cent of ethnic people in Iringa region followed by the Bena with 37 per cent (page 8, Iringa Regional Socio Economic Profile, 2007). The Kinga and the Pangwa make up 11 per cent and 3 per cent respectively. Another 6 per cent is made up of many small groups including Kisi, Manda and other tribal groups who come into the project area searching for green pastures in tea and timber industries as well as employment in government sectors.

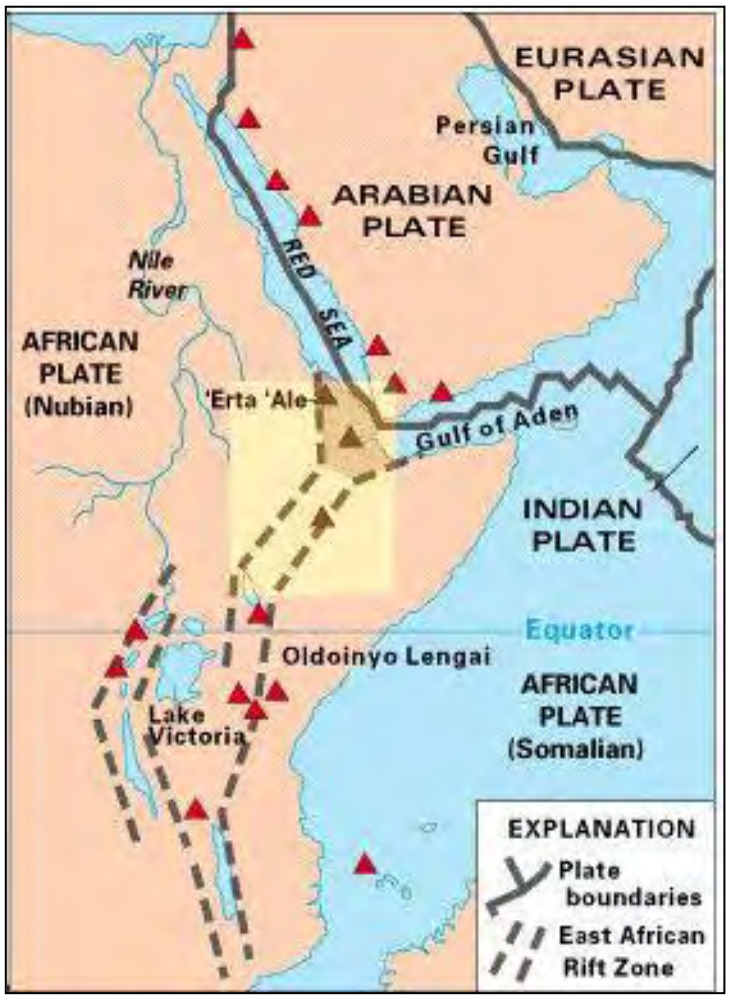
The main Ethnic groups found in Mbeya Region are the Nyakyusa, Safwa and Malila in Mbeya District. Mbarali district is occupied by the Sangu, Hehe, Kinga, Bena and Nyakyusa while Mbeya City is occupied by all the above tribes as well as the Wanji, Ndali, Nyika, Sukuma. Others mainly residing in Mbeya District and Mbarali districts include the Maasai, Sukuma, Barbeig and Gogo who are specifically identified as nomadic and predominantly agro-pastoralists.

4.2.5 Gender and Minority Vulnerable Groups

Changing land patterns and workloads resulting from the introduction of the project are likely to affect men and women, ethnic groups and social classes unequally. Groups that use land to make their living or fulfil their household duties, e.g. for charcoal making, grazing, collecting fuel wood, growing vegetables etc. may be disadvantaged if that same land is taken over for the project. Historically, it has been men from the more settled and powerful groups that have had greatest access to the benefits and increased income from productive areas. Men controlled the means and instruments of production except for hand hoes and small domestic animals (chicken, ducks and rabbits). At present, at least women from all classes including resource weak households and women headed households are benefitting through equal participation with men in production activities. However, in rural households, women are still responsible for food crop production and weeding the fields, while men harvested and marketed the irrigated crops. Incomes in that context are controlled by men. Gender imbalances are rooted and sustained by traditional and cultural values. With regards to food processing and technology operations of crops, both genders are deployed. Women's participation in decision making has been enhanced as both men and women can now compete for chairmanships in village governments.

4.2.6 Topography

Iringa and Mbeya regions have varying topographic features that range from the valleys of the Little and Great Ruaha valleys at about 500-700m a.s.l to the Kipengere and Poroto Mountains above 1500m a.sl. The project upper elevations are in Iringa, Mufindi and Uyole uplands which are far from The Great Rift Valley.



The Great Rift Valley -Source: Wikipedia2012Topography

Table 6 Topographic features in the proposed TL

Section	Topography
Iringa – Kisada Section	From the Iringa sub-station at 1,566m a.s.l which is the lowest lying point altitude in this section, the proposed line will pass in undulating land and low lying hills of Tagamenda and Wenda. The highest point along this section and the entire line is 1934m a.s.l at Ihemi. As from Ifunda it passes in part of Great Rift valley along Ndembera Rivers and continues in almost flat terrain from Klbena and Isalavanu to Kisada. From Ihemi the elevation drops by 263m at Isalavanu about 1670m a.s.l before increasing by 176m to reach the proposed Kisada substation at 1845m a.s.l.
Kisada – Mbeya Section	From Kisada (1,845m a.s.l.), the proposed TL descends gradually to the lowest level at 1098m a.sl at Igawa across Mbarali River on Tanzania- Zambia Highway, From Igawa the section ascend gradually passing on the bottom and slopes of Kipengere Mountain ranges in the villages of Madabaga, Mabuyuni, Mfumbi crossing Kimani and Ruaha Rivers. It then passes on the bottom of Kitulo/Matamba hills crossing Chimala River. The altitude increases gradually from Igawa and Igomelo to the proposed substation at Uyole at 1839m a.s.l. The Chimala –Igurusi- Mambi section of the line

Section	Topography
	will passes almost parallel to the Zambia Highway on the southern part. The altitudes increase rapidly from Imezu passing on the steep terrain of Uyole hill or escarpment which is commonly known as Mlima Nyoka which means Snake Mountain.

4.2.7 Climate

Tanzania has a tropical climate with two seasons (wet and dry) with temperature varying from hot during wet season and cool during dry season, particularly in the central plateau regions of the country, while coastal areas experience more humidity. In the lake zone, the drier months are interrupted by short rain from late October to December followed by the heavy rainy season from January to May with rains peaking in March. The rest of the country experiences only one wet season, from November to May. The project area enjoys a tropical climate with marked changes in temperatures and rainfall due to elevation and season.

Temperature

The temperature around Iringa Town ranges between 15^{o} C and 25^{o} C. In Mbeya region, the average temperatures range is between 12^{o} C in Mbeya Mountains to about 25^{o} C in the lowlands areas.

Rainfall

Iringa and Mbeya regions are typified by variety of climates ranging from the semi-dry areas in Malangali and close to Rujewa town to the high rainfall areas in Mufindi.

The proposed project will mostly pass through the highlands which are characterized by moderate and cool climate and moderate rainfall. Figure 4 and 5 present rainfall patterns at Iringa Town and Mbeya City in the project area.

Figure4 Climate Data for Iringa

IRINGA MEAN RELATIVE HUMIDITY (%)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	77.8	78.9	77.3	73.4	66.0	62.9	61.1	60.8	55.5	52.5	55.7	68.7
IRINGA MEAN RELATIVE HUMIDITY (%)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	59.1	60.8	60.8	56.6	48.5	44.4	40.9	40.8	37.0	36.5	38.5	51.0
IRINGA MEAN MAXIMUM TEMPERATURE (°C)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	26.4	26.5	26.8	26.4	26.1	25.3	24.6	25.5	27.3	28.7	29.1	27.7
IRINGA MEAN MINIMUM TEMPERATURE (°C)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	16.3	15.9	15.5	15.4	14.4	12.7	12.0	12.3	13.2	14.7	15.9	16.5
IRINGA MEAN RAINFALL (MM)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	130.3	118.2	124.3	56.6	11.1	0.1	0.0	0.0	0.6	3.9	29.2	120.8

Source: Tanzania Meteorological Agency

Figure5 Climate Data for Mbeya

MBEYA MEAN RELATIVE HUMIDITY (%)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	79.5	79.9	78.2	76.7	74.9	73.9	71.4	65.2	58.6	59.1	63.6	73.9
MBEYA MEAN RELATIVE HUMIDITY (%)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	68.7	67.7	66.5	66.2	61.4	53.0	48.3	44.3	39.9	40.8	50.0	62.4
MBEYA MEAN MAXIMUM TEMPERATURE (°C)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	23.6	23.8	24.0	23.3	22.8	22.0	21.9	23.4	25.5	26.9	26.4	24.6
MBEYA MEAN MINIMUM TEMPERATURE (°C)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	14.4	14.4	14.0	12.6	9.7	6.4	5.9	7.4	10.1	12.8	14.0	14.4
MBEYA MEAN RAINFALL (MM)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LTM	226.4	172.5	172.5	91.7	16.6	0.6	0.2	0.2	2.4	14.5	59.8	191.0

Source: Tanzania Meteorological Agency

Growing season

The favourable climate in the project area makes it suitable for the growth of a variety of food and cash crops as well as having different types of natural vegetation such as valley grasslands, low land miombo, upland miombo and sub-montane forest. In most parts of the area the crop growing season begins in November and continues to April. This phenomenon is greatly attributed to temperature regime. The growing season for maize is longer in the upland areas than in the low land because of cooler temperatures.

4.2.8 Hydrology

River basins

Iringa and Mbeya regions have varying watershed drainage systems featuring wetlands and well-drained uplands. The regions provide the watershed and catchment for Little and Great Ruaha Rivers, which supply water to Mtera hydropower dam. The Poroto and Kipengere highlands in Mbeya are important sources of water draining into Usangu and Ihefu plains upstream of Mtera and Ruaha National Park. Mtera Dam is located about 60Km North of Iringa, with Ruaha National Park 128Km to the west.

The proposed project TL therefore passes through the catchment areas for rivers that are vital in power generation, wildlife conservation and irrigated farming. The major hydrological features of the chosen TL are described in Table 6.

Table7 Hydrological characteristics along the proposed TL

Sections	Hydrology
Iringa – Kisada Section	The proposed TL passes through the catchment area which drains into Little Ruaha River. Ndembera River in Ihemi, Ifunda and Ulete villages drains into Ruaha River. Areas between Isolavanu and Bumilaying have less hydrological potential, particularly in terms of surface water, because they are characterized by seasonal rivers. People in these areas depend on underground water sources accessed through deep and shallow wells. The substation at Kisada will be constructed near the small shallow lake of Mkewe.
Kisada – Mbeya Section	This section of the TL has hydrological value because it passes through rivers such as Mabarali, Kimani Ruaha and Chimala. They all drain into Usangu and Ihefu wetlands before emptying into Great Ruaha River. Other rivers in this section are

Sections	Hydrology
	Igurusi and Mambi Mlowo River drains Uyole highlands and Inyala - Iyawaya ravine before draining into Usangu- Ihefu plains.

Irrigation

There are no irrigation schemes of significant size along the chosen TL in the upper parts of the project area. However, the TL in Mbarali district passes through areas under irrigation farming, in particular around Igomelo/Igawa, Igurusi and Mambi. These areas fall under the management of Rufiji Basin Water Office (RBWO).

4.2.9 Geology And Soil

Geology

The geology around Mbeya is dominated by the Ubendian systems comprised of granodiorites, diorites, magmatic granite gneiss and granular pyroxene hornblende rocks.

The geological formations may have some implication on the construction of the transmission lines, for example a few areas with gold and gemstone deposits may lie in Mbarali district and Ifunda areas in Iringa district, but such deposits have not been specifically identified in this report. However, the project is linear in nature and thus such impact or conflicts, if any, may be of little significance.

Soils

Soil information described here has been derived from the Atlas of Tanzania (1976).

The soils vary from reddish-grey to reddish brown loam. However, in other areas soils are shallow and vary from stony grey to stony brown and grey-brown loam. In some parts of Mbeya, the soils are characterized by loam Entisols/Vertisols to clay loam Ultisols with good drainage.

The soils in Iringa region are well drained and highly weathered. Areas of higher elevation are dominated by leached clay soils. The mid elevation areas are dominated by moderately drained and leached soils. The low lying areas are dominated by red brown loam and highly fertile soils.

The most likely areas for soil erosion are in Malangali and Bumilayinga wards, particularly in the villages of Kisada and Bumilayinga. Mufindi plateau has red clay soils of moderate fertility with dark topsoil high in organic matter. Much of the land at risk of erosion has gradients greater than 30%, in particular between Iyawaya and on Uyole.

4.2.10 Land Area and Land Uses

In general, medium and high elevation area land use includes: open to closed grassland, open to very open trees, rain fed herbaceous crops (large to medium continuous fields), rain fed shrub crops, tree crops, irrigated crops, forest plantations, sparse vegetation, and tree and shrub savannah. Land use found in both low, medium and high altitude areas include: swamps and urban areas. Land use in low altitude areas include: aquatic agriculture, aquatic areas (fresh water, permanent and temporarily flooded), and open grasslands with sparse trees and shrubs. The table below shows the land area and uses in the project area.

In all districts, total land area is divided into arable land ideal for agricultural production, forests, water bodies, flat land and grasslands. In most cases land in villages belong to individuals and villages. Due to population pressure, many district councils do not have land to offer to investors, but investors can buy land from individuals or village governments for the purpose of establishing investment ventures such as cultivation of cash crops, processing industries, and storage, grading, packaging, and handling facilities.

Table 8: Land area (in ha) by land use by district

Region	District	Total land area	Arable land	Forests	Water bodies, flat land, grasslands
Iringa	Iringa	19,897,500	480,000	114,000	678,500
	Mufindi	6,177,000	300,000	80,000	946,000
	Makete	3,178,000	110,000	56,315	950,000
Mbeya	Mbeya	2,432	189,818ha	47,354	6,028
	Mbarali	1,600,000	196,000	17, 200	259,000
	Mbeya City	21,400	8980	-	-

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication.

Vegetation changes

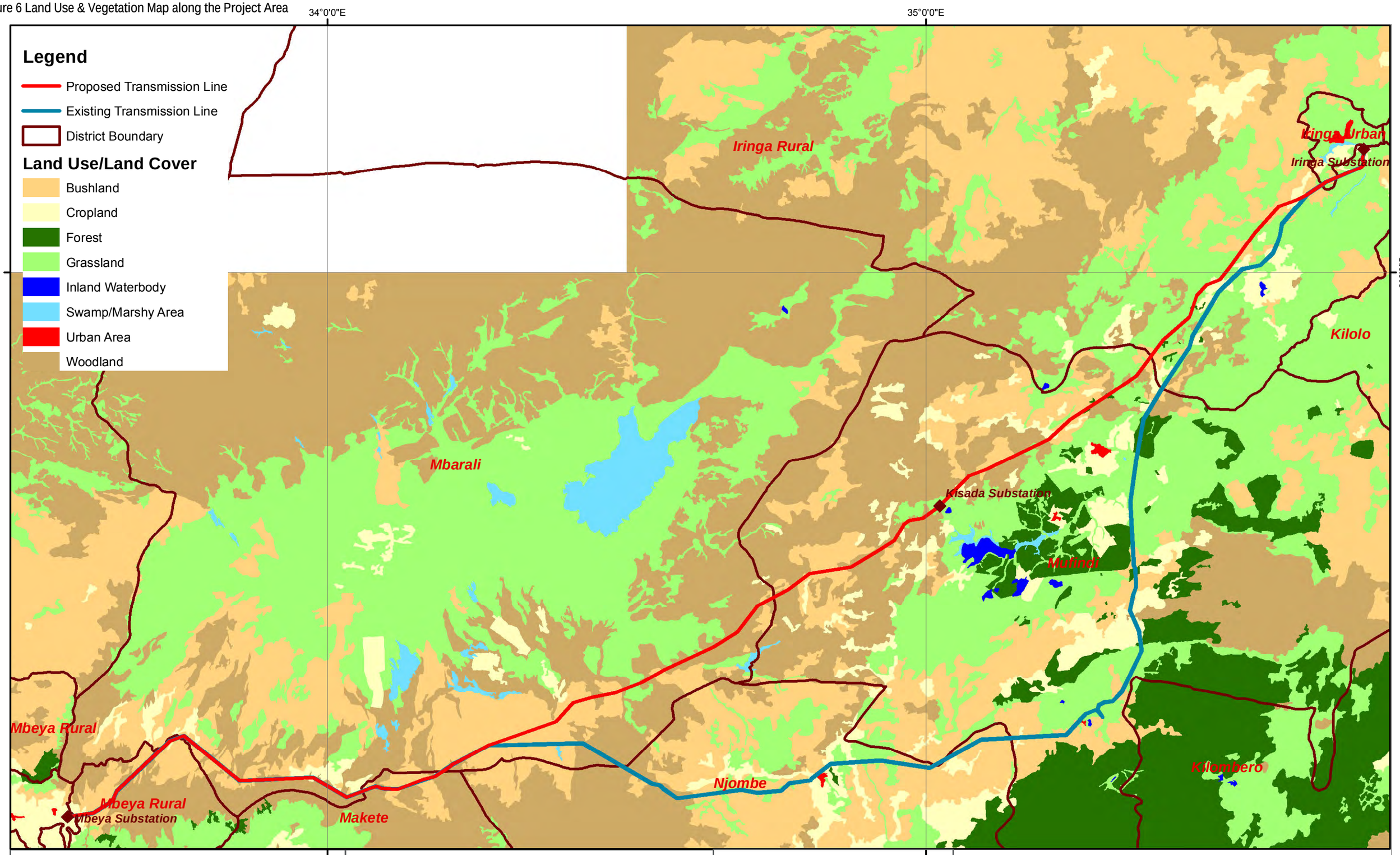
Human destruction or modifications of the natural vegetation is common in the study area. The causes of disturbance include:

i) Agricultural activities, in particular shifting cultivation and opening of new farms between Ihowanza in Mufindi and Luwongo in Mbarali district. Clearing of natural forests to open new agricultural farms was evident in Ihowanza and Luwongo villages on the Iringa-Mbeya regions border.

ii) Felling of natural forest for timber, charcoal and firewood.

iii) Wildfires due to clearing of land and honey collecting.

Figure 6 Land Use & Vegetation Map along the Project Area



Coordinate System UTM 36 South (WGS 1984)	**Source:** IRA, FAO & SMEC
Project Name: Environment and Social Impact Assessment and Resettlement Action Plan of 400 kv Iringa – Mbeya Transmission Line	**Client:** NELSAP
	Consultant SMEC International

0 5 10 20 30 40
Kilometers

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4.2.11 Land Rights and Tenure System

Some villages along the transmission corridor have been surveyed. In all villages land is in owned by individuals, villages, or institutions like schools and churches. Mosques are found along the villages adjacent to the main road to Mbeya and in suburban areas. Land is mainly inherited through a customary land tenure system and is sometimes associated with a particular family (genealogy). In some cases land can be borrowed or given. There is no land scarcity in the area.

However, a number of statutes deal with land tenure in Tanzania. The Land Act classifies land into general land which is land governed by the Land Act, 1999; reserved lands, which are lands designated for various purposes and governed by different Acts; and village land governed mainly by the Village Land Act, 1999. Compensation for the compulsory acquisition of land is also provided for by the Land Acquisition Act, 1967.

4.2.12 Economic Profile

It was observed that many villagers have low incomes as they produce very little for subsistence only and not for commercial purposes. In areas where income generating activities have been initiated there is substantial improvement. There is opportunity for improvement, as arable land under crop production in the region is below 50% (Table 9).

Agriculture

Agriculture is the leading sector in Tanzania's economy since it provides about 80 per cent of employment, 50 per cent of the nation's income and 66 per cent of all foreign exchange earnings (Medium Term Plan for Growth and Poverty Reduction 2004/05 – 2006/07 Vol. I). Agriculture is a significant source of food and supplementary income for households in all districts of Iringa and Mbeya regions. About 90 per cent of the populations in both regions earn their living from agriculture and livestock production. The sector has ensured food security and managed to produce surpluses of maize, the major food crop grown in both regions. Endowed with fertile soils, good weather and sufficient rainfall, the areas are ideal for cultivation of both food and cash crops. Hand hoes are still traditionally used to prepare 85% of the cultivated land in rural areas. The use of tractors for land preparation is minimal due to the high costs of hiring a tractor. Tea, which is one of the major exports outside Iringa region, is the main cash crop, while wheat and maize are the main food crops. Cultivation of flowers and dairy farming are also undertaken, primarily in Njombe and Mufindi districts. Coffee is the major export from Mbeya, while Mbarali is known for its rice paddy production and Makete for its round potatoes. In all rural areas agriculture is practiced through small scale farming involving the cultivation of a few crops on small space available for each household. Other crops grown include pyrethrum, coffee, tobacco, sunflower, beans, millet, sorghum, cabbage, sweet and Irish potato, peas, tomatoes, rice (paddy), groundnuts, wheat and fruits.

Table 9: Area under Major Food and Cash Crops Cultivation in hectares

Region	District	Total Land area	Arable Land Suitable for Agricultural Production	Currently utilized	% of Arable Land Under Crop Production
Iringa	Iringa	1,989,750	480,000	161,488	33.6%
	Mufindi	617,700	300,000	112,781	37.6%
	Makete	317,800	110,000	41,611	38%
Mbeya	Mbarali	1,600,000	196,000	157,800	80.5%
	Mbeya City	21,400	8,980	8,887	99%
	Mbeya District	243,200	216,400	98,710	46%

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication

Permanent plants grown on local farms include guava fruit trees and bamboo, which is tapped to produce local wine. Mikusu (Uapaka kirkiana), an indigenous fruit tree species, is retained or conserved on people's land.

Both sedentary and shifting agricultural cultivation is practised in the TL area.

Sedentary agriculture is found in the upper elevations especially around Ifunda, Mufindi plateau and Uyole highlands.

Shifting cultivation is found primarily in the Miombo woodland areas. The main crops are maize, sunflower, sweet potatoes, cassava, and groundnuts. Details of the food crop are provided in Table 10.

Intensive farming

In some parts of the project area, such as along the Zambia-Tanzania Highway on the bank of Ndembera and Ruaha rivers in Iringa and Mufindi districts, farm areas are under intensive agriculture involving large scale mechanised or commercial farms. In addition, intensive farming is common between Igurusi and Uyole. Crops cultivated under this system are maize, beans, tobacco, flowers, onions, garlic, tomatoes and rice.

Cash crops

Cash crops produced in the proposed TL are tea in Mufindi, and flowers and tobacco in Iringa rural. Wheat is produced at Uyole in Mbeya. Coffee, pyrethrum, tobacco, and rice production are also common in Mbeya region. Details are provided on Table 11.

Table 10 Details of Food Crop in the Project Region

REGION	DISTRICTS	DATA	maize		paddy		sorghum		beans		cassava		sweet potatoes		Irish potatoes		Wheat		Finger Millet	
			2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10
IRINGA	Iringa rural	area ('000'ha)	64.05	66.88	13.08	12.82	-	3.53	14.55	21.22	0.93	1.54	-	2.40	5.61	3.88	0.03	0.12	0.47	0.91
		production ('000'tons)	78.72	44.47	47.63	0.56	-	12.72	7.87	16.58	3.14	9.56	-	19.39	27.36	20.49	0.05	0.19	0.52	1.19
		yield (tons/ha)	1.23	0.66	3.72	0.04	-	3.60	0.54	0.78	3.36	6.22	-	8.08	4.88	5.28	1.49	1.55	1.10	1.30
	Makete	area ('000'ha)	11.46	12.22	0.20	0.20	0.44	0.72	4.22	4.04	0.00	0.00	-	0.61	16.58	2.49	17.24	1.48	-	0.13
		production ('000'tons)	15.30	35.01	0.44	0.17	0.42	0.65	1.97	1.90	0.00	0.00	-	1.35	36.94	9.63	4.45	1.27	-	0.15
		yield (tons/ha)	1.34	2.87	2.21	0.83	0.95	0.91	0.47	0.47	-	-	-	2.22	2.23	3.87	0.26	0.86	-	1.20
	Mufindi	area ('000'ha)	73.57	76.86	0.05	0.15	0.03	0.06	32.98	43.60	0.14	0.08	-	3.63	12.24	8.78	11.55	4.36	2.23	2.56
		production ('000'tons)	121.68	108.03	0.08	0.12	0.05	0.07	36.87	44.57	1.13	0.15	-	30.87	73.22	102.59	7.91	3.75	2.07	2.56
		yield (tons/ha)	1.65	1.41	1.46	0.78	1.54	1.36	1.12	1.02	7.96	1.81	-	8.52	5.98	11.69	0.69	0.86	0.93	1.00
MBEYA	Mbeya rural	area ('000'ha)	58.15	52.70	-	-	0.51	0.47	12.50	126.50	-	-	1.56	2.35	26.34	31.02	2.62	2.22	0.83	0.85
		production ('000'tons)	57.87	117.02	-	-	0.52	0.08	11.74	8.62	-	-	6.07	19.89	169.52	345.65	2.06	0.38	0.83	0.17
		yield (tons/ha)	1.00	2.22	-	-	1.02	0.18	0.94	0.07	-	-	3.90	8.46	6.44	11.14	0.79	0.17	1.00	0.20
	Mbeya urban	area ('000'ha)	4.69	4.22	-	-	-	-	1.66	1.34	-	-	2.63	-	4.47	3.61	0.94	0.26	-	-
		production ('000'tons)	7.64	18.53	-	-	-	-	0.78	0.80	-	-	17.10	-	23.12	42.85	0.54	0.18	-	-
		yield (tons/ha)	1.63	4.39	-	-	-	-	0.47	0.60	-	-	6.49	-	5.17	11.86	0.57	0.69	-	-
	Mbarali	area ('000'ha)	24.30	27.83	33.53	38.77	9.03	5.63	12.00	15.39	1.61	1.63	1.61	4.11	-	-	-	-	-	-
		production ('000'tons)	27.78	30.57	73.00	150.69	7.35	8.23	8.94	12.94	11.71	18.28	9.50	34.45	-	-	-	-	-	-
		yield (tons/ha)	1.14	1.10	2.22	3.89	0.81	1.46	0.75	0.84	7.26	11.22	5.92	8.38	-	-	-	-	-	-

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication

Table 11 Details of Cash Crop in the Project Region

REGION	DISTRICTS	DATA	Coffee		Pyrethrum		Tobacco		Groundnuts		Sunflower		Cashewnuts	
			2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10
IRINGA	Iringa rural	area ('000'ha)	-	-	-	-	1.74	1.10	1.65	-	16.53	0.01	-	-
		production ('000'tons)	-	-	-	-	1.73	2.12	1.14	-	10.68	0.01	-	-
		yield (tons/ha)	-	-	-	-	0.99	1.93	0.69	-	0.65	0.74	-	-
	Makete	area ('000'ha)	-	-	1.80	-	-	-	0.05	-	0.24	-	-	-
		production ('000'tons)	-	-	0.31	-	-	-	0.03	-	0.12	-	-	-
		yield (tons/ha)	-	-	0.17	-	-	-	0.69	-	0.52	-	-	-
	Mufindi	area ('000'ha)	-	-	0.53	-	-	-	0.44	-	4.66	8.71	-	-
		production ('000'tons)	-	-	0.37	-	-	-	0.22	-	3.59	4.15	-	-
		yield (tons/ha)	-	-	0.70	-	-	-	0.51	-	0.77	0.48	-	-
MBEYA	Mbeya rural	area ('000'ha)	11.00	5.95	3.82	3.51	-	-	-	-	1.70	5.12	-	-
		production ('000'tons)	2.15	2.97	1.28	1.51	-	-	-	-	0.44	6.70	-	-
		yield (tons/ha)	0.20	0.50	0.34	0.43	-	-	-	-	0.26	1.31	-	-
	Mbeya urban	area ('000'ha)	1.25	0.15	-	-	-	-	-	-	-	-	-	-
		production ('000'tons)	0.69	0.18	-	-	-	-	-	-	-	-	-	-
		yield (tons/ha)	0.55	1.20	-	-	-	-	-	-	-	-	-	-
	Mbarali	area ('000'ha)	-	-	-	-	-	-	14.80	19.16	2.00	4.76	-	-
		production ('000'tons)	-	-	-	-	-	-	14.37	22.39	0.93	2.78	-	-
		yield (tons/ha)	-	-	-	-	-	-	0.97	1.17	0.47	0.58	-	-

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication

Cattle grazing

Grazing is also taking place alongside agriculture. Cattle grazing are also common in the area, especially around Iringa plains.

It is practiced in the low and middle elevation areas of the TL, where there are open grassland areas suitable for cattle. A large part of the areas (e.g. Igawa, Chimala and Igurusi) traversed by the proposed chosen TL has woodland vegetation heavily infested with Tsetse flies, which makes cattle rising difficult because of trypanosomiasis diseases. For example, in Kisada and Ihowanza villages, people complained of high cattle mortality because of diseases.

Commercial farming

In Mufindi district, vast areas are under the commercial cultivation of tea. Rice (paddy) cultivation is the dominant farming activity in Mbarali and Usangu wetlands.

In the wetland areas, especially in Rujewa, rice cultivation is done on a commercial scale, particularly on irrigated farms where irrigation structures have been put in place along with rice processing factories.

Forest

Iringa region has a forest cover totalling 2,473,570 hectares (46% of the region). This cover includes natural forested grasslands. Apart from natural forests the region has possibly the most extensive area of tree plantations in Tanzania. The total area covered by forest plantation as of 2005 was 179,345 hectares. Forest reserves cover an area of about 483,647 hectares. These are owned by the central, local and village governments. However, encroachment and illegal harvesting are problems which threaten the sustainability of these areas. There are a number of NGOs and CBOs in Iringa region that participated directly or indirectly in environmental conservation through different approaches including promotion of tree planting, establishment of tree seedling nurseries and environmental conservation. Table 12 below indicates forest cover in the project area.

Table 12: Forest cover of Iringa and Mbeya regions by district

Region	District	Land area (ha)	Natural forest Reserved area (ha)	Forest Plantation area (ha)	Forest area on public land (ha)
Iringa	Iringa	1,989,750	140,429	5,671	114,000
	Mufindi	617,700	96,177	102,368	80,000
	Makete	317,800	49,424	10,219	56,315
Mbeya	Mbeya	243,200	-	-	47,354
	Mbarali	178,600	38,400	-	-
	Mbeya City	-	-	-	400,000 (Seedlings planted)

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication.

Beekeeping

The woodlands are important resources for beekeeping. The production of honey and beeswax is a major economic activity in the central project areas. Beekeeping is common or developing at Igawa, Mabuyuni, Igomelo, Madabaga and Kimani where it is being promoted by community based associations. Stocks of modern beehives were observed in the village offices visited during the study.

Figure 7 Traditional Beekeeping near proposed Kisada sub-stationat

Livestock

Animal husbandry is practised by people in towns, sub urban towns and villages. Zero grazing or indoor keeping of cattle, goats, pigs and poultry is practiced. Cattle are kept in small numbers using both zero and extensive grazing methods. Although village governments have grazing land, some farmers practice zero grazing. However, in some areas there is a problem supplying/accessing drinking water for livestock during dry seasons. A major problem with crop farming and animal husbandry is the absence of qualified extension officers in all villages. Agricultural and livestock extension officers are normally posted at division and ward levels and go to villages when requested by individual farmers.

Table 13: Estimated Livestock Population Distribution by Type and by District in Iringa and Mbeya Regions

Region	District	Cattle	Goats	Sheep	Pigs	Donkeys
Iringa	Iringa	186,686	128,012	35,851	12,100	3,550
	Makete	30,717	25,095	14,499	4,852	244
	Mufindi	113,200	18,100	9,200	24,151	-
Mbeya	Mbeya City	9,070	5,940	670	9,844	125
	Mbarali	138,102	52,842	52,842	15,848	2,774
	Mbeya	74,102	29,556	5,718	20,616	1,690

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication, Government of Tanzania publication.

Fishing

Fishing in both Iringa and Mbeya regions takes place mainly in Lake Nyasa of Ludewa district, in Mtera Dam reservoir of Iringa District, Lake Ngwazi in Mufindi and Itombololo Dam reservoir. Some fishing activities also take place in both Great Ruaha River and Little Ruaha River. Fishing in Lake Nyasa is the most important, contributing some 95 per cent of regional fish catches, followed by fishing in Mtera Dam reservoir. Fishing provides employment to many people living near or along fishing resources areas in the regions. Fishing in the regions is entirely artisanal. Generally, the volume of fish caught by fishermen meets the region's consumption demand and the surplus finds a market in neighbouring regions of Morogoro, Dodoma, and Ruvuma and as far as Dar es Salaam. In 2009, Mbarali district had approximately 389 fishermen.

Hunting

Hunting of wild animals and rodents is carried out mainly as a means of preventing farm produce destruction by animals, but the hunted animals are also consumed, serving as useful supplements to the normally protein-limited diets of the majority of the population in the area.

Trading

Trading in suburban and urban areas along the transmission corridor is common as communities in rural areas tend to travel to these areas to purchase necessities. At village level, trading is minimal, seasonal and small scale. Farmers sell their agricultural produce to the cooperative societies. A few villagers are involved in retail businesses mainly selling basic necessities, and bringing in goods not available in their areas. Trading in timber is common in Iringa, Mufindi and Njombe districts and there is pit sawing in nearly every village.

Wage and Self Employment

All household members along the transmission corridor participate in farming activities, respecting customary division of work between adult and young, and between male and female. Hired labour is also common in peak seasons. Labour can be hired for slashing and digging. Traditional labour groups i.e. “migowe” in Njombe district are commonly used. Some people own small shops and kiosks, especially in suburban areas. These small shops are very common and are the main shopping centres along the transmission corridor. Some villages in Mbeya operate open markets, but these are less common in Iringa region. There are butchers in villages but animals are slaughtered and their meat sold at people's homes.

Formal employment for the economically active population in different parts of the districts in the two regions is a major problem. There are concerns about job quality, especially for the urban youth. A high proportion of them remain unemployed, and new jobs created for young people outside agriculture are poorly paid or unpaid. With rapid rural-urban migration, the formal urban economy is unable to absorb the burgeoning urban workforce. Consequently, these new immigrants are employed in the urban informal economy or remain unemployed (Decent Work Country Profile, Tanzania Mainland, 2010).

Incomes and Expenditures

In all rural communities along the transmission corridor ownership of properties is gender biased. While men own farms and valuable animals, women own utensils and small animals. This makes a big difference in levels of income between men and women. One can tell from the prices of goods sold that their incomes are low. Fertilizers are used to increase production in the nutrient-depleted soils. Those who do not use fertilizers produce small amounts of food and cash crops. In many areas people depend on cash income from tea produced from small private plots or labouring at tea estates. The most viable areas for investment in the region are agriculture and agro processing of cash crops, food and horticulture crops.

4.2.13 Water Supply and Water Distribution System

Due to increased economic activities and delivery of social services, all of which utilize water in one way or another, delivery/supply of water has become a burden which the government cannot meet alone without the participation of the private sector. It is the government's policy to involve the beneficiaries in all water projects in both urban and rural water supply. The water sector contribution to GDP has remained at 0.2% for some years, a proportion which is insignificant considering the importance of the sector to the economy. Water sources existing throughout rural and district areas are usually unsafe and unreliable. Rural water is collected from wells, boreholes and rivers (usually polluted by upstream uses). In cities like Mbeya City, water is managed by the Mbeya Urban Water Authority which provides 29,000 M^3 of water equivalent to 85% per cent of the total demand.

According to the Public Services Reform Program (PSRP) less than 29% of the rural and peri-urban population has access to clean water and adequate sanitation services. Access to safe water in urban areas declined from 85% to 65% between 1985 and 1995 and in rural areas from 48% to 40% from 1999 to 2004 (URT, 2005b).

4.2.14 Settlement Pattern and Land use

Human settlements are concentrated along the road network where transport communication and other social services are easily accessible. Population settlements have also been attracted to areas with water availability, for example near river banks.

The type of houses common in the project area are those constructed of baked bricks with corrugated iron sheet roofs. The same type of construction is used for public institutions such as hospitals or dispensaries, schools, churches and mosques. Houses made with thatched grass are found on farms in remote areas and away from main roads. The economic potential of the settlements can be predicted from the type or condition of the houses.

Land use and settlement patterns along the TL can be described as follow in the following Table.

Table 14: Summary of land use and vegetation along the proposed TL

Sections	Land use and vegetation cover features
Iringa – Kisada Section	Peri-urban settlement at Tagamenda on the suburbs of Iringa town near substation. Line passes inside villages but away from village settlements/nucleus such as Tanangozi, Ihemi, Bumilayinga and Ihowanza.Cultivation of food crops and tree/fruit crops. Fruits tree include peaches and plums. Tree plots especially around Ulete/Muwindi, Ifunda, Kibena, Isolavanu and Mlula. Intensive and valley bottom or "vinyungu" in the valley of Ndembera river. Large scale farming for flowers and maize at Ihemi, Ifunda and Muwiundi/Kibena. Private ownership of Natural Forest for carbon sequestration at Muwindi/Ulete Cultivation of maize, bamboo trees, anions, tomatoes and beans. Livestock grazing in Malangali and Ihowanza area. Scattered cultivation, Bushed grasslands and miombo woodland around Malangali, Bumilayinga and Ihowanza.
Kasada-Mbeya Section	Peri-urban settlement around Rujewa Township. Up-coming urban centres are Chimala, Igurusi and Uyole. Scattered cultivation and shrubs and woodlands between Kisada in Mufindi and Muwindi in Mbarali. Valley grasslands in Igomelo, Lugelele and Lunwa. Acacia and woodlands in Msesule Madabaga, Mabuyuni, Chimala, Isitu, Itamboleo and Mengele villages. In Mfumbi/Kimani village the line is passing inside on the edge MKGR Cultivation of rice, maize, anions and beans. The line passes nearby to village settlements such as of Igawa, Lugelele, Mabuyuni, Mabadaga, Mfumbi, Chimala, Igurusi, Mambi and Imezu. Others are Kapyo, Iyawaya, Idunda, Itewe and Itanji. Mixed cropping, plantedtree crops, fruit trees of peaches and avocado. Horticultural and rain fed crops around from Iyawaya to Uyole. Mixture of agriculture/ tree crops, shifting cultivation on Imezu - Uyole slopes

4.2.15 Infrastructure Facilities

There are roads of different types connecting different areas within districts. Regional roads refer to those which connect the district with the outside world. These are in good shape, although they still need some maintenance. Gravel and earth surface district roads connect divisions and wards. There are also village feeder roads which connect villages within districts and regional roads. Virtually all feeder roads are earth tracks or gravel roads in poor condition requiring rehabilitation or spot improvements. The bulk of the road network requires rehabilitation. Road coverage in the transmission line/corridor is shown in Table 15 below.

Table 15: Type of Road in Km

Region	District	Trunk and Regional	District and village	Tarmac	Gravel	Earth
Iringa	Iringa District	-	-	70.0	423.0	577.6
	Mufindi	-	-	95.0	369.0	491.1
	Makete	-	-	10.0	337.6	426.4
Mbeya	Mbarali	-	-	-	115.35	159.65
	Mbeya City	-	-	24	61.72	305.91
	Mbeya District	376.2	503.8	-	-	-

Source Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication.

4.2.16 Wildlife Protected Areas

The proposed transmission line covers a total length of about 292 km from Iringa region to Mbeya region. Habitat/vegetation types found along the proposed TL include human settlements, cultivated fields, riverine vegetation and woodlands. Important habitats that are traversed by the proposed transmission line and/or found close to the project area include riverine vegetation along rivers, Igando-Igawa wildlife corridor, MKGR and Chimala Scarp forest reserve (Figure 3). All these habitats are found close to the proposed transmission line. Other important habitats though found a few kilometers from the proposed TL project include Ruaha National Park and extension (to include the former Usangu Game reserve), Kitulo National Park/Kitulo Important Bird Area and Usangu Flats Important Bird Area .

A brief description of habitat types is provided below. A detailed report on Wildlife is attached in the Appendix 3.

Riverine vegetation

A number of rivers cross the proposed transmission line project area. These include but not limited to the Little Ruaha in Iringa at Ipogoro, Ndembera (near Mafinga), Mbarali and Kimani. These rivers are associated with riverine vegetation and in some areas they form wetlands that support different species of animals.

Igando-Igawa wildlife corridor

This five kilometers wide corridor links MKGR and Ruaha National Park (and its extension) (Frontier-Tanzania, 2003; Jones et al., 2008). The corridor is managed as a Wildlife Management Area (WMA) by the community Institution called UMEMARUWA (Uhifadhi na Matumizi Endelevu ya Maliasili Rujewa na Wanging'ombe). Amongst the mammals known to use the corridor include buffalo, bush duiker, eland, elephant, red duiker, zebra, lions, leopards and caracal (Frontier-Tanzania, 2003; Jones et al., 2008). This corridor though greatly reduced by human activities including vegetation clearance, fire burning, charcoal burning, cultivation and grazing is still important as it serves as a refuge and corridor for wildlife between the protected areas. The proposed TL is expected to pass across this wildlife corridor. The wildlife corridor along the TL is shown in Figure 7.

Mpanga/Kipengere Game Reserve (MKGR)

MKGR was gazetted in 2002 with the goal of maintaining the catchment function of the area and sustainably managing the natural resources found within and around it. It covers an area of 1,574 km^2 and an altitudinal range of 1080 m a.s.l to 2858m a.s.l with two main habitat types, afro-montane forest-grassland mosaic and mid-altitude miombo woodland (Frontier-Tanzania, 2003). It is managed by the Wildlife Division, Ministry of Natural Resources and Tourism. The proposed 400 kV transmission line will pass along the north-western border of this game reserve.

Chimala Scarp Forest Reserve

Chimala Scarp Forest Reserve (17,575 ha) is located to the north of Kitulo Plateau National park/Important Bird Area and is largely miombo woodland on the dry northern face of the Chimala escarpment. This forest reserve is found adjacent to the proposed transmission line project area.

Kitulo National Park

Kitulo National Park that covers an area of 465.4 km2 was established in 2005. It is located in highlands of south western Tanzania and is one of the Important Bird Areas (IBA). It is found about 13 km south of the proposed 400 kV transmission line. It is rich in endemic and rare species such as Rungwecebus kupunji and has wintering sites for various bird species from South Africa, Australia and Europe. The migratory bird species include Abdims stork, Open-billed stork, Blue swallow and European white stork that use the park between November and April.

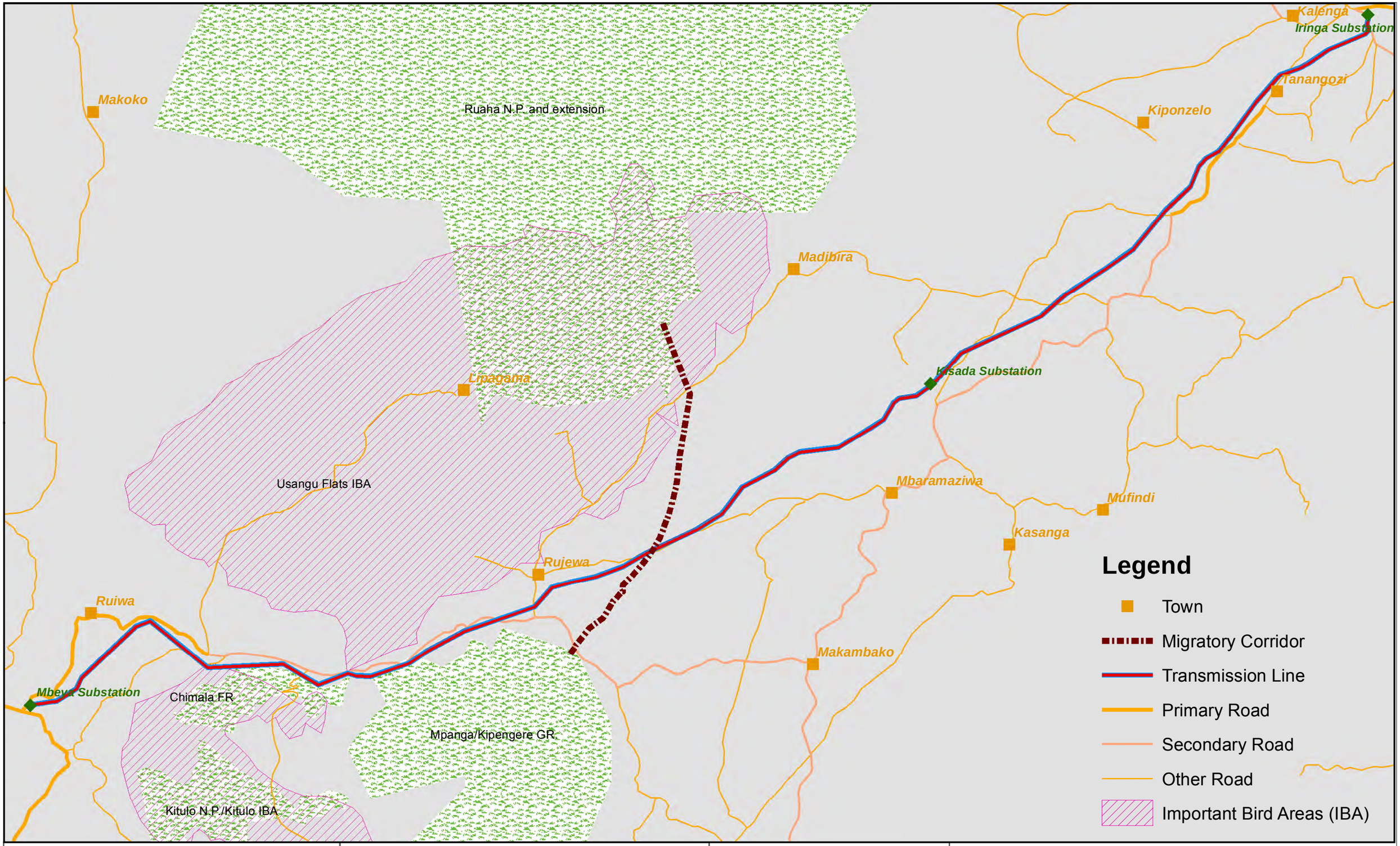
Ruaha National Park

Ruaha National Park which was recently extended to include the former Usangu Game Reserve is found about 26 km north of the proposed transmission line. This national park is linked with MKGR through Igando-Igawa wildlife corridor.

Usangu Flats IBA

Usangu flat is one of the Important Bird Areas (IBA) in Tanzania. It is found about 10 km north of the proposed transmission line. This area is important for many bird species.

Figure 8 Wildlife Corridor along the TL



Coordinate System UTM 36 South (WGS 1984)

Source: NBS, FAO & SMEC

Client: NELSAP

Project Name: Environment and Social Impact Assessment and Resettlement Action Plan of 400 kv Iringa – Mbeya Transmission Line

Consultant SMEC International

0 5 10 20 30 40
Kilometers

N
W E
S

Iganjo Ritual Forest

Iganjo Ritual Forest is an important protected area of social value near the proposed Uyole substation about 1.0Km from Tanzania –Zambia Highway. It is used for ritual and spiritual functions. The forest is a popular ancestral worshipping destination for elders from Safwa clans. Traditional worshippers come from as far as Mbozi, Usangu and Chunya. According to local elders and ward leaders, the site was used to bury Safwa chiefs and their wives in the past. There are also about 7 individual graves of clan elders in the forest. It is a restricted area with entry into the forest requiring the permission or escort of traditional elders.

During consultation with the local residents and leader/elders, it was mentioned that the proposed TL will pass close to this forest. Accordingly the ESIA and Design Consultant proposed the TL will pass about 80m from the Forest's northern border, which is fine with the locals.

The following figure shows the location of Iganjo Ritual Forest and the proposed TL.

Figure 9: Location of Iganjo Ritual Forest

4.2.17 Fauna

Birds

A total of 136 bird species were recorded in the proposed project area during this study. A species list of all birds recorded is given in Table 2 and the list of birds recorded in various sites is given in Table 3. We recorded 44 species at Ipogoro/Tagamenda substation in Iringa, 24 species between Ipogoro and Mafinga, 42 species between Malangali and Igomelo, 27 species at Igando-Igawa Wildlife corridor, 39 species on the northern edge of MKGR, 44 species between Rujewa and Madibira, 29 species in Chimala Forest Reserve and surroundings, 38 species on the southern edge of Usangu flats and 26 species between Igurusi and Uyole. The bird fauna recorded in the proposed project area is typical of the woodland and human influenced areas.

Birds of Kitulo Plateau (IBA 73)

Kitulo plateau, an area of montane grassland, forms part of another IBA that is found in the vicinity of the proposed project area. Important habitats within the IBA include Kitulo plateau, the Livingstone Forest Reserve and the Chimala Scarp FR. Chimala FR is bordered on the north by Miombo woodland on the dry northern face of the Chimala Escapement. Birds in this IBA are found in different categories. Some are vulnerable including the lesser Kestrel, Corncrake and Blue swallow. Some are near threatened including Pallid harrier, Churring cisticola and Kipengere seedeater. Some have restricted range including Uhehe fiscal, Black-lored cisticola, Churring cisticola, Yellow-browed seedeater, Kipengere seedeater and Mountain marsh widowbird. Near-endemic species within the area include the Rufous-naped Lark Mirafra africana nigrescens and Short-tailed pipit which is a rare species.

A detailed report on birds is presented in the Wildlife Report in **Appendix 3**.

Amphibians

During the study we recorded six species of amphibians. Most species encountered are widely distributed in the woodlands and savannas of sub-Saharan Africa. These include Amietophrynus gutturalis, Amietophrynus maculata, Phrynobatruchus acridoides, P. natalensis, Ptychadena mascareniensis and P. mossambica. The number of species of amphibians recorded was very low. This may be due in part to two factors: the amount of time we spent searching for amphibians was very limited and secondly the study was conducted during the dry season where many amphibian species are not active. Several studies have indicated that many species of amphibians are more active and therefore more abundant during the rainy season than during the dry season (Msuya, 2001; Ngalason, 2010).

Of all records made, none of amphibian species is regarded as threatened, endangered, or endemic and none are listed in any of the CITES appendices.

Details of amphibiansis are presented in the Wildlife Report in **Appendix 3**.

Mammals

During the study we recorded a total of ten mammal species along the proposed project area. These include vervet monkeys found almost throughout the proposed project area, olive baboons that were mainly seen in MKGR, Igando-Igawa wildlife corridor and Chimala Forest Reserve; rock hyraces that were mainly seen on wooded rocky hills along the proposed transmission line and slender mongoose seen on wooded rocky hills and in protected areas.

Details of mammals are presented in the Wildlife Report in **Appendix 3**.

Reptiles

During the study we recorded eight species of reptiles along the proposed project area. These include olive sand snake (Psammophis mossambicus), striped-bark snake (Hemirhagerrhis kelleri), variable skink (Trachylepis varia), Striped skink (Trachylepis striata), Trachylepis maculilabris, Wahlberg's snake-eyed skink (Panaspis wahlbergi), Johnston's long-tailed lizard (Latastia johnstoni) and Tropical spiny agama (Agama armata).

Details of reptiles are presented in the Wildlife Report in **Appendix 3**.

4.2.18 Archaeological and Cultural Sites

Central Tanzania is very rich in rock painting sites (Leakey, 1983c; Lim, 1992; Masao, 1979). The paintings probably tell more about Stone Age people and their behaviours and culture than can be learned from stone tools, pottery, bones, and other artefacts that form the basis of archaeological studies. Stylistically, the rock art of Tanzania provides one of the longest chronological sequences of artistic creativity in the world, possibly going back in time to about 40,000 bp (Anati, 1986, 1994). If this date is confirmed, it means that Tanzania was one of the earliest centres for the origin and evolution of artistic capability in the world[2].

Iringa and Mbeya regions are not located in Central Tanzania, however the only protected archaeological site called Isimila Stone Age site is located near Iringa Town. The chosen TL and ROW do not pass through the Isimila Stone Age site. The location of the Isimila Stone Age site is indicted in Figure 3.

Figure 10: Grave/graveyard at Kisada

There are some cultural properties belonging to communities and individuals, such as graves and graveyards, located along the ROW of the proposed TL. It is a normal practice for burial sites to be situated within household farms or in church premises. In total 16 graves are found in the project area.

Table 16: Affected Graves

District	No. of Affected Graves
Iringa Rural	7
Mufindi	-
Makete	-
Mbarali	-

[2] Kenya-Tanzania Interconnection Study, Final Report.

District	No. of Affected Graves
Mbeya City	6
Mbeya Rural	3
Total	**16**

Source: SMEC Survey 2012

4.3 Socioeconomic Characteristics of the Affected Population

This section presents a brief description and analysis of the basic socio economic characteristics of the affected population, based on the results of the household surveys conducted in all 54 affected villages along the ROW. Details of the affected households are presented in Tables 16 to 20. Socio-economic profile of control households i.e. non-affected households were collected as well. In nearly every village, 5-10 households with similar landholding size, household size and occupation were contacted for their profile details (for details refer to RAP Report - Annexure D)

4.3.1 Demographic Profile

Number of Project Affected Households

The project shall impact a total of 1015 households. As can be seen from Table 3.9, Iringa Rural (270), Mufindi (250) and Mbarali (251) followed by Mbeya Rural (177) are the most impacted districts. Makete (40) and Mbeya city (27) are the least impacted due to shorter length of line passing through them. In the case of Mbeya city, the line terminates at Uyole- outskirts of Mbeya city.

Table 17: Project Affected Households

District	No. of Affected Households
Iringa Rural	270
Mufindi	40
Makete	250
Mbarali	251
Mbeya City	177
Mbeya Rural	27
Total	**1015**

Source: SMEC Survey 2012

Segregation of PAPs by Sex

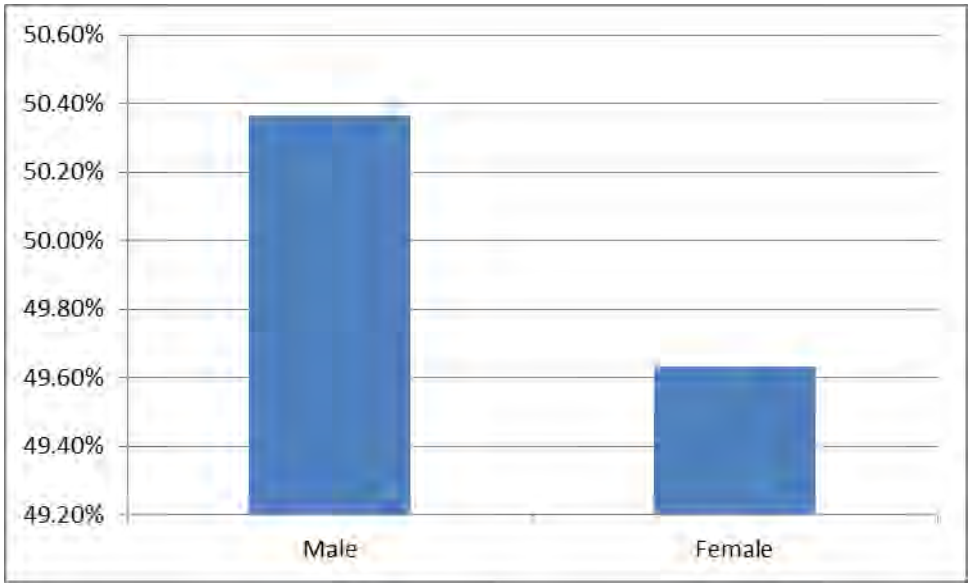
Total number of project affected people (PAP) identified is 5188. Iringa Rural (1708) and Mufindi (1384) have the most PAPs. They are followed by Mbarali district with the 1074 PAPs. Mbeya City (87) has the least number of PAPs.

Table 18: Project Affected Persons Segregated by Sex (in no)

Name of District	Male	Female	Total
Iringa Rural	851	857	1708
Makete	91	85	176
Mufindi	708	676	1384
Mbarali	543	531	1074
Mbeya City	37	50	87
Mbeya Rural	383	376	759
Total	**2613**	**2575**	**5188**

Source: SMEC Survey 2012

The ratio of PAPs by sex is almost equal with 50.37% of the PAPs being male, while the rest (49.63%) are females. However, in the case of Iringa rural (50.18%), Mbarali (51.71%) and Mbeya city (57.47%) the percentage of female PAPs are higher.



Source: Table 16 - SMEC Survey 2012

Vulnerability status of PAHs

Historically, men have had greater access and control of land resources and income. Women have been considered as a group meant to provide unpaid labour. They work more hours than men in the agricultural fields and have little or no time to rest or attend to their gender specific development activities. Gender imbalances are rooted and sustained by traditional and cultural values.

Women are largely responsible for food crop production and weeding the fields while men harvest and sell the crops. In the project area, men take control of major sources of income such as sales from timber, cattle and cash crops. Thus, household incomes at the village level are largely controlled by men. Women depend on minor sources of income such as the sale of vegetables and fruits, while they assume major responsibilities of raising the children welfare and preparing food for the family.

In most cases, women are less educated than men. Girls get married at very young ages, before they complete secondary school. Incidences of school drop-out amongst girls exist because of unplanned pregnancies. Proper intervention is needed to assist women in the rural areas to be conscious and eager to engage on major income generating activities.

According to socio-economic survey, orphans (276), elderly headed households (147) and women headed households (90) are highest among the households by type of vulnerability.

Table 19: Household heads by vulnerability by type

District	Orphans	Women headed households	Elderly headed households	Widow/ unmarried	Physically challenged	Other	Total
Iringa Rural	122	30	64	38	21		275
Makete	1	1	7	5	1		15
Mufindi	90	29	30	7	8		164
Mbarali	40	15	21	16	12	4	108
Mbeya City	6	3	3	2	3		17
Mbeya Rural	17	12	22	17	5	4	77

District	Orphans	Women headed households	Elderly headed households	Widow/ unmarried	Physically challenged	Other	Total
Total	**276**	**90**	**147**	**85**	**50**	**8**	**656**

Source: SMEC Survey 2012

One of the reasons for high number of women headed households is that polygamy which is traditionally accepted in all villages in the project area, gives power to men to marry as many as 4 wives or more. In Iringa and Mufindi district villages, these same men would leave their wives in villages and go to work in the Tea Estate and factories based in Mufindi. They would then meet new partners who might be carrying HIV/AIDS virus. The same happens in Mbarali and Mbeya Districts where men go to Mbeya City for greener pastures and end up being infected with HIV/AIDS. As each wife owns a house, when these men die, each wife takes care of her family separately, thus increasing the number of households headed by women. Prior to their husband's death, all wives' households are counted as one household unit headed by one man.

Average Household Size

The average household size along the ROW ranges from 4.0 to 6.5 people per district household. Makete district recorded only 4.0 persons per household whereas Mufindi and Iringa rural were among the highest with 6.5 persons per household.

In most of the villages, families tended to stay together and to share most of their resources including meals. For instance families sharing a compound would include parents, their married children as well as their grandchildren. The family tends to share meals, farms and other basic needs.

Table 20: Average Size of Household by district

District	Average Household Size
Iringa Rural	6.5
Mufindi	6.3
Makete	4.0
Mbarali	5.2
Mbeya City	4.7
Mbeya Rural	5.3

Source: SMEC Survey 2012

Landholding size:

43% of the households indicated landholding of less than 1 acre, 39% indicated landholding between 1 and 5 acres, while 18% indicated landholding more than 5 acres.

Table 21: Average Land holding size by district (%)

District	less than 1 acre	1-5 acre	Above 5 acre	Total
Iringa Rural	27.4	59.8	12.8	100
Makete	57.6	33.3	9.1	100
Mufindi	5.3	43.6	51.1	100
Mbarali	21.1	48.9	30.0	100
Mbeya Rural	71.1	27.3	1.6	100
Mbeya city	77.8	20	2.2	100
Mean	**43**	**39**	**18**	**100**

Source: SMEC Survey 2012

4.3.2 Educational Levels

Almost 13% of the surveyed households in all the 6 districts have not attained any level of education. The rate of illiteracy was relatively high in Makete and Mbeya. Most head of household have attained basic primary education (70%), and only 11% have attained secondary education. Less than 1% of the affected population has college or university education. With the current emphasis by the government to ensure that Tanzanian children attend schools, the rate of school enrolment has also increased in most parts of the country. Table 22 below shows the distribution of the populations' education status in the proposed power transmission area.

Table 22: Educational levels of DPs

Name of District	Illiterate	Primary	Secondary	Graduate	Technical	Vocational	Others
Iringa Rural	10	70	12				8
Makete	14.4	75.7	9.9				
Mufindi	7	61	13	1			18
Mbarali	16.2	66	14			1.8	2
Mbeya Rural	14.1	75.3	6.2	.4			4
Mbeya city	20	69	8	2			1
Total	**13.6**	**69.5**	**10.5**	**0.6**		**0.3**	**5.5**

Source: SMEC Survey 2012

4.3.3 Occupational Pattern

A majority of people along the transmission corridor are engaged in farming activities. They observe customary division of work between adults and young including gender norms. Hired labour is also common in peak seasons and can be hired for slashing and digging. Traditional labour groups i.e. "migowe" are common in Iringa region. Some people own small shops and kiosks, especially in suburban areas. These small shops are very common and are the main shopping centres along the proposed transmission corridor. Some villages in Mbeya operate open markets, but these are less common in Iringa region. There are butchers in villages but animals are slaughtered and meat is sold in people's homes.

According to socio-economic survey, 84% of household heads reported farming i.e. cultivation on own land or agricultural labor as their main occupation. Landless labour are fewer (3.8%) but these also include households who carry out such activities during non-farm season. Only 1% reported government service as their occupation, 3.2% business and 0.5% private sectors. A number of female headed households reported maid servant (0.8%) as their primary occupation. A lot of female headed households reported maid servant (0.8%) as their primary occupation while 6.7% fall under unspecific type of employment (others).

Table 23: Households by Type of Occupation (%)

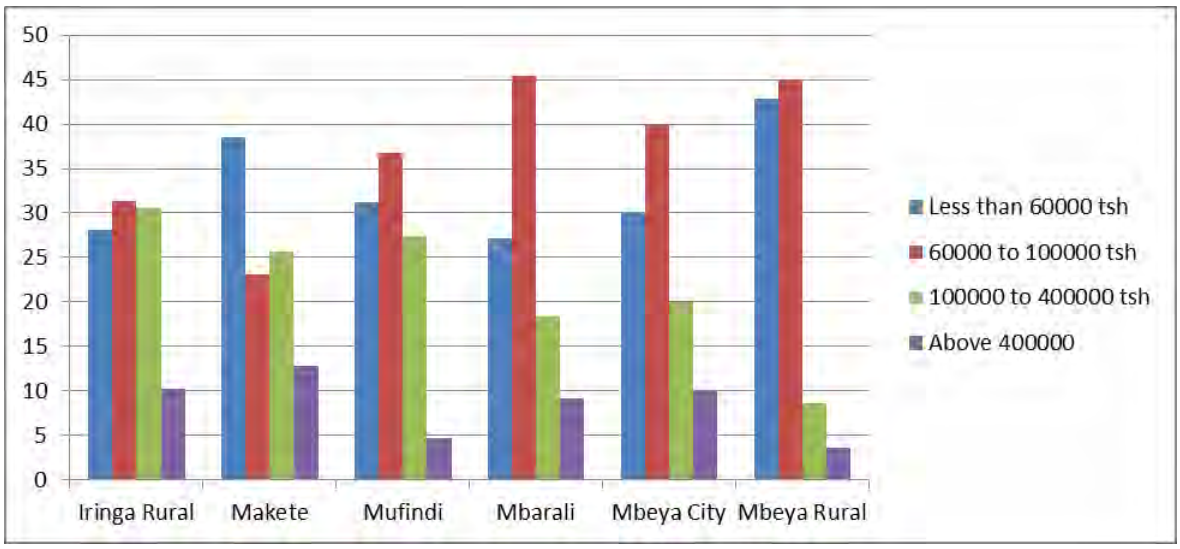
Name of District	Agriculture	Landless labor	Business/trade	Government service	Private service	Maid servant	Others
Iringa Rural	75						25
Makete	77	13	10				
Mufindi	80	5	5	2		3	5
Mbarali	85	4	3	3	3	2	
Mbeya Rural	87	1	1	1			10
Mbeya city	100						
TOTAL	**84**	**3.8**	**3.2**	**1**	**0.5**	**0.8**	**6.7**

Source: SMEC Survey 2012

4.3.4 Income Status

Monthly income of PAHs, varied across districts. While 31.5% of the PAHs reported income under Tsh 60000/month, only 7.6% reported incomes above Tsh 400000. The rest of the PAHs (60.9%) reported income between Tsh 60000 and Tsh 400000. While all districts had PAHs who reported incomes in excess of Tsh 400000, only Iringa rural (10.2), Makete (12.8%) and Mbeya City (10.0%) recorded of more than 10% of such PAHs.

Monthly Income of PAHs (%)



Source: SMEC Survey 2012

4.3.5 Expenditure Details of PAHs

Expenditure on education was highest among those affected in Mbeya City area and lowest in Mbeya Rural, while in Iringa region, expenditure is almost uniform across all districts. Transportation was another major expenditure in Mbeya City and villages in Mufindi district. Food was recorded as a large expenditure in Makete district (Tsh 119625), while it was lower in villages in all other districts. Expenditure on clothing was high in Mbeya city and also in villages in Mufindi district. Ceremony related expenditure was lowest in Mbeya rural and highest in villages in Mufindi district (See Table 24)

Table 24: Monthly Expenditure by PAHs by Distract (in Tsh)

District	Education	Health service	Transport	Food	Clothes	Ceremony	Other
Iringa Rural	70,342	31,808	43,833	65,198	49,953	68,072	35,000
Makete	55,515	10,525	27,784	119,625	36,029	31,583	
Mufindi	54,000	38,417	141,096	53,538	103,548	120,973	63,333
Mbarali	46,721	20,527	22,691	76,044	36,616	56,593	141,111
Mbeya City	167,501	76,500	65,882	77,600	151,667	50,100	120,000
Mbeya Rural	40,400	26,448	19,208	52,950	30,907	19,118	250,000

Source: SMEC Survey 2012

4.3.6 Water Supply and Sources of Water

Various sources of water are available in the villages and urban areas along the way leave. These sources and supply systems include traditional wells, communal wells with pumps, rivers, dams, streams, water taps from municipal and Council systems and water harvesting techniques. About 98.3% of the households in Mbeya City reported piped

water as their main source of water. While in Makete district, 88.3% of the households reported other sources such as streams as their main source of water. 2.9% of the households in Iringa Rural indicated borewell as their source of water, while Mbeya rural recorded 22.9% for dug wells. Although water is available in some areas, its quality is very poor due to lack of treatment.

Table 25: Source of Water indicated by Households (%)

Name of District	Borewell	Dugwell	Pipe water	Other sources (river, stream)
Iringa Rural	32.9	14.4	25.5	27.2
Makete	3.9	3.4	4.4	88.3
Mufindi	27.6	28.8	19	24.6
Mbarali	20.8	29.7	27.8	21.7
Mbeya City	0.9	0.8	98.3	0
Mbeya Rural	13.9	22.9	20.2	43

Source: SMEC Survey 2012

4.3.7 Health Services

Households reported on access to dispensary, pharmacy (medicine shops) and hospitals and other informal sources such as home remedies or informal practitioner. See Table 25 below.

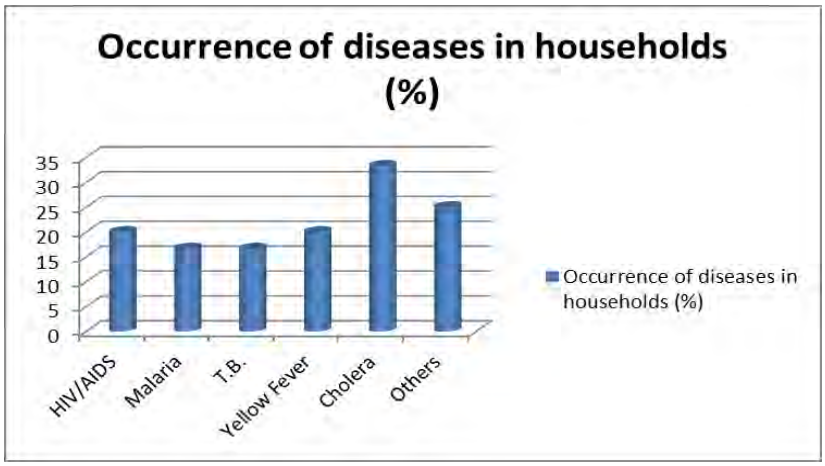
Table 26: Access to health care (%)

Name of District	Dispensary	Pharmacy	Hospital	Other informal sources
Iringa Rural	36.1	10.5	16.6	36.8
Makete	7.8	0.7		91.5
Mufindi	38.1	15.7	2	44.2
Mbarali	8.3	47.1	37.7	6.9
Mbeya City	2.5	9.2	66.5	21.8
Mbeya Rural	7.2	17	37.2	38.6
Average	16.67	16.70	32.00	39.97

Source: SMEC Survey 2012

Common diseases in the areas include Cholera, Malaria, TB and other water borne diseases. HIV/AIDS is also a major challenge and an issue to be seriously considered in the proposed project.

Average Occurrence of Diseases in Households (%)



Source: SMEC Survey 2012

4.3.8 Energy Use

More than 95% of the rural population in all districts depends on firewood as their main source of energy supply for domestic use. Charcoal and kerosene are mainly used in towns. Numerous individuals in villages and sub-villages sell charcoal and firewood for income generation. Charcoal is obtained from both planted and indigenous trees. The collection of fuel-wood is mainly done by women. Excessive use of charcoal and firewood has lead to deforestation and land degradation in all districts.

Towns depend heavily on electricity and refined petroleum products such as petrol, diesel and lubricating oil. Petrol filling stations distribute refined petroleum products. Iringa and Mbeya regions are connected to the National Transmission Grid. TANESCO is the only entity that establishes, controls, and distributes electricity and set tariffs for the whole country.

Sources of Energy used for cooking: Charcoal is the major fuel used for cooking, while Firewood and kerosene are reported as well. Gas and others energy sources were reported only in urban areas.

4.3.9 Assets Owned by Affected Households

Besides immovable assets, households were surveyed for their movable assets such as ownership of bicycle, car, fridge, radio, computer, etc. In Iringa 50% of the surveyed households reported ownership of a Bajaj. Iringa Rural also reported the highest (45.3%) rate of ownership of Motorcycles. Fridge ownership was highest in Mbarali and Iringa Rural. Details of ownership are presented in the final RAP report.

4.3.10 Land Tenure

About 90.7% of the affected land in the ROW is leased by the community i.e. customary lease, while 2.4% was recorded as government land, community land is 2.8%. 4.1% of the land is owned by other institutions.

Table 27 Type of Ownership (%)

District	Leased	Government	Community	Others
Iringa Rural	88.5	1.1	1.9	8.5
Makete	85.0	15.0		
Mufindi	91.9	2.8	4.0	1.2
Mbarali	92.3	2.8	4.5	0.4
Mbeya City	96.7		3.3	
Mbeya Rural	90.2			9.8

Source: SMEC Survey 2012

4.4 Infrastructure and Other Services

4.4.1 Roads

There are roads of different types connecting different areas within districts. Regional roads refer to those which connect the district with the outside world. These are in good shape, although they still need some maintenance. Gravel and earth surface district roads connect divisions and wards. There are also village feeder roads which connect villages within districts and regional roads. Virtually all feeder roads are earth tracks or gravel roads in poor condition requiring rehabilitation or spot improvements. The bulk of the road network requires rehabilitation. Road coverage in the transmission line is shown on table 28 below.

Table 28 Roads Coverage in the Project area

Sl No.	District	Trunk and Regional Rd (km)	District and village Rd (km)	Tarmac Rd (km)	Gravel Rd (km)	Earth Rd (km)
1	Iringa District	-	-	70.0	423.0	577.6
2	Makete	-	-	10.0	337.6	426.4
3	Mufindi	-	-	95.0	369.0	491.1
4	Mbeya City	-	-	24	61.72	305.91
5	Mbeya Rural	376.2	503.8	-	-	-
6	Mbarali	-	-	-	115.35	159.65

Source: Iringa Region Social Economic Profile 2007; Mufindi and Mbarali Social Economic Profiles, 2010 and 2009; Mbeya City and Mbeya District Profiles 2011, Government of Tanzania publication.

4.4.2 Telecommunications

Telecommunication Networks are available in all districts and Mbeya City has land line telephones operated by Tanzania Telecommunications Company Ltd, and mobile phone services provided by Airtel, Zantel, Tigo and Vodacom. Radio calls are run by Tanzania Postal Services Company Ltd and are mainly found in remote and bordering areas. Fax services, postal services and telephone services are also available.

4.4.3 Education Services

The following Table provides the list of available education services in the project impacted area.

Table 29 Number of available Education Services in the Project Impacted Area

Sl No.	District	Secondary school	Primary school	University	Technical school	Total
1	Iringa District	11	6	-	3	19
2	Makete	1	1	-	-	2
3	Mufindi	11	12	-	3	26
4	Mbeya City	3	2	-	-	5
5	Mbeya Rural	4	5	-	-	9
6	Mbarali	7	22	-	-	29

Source: SMEC Survey 2012

4.4.4 Health Service

Tanzania Mainland's health care delivery revolves around primary health care. It is a self-help service in which clients contribute. It addresses 90 per cent of society's health problems. It is accessible in that services are within reach. No one is excluded as even the poorest of the poor have been provided with mechanisms for inclusion. It is hierarchal with the dispensary as the immediate grassroots (local) facility with health centres as an

intermediate level facility and hospital serving as the highest level (in terms of services and facilities offered) health care provider.

The following table provides the details of no of available health services along the proposed TL.

Table 30 Number of available Health Service in the Project Impacted Area

Sl No.	District	No. of Hospital	No. of Dispensary	No. of Health centres
1	Iringa District	-	8	2
2	Makete	-	2	-
3	Mufindi	3	11	1
4	Mbeya City	-	2	-
5	Mbeya Roral	-	2	1
6	Mbarali	2	7	3
	Total	**5**	**32**	**7**

Source: SMEC Survey 2012

4.4.5 HIV/AIDS

In both regions there are reported cases of HIV/AIDS. According to HIV/AIDS data in Iringa region between the years 1990 and 2003, there was a 13 per cent increase in the number of new HIV/AIDS cases. Recent records show that more than 1,200 people are affected in the project area.

Table 31 HIV/AIDS Record in the Project Area

Sl No.	District	No. HIV People	Death due to HIV
1	Iringa District	370	13
2	Makete	260	5
3	Mufindi	98	89
4	Mbeya City	30	-
5	Mbeya District		
6	Mbarali	504	115

5 PUBLIC CONSULTATION

5.1 Overview

The aim of the public consultation process is to solicit public views and concerns on the project, explore ways of avoiding or minimising all concerns and reach a consensus that all concerns have been adequately addressed. The Consultant's core strategic approach was to encourage full participation in project implementation by national, district and local authorities and community stakeholders. In the ESIA process stakeholder carried out in two stages, initially a very broad definition of the project was given to encompass all different individuals, groups of individuals, government agencies, and beneficiaries, cooperative bodies and all other formal or informal groups associated with the project.

5.2 Methods of Stakeholder Participation

The ESIA was carried out in two phases. In Phase I, it was carried out to assess potential impacts of all the four proposed route alternatives and during Phase II; impacts were assessed only on the chosen TL. Both phases are described below

Phase I – Preliminary Stage

Section 89 of the Environmental Management Act (EMA, 2004) and ESIA Regulation 17 (URT, 2005) provide details and procedures for public participation in the ESIA process. The term "stakeholders" has become common in the EIA process and stakeholders' participation is an important component of the EIA process. It is one of the key factors that enhance environmental governance. Stakeholders are individuals, groups of individuals or institutions that have an interest in the proposed project. This includes those positively and negatively affected by the project. Stakeholder participation involves processes whereby all those with an interest in the outcome of a project actively participate in decisions on planning and management of the proposed development. In stage I a preliminary ESIA was conducted in all villages that the proposed routes were expected to traverse. Various methods were used in ensuring that all relevant stakeholders were consulted and their views incorporated in this preliminary report. Participatory methods such as focus group discussions, household questionnaires and public meetings were used. The team also visited all critical sites and conducted discussions with stakeholders' onsite to identify their views and concerns.

The stage commenced by informing all stakeholders prior to undertaking and consultation. Introduction letters were provided by TANESCO to all concerned regional authorities to inform them about the project as well as seek permission to work in their respective districts. These letters were then channelled to the District Executive Director (DED) for the same purpose and to seek appointments to consult the district officials and to undertake the preliminary ESIA in the respective villages. Subsequently, these letters were distributed in all relevant villages and appointments were sought with village government officials as well as the local communities.

Specifically the following methodologies were used in undertaking this exercise include the following.

5.2.1 Household Questionnaire

Household questionnaires intended to obtain baseline information of the affected population were administered in the villages. Besides collecting information on socio-economic and land related issues, these also sought to obtain respondents' views regarding the project, compensation and re-settlement. The collected socioeconomic data

will be used in the future for monitoring purposes, depending upon the option finalized. The household sample was randomly selected but with a focus on households that might be affected by the project.

5.2.2 Village Public Meetings

The team conducted public meetings in all affected villages to ensure that all villagers are informed of the project; the team ensured women attended and participated in the meetings. Besides, focus group discussions (FGDs) were held with the women in these villages. The meetings aimed at informing the villagers about the project and the associated impacts. Villager communities were informed of the positive and adverse impacts of the project which include loss of land, possibilities of increase spread of HIV/Aids (especially during the construction phase), as well as other environmental and social impacts associated with the project. Villager communities were also sensitized on their right to be compensated and applicable compensation norms if they will lose land, crops and/or houses. Further, they were given an opportunity to ask questions, raise their concerns and provide information to the team on issues such as availability of land in the village for resettlement purposes.

Figure 11 : Consultation at Tembela

Meetings were conducted in all affected villages and aimed at collecting specific data at the village, discussing alternative line routings that could minimize impact. Also it helped to identify sensitive sites/areas such as cultural sites that lie within the village or its neighbourhood. These meetings were also designed to sensitize the village leaders regarding how they can handle compensation matters and also to ensure they inform other villagers who were unable to attend the village public meetings.

Figure 12: Meeting with villagers and leaders

5.2.4 Meetings With Districts Officials

Meetings were held with different officials in all seven districts that will be affected by the project as shown in the following figure. The aim of the meetings was to discuss the project with the district officials and to obtain relevant data and information from the respective districts. Issues of alternative land and compensation were also discussed with the district officials.

Figure 13: Meeting with Kibena Leaders, Iringa District

5.2.5 Consultations With Other Relevant Stakeholders

In Dar es Salaam the team also consulted various stakeholders at ministerial and Government Agencies to obtain views at policy level. These included the Ministry of Natural Resources and Tourism (Forestry and Beekeeping Division, Wildlife Division, the Division of Antiquities), NEMC, TANROADS and TANESCO. NGOs, TAZAMA Pipeline

and TAZARA Railways were also consulted. Other stakeholders consulted in Dar es Salaam at this level included the Ministry of Agriculture and Food Security and the Ministry of Lands and Human Settlements. Various mining development companies that are based in the northern parts of the country were also consulted to air their views regarding the project. Table 32, 33 and 34 summarize the issues and presents the reactions of some of the key stakeholders.

Phase II – Final ESIA Stage

Following the selection of the chosen TL, the communities of villages that shall be impacted by the project were consulted again prior to demarcation of finalized route and survey for household enumeration.

5.2.6 Summary of Stakeholder Issues and Concerns

Village consultation meetings were conducted in fifty four (54) villages covering six districts. Details are presented below:

Project Information: Consultations in each of the project villages commenced by stating the objective i.e. inform respective village communities about the project, compensation process for project affected persons (PAPs) who will lose land, houses, crops and other properties as well as to elicit their views, concerns and opinions. The team provided information on the proposed project for the 400kV transmission line constructed from Iringa to Mbeya. Communities were informed that TANESCO shall be acquiring a wayleave i.e. a corridor of 90 meters for the proposed 400 kV line and 70 meters along the existing 220 kV line They were informed that subsequent distribution of the power shall enable electrification and enable start-up of small scale industries. In addition, during and post construction, there would short-term work opportunities with the engaged construction Contractor. The project will create employment for some members of the local community during and after construction.

Further the communities were informed of the survey for demarcation of the centreline of the transmission line and the household enumeration that shall accompany the survey process. Their cooperation to the household survey and demarcation survey was solicited and it was stated land which is owned by individuals or village government should be clearly identified. Their presence during the survey would ensure that no plot is missed and identification is not inaccurate. Their presence would also ensure the team accurately records all properties falling in the transmission line and thereby determine the value of compensation for the land. At the end of each meeting participants were allowed to ask questions on issues which were not clear.

Concerns expressed by communities: Concerns of the communities ranged from issues relating to compensation; double impact i.e. first impacted by the existing 220 kV line and now again by the proposed 400 kV line; safety measures, etc. These are summarized below:

i) Villages with existing 220kV transmission line, some persons had not been compensation from that earlier project. TANESCO promised to pay all affected people however the promise was not met, not all affected people were paid;

ii) Compensation should consider enabling PAPs to get alternative land for agriculture or livestock keeping;

iii) Proper valuation of properties and payment to be made in time;

iv) Employ more local workers i.e. from the village and thereby avoid bringing persons from outside to help to minimize risks of HIV transmission;

v) TANESCO has to set money aside for environmental conservation;

vi) Communities across the entire route mentioned that the 400kV line is likely to be very dangerous for the people in the villages. It was therefore recommended that TANESCO should provide safety education to the community prior to commencement of construction. Further TANESCO should also carry out construction activities in a safe manner.

Suggestions from the communities: The following suggestions were made by the communities for consideration by TANESCO during implementation of the project.

i) Electricity should first be supplied in their respective village before passing to other places, as the existing transmission line does not supply power to the village;

ii) The project has to help to ensure water supply in the village since TANESCO has restricted them from accessing its water;

iii) The project has to fund the mother and child centre which will be providing education and reproductive health services during and after the project construction;

iv) The project must employ youth in the village during construction;

v) TANESCO has to dedicate some amount of money for environmental conservation;

vi) Compensation has to be done based on current life situation; and

vii) Priorities of power supply have to be given to villages affected by the project.

Support for the project: Communities expressed their keenness of such a project that would help to electrify or improve reliability of power. Further, it would bring development of new industries resulting in enhanced employment opportunity to the local community. Availability of reliable power supply will promote more investments and it would also lead to appreciation in land value.

Table 32 Concerns expressed by Government Ministries/ Public Sector

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Mr. Juma S. Mgoo. Ag. Director Resource Management - MNRT	▪ Detailed EIA study is important. ▪ The project will clear planted trees in Sao Hill forest. ▪ Participation of stakeholders in the project planning is important to capture their concerns.	▪ The developer is obliged to compensate for the felled trees in forest plantation if EIA report is accepted and the project is constructed. ▪ Detailed mitigation measures are provided in the Mitigation Chapter.
Mr. Donatus Kamamba Director of Antiquities MNRT Mr. F. S. Ndunguru. Assistant director Research and Training	▪ Excavation works may damage Isimila archaeological site. ▪ The physical boundaries of the Isimila site are known and demarcated on the ground. ▪ Iringa people are culturally sensitive e.g. about burial sites. ▪ Excavations works should not be forbidden but supervised.	▪ Careful assessment of environment and cultural sensitivity. ▪ Careful design of the route.
Mr. Nuhu Mwasumilwe Acting Regional Administrative Secretary (RAS), Iringa Region	▪ The project has positive economic benefits such e.g. growth of timber s and agribusiness industries. ▪ Improved power supply will reduce environmental destruction for alternative energy. ▪ The project will supply power to education institutions. ▪ Destruction of planted trees, food and tea crops.	▪ The project will cooperate with RAS office for support and advice. ▪ Payment of compensation for land properties.
Mrs. B. O. Swai Regional Administrative Secretary Mbeya	▪ Rehabilitate the environment after construction. ▪ Pay compensation for damages and land takes. ▪ Involve district councils in decision making. ▪ The project will benefit the country.	▪ Compensation will be paid
Mr. Abbas Kandoro Regional commissioner,	▪ Mbeya region is officially aware about the project.	

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Mbeya.	▪ Involvement and participation of people important. ▪ Option 1 and 4 is more feasible, will minimise friction with people, passes in less populated areas. ▪ People have been evacuated from wetland thus less expected impact.	
Ms. Tina Sekambo District Executive Director Iringa District Council	▪ The project will damage properties along the line route. Government rates should be respected. ▪ Power transmission lines in Iringa district have compensation disputes ▪ The district has capacity and better approaches to deal with people. ▪ Experience shows that property valuation is associated with mistakes.	▪ Fair compensation will be provided for any damages according to the law. ▪ The developer will involve and educate people about the proposed project. ▪ Key stakeholders will be involved in the project implementation. ▪ Careful assessment of property before compensation.
Mr. Carlos Mhenga Ag. Town Executive Officer Makambako Township. Ms Anne Kwetukoa Accountant Makambako Township.	▪ Poor education and information about the project. ▪ Disturbance of settlements, agricultural activities, trees, graves, business and surveyed plots. ▪ Disturbance of utilities; railway and oil pipelines. ▪ Interference with the site designated for SINO TAN Wind Farm. ▪ Lack of compensation payment for empty lands. ▪ The TL may interfere with Tanzania – Zambia highway twice at Makambako	▪ Careful design and consultation with relevant authorities.
Mr. Nassib Mmbaga District Planning Officer, Mufindi. Mr. Shaban Adha District Forest Office, Mufindi	▪ Displacement of farm and house properties inevitable. ▪ Positive benefits to the nation than negative ones. ▪ Disturbance of timber trees; pine, wattle and eucalyptus in the TL. ▪ Impact on tea crops not significant because they can continue to grow under the power lines. ▪ Disturbance of graves in private and communal burial sites. ▪ Mufindi is an industrial district thus will benefit largely from improved power supply.	▪ Compensation for farm and house properties. ▪ Careful design to avoid or reduce negative impacts.

Name of Person, Title and Organization	Concerns	Proposed Mitigations
	▪ Effect on institutional buildings e.g. schools along the proposed TL. ▪ Interference with irrigation schemes in the low lands of Mgololo. ▪ The construction is likely to disturb water sources.	
A. E. Kaminyonge DED Mbarali District Council	▪ Involvement and participation of people in project process is important. ▪ The project will benefit the country in terms of power availability and stabilization	▪ As above
Festo Mbakilwa WEO Wangingombe	▪ Farms will be affected, land take ▪ Houses relocation obvious ▪ The project will not give electricity to the villages ▪ Graveyards will be affected. ▪ Oil pipeline exist in the existing TL especially at Ufwala.	▪ Compensation will be provided
Mr. Linus Shao Town Planner, Ministry of Lands, Housing and Hunan Settlements Development. (MLHHSD) Mr. Thomas Kapinga Town Planner, MLHHSD	▪ The project will take land and property under government and individual ownership. ▪ Disputes over land compensation. ▪ The project will make a big portion of land under the transmission line idle. ▪ Need for thorough consultation in the project area, each village should be covered by EIA/RAP study. ▪ Determines readiness of the people to accept the project. ▪ Consult managers for Game Reserves, Forests and National Parks.	▪ Compensation for land and property including government and individual forests. ▪ Use official government rates for compensation. ▪ The project design should respect Master Plans for Towns and cities. ▪ Consult all stakeholders adequately. ▪ Allow soft development under the transmission wires; seasonal crops, no permanent structures and crops.
Mr. Benjamen Kiswake Zonal Manager, Occupational safety and Health Authority (OSHA) Mr. Mjawa Muhammed	▪ The contractor is required to register with OSHA. ▪ The contractor is responsible with workers safety. ▪ The contractor is required to have own policy of Occupational Health and safety (OHS). ▪ Corona and electromagnetic effects.	▪ Provide enough education and awareness creation about project, impacts and mitigations. ▪ People in the neighbourhood should be given education about project benefits, effects such as corona and

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Occupational Health and Safety (OHS) Inspector Eng. Lordgard Bishanga OHS Inspector, OSHA Dar es Salaam	▪ The project will cause electrocution accidents. ▪ People will sustain the project if given enough education. ▪ The commissioner for Mediation and Arbitration (CME) is responsible for compensation at work places. ▪ The OHS Act No. 5 of 2003 changed the name of Factory Inspectors to Work Place Inspectors.	electromagnetism. ▪ Provision of education about corona and electrocution accidents.
Mr. Evance Balama. District Commissioner, Mbeya District.	▪ The project will take peoples land ▪ Put emphasis on participation and persuasion of people. ▪ Need for effective approach to minimise disputes during construction.	▪ Consultation with MKGR and the Warden for Kitulo National Park authorities
Emmanuel Mwalukasa Ag Principal. Uyole Agricultural Training Institute	▪ Peoples land will be taken by the project ▪ Possible interference with infrastructures for Urban Waste water. ▪ Planted trees will be cut down.	▪ As above
Dr. Malley Zonal Director Uyole Agricultural Research and Development Mr. Benjamen Kiyovele Zonal Research Coordinator. Southern Regions	Positive impacts; ▪ The project is good for energy security ▪ Negative impacts; ▪ Creation of employment for unskilled and semiskilled people ▪ Business creation for women ▪ Construction of access roads will bring local benefits. Negative Impacts: ▪ If TL is passed in Uyole areas it will interfere with set institutional land use plans. ▪ The project will create competition for labour with local companies/institutions ▪ May affect confiscated research because of possible magnetic effects ▪ Uyole is close to Aircraft landing site. There have been aircraft accidents close to TL lines during landing and takeoff for unknown reason. Possible compounded effects.	▪ As above

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Ms. Juliana Malange DED, Mbeya Rural District. Mbeya	Educate the affected people from the start of the project. Pay promptly to avoid disputes with PAPS.	▪ As above
Mr. Idd Juma. City Director, Mbeya	▪ Avoid TL in Uyole area on the outskirts of Mbeya city, it is under speedy development. ▪ Locate substation in Uyole Agricultural Institute which is under state ownership to minimise displacement of private houses. ▪ Follow legal procedures in compensation. ▪ Pay compensation in time to avoid disputes. ▪ Involve influential politicians in educating people about the project benefits. ▪ The demand for industrial plots is ever increasing in Mbeya thus power demand in future.	▪ As above
Mr. George Mkongwa WEO Ilembula Njombe	▪ Compensate people for land taken. ▪ Safeguard youth employment during construction.	▪ As above
Mr. Filbert Mbeyela WEO Malangali Mufindi	▪ The project will take farm lands ▪ The project will displace residential houses ▪ Project development will interfere with graveyards.	▪ Disturbance of house and land will be compensated
Abel Mgimwa Ag. District Executive Director, Iringa District Council	▪ Energy sources will be improved as many villages have no electricity ▪ Development of the project area will in general improve. ▪ Proper evaluations and compensations should be done ▪ Power transmission lines in Iringa district have compensation disputes with TANESCO	▪ Land, housing and other properties will be properly compensated. ▪ People will participate effectively in the process.
Ms. Immmaculata Senje Head of Department, Land and Natural Resources, Iringa District Council	▪ Many people in the project area depend on land and forestry for income ▪ The project will take peoples land ▪ Natural plantations and planted forests will be cut	▪ There will be participatory evaluation of properties to reduce complains. ▪ Compensations will be properly assessed and timely paid.

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Julius Sanga Cartographer Godfrey Mwanga Cartographer, Iringa District Council	▪ Income generation will be affected due to forestry cut	▪ As above
Lucy Nyalu District Agricultural and Livestock and Livestock Development Officer ,Iringa District Council	▪ Land will be taken up thus affecting agricultural production ▪ Lowland areas known as vinyungu will be affected thus reducing dry season food production. ▪ Village Agricultural projects under the District Agricultural Development Projects (DADPS) might be disturbed due to land take ▪ The proposed project will affect livelihood.	▪ Farmers will participate in the whole compensation processes ▪ Compensations will be transparent and timely
Prosper Njau Ag. District Land and Natural Resources Officer, Iringa District Council	▪ There might be land disputes if compensations are not well handled. ▪ Land take will be big affecting food and forestry production. .	▪ Compensations will be properly assessed and timely paid
Kaminyoge E. A. District Executive Director, Mbalali District	▪ Development of the project area will in general improve. ▪ The project will damage properties along the line route ▪ Improved power supply will reduce environmental destruction for alternative energy.	▪ Land compensations and valuations will be properly and timely effected
Festo Nkemwa Township Executive Officer, Rujewa Township Authority	▪ Development of the project area will in general improve. ▪ Loss of land as a source of livelihood due to land take ▪ Project will instigate household food insecurity	▪ Land compensations will be effected to avoid disturbance of food production cycles
Noel Abel Ag. Chief Human Resources Officer Mbeya City	▪ Provision of electricity will improve the standard of living in villages. ▪ Compensations should be fare and prompt ▪ Transparency in the whole process will reduce unnecessary complaint	▪ Compensations will be properly assessed and timely done
Boniface Lyembo	▪ Follow legal procedures in compensation.	▪ As above

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Honourable Councillor Pulayimu Waya Secretary, Chiefs Secretariat Iganjo Ward, Mbeya City	▪ Pay compensation in time to avoid disputes. ▪ Involve influential politicians in educating people about the project benefits. ▪ Head of chiefs should not be neglected ▪ Cultural and worship areas might be affected.	▪ Compensation legal procedures will be followed. ▪ The developer will involve and educate people about the proposed project.
Zuberi Wilago Hamis Laitony Mwajanga Tepela: Chairmen, Elizabeth Mushi, Street Extension Officer, Ikhanga,Ilowe, Itanji streets, Iganjo Ward, Mbeya City	▪ As above ▪ Involve stakeholders in the whole process ▪ Worried that old compensation disputes with TANESCO might trickle into their area ▪ Unjustified and late compensations to affect community livelihood.	▪ As above ▪ Involve stakeholders in the whole process

Table 33 Concerns expressed by Utility organizations

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Eng. Ferdinand Hugo. Ag. Chief Civil Engineer. Tanzania Zambia Railway (TAZARA)	▪ The project is not likely to interfere with TAZARA communication as they are using High Frequency equipment instead of open copper wires. ▪ Electrocution accidents may occur. ▪ All TAZARA stations have well defined ground boundaries. ▪ The wayleave for TAZARA railway corridor is 100m.	▪ The design will provide enough ground clearance at railway crossings. ▪ Proper safeguards measures will be used against electrocution. ▪ Designer will share final design/drawings and identify crossing points
Eng. E. N. Kawiche Regional Manager TANESCO, Iringa	▪ It is important to involve stakeholders in the project process. ▪ The proposed TL will displace houses, damage crops and ancestral graves. ▪ People of Iringa are sensitive to burial sites. ▪ The project will improve agricultural industries such as of milk, tea, paper and timber.	▪ Consultation will take place.
Eng Julius Sabu Ag. Regional Manager Mbeya	▪ Avoid houses and farm displacement ▪ Education and awareness rising is important.	▪ The design consultant has to ensure the design minimise house/farm displacement.
Eng. Paul Lyakurwa Regional Manager TANROADS, Iringa	▪ Lack of formal introduction of the project to stakeholders and poor participation in the project. ▪ The road Wayleave (WL) is 60m and demarcated by beacons. ▪ Disputes may occur over compensations. ▪ Some section of the road WL can be shared with TANESCO. ▪ Traffic and electrocution accidents. ▪ Relocate ancestral graves. About 5 million TZS was used to relocate 3 graves along the main road at Tanangozi in 201l.	▪ The design will avoid WL overlaps. ▪ Road regulation calls for early consultation in case of any intent to use road WL. ▪ Safety consideration is crucial along WLs for power and road. ▪ The project will implement close consultation with community elders regarding relocation of ancestral graves.
Eng. James R. Nyabakari Regional Manager, TANROADS Mbeya Eng Masuka Mkina Head of Engineering	▪ Inadequate consultation/communication with utility companies will delay implementation of new projects to allow design changes. ▪ The 2007 road regulation requires utilities to observe 60m of RoW. Construction of utilities in ROW is temporary and the removal responsibility lies with owners.	▪ As discussed above.

Name of Person, Title and Organization	Concerns	Proposed Mitigations
TAROADS Mbeya	▪ Make careful design in urban areas to minimise impacts. ▪ Respect road RoW during project design, ask for permit if construction will interfere with RoW. ▪ Provide adequate clearance in road crossings.	
Mr. Peter Chacha Manager Tanzania Zambia Pipeline, Inyala Station.	▪ The Pipeline Company will provide experts to guide construction at crossing areas. ▪ The project will improve national power supply	▪ As discussed above.
Eng. Abdulrahman Nyenye TANESCO District Manager Makambako Township	▪ Complains about unfair assessment and compensation. ▪ Sometime Land valuers cheat or give unreliable information to People Affected by the Project (PAPs). ▪ The proposed project will disturb livelihood. ▪ A wind project by SINO TAN is planned for construction near Makambako substation.	▪ Careful assessment and fair compensation. ▪ Educate people about effects.
Eng. Esther Ngailo TANESCO District Manager Mufindi	▪ Improvement of power availability in the region. ▪ The project will displace people but there is vast land available. ▪ Tea estates and irrigation schemes may be disturbed. ▪ Negative impact on Mufindi Tea Company (MTC) and Unilever Tea estates.	▪ Avoid displacement of households, farm crops and business.

Table 34 Concerns expressed by Conservation Institutions, private companies and NGOs

Name of Person, Title and Organization	Concerns	Proposed Mitigations
Mr. Paul Nyiti. Senior Conservator. Wildlife Conservation Society of Tanzania (WCST)	▪ Large birds such as cranes with low night vision may collide with the overhead lines. ▪ The line may interfere with migratory birds if passes in wetlands. Migratory birds love wetland areas.	▪ Avoid wetlands. ▪ Involving appropriate specialist to determine impacts and mitigation measures.
Mr. Joachim Kessy. NEMC Zonal Office, Mbeya	▪ Avoid wetlands and high biodiversity areas. ▪ There are irrigation infrastructures in wetland areas ▪ There are pipeline irrigation projects in wetland areas.	▪ As discussed above
Mr. Reuben Mwabeza Chairperson Green Perspective Organisation (GREPO) NGO, Mbeya.	▪ The project will bring positive energy development for Tanzania. ▪ Early sensitization of people about the project is important especially after completion of design. ▪ Awareness about HIV/AIDS is important.	▪ As discussed above
Ms. Mangalo Salum Ag. Forest Manager, Sao Hill Forest Plantation	▪ Benefits;Power stability Negative Impacts; ▪ Trees will be felled down in Mufindi to pave way for the project corridor. ▪ Forest Land will be taken by the TL. ▪ Access roads will result into land take and tree cutting. ▪ Mature trees can be sold to the market before construction.	▪ As discussed above
Mr. George P. Gidai MKGR	▪ There are no many animals in MKGR. ▪ The area of the reserve passes close TAZAM highway in Luhowelo village.	▪ The design will try to avoid wildlife areas.
Ms. Victoria Rugalugira Logistics and Labour Officer, Unilever Tea Company.	▪ Projects should be peoples centred	▪ Consultation will take place.

A detailed list of concerns expressed in each village is presented in Appendix 4.

5.3 Communication Strategy Plan

Timely and accurate information dissemination requires a set of proactive measures be taken to instill confidence amongst PAPs. Therefore the communication strategy requires direct interaction with the project affected households, and the whole community. An appropriate communication strategy shall require critical elements:

i) have an enabling and supportive environment within the existing institutional setup; and

ii) take support from existing avenues such as barazas to inform, coordinate, disseminate information and facilitate activities and help build rapport;

iii) finally be prepared for a long waiting period to reduce their fears and anxieties, particularly with respect to compensation and other safety issues wherein information disseminated is supported by prompt responses and commensurate actions.

The overall goal of the communication strategy is to rightly inform the communities, correct prevalent misperceptions and create an atmosphere of trust and cooperation

Specifically the objectives of the communication strategy shall be as follows:

i) to create a shared understanding of the objectives of the current project

ii) to create a sense of appreciation of the efforts to address and alleviate the impacts caused by taking of land for the transmission line;

iii) to create awareness empower and build capacity;

iv) to sensitize the staff involved in the project as well as other relevant officials of the need to regularize interactions with village communities to allay apprehensions and correct misconceptions:

v) to orient the vulnerable groups and women to participate in the meetings conducted and to support them.

The foremost requirement of the communication strategy is to disclose the details on project activities and entitlement provisions as applicable to PAHs. The following action plan is proposed:

i) Use of Barazas for holding of meetings: These customary but informal avenues can be utilized by TANESCO and district administrations to disseminate information and discuss issues relevant to project and PAPs. Regular meetings – more frequent initially shall be a key confidence building feature. As it is expected that PAPs will have more questions and concerns to express, there shall be a need to carry out meetings on not just a periodic basis but also as deemed necessary by officials and requested for PAPs/PAHs. Such meetings should be attended by key officials from the District administration, involve members of the village administration and affected PAPs. Further as a matter of practice the discussion points from such meetings, outcomes and the list of participants should be diligently recorded and the same should be pasted on the notice boards. Further care should be taken to ensure maximum participation of PAPs by holding meetings at mutually agreed date and time. Organizing and holding of separate meetings with vulnerable groups – particularly female headed households, is a pre-requisite.

ii) Installation of Notice boards at key locations in all the affected villages: Notice boards represent information that is definite and is also permanently available to PAPs. It

should include description of the project along with a sketch indicating the route and direction of the line bordered by adjacent village/sub-villages; and finally the names and contact details of key officials at the District administration offices and TANESCO Regional Offices, who can provide further information.

iii) Provision of separate space: It is recommended that TANESCO's Head Office and Regional Offices provide separate space for the disclosure of all project documents including RAP. These space/area should contain all project related documents:

- information (in digital and non-digital form), Project reports, and line route over village maps;
- database of affected households, consisting primarily of non-confidential information collected from surveys; and
- information pertaining to the compensation and allowance payment process; entitlement notifications

iv) Designate an officer specific for the purpose: TANESCO's regional offices should designate a Public Information Officer – who shall be responsible to provide information on the project. He/she should be involved right from the stage of RAP disclosure.

v) v) Media Centre of TANESCO: The department shall prepare appropriate publicity material for usage by Regional TANESCO offices and district and village administration to disseminate information amongst affected villages that lie en-route. It shall further educate communities regarding likely accidents and safety prevention measures (See Box 1).

Box 1 – Information relating to accident and safety messages for extra high voltage transmission lines

Transmission lines are extra high voltage lines transmitting electricity from a generating station to consumers via grid substations. Currently in TANESCO, transmission lines are of 66,000 Voltage (66 kV), 132,000 voltage (132 kV) and 220,000 Voltage (220 kV) lines.

Sources of accidents occurring in electricity transmission lines

- Carrying out activities under the lines. E.g. farming, cattle grazing, playing, etc.
- Building closer or under the lines
- Vandalism. e.g. of members of transmitting steel towers, conductors (cables)
- Bush fires

Type of accidents occurring in transmission lines

- Electrocution of people and other living creatures
- Fires
- Hit by falling steel towers, conductors, etc
- Social and economic accidents. E.g. blackouts, loss of revenue to Tanesco and the nation

How to avoid accidents occurring in transmission lines

- Do not do any activity under transmission lines. You are endangering your life.
- Do not build closer or under transmission lines
- Stop vandalism of electrical equipment in transmission lines.
- Do not set bush fires.
- Objects touched by a fallen wire e.g. fences, buildings or even surrounding ground must be considered energized and should not be touched.
- Stay away from towers and lines during extreme windstorms, heavy rains, thunderstorms or other extreme conditions.

Source: www.tanesco.go.tz

5.4 Disclosure

The Division of Environment as well as National Environment Management Council (NEMC) of Tanzania fully supports and requires public consultation to be undertaken as part of the environmental assessment process. To this effect, NEMC has included Guidelines for Public Consultation to its Environmental Impact Assessment Guidelines.

With respect to disclosure requirements of the World Bank, the Client will make available the ESIA and RAP reports to the World Bank for review and comment and public disclosure in accordance with the Bank's BP 17.50 policy on Disclosure. The disclosure will be in Swahili and English as appropriate

Once the updated final RAP is approved by NELSAP, the Executive Summary and Full RAP document shall be translated into the local language – Swahili. TANESCO – main implementing agency would disclose the document on its website. Executive summary and full report shall be placed at suitable locations in the region headquarters – both at Iringa and Mbeya and also at TANESCO's Regional Offices. Simultaneously TANESCO shall inform the World Bank of: i) its date of disclosure of the RAP; and ii) provide a no-objection for disclosure of the RAP at World Bank's Infoshop.

Before commencing Project implementation a project launch and RAP disclosure workshop will be conducted at both these locations to launch the RAP implementation with participation of representatives of the affected people (e.g. village chairpersons, village officer) and other stakeholders from the districts (e.g. Land officer, government valuer, representative of the Contractor etc). The main objectives of this workshop will be:

i) to provide information, and bring clarity on issues raised relating to entitlements and benefits;

ii) to provide information on compensation payable and processes involved therein.

iii) consult and create awareness amongst local community members about rehabilitation;

iv) to ensure that vulnerable groups understand the process, and that their needs are specifically taken into consideration; and

v) to solicit help from local government officials and other bodies, and encourage their participation in RAP implementation.

A sample of one page notification for publication in newspapers/distribution is provided below.

PUBLIC INFORMATION

General public is hereby informed that construction of a High Voltage lines is proposed in your area. Power shall be transmitted across the lines to help electrify the regions of Iringa and Mbeya and thereby improve power supply in the whole region.

Following points are for your awareness:-

- Completion period of the project will be around 2 years
- Construction works of these lines will generate temporary local employment for unskilled labors (men/women) and help you to supplement your income.
- Better power transmission and supply in the region shall benefit in electrification in your villages and/ or lead to better power supply in your area in the near future
- You shall be notified about the start of construction in your village area by the district authorities
- Land under the transmission lines and Towers (Wayleave) has been acquired by TANESCO and therefore no crops, trees or structures or other activity is permitted within this wayleave.

PUBLIC INFORMATION
TANESCO solicits your co-operation for successful completion of the project. Let us together contribute for the prosperity of the region and United Republic of Tanzania. **Thank You**

5.5 Grievance Mechanisms

5.5.1 Grievance Redressal

Disputes or grievances may arise as a result of resettlement-related/compensation issues, such as:

i) error in the identification and/or measurement of affected property and people within the wayleave;

ii) disagreement around the ownership of property/assets (such as inheritance related disputes);

iii) disputes arising over improvements to structures post valuation but prior to compensation payments;

iv) disagreement on property valuation with respect to market price; and

v) problems relating to the time and manner of compensation payment

A grievance redressal mechanism independent of the implementing agencies is therefore essential to allow affected individuals to voice concerns and seek redressal. The Land Act (Section 156) only provides for grievances related to land acquisition and compensation issues related to creation of a wayleave to be brought to the High Court of Tanzania. It is usually too expensive and impractical for most of the residents and businesses within the project area. Any dispute that may arise should be best redressed through project management, local civil administration, other civil administration or other channels of mediation acceptable to all parties. Such channels of mediation may involve customary and traditional institutions of dispute resolution. Also addressing of complaints at the level they occur and not letting them become bigger in nature, is often the most effective way. The PIU officer in charge of grievances should make every effort to resolve grievances at the community level, rather than Therefore it is recommended that claims and complaints regarding compensation and resettlement issues are brought to attention of the local leadership. They will then forward grievances concerning the non-fulfilment of entitlement contracts, levels of compensation or seizure of land and asset without compensation to the corresponding Ward Executive Officer or eventually directly to the District Executive Director for redressal. This would ensure that recourse to the legal system as being the last resort. More details on grievances are presented in the RAP report.

6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

6.1 Introduction

The assessment of impacts is based on a three step procedure making impact assessment, conclusions and recommendations more objective, easier to understand, follow and trace back if necessary. The core of the procedure is to combine the 'value' of the affected environment and the 'magnitude of impacts' to obtain the 'overall impact assessment'.

Step 1 Firstly, baseline conditions are described in detail and in the cases where relevant, an "estimate" of the importance or value of environmental and social features have been identified. Such values are related to international, national or local guidelines, standards and expressed priorities.

Step 2 The second step is to describe and if possible quantify the magnitude of potential project impacts. The impacts are measured in terms of their extent in time and space, the vulnerability of the environments affected, the reversibility of the impacts and the probability that the impacts will occur. The magnitude of impacts is evaluated on a scale from 'high negative' to 'high positive'. (See Table 21) The impacts have been evaluated for the short-term construction phase and the long-term operation phase.

Step 3 Overall impact assessment at this stage is done without consideration of mitigation measures. After the description of mitigation measures in the next Section, the anticipated effects of implementing the mitigation measures as well as any remaining impacts and the 'overall impact assessment' are presented as a comparison of impacts with and without implementation of mitigation measures.

6.2 Rating Scale

The descriptions of impacts as well as their valuation are grouped in three complexes

i) natural resources,

ii) socioeconomic issues and

iii) health and safety.

At this final stage, quantification and valuation of the impacts are based on quantitative data as far as available: e.g. number of affected houses, size of impacted area by type of impact, and people employed in construction and maintenance in relation to the total number of PAP.

Table 35: Impact Rating Scale

Ranking of Impact	Symbol
Major negative impact	- - -
Medium negative impact	- -

Ranking of Impact	Symbol
Minor negative impact	-
Insignificant	0
Minor positive impact	+
Medium positive impact	+ +
Major positive impact	+ + +

As a result of this procedure, positive and negative impacts are ranked in a relatively objective manner.

The analysis of potential impacts is discussed with reference to the geographic area where the impact might be observed. For certain issues an overall assessment is provided covering the whole length of the TL. However, a comparison table showing impacts on each proposed options are provided in the following sections.

Both positive and negative impacts are expected to occur as a result of the Project. Impacts include environmental, social and economic impacts. Some of these impacts are direct and others are indirect. The following section discusses the impacts from the Project.

6.3 Impact on the Natural Environment

6.3.1 Vegetation Cover

Additionally, some land outside of the wayleave will be required for access roads from the main road to the line (generally to the angle towers, but due to the topographical conditions occasionally to other sites along the line as well) for work camps and substations. The total land area affected (by land use) by the wayleave is approximately 6,382 acres out of which around 60% (3815 acres) are private cultivable land.

Table 36: Percentage of losses of Vegetation Cover / Land Use along the TL

Cultivable land	Forest and game reserve	Grassland	Bush land & woodland	TOTAL
60%	7%	13%	20%	100%

Source: Source: Land Cover and Land Use Map. 1:250,000

Under TANESCO management it is usual to clear tall vegetation along the TL corridor. This exercise needs to repeat periodically during the operation phase, thus denying any chance for woody vegetation to come into contact with live wires.

As the survey was carried out during a dry season, very few perennial crops were to be seen. In areas, particularly under agriculture schemes such as Lusese, Majenje (Mbarali) crops such as Cabbage were recorded. However, in such areas too, there were more Banana, Orange, Avocado and Guava trees. Suitable mitigation measures addressing the loss of crops and vegetation are described in Chapter 7. The extent of crop clearing is presented in Table 37.

Table 37: Impact on Trees by type

District	Bamboo	Banana	Orange	Guava	Avocado	Peaches	Mango
Iringa Rural	2,961	27	88	113	3	8	947
Mbarali	134	733	363	30	80	16	74
Mbeya City	1						
Mbeya Rural	2	5	2	2	1	2	2
Mufindi	754	34	167	105	7	7	94
Total	**3,852**	**799**	**620**	**250**	**91**	**33**	**1,117**

Source: SMEC Survey 2012

Negative impacts will be higher during the construction phase and much less evident during the operational phase; however with proper mitigation measures potential impacts can be reduced to acceptable levels.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- - -	-
Operational Phase	- -	0

6.3.2 Soil Erosion

The building of foundations for transmission line towers can potentially exacerbate soil erosion. In addition to the loss of productive land due to soil erosion and land acquisition for tower construction, soils can be impacted as a result of disposal of waste materials, and compaction with heavy machinery used for the establishment of towers and the transmission line.

Along the existing line, the stretch from Iringa to Tanangozi, some sites with severe erosion problems have been observed, both steep terrains such as on the slopes of Tagemenda and Wenda hills and on the flat areas exposed to rapid flow and flooding during rainy season, and near sandy river banks. This will not only be a threat to the soil in terms of soil loss and degradation, but also a serious danger to the stability of towers along the existing line. Other erosion sensitive areas observed along the proposed TL are Bumilayinga – Kiponda in Mufindi and Uyole slopes in Mbeya.

These impacts can be managed by restricting the use of heavy machinery and vehicles to designated work areas and implementation of soil protection works in areas sensitive to erosion prior to construction.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase	-	0

6.3.3 Climate Change

The removal of vegetation may have some minor effects on local climate such as increasing the temperature and reducing air humidity. However, for the climate and landscape conditions found in this region such impacts are not likely to be significant.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	0	0
Operational Phase	0	0

6.3.4 Landscape Aesthetics

The aesthetic impact of lines and towers is a subjective matter determined by individual preferences. The towers might be perceived as architectural monuments and symbols of development or as intrusions in the landscape. The attitudes and perceptions will change over time. However, it is fair to say that the visual impacts of power lines in most cases will be regarded as negative.

The impacts are caused by two elements: the towers and the wayleave where the taller vegetation is removed. In an open landscape it is the tower themselves and to some extent the conductors that will make the visual element.

Large scale, open or slightly undulated landscapes and areas with quite dense vegetation have a high tolerance for infrastructure such as transmission lines;

Most of the proposed TL will cross through landscapes dominated by open woodland, bush land and grassland as well as cultivated land with scattered settlements. The potential impact will be minimal except for those urban areas where the corridor passes along the existing TL and close to the road network.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	-	No mitigation measure
Operational Phase	-	No mitigation measure

6.3.5 Wildlife

TL alignment close to woodland and closed bushland will have influence on the diversity of habitats and species in the project area, particularly birds and small mammals. Construction of transmission can include forest fragmentation and the loss and degradation of wooded habitat. Fragmentation will make interior forest/woodland species more vulnerable to predators and competition from edge species. The continued fragmentation of a forest/woodland can cause a permanent reduction in species diversity and suitable habitat.

Vegetation in the proposed project has been greatly altered by human activities. Important habitats along the proposed transmission line and/or found in vicinity to the project area include riverine vegetation along rivers, the 5 Km Igando-Igawa wildlife corridor and MKGR. The corridor links MKGR and Ruaha National Park (and its extension) (Frontier-Tanzania, 2003; Jones et al., 2008). Amongst the mammals known to use the corridor include buffalo, bush duiker, eland, elephant, red duiker, zebra, lions, leopards, serval and caracal (Frontier-Tanzania, 2003; Jones et al., 2008). This corridor though greatly reduced by human activities including vegetation clearance, fire burning, charcoal burning, cultivation and grazing is still important as it serves as a refuge and corridor for wildlife between the protected areas. The proposed TL is expected to pass across this wildlife corridor hence impacting on it.

Construction and maintenance of transmission lines may destroy individual plants and animals or might alter/fragment that provides habitat to wildlife so that it becomes unsuitable for them. For example, trees used by rare birds for nesting might be cut down or soil erosion may degrade rivers and wetlands that provide required habitat. Many species of amphibians, birds, mammals and reptiles require well sheltered habitats and some are arboreal that require suitable habitats for their arboreal life. Along the proposed project area there are important nesting/petching sites for birds. Experience shows conversion of forest habitats to transmission corridor tends to selectively displace permanent resident species. Also, clearance of vegetation may expose some wildlife fauna to potential predators

Approximately 90 metres of TL will pass inside the boundary of MKGR. The vegetation in this part is comprised of miombo and acacia-woodland including bushed grasslands on the slopes and bottom of Kipengere Mountain. The proposed TL will run parallel to the existing 220 kV and following consultation with the Game Reserves Authorities no significant impacts are anticipated as long as appropriate mitigation measures are implemented. The final decision has to be discussed with the Ministry of Natural Resources and Tourism. Notably, development activities in game reserves are permissible under certain conditions.

More details are provided in the Wildlife Report (Appendix 3).

Figure 14: Existing 200 kV Line crossing inside Mpanga Game Reserve See border beacon on the left

Where the line crosses (seasonal inundated) wetland, the land use and vegetation cover will not be changed. As these areas are already used for livestock grazing or crop cultivation, the terrestrial habitat for waterfowls will not be changed.

Disturbances due to equipment noise and vibration at the construction site will last only some days to a few weeks. Based on long-term experience of such projects in wildlife reserves, there is no reason to assume that these disturbances will have any considerable impact on wildlife behaviour.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- - -	-
Operational Phase	-	-

6.3.6 Collision of Birds with the infrastructures of the Transmission Line

Bird mortality from collisions with power lines is well documented (Bevanger, 1994). Collisions occur most often where transmission lines intercept areas where birds concentrate, such as migratory flyways, feeding areas, and nesting/roosting sites (Savereno et al., 1996). In addition, collisions are more likely to occur during periods of high winds or low visibility such as on foggy, rainy, or snowy days. Although some avian collisions with power lines occur during migration, most collisions take place during flights within a daily use area.

Along the proposed project area, birds migrate between the plains (Usangu flats and Ruaha National Park) and the highlands (MKGR and Kitulo IBA area). Furthermore, the protected areas in the vicinity of the proposed project area are used by Palearctic and Intra-African migrants and such collisions with birds are likely to occur. Avian collisions are generally distributed across broad taxonomic groups (Savereno et al., 1996). Species at highest risk for collision are often associated with aquatic habitats. This may be due to the dense flocks formed by many water birds. Thompson (1978) reported that the most consistent victims of wire strikes were large migratory water birds such as ducks, geese, cranes, herons, pelicans, swans, and shorebirds. In general, transmission line-related mortalities do not affect the viability of avian populations that are healthy with good reproductive potential (SAIC, 2000). Studies by different researchers have shown collision mortality rates are typically less than 1% of the number of birds using an area (Rusz et al., 1986).

Suitable mitigation measures are described in Chapter 7.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase	- - -	- -

6.3.7 Hydrocarbons

Hydrocarbons pose a potential risk to surface and ground water sources when released into the environment. Sites prone to such events will be the work camps with storage and maintenance facilities and activities, and the sites where tower construction takes places and therefore vehicles and engines have to be refuelled. This potential impact will be temporary and will cease with the end of the construction phase.

At substations substantial amounts of hydrocarbons will be stored and used for transformers and capacitors. The risk of oil spill at the substations is a constant risk with low probability but high potential impact. Suitable mitigation measures are described in Chapter 7.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase		

6.3.8 Water Resources

The construction of towers may interfere with natural drainage systems and modify surface water flows, which can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams and other drainage channels.

Effluent discharged from temporary campsites, as well as cement slag during construction, can all pose pollution risks to streams intercepting the transmission line route. Although temporary in nature, these impacts can be ongoing if disused work sites are not rehabilitated and adequate drainage works constructed to prevent erosion. Siting of towers away from drainage lines and flood ways can also minimise interference to natural drainage systems. The important river crossings are located along Ndembera, Mbarali, Kimani, Ruaha, Chimala, Mambi and Mlowo rivers. Few irrigation canals and structures are located at Igomelo/Rujewa and Igurusi/Manjenje. These are the areas where construction activities should be carefully implemented to avoid or minimise siltation and pollution of water resources.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase		

6.3.9 Waste and Wastewater

Work camps, substations and construction sites will be sources of scrap metal, oil contaminated waste, and household waste. It's a usual "good practise" of professional contractors to collect, recycle or depose these wastes at designated facilities.

Approximately 80% of the labour force will have their accommodation in the project area, mostly in the work camps. Sewerage systems are not common in the villages affected by the line. The temporal presence of 250 people in a larger village or smaller town may cause no relevant additional environmental pollution, if the work camps use safe measures for the disposal of human waste. This is likewise a "good practise" for professional contractors.

Hence, there will be no relevant impact on environment from these potential pollution sources. Wastewater from repair shops and washing places may be contaminated with hydrocarbons (oil, lubri-cants and solvents) will exist also in the operation phase (Substations). Suitable mitigation measures are described in Chapter 7.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase	-	-

6.4 Socio-economic Impacts

The proposed TL has an overall impact on 58 villages of which 27 fall within the Iringa region and 31 in the Mbeya region. Altogether there are 5,188 PAPs, of which approximately 63% live in the Iringa region and the rest 37% in the Mbeya region.

6.4.1 Housing and Structures

The most important negative social and economic impact will be the necessary removal of houses affected by the wayleave. Some 21 houses and related structures will be affected by the way-leave and will need to be removed (Table 38) Suitable mitigation measures are described in Chapter 7.

Table 38: Number of Affected Structures

District	Name of Village	No. of Structures
Iringa Rural	Tagamenda	2
	Kibena	1
Mbarali	Uhamila	4
	Mfumbi	1
	Majenje	1
	Kapyo	1
Mufindi	Maduma	2
	Kiponda	6
	Tambalang'ombe	1
	Bumlayinga	1
	Ndolezi	1
	Total	**21**

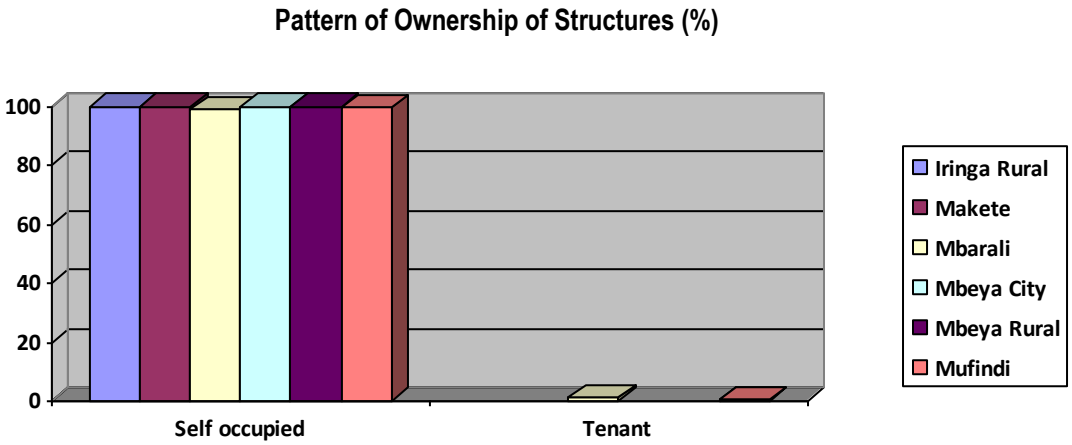
Source: SMEC Survey 2012

Some 91.9% of the PAHs own structures on a customary right basis, while 5.6% were found to be with title-deeds. 2.1% were non-titleholders who had been occupying without any formal right. Ownership structure is shown in Table 39.

Table 39: Ownership Structure (%)

District	Title deed	Customary right	Tenant	Non-title holder
Iringa Rural	6.7	86.7		6.7
Makete	2.5	97.5		
Mbarali	10.8	87.9	1.2	
Mbeya City	6.7	93.3		
Mbeya Rural		100.0		
Mufindi	2.8	96.0	0.4	0.8
Average	**5.6**	**91.9**	**0.4**	**2.1**

Source: SMEC Survey 2012



Source: SMEC Survey 2012

As presented in the above graph, most of the structures are owner occupied with an exception of Mbarali (1.2%) and Mufindi (0.4%) districts.

Figure 15: Types of Structures Impacted

A relatively small number of houses/structures will be demolished, and the potential impact is considered medium.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- - -	- -
Operational Phase	- -	-

6.4.2 Infrastructures and Services

The proposed TL will avoid most public infrastructure such as schools, churches, mosques etc. A small water supply structure (small tank with gates) covering approximately 5 acres will be affected near Isongawa village.

Overall impact rankings are:

Phases	Without Mitigation	With Mitigation
Construction Phase	-	0
Operational Phase	0	0

6.4.3 Land Use

Settlement areas

The Proposed option will have minimal impact on rural settlements as it is passing significantly far from the village centres. Notably, following the 1967villegalization or resettlement program in Tanzania, villagers were settled in planned villages so as to facilitate access to social services such as schools, dispensaries, shops, water sources and worshipping buildings. This has made many community settlement in the project area confined to the now village centres. Apart from village centres, some village population is concentrated in sub-villages which may be located about 1-4Km from village nucleus.

The larger section of the proposed line is aligned away from settlements especially in marginal lands which are not suitable for settlements because of lack of desirable natural suitability criteria such as fertile soils, water availability and closeness to road network. Few exceptions of potential urban development land are found along the proposed route. For example, near Tagamenda substation outside Iringa town, few individual plots which will be affected are potential for future development under urban setting especially those parallel to the existing line and Iringa-Dabaga road (about 2Km). Otherwise, around Iringa town the line is passing in marginal lands on hill slopes and tops with rock out-crops and poor soils that cannot support agricultural crops. They are also difficult to access because of harsh terrain. In other areas such as around Ifunda and Igurusi the line is passing in valley bottoms and seasonally inundated areas which are not suitable for settlements and infrastructural (non TL) development. In other areas such as around Iringa-Mbeya border the line is cutting across vast woodland areas which are infested with tsetse flies thus unfit for cattle grazing as well is human, difficult to access and away from social services.

Therefore, the planned project will not take large chunks of land in areas which are potential for settlements or future urbanisation. The number of villages in the direct impact zone is about 56 while additional 18 fall in the in direct impact zone. The later

will be affected by PAPs who may move in to look for alternative land or food. The nearest village settlements such as Ihemi and Igomelo and Mabuyuni are 100m -500m from the line while the furthest such as Isalavanu and Ihowanza are located 1.5-3km.

The only potential area for settlement or urban development which will be impacted is the surveyed area at Igomelo where several plots within 1.0Km will be affected. Second is the section at Iganjo area around the proposed Uyole sub-station. This area is fast coming under urbanisation and land price here is high. The area at Lyambogo sub-village at Chimala and the nearby Isitu village is also rapidly upcoming urban development area. At Isitu the line is passing about 200m behind the planned public market which is currently operational. Around the proposed Uyole substation you have institutional (Training Institute for Anglican Church) and individual residential and horticultural plots. This is a section where land take impact will be deeply felt by PAPs and also the land price is substantial. Nevertheless buildings or structures coming under the corridor in these sections and in the entire route are about 20 of which some are not fully developed.

A summary of potential future settlement or urban development sites along the proposed routes which required further scrutiny and careful final design are at the following sites

i) Around Tagamenda substation outside Iringa Town

ii) Igomelo outside Rujewa Town (plots surveyed)

iii) Around Chimala sub-town and Isitu village

iv) Iganjo ward near Uyole substation.

Cultivated areas

As mentioned on table 36 above, it is estimated that a total of 6382 acres of land will be affected out of which 462 acres of cropland, 62 acres of forest, and the rest are bushland, grassland and woodland.

Approximately 3815 acres of private farm land/plantation land will be impacted by the project. The break-up is presented in Table 40

Table 40: Cultivable land area coming in the proposed transmission line by district

District	Acres
Iringa Rural	754
Makete	323
Mbarali	1236
Mbeya City	17
Mbeya Rural	120
Mufindi	1361
Total	**3815**

Source: SMEC Survey 2012

Only 11.5% of the total land is irrigated land, while 83.2% of the land affected is un-irrigated land, and 2.4% is waste land. This is shown in Table 41.

Table 41: Impact on private land by classification of land (%)

District	Irrigated	Un-irrigated	Waste land
Iringa Rural	8.2	90.3	2.7
Makete		85	
Mufindi	11	85.5	4.4
Mbarali	23.2	76.3	0.5
Mbeya City		84.2	15.8

District	Irrigated	Un-irrigated	Waste land
Mbeya Rural	6.2	77	0.6
Average	**11.5**	**83.2**	**2.4**

Source: SMEC Survey 2012

The main type of agriculture practiced along the corridor is predominantly seasonal with low height for example maize, beans and rice which do not reach above 2.0m of height. Permanent and higher crops such as timber, orchards and banana are limited. The use of wayleave area for short and seasonal crops may be allowed by TANESCO though legally is not permitted under the high voltage power lines. The agricultural land which will be lost to pave way for the project will be limited to sites that will be used for the construction of workers camps and workshops. In addition, tower foundations and access roads. Notably, the construction of new substations at Kisada will require substantial land for the infrastructure itself, staff houses, offices and access roads for transportation of heavy equipment (transformers) during construction and workers and maintenance machinery during operation phase. The substation design and associated specifications including that of access roads will be worked out a later stage during the contract phase.

People around the two proposed substations are expected to benefit economically and socially from access roads and associated developments around the substations. For example, increased household income and general economics because of improved road access to market centres for agricultural produce. The use the anticipated new access roads by farmers is expected to further minimise the impact of land loses. It will therefore expected to compliment compensate paid to loss of lands for cultivation.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase	-	-

6.4.4 Cultural Property Resources (CPR)

Graves have been found along the wayleave of the existing TL as well as of the proposed TL. Beliefs and traditions in the project area allow graves to be relocated if it is done in a culturally sensitive way. Suitable mitigation measures are described in Chapter 7.

Based on the archaeological field survey and discussion with the Antiquities Department, no archaeological sites were identified along the wayleave area. The closest site was identified as the protected Isimila Stone Age site near Iringa Town south of Tanzania-Zambia highway, but the wayleave passes about 2 Km away, north of the highway. The Iganjo ritual forest and worshipping site near Uyole substation is located about 80m from the proposed corridor.

The number of impacted CPRs, in the form of graves, is 16, out of which 9 are in Mbeya and 7 in Iringa region.

Figure 16: Graveyards around Iganjo

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	-
Operational Phase	- -	-

6.4.5 Access Road

There will be a need for substantial construction of new roads resulting in job opportunities in the area.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	+ + +	
Operational Phase	+	

6.4.6 Employment and Income Level

The project will engage local people to work as casual labourers. Based on previous experience, it is estimated that an average of about 0.5 workers per 1,000 people living in

villages along and near the transmission line will get a job during the constriction period. The recruiting of local workers is the responsibility of the Contractor, as the Contractor will be responsible for the working schedule, quality of the work, budget, safety etc. A work camp will serve approximately 250 employees .About 80% are required to be recruited locally. Importantly, TANESCO is expected to ensure that local workers including youth and women are given first priority for unskilled jobs and, when qualified, for semi-skilled and skilled positions.

Apart from direct part time employment other temporary job opportunities will be available such as increase commerce and services activities such as the sale of agricultural and livestock products. It is also expected that TANESCO will enter into an agreement with local communities for cleaning the wayleave. Discussions with local communities revealed that there is currently such an agreement, although there were complaints that wages were sometimes delayed or not paid at all.

It is expected that the overall income level in the project area as a whole will be raised significantly over the construction period.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	+ + +	
Operational Phase	+	

6.4.7 Gender Analysis

The region has more females in the population than males. According to the survey, about 90 PAHs are women headed, which implies on the one hand that those women have the responsibilities of managing both income generation for the family as well as carrying out domestic chores. On the other hand, the decision making power is likely be vested with women in these households. However, female headed households are common in the matriarchal families of the region which account for almost half of the households. Despite all this, the condition of women is not very promising in the project region in terms of access to education, available health facilities, etc.

6.5 Impacts on Health and Safety

6.5.1 Air and Dust Emissions

This will be an issue during the construction of access roads and clearing of vegetation along the ROW, especially since it is recommended that construction take place during the dry season. However, most construction activities will be undertaken away from residential areas and with the implementation of mitigation measures the potential impact is expected to be minor.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	-	0

Phases	Without Mitigation	With Mitigation
Operational Phase		

6.5.2 Noise

Noise resulting from access road and transmission line construction may disturb neighbouring communities and local fauna. This impact will be of a temporary nature and can be minimised by adopting appropriate mitigation measures (refer to Section 7) including maintaining equipment and vehicles to manufacturers' standards and limiting operating times to daylight hours. Another noise source during the operation phase will be the transmission wires: the electromagnetic field of high voltage lines will cause a "buzzing" called corona noise, to be heard mostly within the wayleave only, especially during high air humidity in the rainy season.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- -	0
Operational Phase	-	0

6.5.3 Electrocution

High tension power lines are associated with electrocution risks for human beings and climbing/flying animals. It is a particular challenge for playing kids. This risk is along the entire line together with its substations. However, the effect or risk will be more confined to the areas around large settlements and particularly where the level of education is low in the absence of public awareness or education programs. The risk for electrocution is expected to be minimum along the sections where the new line runs parallel to the 220 kV line because the villagers will be familiar will such an infrastructure and its inherent risk. Also, TANESCO has been implementing public education along the existing TL.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase		
Operational Phase	-	0

6.5.4 Electromagnetic Fields

There has been a lot of public concern related to suspicions that the radiation of the electromagnetic field (EMF) created by power lines and substations might cause serious health impacts on people living or working close to such structures. A number of health problems have been claimed to be caused by EMF. The focus has in particular been on the alleged over-frequency of leukaemia for children living near power lines. Several institutions and countries have developed guidelines and standards for exposure to EMF,

referring to the recommendation of the International Commission on Non-Ionising Radiation Protection (ICNIRP) accepting a magnetic field of 100 micro Tesla (µT). To scrutinize such recommendations will surely not be the job of TANESCO. Therefore, TANESCO's Engineering Instructions take this view and assume that there will be no impact or risk for people outside of the wayleave.

Some serious organisations as well as industrialized countries are more cautious, e .g.

i) EPA (Environmental Protection Agency, USA) recommended a limit of 0.2 µT, following the recommendations of IARC (International Agency for Research on Cancer, sub organisation of WHO) in 1996

ii) Sweden also requests 0.2 µT for kindergarten and schools

iii) WHO classifies 0.3-0.4 µT as a potential cancer risk, following the TCO-norm for e.g. computer work places.

Some epidemiological studies performed in Sweden and recently (2002) in Japan indicate a raised rate of children's leukaemia for levels higher than 0.2 to 0.4 µT.

It has to be taken into account that ICNIRP

i) is a private organization not authorized by any government or UN organization (also not by WHO)

ii) accepts only the effect that EMF may warm up the tissue

iii) neglects the basic fact (known since 1935) that EMF may interfere with biological systems working within the same frequency band, e. g. the human brain, the nervous system and cellular processes including cell division.

Therefore, the precautionary principle should be applied, which means that the field strength should be kept as low as technical possible and economically reasonable, as the scientific community as well as governmental organization still have very different opinions about the maximal acceptable field strength: the legal limits in European countries vary by a factor of at least 500.

The strength of the magnetic field depends mainly on the configuration of the conductors, the operational mode of the line and the distance from the line.

Overall impact ranking:

Phases	Without Mitigation	With Mitigation
Constriction Phase		
Operational Phase	-	0

6.5.5 Safety

Construction sites pose potential hazards to both workers and nearby communities. Workers need to be instructed in safe work practices and provided with appropriate protective clothing and equipment. People from surrounding communities should be excluded from construction sites wherever possible.

Overall impact ranking:

Phases	Without Mitigation	With Mitigation
Constriction Phase	-	0
Operational Phase	- -	-

6.5.6 HIV/AIDS

HIV/AIDS is a global concern and very much a problem in east African countries including Tanzania. Given the prevalence of this disease in Tanzania, the national government is keen on incorporating a strategy for controlling it by every possible means, and thus, all development projects are required to address the issue. There is thus a need to assess the disease scenario to better understand how the project activities may affect the spread of HIV/AIDS and develop an approach that minimizes any such impacts associated with project implementation. Though it is a cause of concern, people in this part of the country avoid discussing HIV/AIDS. An attempt has thus been made to develop an understanding of the disease prevalence based on secondary sources of information.

In both regions there are reported cases of HIV/AIDS. According to HIV/AIDS data in Iringa region between 1990 and 2003, there was a 13 per cent increase in the number of new HIV/AIDS cases.

Along the proposed transmission line, the possibility of increased prevalence of HIV/AIDS can be assumed as the Iringa region, through which the major length of the corridor passes, has a high prevalence of the disease. However, since this option is falling under rural areas of the region, less prevalence of HIV/AIDS is assumed compared to Iringa's urban areas.

Overall impact ranking are:

Phases	Without Mitigation	With Mitigation
Construction Phase	- - -	- -
Operational Phase	- - -	- -

7 MITIGATIONS MEASURES

7.1 Introduction

This Chapter presents the mitigation measures and compensatory actions that might be relevant to this study. A revised impact assessment is also presented in the end of the chapter, indicating the environmental and social impact assuming that the proposed mitigation measures are successfully implemented. Some mitigation measures may concern different aspects and. subsections.

There are several levels and functions for mitigation measures. In general mitigation measures for complex construction projects would include:

i) Avoiding the impact altogether by removing planned elements or by changing plans.

ii) Minimising impacts by limiting the degree or magnitude of the action.

iii) Rectifying the impact by repairing, rehabilitation or restoring the affected environment.

iv) Reducing or eliminating the impact over time by preservation and maintenance operations.

v) Compensating for the impact by replacing or providing substitute resources to Project Affected People (PAP).

With respect to potential impacts by technical equipment, working conditions, operation methods, handling of hazardous substances etc. on health, safety and environment, the contractor has to comply with local as well as international regulations. There is neither the necessity nor is it within the scope of this report to deal with these regulations here again, which will be, by the way, not always consistent. Therefore, the statements concerning these aspects will not include any details.

7.2 Natural Environment

7.2.1 Vegetation Cover

i) Clearing of the wayleave should be incorporated in project design/drawing. Sites vulnerable to soil erosion and landslides risks along the TL, including harsh slopes, should be spared from open clearing during construction and operational phases. Selective clearing, in which all vegetation is cleared from tower footing locations and from access and maintenance roads but only plants that exceed an acceptable height for line safety are removed elsewhere has immense benefits for erosion and dust control and animal movement and habitat. Also avoid bush fires close to camps by careful handling of fire sources.

ii) Permanent loss of vegetation should be compensated by adequate planting activities in neighbouring areas.

iii) If possible, the initial clearing as well as further pruning in the phase of operation should be done manually instead of using heavy machinery. This will reduce unnecessary large scale trampling of vegetation as well as soil compaction and will give some people a permanent job.

iv) Where both transmission lines will run parallel, the chance to use a single common way for inspection and maintenance should be examined.

v) After finalisation of construction work, areas not needed anymore such as camps or temporary workshops should be replanted / rehabilitated as far as the line security is not impeded. Use of indigenous species should be promoted.

vi) Forest authorities together with the developer in the concerned areas should devise ways to increase protection of the areas in collaboration with local communities.

vii) Reforested and rehabilitated areas and areas with natural succession have to be protected against degradation; therefore TANESCO should design measures to support district and village administration in tree planting/reforestation.

If the above measures are undertaken, impact on vegetation will not only be minimized but also will overcompensate the project related impacts.

7.2.2 Soil Erosion

i) The contractor has to apply best environmental practise in constructing the foundations for the towers/access roads.

ii) Construction activities should not take place in erosion prone land and close to rivers and watercourses in the rainy season.

iii) In areas prone to soil erosion suitable sediment binding grasses such as *Cynodon dactylon, Pen-nisetum clandestinum, Cenchrus ciliaris, Chloris roxburghania* and *Eragrostis superba* have to be planted in degraded substrates. In the long term, the natural vegetation cover should be restored. The plants will have to be preserved against grazing and wild fire during the first years. Developer to designate people or administration for suitable surveillance.

7.2.3 Climate Change

No mitigation measures are recommended against climate change as the impact is not expected to be significant.

7.2.4 Landscape Aesthetics

Location of the towers should be carefully selected during design stage to minimise impact on landscape aesthetics.

7.2.5 Wildlife

i) Where possible use the existing corridor of TAZAMA oil pipeline and existing 220Kv transmission line that passes in the proposed project area. Corridor sharing can be a useful method in mitigating environmental impacts of a new transmission line. Sharing corridors may also minimize impacts by creating an incremental, rather than a new impact.

ii) Carry out selective clearing along the TL corridor. For example around tower footing locations and access/maintenance roads for vegetation especially miombo and acacia woodland that exceed an acceptable height for line safety. Retain vegetation in areas which have immense benefits for erosion, dust control, and animal movement and habitat with special attention on wildlife migratory route between Igando and Igawa.

iii) Enforce a no-hunting rule for the project workforce.

iv) Work out specific measures in the design including tower placement, location of camps and workshops away from corridor.

v) Minimize the need for tree removal through careful design.

vi) Careful timing of project activities to avoid coinciding with wildlife movement across the corridor. Accelerate work when crossing the corridor so as to minimize the duration of disturbance.

vii) Make the wayleave as narrow as possible in forested areas by design works.

viii) Avoid passing the line through closed canopy forest or miombo woodland

ix) Survey wayleave periodically after construction and control or remove invasive species detected.

x) Limit the number of towers located in wetlands for example between Chimala and Igurusi.

xi) Implement sufficient measures against triggering accidental bush fires.

xii) The contractor/developer shall be obliged to create awareness about wildlife values among the construction workers particularly during animal migration seasons.

xiii) Close collaboration between the developer and Ministry of Natural Resources and Tourism are required to identify the best method to align the proposed TL inside the MKGR.

It is safe to say that these measures are expected to compensate the impact on these areas. More details are provided in the Wildlife Report in Appendix 3.

7.2.6 Collision Of Birds With the Transmission Line

i) A study by Alonso et al., 1994 indicated that fitting wires with markers (brightly coloured 'aviation' balls, thickened wire coils, luminescent, shiny or hinged flashing or flapping devices) reduce bird mortality through collision with transmission lines by 60%. We recommend using marked devices and other means as recommended by some authors e.g. Alonso et al., 1994; Jenkins et al., 2010. On marked lines birds change course more frequently than on un-marked lines. These markers can be conducted in sites frequently passed by migratory birds particularly between MKGR and Igurusi IBA. Marking decreases flight intensity and collision frequency with birds.

ii) Another feasible measure is normally to plan the line routing to avoid locations with possible high concentrations of larger birds which flies low (especially wetlands) and climbing mammals.

iii) In areas with high bird activity (between MKGR and Igurusi) and where the new line parallels the existing 220kV line, towers should be used that will avoid having the new conductors at different heights than the old one.

iv) In potential bird migratory routes, technical measures are also available, for instance attaching devises to the conductors and towers to make them more visible to birds and to discourage resting and climbing by animals at sections of the line where such problem has been experienced or can be envisaged.

v) Minimise the number of conductor levels across routes used migratory birds particularly between MKGR and Igurusi, if possible.

vi) Limit the number of towers located in wetlands. For example between Chimala and Igurusi.

vii) The shield wire should be as close as possible to the highest conductor level.

viii) Place markers on shield wires in areas where bird collision potential is high.

ix) Monitor avifauna along the transmission line to detect any negative ecological effects.

7.2.7 Hydrocarbons

i) Construct and use oil resistant sealing for all surfaces in the camps where hydrocarbons (fuels and lubricants) are permanently handled and stored; these areas have to be sheltered and protected against storm water

ii) Store hydrocarbons in oil resistant containers in the field, refuelling of vehicles and machines in the field should be done using portable oil collection pans only.

iii) Use well-maintained equipment and good environmental practices during construction and operation in order to reduce the risk of hydrocarbon pollution; this will be mandatory when operating close to or in areas of special ecological value or close to water bodies and ground water sources used for drinking water.

7.2.8 Waste and Waste water

i) Sewage from construction camps and offices should be handled properly by ensuring good sanitary conditions for the labour force. The wastewater generated should be hygienically treated before disposal to avoid pollution of water sources. Better and safer water sources for domestic use can be planned in project areas and direct impacted communities.

ii) Separate collection of materials suitable for recycling and composting. Other nonhazardous wastes have to be deposited at specific landfill sites already used for this purpose in compliance with Tanzanian regulations.

7.3 Socioeconomic Issues

7.3.1 Land use

i) Compensate individuals whose properties will be lost.

ii) Work camps (equipment yards and workers' camps) no longer needed for construction purposes shall be cleaned and then transferred to the village administration for further use.

More details on compensation are presented in the Resettlement Action Plan.

7.3.2 Housing

i) As far as practicable, residential structures should be avoided by proposing alternative line routing as appropriate. However, in inevitable cases there will be likelihood of involuntary resettlement issues for all affected residential establishments coming directly under the proposed transmission line. As per the guidelines of funding agency and the Government of Tanzania rules, all the affected houses will be relocated and compensation for loss of structures will be provided as per all project adopted norms.

ii) Compensation of all assets and grievances to the project affected people as well as to the villages concerned. Monetary compensation for structures lost will be estimated at current market price index. Towards restoring livelihood / income impacted due to demolishing commercial structures will be made as per the guidelines of funding

agency and the Government of Tanzania rules. Economic rehabilitation grants, skill development in alternative livelihood creation, etc. may be provisioned in the entitlement framework for enhancing quality of life through sustainable economic rehabilitation of the affected persons.

More details on compensation are presented in the Resettlement Action Plan.

7.3.3 Cultural Property Resources

i) The CPRs observed in the region are mostly graves, belonging to communities in the villages. These house graves of ancestors of households and are regarded as very important in terms of religious and social perspectives. Thus, minimizing impacts on such graves will be done towards preservation of cultural heritages of the local communities. In cases where it is unavoidable, relocation of such properties will be done with utmost care and respect to people's sentiments on heritage. For this, affected communities will be consulted before taking any decision on relocating the CPRs.

ii) Compensation of graves to be removed should include all expenses related to the relocation such as for ceremonies and labour in connection with exhumation and reburial

iii) Beliefs and traditions should be taken on board, as the practices of relocating graves differ from one tribe to another or even from one religious denomination to another.

iv) Report relevant observations during exploration and construction work immediately to the Antiquity Department

v) Interrupt the work at the sites concerned and not restart without approval from the Antiquity Department.

More details on compensation are presented in the Resettlement Action Plan. In addition, the TANESCO or contractor will include procedures about any chance finds for archaeological materials or site in the ESMP.

7.3.4 Tree Crops

i) The plantation lands to be acquired will be compensated as per guidelines of the Government of Tanzania and the funding agency. This will be done complying with the norms in compensating loss of livelihoods and income.

ii) Permanent loss of trees should be compensated by adequate planting activities in neighbouring areas.

iii) Reforested and rehabilitated areas with natural succession have to be protected against degradation. Therefore TANESCO should design measures to support district/village administration in tree planting/reforestation.

If the above measures are undertaken, impact on vegetation will not only be minimized but also will overcompensate the project related impacts.

7.3.5 Access Road and Public Infrastructure

i) Compensation should be paid early enough in order to allow the construction and commissioning of a suitable alternative prior to demolition of the facility or infrastructure

ii) All procedures for valuation, compensation and reallocation of any affected public infrastructure should be participatory i.e. involve responsible village authorities, local people and relevant district authority.

7.3.6 Employment

i) The developer will implement workable strategies to enhance employment benefits. For example providing information to local inhabitants about existing employment opportunities and liaison with local leadership in securing employment for local people while ensuring equality and concerns of vulnerable groups. The measures should be implemented during construction phase when chances are available for skilled and semi-skilled people to be employed.

ii) TANESCO in particular, should demand that local people are given first priority jobs and, when qualified, for semi-skilled and skilled positions as well. More emphasis should put on women and youth.

iii) These measures should be implemented during construction phase when chances are available for skilled and semi-skilled people to be employed.

7.4 Health and Safety

i) The contractor shall be obliged to apply the best practices regarding health and safety for the workers and population in the project area.

ii) Potentially dangerous construction sites shall be fenced off and guarded so that people are pre-vented from entering.

iii) Provision of safety gear and Personal Protective Equipment (PPE) to the workers such as helmets, gloves, protective boots, goggles and hearing protection. “No PPE no work” rule shall be enforced.

iv) Warning signs shall be put up around the construction sites.

v) Moisturize open surfaces when and where high dust emissions are observed.

vi) Accommodation camps shall have a reliable supply of safe drinking water as well as proper sanitary facilities such as latrines and showers, look for alternative sources of water in areas that have no water or limited water. In addition, waste water should be treated adequately.

vii) Establish mobile hospital services that can be used by the workers while on site. Also a proper first aid and referral system shall be set up at site.

viii) Periodic medical examination should be performed on all workers.

ix) Drives should drive carefully.

x) The contractor will be required to prepare and present for approval by TANESCO an Environmental and Social Management Plan (ESMP) and Health, Safety, Environmental and Social Plan (HSES) that shows how management measures will be implemented.

7.4.1 HIV/AIDS

HIV/AIDS is a global concern, and has high prevalence in Tanzania. To tackle HIV/AIDS, GoT has taken the following strategies:

i) Strengthen the role of public, faith groups, People living with HIV/AIDS, CBOs to ensure that all stake holders are actively involved in HIV/AIDS work and to provide a framework for coordination and collaboration.

ii) Encourage and promote the spirit of community participation in HIV/AIDS activities. For example, strategic planning and implementation. Also, includes ward level and village level strategic planning for prevention of transmission of HIV/AIDS and STIs.

iii) Work closely with NGOs and Faith Groups in the fight against drug substance abuse that increases the risk of HIV transmission.

iv) Provision of appropriate effective treatment for opportunistic infections at all levels of the health care system

v) Implement programs that will inform the community about HIV/AIDS and the real life challenges in its prevention and care.

vi) Encourage and support the communities to develop appropriate approaches to reduce HIV infection.

vii) Support the procurement and distribution of good quality condoms. Also make them available and affordable to the community.

viii) Assist voluntary HIV testing, pre-and post-test counselling.

The following mitigation measures in the same line with GoT strategies are proposed:

i) NGO should be hired to carry out an awareness campaign along the project area.

ii) The contractor shall be obliged to test all workers periodically on HIV/AIDS, to oblige them to participate at periodical information meetings, and to offer them condoms for free.

iii) District councils, NGOs/CBOs and TANESCO should continue to inform workers and local communities on HIV/AIDS pathways that cause the spread of the disease.

iv) NGOs should establish and support voluntary counselling and testing centres for HIV/AIDS as well as encourage local people and workers to use such services.

v) Information materials on HIV/AIDS should be posted at all work sites and villages along the wayleave.

vi) Distribution of good quality condoms etc.

7.5 Summary of Mitigation Measures

A summary of the major (above mentioned) mitigation measures are presented below:

Type of Impact	Proposed Mitigations
Vegetation cover	- Selective clearing, in which all vegetation is cleared from tower footing locations and from access and maintenance roads but only plants that exceed an acceptable height for line safety are removed elsewhere has immense benefits for erosion and dust control and animal movement and habitat. - Carry out replanting in disturbed sites by use of indigenous species.

Type of Impact	Proposed Mitigations
	- Collaboration between developer and stakeholders on environmental protection.
Soil erosion	- Apply best environmental practise in construction activities. - Avoid disturbing erosion prone areas such as steep slopes and river banks. - Use suitable grass and natural regeneration to protect erosion prone areas.
Landscape aesthetics	- Carefully select the tower location sites during the design stage
Wildlife	- Share corridors to allow passage of migratory animals. - Do not clear natural trees/vegetation (miombo) >/=15m height. - Create awareness about wildlife values among workers. - Collaboration of stakeholders regarding alignment of TL inside MKGR.
Birds collision	- Fit wires with bright, shiny and coloured markers or flapping devices - Careful design of line routing to avoid larger birds and climbing mammals. - Attach special devises to conductors/towers to scare climbing animals.
Hydrocarbons	- Proper construction /reinforcement of surfaces against hydrocarbon pollution. - Proper storage and safe disposal. - Implement proper and regular maintenance for equipment.
Waste and Wastewater	- Proper handling of sewerage and disposal of solid and liquid waste before treatment and safe disposal.
Land use	- Careful design to avoid serious impact on land and individual properties. - Pay compensate for affected properties
Housing	- Avoid residential structures during the design stage. - Compensate assets and put up mechanism for grievances resolution.
CPR	- Minimize impact through design and consult people about any relocation. - Report any findings for any CPR to Antiquity Department.
Tree crops	- Pay compensation for loss of tree crops and replant. - Reforest and rehabilitate lost vegetation including miombo forest. - TANESCO to support local administration in planting/reforestation activities.
Access roads and public infrastructure	- Pay compensation before demolition and project construction. - Involve stakeholders and relevant authorities in valuation and compensation process.
Employment	- Implement proper measures to employment of local people.

Type of Impact	Proposed Mitigations
	- Application of best practices regarding health and safety. - Fencing of dangerous sites and provision PPE to the workers. - Use of warning signs around the construction sites. - Moisturize open surfaces with high dust emissions. - Supply safe drinking water and sanitary facilities to workers camps. - Contractor is obliged to prepare and implement ESMP.
HIV/AIDS	- NGO should be hired to carry out an awareness campaign along the project area. - The contractor shall be obliged to test all workers periodically on HIV/AIDS, to oblige them to participate at periodical information meetings, and to offer them condoms for free. - District councils, NGOs/CBOs and TANESCO should continue to inform workers and local communities on HIV/AIDS pathways that cause the spread of the disease. - NGOs should establish and support voluntary counselling and testing centres for HIV/AIDS as well as encourage local people and workers to use such services. - Information materials on HIV/AIDS should be posted at all work sites and villages along the wayleave. - Distribution of good quality condoms etc.

8 ANALYSIS OF ALTERNATIVES

8.1 "Do Nothing" Option

If the Project were not to proceed a number of significant benefits to Tanzania would be foregone. This “do nothing” option represents the scenario where the project is not implemented and the environment is left untouched or continues as it is. This alternative, however, entails missing all the positive impacts anticipated from the project such as improved power supply in the Iringa and Mbeya regions as well as the stability of the power network. Similarly, this alternative will deny the benefits for the national economy in general and also in the project area, including hampering the prospective rural electrification programmes the government is considering. Conversely, the adverse impacts identified in Section 6 would also not be realised and Project funds could be invested in alternative projects such as rural infrastructure development including roads and electrification which would bring considerable benefits to local communities.

8.2 Alternative Transmission Line (TL) Options

During preliminary phase the following four Options were analysed and based on the outcome of the result (in terms of socio-economic and technical considerations) Option 4 has been chosen by the Client. Brief descriptions of these four options are described below.

8.3 Option 1

8.3.1 Route Description

Option 1 (Figure 17) is the TL located the furthest to the north. This TL generally follows a south-westerly direction from Iringa to Mbeya. The TL begins at an existing substation in Iringa, which is just south of the city centre, and follows an existing 220kV line. All four options follow the same path from the substation to just before the village of Tanangozi, where option 1 crosses route A 104 and continues on its own path. Option 1 stays to the north of route A104 for most of its trajectory. It also passes north of the villages of Tanangozi, Ifunda, Ulete and Mafinga. From this point, the TL begins to bypass Sao Hill Forest Plantation but also passes to the south of Makongomi and north of Bumilayinga.

Additionally, it is located between the villages of Ugenza and Iheme and south of Ikweha. Continuing its south-westerly route, the TL can be found between the villages of Iberege and Ihowanza, north of Igawilo and south of Mawindi and Rujewa. From Rujewa, it then passes near Mabuyuni and Mabadaga, cuts though a marsh and passes south of Kapunga and Mporo. The TL then beings to approach route A104 and follows it more closely until Mbeya. Most of the region is composed of a tree savannah and many rivers and streams are present. Access to the TL should be relatively easy due to the various roads in the region. As mentioned previously, route A104 is just south of the TL. Where, the TL is far from this road, many secondary roads and tracks are present.

8.3.2 Environmental and Social Impacts

This option has the shorter (287.3 km) length amount all four options, thus impacts such as increased vegetation clearing, soil erosion construction traffic and, construction noise are expected to be less than other options. However during survey it was noted that this option will have difficult access along an approximately 25 km segment in hilly terrain and will cross the existing railway line a minimum of 4 times which will increase the overall cost of the project. Also this option has an approximately 19 km segment in poorly drained soil with weak bearing capacities, which will cause soil erosion in those areas.

Summary of social impacts are provided below:

i) The proposed Option 1 of the transmission TL has an overall impact on 16 villages in Iringa region and 13 villages in Mbeya region.

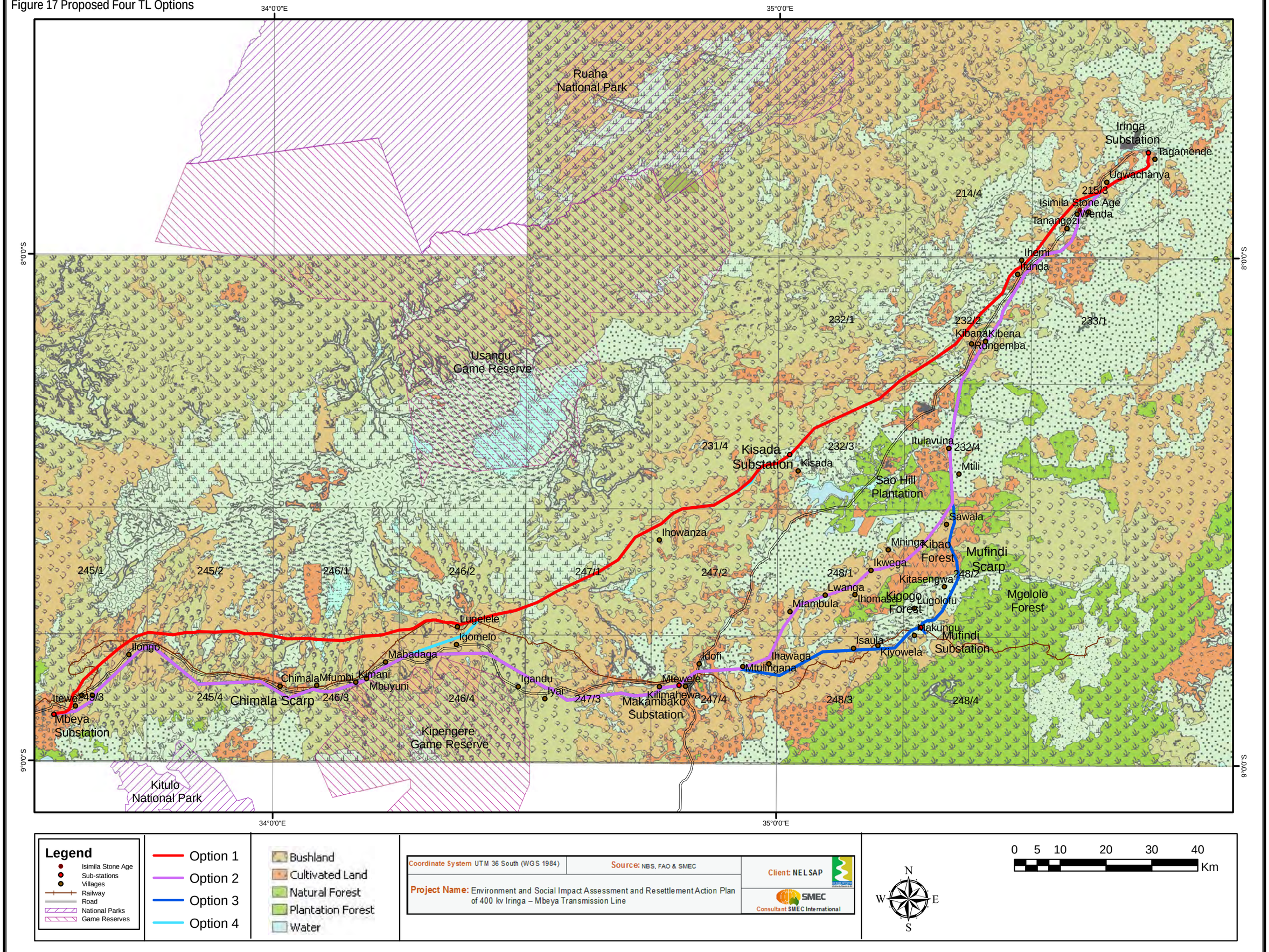
ii) Altogether there are 369 PAHs, out of which 59% live in Iringa region and the rest 41% in Mbeya region.

iii) In terms of impact on land and properties, it has been estimated that about 5405 acres of land belonging to PAHs is getting impacted, out of which 4524 acres are under agriculture.

iv) PAHs would lose 155 residential structures as these are getting impacted for the proposed transmission TL. There will be involuntary resettlement issues for all these 155 would be affected PAHs.

v) The number of impacted CPRs, in the form of graves, is 16.

Figure 17 Proposed Four TL Options



Legend

- Isimila Stone Age
- Sub-stations
- Villages
- Railway
- Road
- National Parks
- Game Reserves

- Option 1
- Option 2
- Option 3
- Option 4

- Bushland
- Cultivated Land
- Natural Forest
- Plantation Forest
- Water

Coordinate System: UTM 36 South (WGS 1984)	Source: NBS, FAO & SMEC
Project Name: Environment and Social Impact Assessment and Resettlement Action Plan of 400 kv Iringa – Mbeya Transmission Line	Client: NELSAP
	Consultant: SMEC International

N W E S

0 5 10 20 30 40 Km

8.4 Option 2

8.4.1 Route Description

Option 2 is the middle TL, which comprises mostly Option 1 but differs when it diverges from the existing transmission line just south of Kalinga. From this point the TL follows a south-westerly direction and passes north of the Villages of Mufindi, Kasanga and Manga. It re-joins option 3 and the existing transmission line just north of Makambako which is also near route A104.

This option takes a more direct path between Mufindi and Makambako bypassing the town of Makungu and thus having a shorter distance then option 1.

8.4.2 Environmental and Social Impacts

Due to the significant length (323.4 km – second longest) of this route, impacts such as increased construction traffic, vegetation clearing, soil erosion, construction noise will be greater and more evident over a larger area than for Options 1 and 4. Also this option will pass close to an airport runway at Sao Hill. Like Option 1, Option 2 also passes through a poorly drained sector but only for 4 km; however this option has the flexibility to connect with the existing substation at Makambako.

From a social perspective the following impacts are identified from the field survey:

i) The proposed Option 2 of the transmission TL has an overall impact on 34 villages in Iringa region and 20 villages in Mbeya region.

ii) Altogether there are 742 PAHs, out of which 73% live in Iringa region and the rest 27% in Mbeya region.

iii) PAHs would lose 323 residential structures as these are getting impacted for the proposed transmission TL.

iv) About 1225 acres used by PAHs for plantation of fruit trees such as guava, orange, mango, etc. There is likelihood of reduction in income of PAPs since many of them depend on horticulture activities.

8.5 Option 3

8.5.1 Route Description

Option 3 (Figure 17) is the TL located the furthest to the south. As previously mentioned the TL follows the same route as option 1 until the village of Tanangozi. From this point, option 3 continues to follow the existing 220kV transmission line in a south-westerly direction, but south of route A104. It passes south of Ifunda, Ulete and to the east of Mafinga. At this point, the TL turns to the south to bypass Sao Hill Forest Reserve, deviates from route A104 and passes east of Kalinga and Mufindi. Near the village of Makungu, the TL diverges from the existing line to avoid the village. It changes its path towards the west and then passes to the south of Makungu, re-joins the existing line not long after, and then passes near the villages of Kitandalilo and Manga. Just before the village of Makambako, the TL diverges once again from the existing line in order to bypass Makambako to the north. After contouring the village, the TL re-joins the existing line near the village of Ikingula as well as route A104.

Continuing its path, the TL passes south of Wangingombe and changes its direction to the north-west and then passes to the north of Ilembula and Iyayi. The TL then pursues a

direction towards the south-west, passing south of the villages of Igawa, Kimani, Ruaha and Chimala. From Chimala, the TL is located to the south of routeA104 and begins following a north-westerly direction. It passes south of Majombe, Igurusi and Mambi, - villages located along route A104. Not far from Mambi, the TL changes its path towards the south-west, passing east of Ilomba and Inyala. Access to the TL is easy for the majority of the route. The TL generally follows route A104 and where it diverges several secondary roads and tracks are present. Furthermore, the presence of the existing transmission line facilitates access.

8.5.2 Environmental and Social Impacts

Due to the significantly greater length (336.8 km) of this route, impacts such as increased construction traffic, vegetation clearing, soil erosion, construction noise will be greater and more evident over a larger area than for the other Options 1, 2 and 4. However like Option 2, this Option also has the flexibility to connect to the existing substations at Mufindi and Makambako. Though this option is easy to access, it has an approximately 7 km poorly drained segment. Also like Option 1, this proposed line will cross the railway line 4 times. Close proximity of Mufindi and Sao Hill airstrip also makes this option less favourable.

Summary of social impacts identified during field visits are presented below.

i) The proposed Option 3 of the transmission TL has an overall impact on 55 villages out of which 32 come under Iringa region and 23 villages in Mbeya region.

ii) The TL passes almost entirely through rural areas. Altogether there are 770 PAHs, out of which 71% live in Iringa region and the rest 29% in Mbeya region.

iii) In terms of impact on land and properties, it has been estimated that about 5156 acres of land belonging to PAPs is getting impacted, out of which 2869.5 acres are put to agriculture, 1493.5 acres under plantation and 793 under grassland.

iv) PAHs would lose 264 residential structures as these are getting impacted for the proposed transmission TL. All the residential structures need to be relocated.

v) The number of impacted CPRs, in the form of graves is 17.

8.6 Option 4 – The Chosen Option

8.6.1 Route Description

Proposed Option 4 (Figure 17) is a mix of options 1 and 3. It takes all the advantages of options 1 and 3 while avoiding the swampy area north east of Mbeya, which is difficult to access. It has a total length if 292 km compared to 336,8 km for option 3 and 323,4 km for option 2. This Option crosses the railway only once compared to 4 times for Option 1 and 3.

8.6.2 Environmental and Social Impacts

This is one of the shortest (292 km) routes among four and has a minimum number of angle points compare to other Options. Also approximately 3 km of the line pass through the poor drained section in this option, thus impacts such as increased vegetation clearing, soil erosion, construction traffic, and construction noise is expected to be lesser than all the other 3 options.

i) The proposed Option 4 of the transmission TL has an overall impact on 54 villages of which 25 are in Iringa region and 29 in Mbeya region.

ii) Based on the detailed survey during Phase II, a total of 5188 PAHs have been identified.

iii) In terms of impact on land and properties, it has been estimated that about 6382 acres of land belonging to PAHs will be impacted.

iv) PAHs would lose 21 houses/structures.

v) The number of impacted CPRs, in the form of graves, is 16.

8.7 Assessment of Alternatives

An assessment of the social and environmental impacts associated with the Project based on field inspections and literature sources indicates that most impacts associated with the Project are of a temporary nature resulting during construction and can be minimised by implementation of appropriate safeguards.

The Consultant's investigation indicates that, for the most part, the impact of the Project is expected to be temporary and acceptable provided appropriate mitigation measures are implemented.

Table 42 provides a comparison in terms of physical aspects while Table 43 provides a summary of the comparison of the environmental and social impact assessments for all four Options. These comparisons will be the basis for finalization of preferred Route Option selection for this project.

Table 42 Physical Comparison among all Proposed Options

Aspects	Option 1	Option 2	Option 3	Option 4
Distance (km)	287.3	323.4	336.8	292.2
Angle Point	76	76	87	68
Flexibility to connect to existing substation	-	Makambako	Mufindi and Makambako	-
Difficult Access(approx.)	25 km	Easy	Easy	12 km
Poorly Drained Section/soils with weak bearing capacities	19 km	4 km	7 km	3 km
Railway Crossing	4	1	4	1
Airport, landing runway	-	Sao Hill	Mufindi, Sao Hill	-

Table 43Summary of Social and Environmental Impacts for Options 1, 2, 3 and 4

	Impact	Option 1	Option 2	Option 3	Option 4	Impact phase
Physical	Permanent loss of land to establishment of towers (acre)	194.84	193.92	257.80	18	c
	No. of PAPs	369	742	770	1015	c

	Impact	Option 1	Option 2	Option 3	Option 4	Impact phase
	Loss of Houses/Structures (number)	155	323	264	21	c
	Dislocation of Graves	16	17	17	16	c
	RAP Cost (approximate - USD)	7,164,304.85	10,708,108	10,305,354.	2,232,460[3].	
	National economic benefit in Tanzania	+++	+++	+++	+++	o
Natural Environment	Vegetation Cover	- -	- - -	- - -	- -	c
	Soil Erosion	- - -	- -	- -	- -	c
	Climate Change	0	0	0	0	
	Wildlife	- -	- --	- --	- - -	c,o
	Landscape Aesthetics	- -	-	-	-	c,o
	Collision of Birds with line	- - -	-	-	- - -	o
	Hydrocarbons	- -	- -	- -	- -	c
	Water Resources	-	-	-	-	c,o
	Waste and waste water	-	-	-	-	c,o
Socio-economic	Land use	- - -	- -	- - -	- -	c
	Housing	- - -	- - -	- - -	- -	c
	Cultural Property Resources	-	- -	- -	-	c
	Tree Crops	-	- - -	- - -	-	c
	Access Road and Public Infrastructure	+++	+++	+	++ +	c,o
	Employment	+++	+++	+++	+++	c,o
Health and Safety	Air and dust	-	-	-	-	c
	Noise	-	- -	- -	-	c, o
	Electromagnetic field	-	-	-	-	o
	Safety	-	-	-	-	c,o
	HIV/AIDS	- - -	- - -	- - -	- - -	c

+ minor positive impact
++ medium positive impact
+++ major positive impact
- minor negative impact
-- medium negative impact
--- major negative impact
c -construction phase
o - operation phase

[3] Breakdown of RAP cost are provided in the RAP report

Based on analysis of data, out of the four alternative TLs the Client has chosen Option 4 as the most preferred option and advised the Consultant to carryout detailed ESIA on this chosen option.

9 ENVIRONMENTAL MANAGEMENT PLAN

This Section addresses mitigation measures, monitoring and institutional arrangements for the environmental management of the chosen transmission line.

The purpose of the environmental monitoring program is to ensure that the envisaged outcome of the Project is achieved and results in the desired benefits to Tanzania. To ensure the effective implementation of the EMP it is essential that an effective monitoring program be designed and carried out. The environmental monitoring program provides information on which management decisions may be based during construction and operational phases. It provides the basis for evaluating the efficiency of mitigation and enhancement measures and suggests further actions that need to be taken to achieve the desired Project outcomes. An environmental monitoring program is outlined in Section 9.4.

9.1 Proposed Environmental Management Measures

An outline of the environmental mitigation measures during the various stages of the Project is provided in the following Environmental Management Plan. It should also form the basis of the Construction Contractors EMP. Additionally, the Contractor should prepare and implement:

i) A drainage and erosion control plan;

ii) A rehabilitation plan for disturbed areas;

iii) A waste management plan;

iv) An intervention plan for contaminants accidental spills;

v) A fuel and other hazardous materials management plan.

Table 44Environmental Management Plan

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
PRE-CONSTRUCTION STAGE					
Community Consultation	Inform all communities along transmission route of schedule of implementation of Project and their rights to compensation	Throughout ROW	Before the commencement of construction	Contractor, Engineer, TANESCO	TANESCO
Clearances, Approvals and Permits	Only licensed quarries and sand suppliers shall be used.	Throughout ROW	Before the commencement of construction	Contractor	Engineer
	Obtain consent for borrow pit operation from the landowner with prior approval of the rehabilitation proposal of the borrow areas from the Engineer	Throughout ROW	Before the commencement of construction	Contractor	Engineer
	Provide a copy of all necessary permits to the Engineer.	Throughout ROW	Before the commencement of construction	Contractor	Engineer
	Adhere to all permit terms and conditions.	Throughout ROW	Throughout contact period	Contractor	Engineer
	Obtain written permission from private landholders to conduct activities on their land prior to commencing these activities, and provide copies to the Engineer.	Throughout ROW	As required prior to commencing the intended activities	Contractor	Engineer
Land and Building Acquisition	Final survey of all affected assets to update the RAP cost estimates prior to payment of entitlements. Complete all necessary land and building acquisition in accordance with RAP and entitlement Framework prior to the commencement of any construction works	Alignment of impact	Before the commencement of construction	TANESCO	TANESCO
	Provide copies of land acquisition details to the Engineer and Contractor.	Throughout ROW	Before the commencement of construction	TANESCO	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
Land and Building Acquisition	Provide a list of affected property owners to the project developer	Throughout ROW	Before the commencement of construction	TANESCO	TANESCO
Training	Organise environmental management and safety training. All Contractors and Supervising Consultant Field Supervisor/s shall attend the training.	On site	At least 1 month prior to commencement of construction	Supervision Consultant / Contractor	TANESCO
Implementation of Environmental Management Requirements	Preparation of Contractor Environmental Management Plan	All work sites and activities	Before commencement of construction	Contractor	Engineer
Health and Safety Issues	Preparation of a Health and Safety Plan for workers and impacted communities addressing issues including: • Measures to prevent the spread of HIV/Aids such as free condoms • Education of workers and impacted communities • Provision of safety equipment for workers • Use of child labour to be prohibited	All work sites	Before commencement of construction	Contractor	TANESCO
Construction Plants, Machinery and vehicles	Trial run of Contractor's plants, machinery and vehicles for ascertaining that their emission and noise levels conform to the standards stipulated by TBS or relevant Authorities..	Construction Camp / Vehicle depot	Before commencement of construction	Contractor	Engineer
Work site Survey, Pegging and Approval	Survey the proposed alignment with a level and peg the centreline.	Beginning of ROW.	Before commencement of construction	Contractor	Engineer
	Jointly inspect the surveyed alignment.	Along whole ROW	Before commencement of construction	Contractor / Engineer	Engineer
	Locate, peg out and seek approval from the Engineer for each	Throughout	Before	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	ancillary site prior to the commencement of related activities.	ROW	commencement of construction		
	Inspect and approve, if correct, all pegged ancillary sites.	Throughout ROW	Before commencement of construction	Engineer	Engineer
CONSTRUCTION STAGE					
Vegetation Clearance	Clearly marked area to be cleared along the RoW according to the design. Identify and mark vulnerable sites against soil erosion that will be left intact or receive selective clearing. Selective clearing, in which all vegetation is cleared from tower footing locations and from access and maintenance roads but only plants that exceed an acceptable height for line safety are removed elsewhere has immense benefits. Seek approval for clearing from the Supervision Engineer before clearing.	Throughout ROW	Before clearing the vegetation along a section of the RoW	Contractor	Engineer
	Inspect and approve all correctly located and pegged clearing sites. Vegetation clearance shall only be undertaken once consent to clear trees and valuable plants along the RoW has been obtained from each owner. Instruct all construction workers to restrict clearing to the marked areas and not to harvest any forest products for personal consumption.	Throughout ROW	Before clearing the vegetation along a section of the TL	Engineer	TANESCO
	Ensure that all clearing is undertaken with minimal disturbance to the surrounding environment, within the extent of approved sites only.	Throughout ROW	Before clearing the vegetation along ROW	Contractor	Engineer
	Stockpile cleared shrub foliage where possible within the ROW for later use as a brush layer.	Throughout ROW	Throughout construction period	Contractor	Engineer
	Contractor to submit their ESMP to the Engineer for review and approval and then they have to follow the plan.		Throughout construction period	Contractor	Engineer
Construction Traffic Management					

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
Construction traffic causing damage to local roads due to overloading, increase in congestion, and increased road safety hazards	Contractor and subcontractors, to use appropriate vehicles, and to comply with legal gross vehicle and axle load limits. Contractor to repair damage at own expense.	Throughout Project area	Throughout Construction period	Contractor	Engineer
Road safety hazards associated with temporary traffic diversions	Contractors to minimise road safety hazards and inconvenience to other road users by taking all appropriate measures	All traffic diversion stretches	Throughout Construction period	Contractor	Engineer
Erosion	Clearly mark the areas to be cleared of vegetation before clearing commences. No clearing of vegetation shall occur outside of these areas.	Each 1 km of the ROW	Prior to commencement of vegetation clearing	Contractor	Engineer
	Wherever possible avoid locating construction areas, access tracks and construction camps on steep slopes / productive agricultural land.	All Project area	Prior to commencement of construction	Contractor	Engineer
	Identify vehicle access tracks and parking areas prior to commencement of construction. Ensure construction workers are aware of the locations of these areas and that vehicles are restricted to these areas.	All Project areas	Prior to commencement of construction	Contractor	Engineer
	Prior to commencement of works construct necessary temporary/ permanent erosion and sedimentation control structures.	All Project areas	Prior to commencement of works	Contractor	Engineer
	Ensure topsoil is left in a non-compacted condition following completion of works. Ensure re-vegetation at the earliest time.	At all work sites	Immediately following construction work	Contractor	Engineer
	Following completion of works prepare areas for rehabilitation by revegetation or engage local community to plant vegetation.	At all work sites	Immediately following completion of works	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	Where culverts or pipes have been installed, line water flow exit points with stone or cement rip-rap for a length of two metres.	At cross-drainage structure with erosion potential	During construction	Contractor	Engineer
Sedimentation and Siltation	Identify and map all areas where soil disturbance will occur. For each of these areas, identify appropriate sediment control structures and install structures prior to commencement of work.	Throughout alignment	Prior to commencement of construction work	Contractor	Engineer
	If possible, schedule works requiring large areas of soil disturbance or newly formed embankments to avoid the rainy season.	Throughout alignment	Prior to commencement of construction	Contractor	Engineer
	Where possible a bund or trench shall be constructed on the down slope of the construction areas to divert run-off to sediment control structures. The bund or trench shall be removed upon completion of construction works.	At proposed cross-drainage structure locations	Prior to commencement of work Immediately following completion of construction	Contractor	Engineer
Water pollution	• Ensure that potential sources of petro-chemical (including bituminous materials) pollution are handled in such a way to reduce chances of spills and leaks. • Train work crews in safe handling of petro-chemicals. • Minimise soil sedimentation as outlined under sediment control. • Contractor to make suitable arrangements for water requirements and to provide alternative supply to any users affected by contractor's abstraction of local water source.	Throughout alignment	Prior to commencement of construction	Contractor	Engineer
Noise	• Use well maintained equipment (with mufflers where appropriate). • Use noise screens or mounds near residences, schools and health centres.	Throughout alignment	Throughout construction period	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	• Carry out noisy construction activities during daylight. • Advise local people when there will be unusually high levels of noise.				
Protection of sensitive environmental areas	• Identify natural areas in site plans, especially environmentally sensitive or ecologically fragile areas. • Locate construction sites/activities away from sensitive areas. • Ensure those involved in construction are aware of these areas and the usage limits of such areas. • Provide training to construction teams to ensure an understanding of the requirements regarding environmental protection of sites.	Throughout alignment	Prior to commencement of works Throughout construction	Contractor	Engineer
Protection of vegetation	• Identify vegetation that will need to be removed/protected. • Remove identified trees in such a way as to minimise damage to surrounding vegetation. • Ensure the construction crew is aware remaining vegetation must not be touched or damaged.	Throughout Alignment	During site preparation Prior to construction Prior to commencement of construction	Contractor	Engineer
Worker's Camp	Contractors to prepare for approval detailed site environmental plans for the base camps and other work sites, which make adequate provision for safe disposal of all wastes, and prevention of spillages, leakage of polluting materials etc. Contractor to be required to pay all costs associated with cleaning up any pollution caused by his activities and to pay full compensation to those affected.	Before construction starts Post-use of the site	Throughout construction	Contractor	Engineer
Archaeological sites	Fence off archaeological sites, if any sighted / uncovered during works and report it to the appropriate authority.	At all Project sites	Prior to the commencement of works and throughout construction	Contractor	Engineer
Socio-environmental	• Advise the local community of project plans in advance of construction, and involve them in the site / construction planning	For the whole	Prior to commencement of	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
issues	process.	Project	works		
	• Avoid disturbances near residential areas where possible.		Throughout construction	Contractor	Engineer
	• Identify culturally sensitive areas and avoid disturbing them.	At all Project sites	Prior commencement and throughout construction	Contractor	Engineer
	• Control run-off and manage sediment near residential areas.		Throughout construction	Contractor	Engineer
	• Arrange for local people to be employed and trained.		Prior to commencement of, and throughout construction		
	• Include women, poor & vulnerable groups in the implementation of the Project activities.	For the whole Project	Prior to commencement of, and throughout construction		
	• Negotiate and agree on with community about disposal areas and stockpile sites.		Prior to commencement of, and throughout construction		
Drainage	• Survey and peg all designed drainage works prior to construction. Outlet drains into existing stable drainage lines, or where this is not possible, consult with adjoining down slope landowners on mutually acceptable locations for drain outlets. • Jointly inspect the pegged drainage works. • Construct all designed drainage works prior to, during or immediately following excavation work in order to minimise the erosion hazard.	Throughout Alignment	Beginning with and continuing throughout construction	Contractor Engineer / Contractor Contractor Contractor	Engineer TANESCO Engineer Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	• Inspect all works and ancillary sites for drainage and erosion problems after each major storm event during the period of construction. Repair all failed drains and take other appropriate action as directed by the Engineer.				
Topsoil Saving and Re-use	• Save all available topsoil from within the ROW and other borrow pit areas and re-use it for site rehabilitation approved by the Engineer. • Strip and stockpile topsoil from all ancillary sites that are to be disturbed. • If topsoil is to be stockpiled, keep it separate from sub-soil material. • Sow a cover crop on each top-soiled battery within 2 days of top-soiling.	Throughout Alignment	Throughout construction	Contractor	Engineer
Disposal of Materials	• Identify, peg and seek approval from the Engineer for permissible disposal locations. • Inspect and approve all correctly located disposal locations. • Instruct the construction workforce on the approved fill/material disposal locations and strictly supervise the correct placement of fill at these sites.	Throughout Alignment	Throughout construction	Contractor Engineer Contractor	Engineer TANESCO Engineer
Reinstatement of Services	• Inventory all services to be reinstated. • Liaise and reach agreement with affected landowners, local authorities, public undertakings and local people regarding services to be maintained, temporarily cut and reinstated, including the timing and location of cuts and reinstatements. Obtain written permission from affected landowners / local people regarding the temporary cessation of services. • Maintain or provide temporary services during construction, including temporary water supplies. • Progressively reinstate or repair all interrupted services to their previous capacity.	Throughout Alignment	Prior to interruption of any services Following construction	Contractor/Engineer	Engineer/TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	• Inspect and certify the adequate reinstatement of services.				
Workforce Camps	• Locate, peg and seek approval from the Engineer for workforce camp sites. • Inspect and approve all correctly located camp sites. • Provide and maintain proper drinking water, worker's health check-up, and sewage and waste disposal facilities at the camps. • Recycle or dispose of solid waste as per approved waste management plan.	Construction camp lease area	Throughout construction	Contractor Engineer Contractor	Engineer TANESCO Engineer
Workforce Management	• Engage local people to work as casual labourers. About 80% are required to be recruited locally. Importantly, TANESCO is expected to ensure that local workers including youth and women are given first priority for unskilled jobs and, when qualified, for semi-skilled and skilled positions. • Liaise with affected communities regarding proposed construction activities. • Ensure workers act in a responsible manner to local people and do not harvest or take personal resources, forest products or wildlife. • Ensure that no or minimal wood is burnt by any construction workers on or off site. • Provide kerosene or gas for all workforce cooking needs. • Restrict working hours near habitations to between 06.00-18.00.	Near Construction camp sites	Before and during building of construction camps	Contractor Contractor	Engineer / TANESCO
Dust Nuisance	• Vehicles delivering materials shall be covered to reduce spills and dust blowing off the load. • Use of water tankers to control dust at construction sites adjacent villages/houses	Throughout Alignment	Beginning with and continuing throughout construction	Contractor	Engineer
Gaseous Air	• Vehicles and machinery will be regularly maintained so that	Throughout	Beginning with and	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
Pollution	emissions conform to National Standards.	Alignment	continuing throughout construction		
Noise	• Workers in vicinity of strong noise will wear earplugs and their working time should be limited. • Construction would be stopped from 21:00 to 06:00 hrs at construction sites located within 150 m of residential areas. • Machinery and vehicles will be maintained to keep noise at a minimum.	Throughout Alignment	Beginning with and continuing throughout construction	Contractor	Engineer
Siltation	• Construction materials containing fine particles e.g. aggregates, limestone etc. will be stored in an enclosure away from water bodies to ensure that sediment laden water does not drain into nearby water courses.	Near cross-drainage structures and water bodies	Throughout construction	Contractor	Engineer
Alteration of Drainage	• In sections along water courses, earth and construction waste will be properly disposed of so as to not block rivers and streams, resulting in adverse impact on water quality.	Near cross drainage structures	Whenever encountered during construction	Contractor	Engineer
	• All necessary measures will be taken to prevent earthworks from impeding cross drainage at rivers/ streams, canal/existing irrigation and drainage systems.	Near cross drainage structures	Whenever encountered during construction	Contractor	Engineer
Sanitation in Construction Camps	• Camps shall be located at a minimum distance of 100 m from water sources. • Sufficient measures will be taken in the construction camps, i.e. provision of garbage tanks and sanitation facilities including septic tank and soak pits • Drinking water will meet National Standards. • Special attention shall be paid to the sanitary condition of camps.	At all construction and camp sites	Before and during building of construction camps Throughout construction period	Contractor	Engineer
Increase in Water-borne, Insect-borne Communicable	• Make certain that there is good drainage at all construction areas, to avoid creation of stagnant water bodies especially in urban/industrial areas, including water in old tires.	At all construction and camp sites	During construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
Diseases	• Provide adequate sanitation and waste disposal at construction camps. • Provide adequate health care for workers and locate camps away from vulnerable groups				
Cultural Resources	• If archaeological relics or remains are discovered, the appropriate authority should be notified immediately. The construction should be stopped until the authorised organisation assesses the remains and approves continuation of work after appropriate measures are implemented. • Archaeologists will supervise any necessary excavation to avoid any damage to the relics.	Wherever such archaeological remains are discovered	Throughout construction	Contractor with National Archaeological Organisation	Engineer / TANESCO
Hazards and Hazardous Materials	• Safely handle and store hazardous materials. • Seek directions from the Engineer for the disposal of hazardous materials. • Provide disposal directions to the Contractor when requested. • Clean up spills of hazardous materials immediately. • Suppress fires on or adjacent to construction or ancillary sites. • In case of spill of hazardous materials, relevant departments will be informed at once and will deal with it in accordance with the spill contingency plan.	Throughout Alignment Substations	Throughout construction as and when required	Contractor Contractor Engineer Contractor Contractor	Engineer Engineer TANESCO Engineer Engineer Engineer / TANESCO
Soil Erosion	• On slopes and other suitable places along the alignment, trees and grass shall be planted • On sections with high filling and deep cutting, slopes shall be covered by mulch walls and planted with grass.	Primarily at cross drainage structures	Upon completion of construction activities at these sites	Contractor Contractor	Engineer Engineer
Compaction of Soil	• Construction vehicles should operate within the Alignment of Impact i.e. approx. 20.0 m to either side of the centre line to avoid damaging soil, and vegetation.	Throughout Alignment especially in productive	During Construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
		areas			
Loss of trees	• Tree clearing outside ROW should be avoided beyond what is required for construction activities and / or to provide adequate conductor clearance. • All vegetated areas cleared for temporary work sites will be revegetated according to a Re-vegetation Action Plan.	Throughout Alignment Areas of proposed tree plantings	During clearing / grubbing activities After completion of construction activities	Contractor Contractor	Engineer Engineer
Wildlife	• Carry out selective clearing along the TL corridor. For example around tower footing locations and access/maintenance roads for vegetation especially miombo and acacia woodland that exceed an acceptable height for line safety. Retain vegetation in areas which have immense benefits for erosion, dust control, and animal movement and habitat with special attention on wildlife migratory route between Igando and Igawa. • Enforce a no-hunting rule for the project workforce. • Work out specific measures in the design including tower placement, location of camps and workshops away from corridor. • Minimize the need for tree removal. • Careful timing of project activities to avoid coinciding with wildlife movement across the corridor. Accelerate work when crossing the corridor so as to minimize the duration of disturbance. • Make the wayleave as narrow as possible in forested areas by design works. • Avoid passing the line through closed canopy forest or miombo woodland • Survey wayleave periodically after construction and control or remove invasive species detected. • Limit the number of towers located in wetlands for example between Chimala and Igurusi. • Implement sufficient measures against triggering accidental bush	Throughout Alignment but especially near KPRG and Ruaha national park.	Construction and Operation	Contractor	Engineer / TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	fires. • The contractor/developer shall be obliged to create awareness about wildlife values among the construction workers particularly during animal migration seasons. Close collaboration between the developer and Ministry of Natural Resources and Tourism are required to identify the best method to align the proposed TL inside MKGR.				
Bird collision	• Use marked devices and other means on wires. On marked lines birds change course more frequently than on un-marked lines. These markers can be conducted in sites frequently passed by migratory birds particularly between MKGR and Igurusi IBA. Marking decreases flight intensity and collision frequency with birds. • In areas with high bird activity (between MKGR and Igurusi) and where the new line parallels the existing 220-kV line, towers should be used that will avoid having the new conductors at different heights than the old one. • In potential bird migratory routes, technical measures are also available, for instance attaching devises to the conductors and towers to make them more visible to birds and to discourage resting and climbing by animals at sections of the line where such problem has been experienced or can be envisaged. • Minimise the number of conductor levels across routes used migratory birds particularly between MKGR and Igurusi, if possible. • Limit the number of towers located in wetlands. For example between Chimala and Igurusi. • The shield wire should be as close as possible to the highest conductor level. • Place markers on shield wires in areas where bird collision potential is high. • Monitor avifauna along the transmission line to detect any	Throughout Alignment but especially in wetland areas	Construction and Operation	Contractor	Engineer / TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
	negative ecological effects.				
HIV/AIDS	• NGO shall be hired to carry out an awareness campaign along the project area. • The contractor shall be obliged to test all workers periodically on HIV/AIDS, to oblige them to participate at periodical information meetings, and to offer them condoms for free. • District councils, NGOs/CBOs and TANESCO should continue to inform workers and local communities on HIV/AIDS pathways that cause the spread of the disease. • NGOs should establish and support voluntary counselling and testing centres for HIV/AIDS as well as encourage local people and workers to use such services. • Information materials on HIV/AIDS should be posted at all work sites and villages along the wayleave. • Distribution of good quality condoms etc.	Throughout Alignment but especially in all 56 villages and surrounding areas	Construction and Operation	Contractor	Engineer / TANESCO
POST-CONSTRUCTION (OPERATION) STAGE					
Re-vegetation	• Progressively sow all disturbed construction and ancillary site surfaces with a cover crop mix immediately following final use of each ancillary site. • Progressively implement re-vegetation works, commencing in the correct planting season. • Regularly monitor the effectiveness of re-vegetation measures.	Throughout Alignment	After completion of every 10km of ROW After completion of every 10km of ROW section Every six months for two years after re-vegetation	Contractor Contractor Contractor	Engineer Engineer TANESCO
Management Plan for Maintenance of ROW	• The ROW will require periodic maintenance to maintain adequate clearance between conductors and vegetation	Along ROW	Prior to the start of operations	TANESCO	

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision /\
Site decommissioning	• Establish a site revegetation plan. Where possible involve local community to provide materials and implement revegetation. • The revegetation plan shall include: • Name(s) of contact landowner/community group • Summarised outcome of discussions, and decisions on what will be planted; and • List of seedlings/stock to be provided and by whom.	All ancillary sites	Immediately following completion of construction work	Contractor	Engineer
Ancillary Site Rehabilitation	• Rehabilitate ancillary sites such as borrow areas, camp sites, material storage sites etc. within 1 month of their final use, including the removal of structures, refuse, stockpiles and other temporary features. Revegetate the sites with a cover crop and permanent vegetation as appropriate.	At all ancillary sites	Within 1 month of final use of the ancillary site	Contractor	Engineer / TANESCO

9.2 Approximate Budget for ESMP

An estimated ESMP budget based on the feasibility report is provided below. Please note that the costs of the compensation and resettlement measures are addressed in the distinct RAP report.

Table 45 Estimated ESMP Cost

Impact on/by	Mitigation/enhancement measures associated with cost	Responsible institutions	Project phase	Estimated cost* (USD)
Vegetation clearance, habitat diversity	• Selective clearing in the wayleave • Manual clearing instead using heavy machinery	Contractor	c, o	30,000
	• Replantation	TABESCO, communities	o	5,000 p.a.
Bird Collision	• Use marked devices and other means on wires. • Fit flapper devices on the shield devices	Contractor	p, c	15,000
	• Minimize number of conductor levels • Shield wires should be as low as possible	Design Consultant, TANESCO	p	1,000,000
Soil erosion	• Selective clearing in the wayleave	Contractor	c, o	Budget provided under vegetation clearance
Health and safety	• Preparation and implementation of a health, safety, environmental and social management plan approved by TANESCO	Contractor	c	10,000
HIV/AIDS	• NGO shall be hired to carry out an awareness campaign along the project area. • The contractor shall be obliged to test all workers periodically on HIV/AIDS, to oblige them to participate at periodical information meetings, and to offer them condoms for free. • District councils, NGOs/CBOs and TANESCO should continue to inform workers and local communities on HIV/AIDS pathways that cause the spread of the disease. • NGOs should establish and support voluntary counselling and testing centres for HIV/AIDS as well as encourage local people and workers to use such services. • Information materials on HIV/AIDS should be posted at all work sites and villages along the wayleave. • Distribution of good quality condoms etc	District health authorities, NGOs, TANESCO, Contractor	c, o	50,000
Other complaints	• Rural electrifications of villages	Design Consultant,	p	1,500,000

Impact on/by	Mitigation/enhancement measures associated with cost	Responsible institutions	Project phase	Estimated cost* (USD)
		TANESCO		

*at this stage, the estimated cost is provided based on the feasibility report.
c: construction phase; o: operation phase

9.3 Institutional Arrangements

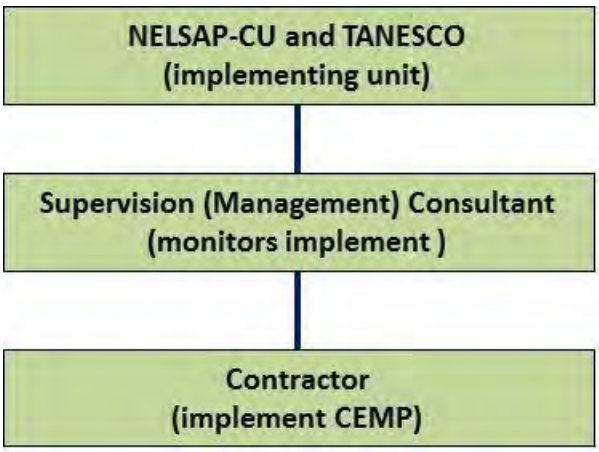
The Nile Basin Initiative (NBI) is the executing agency of the study through its secretariat (Nile-SEC) based in Entebbe (Republic of Uganda). The NELSAP Coordination Unit (NELSAP-CU) is the implementing agency of the study in close coordination with the Project Steering Committee (PSC) composed of members from TANESCO. NELSAP is responsible for overall management of the study while the PSC is responsible for the technically aspects of the study.

Thus the Nile Basin Initiative (NBI) together with TANESCO has been vested with the overall responsibility for the coordination, planning and implementation of the Project. The actual implementation of the environmental monitoring and management and land acquisition and resettlement components will be carried out by TANESCO.

It is anticipated that construction will involve a Supervision (Management) Consultant with responsibilities under the direction of NELSAP-CU and TANESCO of directly supervising the Contractor implementing the works.

The EMP is based on NELSAP-CU and TANESCO having the overall responsibility for the coordination, planning and implementation of the Project as well as the actual implementation of the environmental monitoring and management and land acquisition and resettlement components. It is also based on the appointment of a construction Supervision (Management) Consultant with responsibilities under the direction of NELSAP-CU and TANESCO of directly supervising the Contractor implementing the works (as outlined in the following Figure).

Figure 18: EMP Organization Chart



9.4 Training

The following Table outlines the proposed training for TANESCO staff as well as employees of the Contractor, which was prepared in consultation with a TANESCO representative. The training is aimed at the practical aspects of environmental monitoring and management.

Table 46 Training for TANESCO and Contractor Staff

Sl No.	Training Recipients	Mode of Training	Environmental Aspects to be Covered	Training Conducting Agency
1	TANESCO Environmental Staff	Lecture System Workshops Group Discussion Visit to case study	• Environmental overview • Environmental regulations & acts • Environmental issues associated with power transmission projects • Environmental Management Plans • Environmentally sound construction management	Environmental and Social Specialists, Supervision Consultant
2	Contractor's Staff	Seminar Workshop Lectures	• Environmental overview • Environmental impact assessment • Environmental Management Plan implementation • Environmental Regulations & Acts • Environmental pollution associated with power transmission projects • Environmentally sound construction management • Power transmission projects and environmental issues	Environmental and Social Specialists, Supervision Consultant TANESCO Environmental Units
3	TANESCO Operation/Maintenance Staff	Seminar Workshop Lectures	• Environmental Management Plan implementation • Environmental pollution associated with power transmission projects • Best environmental practices	Environmental and Social Specialists, Supervision Consultant TANESCO Environmental Units

9.5 Monitoring

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

i) Visual observations;

ii) Selection of environmental parameters at specific locations;

iii) Sampling and regular testing of these parameters.

Monitoring should be undertaken at a number of levels. Firstly, it should be undertaken by the Contractor at work sites during construction, under the direction and guidance of the Supervision Consultant who is responsible for reporting the monitoring to the implementing agencies, TANESCO. It is not the Contractor's responsibility to monitor land acquisition and compensation issues. It is recommended that the Contractor employ one

local full time qualified environmental inspector for the duration of the Contract capable of undertaking the required monitoring or to supervise an external monitoring group (such as a university) to undertake the monitoring on behalf of the Contractor. The Supervision Consultant should include the services of an international environmental and monitoring specialist on a part time basis as part of their team.

TANESCO should in turn undertake independent monitoring of selected parameters to verify the results of the Contractor and to audit direct implementation of environmental mitigation measures contained in the EMP and construction contract clauses for the Project. TANESCO also has the direct responsibility to implement and monitor land acquisition and compensation issues as outlined in the RAP. Their Project teams should include an environmental monitoring and management specialist as well as a sociologist experienced in land acquisition and compensation issues. A total of 6 person months per year could be allocated by each organisation to the Project during the pre-construction and construction stages. Periodic ongoing monitoring will be required during the life of the Project and the level can be determined once the Project is operational.

In general monitoring is the responsibility of the project proponent, NEMC and the responsible sector ministries and responsible environmental agencies. NEMC has the overall responsibility for issuing approval for the Project and ensuring that their environmental guidelines are followed during Project implementation. Their role therefore is to review environmental monitoring and environmental compliance documentation submitted by the implementing authorities and they would not normally be directly involved in monitoring the Project unless some specific major environmental issue arose. There might also be included elements of self-monitoring by the contractor but this will have to be controlled by one of the above mentioned parties. The self –monitoring will in particular play an important part of the Construction Phase Monitoring. It is important that the relevant District officers are given a key role in the monitoring activities. In the case where the local capacity and competence is insufficient for the purpose it should be considered to engage national level NGOs in the process.

Environmental monitoring of the following parameters is recommended as a minimum for the Project.

9.5.1 Water Quality Monitoring

Construction camps are often a source of significant surface and groundwater pollution if not managed and sited properly. It is recommended therefore that the Contractor undertake monitoring of any effluent, waste water, or rainfall runoff discharged from campsites. This would encourage the Contractor to implement proper wastewater treatment facilities on site through the use of settling and treatment ponds.

The parameters to be analysed should include the following:

- pH
- EC
- SS
- Turbidity
- Colour
- NH_4^+
- NO_3^-
- Total P
- Fe

- Al
- DO
- BOD
- Grease and oil
- Total coliform

If the discharged effluent does not meet the Tanzanian standards then the Contractor must take further treatment measures or refrain from discharging effluent directly into nearby watercourses.

9.5.2 Noise Levels Monitoring

Although noise during construction is not expected to be a problem with the Project, periodic sampling of Contractor equipment and at work sites should be undertaken to confirm that it is not an issue. Noise level monitoring could be supplemented by consulting with Project Affected People in the first instance to identify the level of monitoring required.

9.5.3 Soil Erosion Monitoring

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

9.5.4 Monitoring of Vegetation Clearing

Unique stands of indigenous trees should not be removed for the establishment of towers. The Contractor's environmental inspectors should make sure that the unique tree stands identified during the present study are not removed and that the clearing is confined within the design lines.

9.5.5 Monitoring of Bird Collisions

Monitor the bird population/movement around the wetland and bird hot spot. Also, avifauna along the transmission line needs to be monitored to detect any negative ecological effects.

9.5.6 Monitoring Rehabilitation of Work Sites

The Contractor's environmental inspectors should ensure that areas used as temporary campsites for workers are progressively rehabilitated, as they are no longer required. Once a site is rehabilitated it should be "signed off" by relevant authority.

9.5.7 Monitoring of Accidents/Health

The Contractor's environmental inspectors must make sure that appropriate signs are posted at appropriate locations/positions to minimise/eliminate risk of electrocutions.

In addition the environmental inspectors should make sure that:

i) Measures to create awareness regarding sexually transmitted diseases, primarily HIV/AIDS, and other diseases such as malaria, schistosomiasis, leishmaniasis, and onchocerciasis are taken;

ii) Preventive measures to reduce/eliminate malaria, schistosomiasis, leishmaniasis, onchocerciasis and other infections where/when ever appropriate are put in place;

iii) Periodic health surveys are carried out along the transmission route;

TANESCO will have overall responsibility to oversee that all environmental measures are put in place and that regulations are enforced. The construction supervision consultant should assist TANESCO in this process in order to make sure that contractors fulfil the environmental requirements.

The following parameters could be used as indicators:

i) Presence of posted visible signs on towers, etc.;

ii) Presence of sanitary facilities at campsites;

iii) Level of awareness of communities pertaining to dangers/risks associated with power lines;

iv) Presence/absence of unique stands of indigenous trees along the power line establishment route; and

v) Accident reports. Records on actual accidents associated with the establishment of the transmission line could be compiled with the help of local peasant association officials, teachers/students of local schools.

Table 47 Monitoring Plan

Environment Component	Project Stage	Parameter	Standard	Location	Frequency	Duration	Implement-ation	Supervision
Land Acquisition and Compensation	Pre-construction	Ensure compensation paid as per RAP	RAP	Along ROW for all PAPs	Monthly until complete		TANESCO /NELSAP	TANESCO
Water Quality	Construction	pH, EC, SS, turbidity, colour, NH4+, NO3-, total P, Fe, Al, DO, BOD, grease & oil, total coliform	standards recommended by NEMC and Tanzania Bureau of Standards (TBS)	Construction Camps	Monthly during operation of camp		Contractor	Supervision Consultant
Noise Levels	Construction	Noise levels on dB (A) scale	standards recommended by NEMC and TBS	At equipment yards	Monthly as required by Supervision Consultant		Contractor	Supervision Consultant
		Noise levels on dB (A) scale	standards recommended by NEMC and TBS Tanzania	Noise level meter kept at a distance of 15m from edge of ROW	As directed by the Supervision Consultant	Readings to be taken at 15 second interval for 15 min every hr and then averaged	Contractor	Supervision Consultant

Environment Component	Project Stage	Parameter	Standard	Location	Frequency	Duration	Implement-ation	Supervision
Soil Erosion	Construction	Turbidity in storm water	standards recommended by NEMC and TBS Tanzania	As identified	Pre-monsoon and post monsoon seasons		Contractor	Supervision Consultant
Vegetation Clearing	Construction	Monitor clearing to ensure consistent with EMP	EMP	Along ROW and works areas	As required		Contractor	Supervision Consultant
Bird collisions	Construction and Operation	Monitor the bird population/movement around the wetland and bird hot spot.	EMP	Along ROW and wetlands	Once a year, preferably in the rainy season		Contractor	TANESCO
Rehabilitation of Work Sites	Construction	Monitoring to ensure all work sites are progressively rehabilitated	EMP	Work camps, material storage sites, along ROW	As required		Contractor	TANESCO
Health	Construction	Signs, posters displayed, health awareness lectures, mosquito nets in malaria prone areas for each worker, health checks for workers	EMP	Along ROW, work camps and surrounding areas	Monthly		Contractor	TANESCO
Accidents	Construction	Safety training for workers, accident reports, community consultation	EMP	Along ROW	Monthly		Contractor	TANESCO

Table 48 Approximate estimated budget for monitoring

Component	Item	Unit Cost (USD)	Quantity	Approximate Total Cost (USD)
Water Quality	At locations specified in monitoring plan	50	500 samples	25,000
Noise Levels	At equipment yards, along ROW	15	100 samples	1,500
Soil Erosion	Measurement of turbidity	10	100 samples	1,000
Bird collisions	Monitor the bird population/movement	Lump sum	Once a year	40,000

Component	Item	Unit Cost (USD)	Quantity	Approximate Total Cost (USD)
	around the wetland and bird hot spot			
Contractor Staff	Environmental Inspectors	1,500 / person / month	2 full time equivalent staff for duration of Construction (10 months)	36,000
TANESCO Staff	Environmental monitoring staff	2,000 / month	1 full time equivalent staff for duration of Project (20 months)	40,000[4]
Capacity Building and Training	As per training program		Transport, equipment etc.	20,000[5]

[4] This was discussed with TANESCO representatives.
[5] This was discussed with TANESCO representatives.

10 CONSLUSION

The proposed transmission line is a project of major importance for the infrastructure development and the socio-economic development of Tanzania in general and the Iringa – Mbeya region in particular.

This ESIA concludes that the proposed TL Project will not cause significant social and environmental impacts. Most adverse impacts will be of a temporary nature occurring during the construction phase and these can be managed to acceptable levels. Implementation of the EMP will ensure that the overall benefits from the Project will greatly outweigh any adverse impacts.

The project will provide opportunities for a number of jobs in the construction phase and a few jobs on a permanent basis, thus having a positive local socio-economic impact. Verifiable effects will be minimal, as long as the construction of this line will not be combined with an electrification of the villages along the line. A least cost solution in time for this issue is part of the recommendations.

It is recommended to carry out monitoring at 4 stages of the project. Pre-construction monitoring will be necessary to improve the knowledge basis for the preparation of the final Resettlement Action Plan. Monitoring will be needed to control the environmental performance of the contractor during the construction phase. It is advised to monitor the development a few years after the construction has finished. This will improve the knowledge of transmission line related impacts and if necessary result in new or modified mitigation requirements.