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UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR THE PROPOSED 292KM IRINGA-MBEYA 400KV POWER TRANSMISSION AND ASSOCIATED SUBSATIONS AT KISADA (MAFINGA) AND IGANJO (MBEYA) IN IRINGA, NJOMBE AND MBEYA REGIONS, TANZANIA

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DECLARATION OF EXPERTS

We hereby certify that the information given to this updated ESIA report is correct and true to the best of our knowledge. The following individuals involved in the updating of ESIA report as part of study team:

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ACRONYMS AND ABBREVIATIONS

Al	Aluminium
a.s.l	Above sea level
BOD	Biological Oxygen Demand
BP	Bank Procedures
CO_2	Carbon Dioxide
CC	City Council
CPR	Cultural property resources
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
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
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
GRM	Grievance Redress Mechanism
Ha	Hectare
IAP	Interested and Affected Parties
kg	Kilogram
km	Kilometer
kV	Kilo Volt
l	Litre
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
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_{4+}	Ammonium
NO3	Nitrous Oxide
NOx	Oxides of Nitrogen
OP	Operational Policies
OSHA	Occupational Safety and Health Administration
PAPs	Project Affected Persons
PAH	Project Affected Households
PM	Particulate matter

PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RAS	Regional Administrative Secretary
RBWO	Rufiji Basin Water Office
RC	Regional Commissioner
RM	Regional Manager
RoW	Right of Way
RPF	Resettlement Policy Framework
SAPP	Southern Africa Power Pool
SMEC	Snowy Mountains Engineering Corporation
SS	Suspended Sediment
S/S	Substation
t	Ton
TANESCO	Tanzania Electric Supply Company Limited
TAWIRI	Tanzania Wildlife Research Institute
TAWA	Tanzania Wildlife Authority
TANAPA	Tanzania National Parks Authority
TAZAM	Tanzania Zambia Highway
TAZAMA	Tanzania Zambia Pipeline Authority
TAZARA	Tanzania Zambia Railway Authority
TBS	Tanzania Bureau of Standards
TC	Town Council
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
WEO	Ward Executive Officer
WHO	World Health Organization
WL	Wayleave
WMA	Wildlife Management Area
μm	micrometers

EXECUTIVE SUMMARY

Background

This Executive Summary is associated with the updated Environmental and Social Impact Assessments (ESIA) carried out for the proposed high voltage 400kV TL from Iringa-Mbeya overhead transmission line which is about 292km long. This is part of Iringa-Mbeya-Tunduma-Sumbawanga high voltage 400kV TL project. The proposed 400 kV Iringa-Mbeya transmission line project will in future link with a 400kV Backbone Iringa to Shinyanga which will facilitate the smooth power transfer to the northern part of the country and neighboring countries such as Zambia in south and Kenya and Uganda in North. The proposed project is in line with other projects currently under implementation including the 400 kV Iringa - Shinyanga (through Singida) and the 400 kV Kenya (Nairobi) – Tanzania (Arusha – Singida). Currently the segment between Mbeya and Iringa there is a 220kV transmission line which appears a weak link which needs to be reinforced. Also, in terms of power quality and reliability issues most of power lines here in Tanzania suffer from voltage depressions, surges and sometimes total outages. The situation calls efforts for construction of new power transmission lines in addition to improve the power transferring capabilities.

In addition, TANESCO is in the process of implementing construction of Mbeya – Tunduma – Sumbawanga 400kV Transmission Line (320 km) and associated substations at Mbeya, Tunduma and Sumbawanga. The project will enter at the proposed Tunduma (Nkangamo area) substation whereby one circuit will interconnect with Zambia at Tunduma (Zambian border) and the other circuit will proceed to Sumbawanga. The project has a regional impact as it will link NBI/Eastern Africa Power Pool (EAPP) countries to Southern Africa Power Pool (SAPP).

Currently, Government of Tanzania through TANESCO is in the process of obtaining financial assistance from World Bank (WB) for implementation of energy projects including the proposed construction of this Iringa-Mbeya-Tunduma-Sumbawanga 400kV Power Transmission line (TL) whereby this section of Iringa-Mbeya 400kV Power Transmission line (TL) is part of it. This will cover about 292km with Right of Way (RoW) of 52m for 400kV Power Transmission line (TL) from Iringa to Mbeya. Also this project will include construct of 3 Substations as follows:

- ✓ Iringa Substation[1]
- ✓ Kisada Substation
- ✓ Mbeya Substation[2]

Before implementation of this project, Environmental and Social Impact Assessment (ESIA) is among of the relevant document needed by the WB for project appraisal.

The ESIA study for 400 kV Iringa – Mbeya Transmission Line was prepared in 2014 **by M/S. SMEC International Pty Ltd.** Subsequently, limited action had been taken to progress the project until recently when the Government of Tanzania approached the World Bank for financial support to implement the project. WB reviewed it in 2017 and come put with comments.

In addition to that it is noted that during ESIA study carried out on 2014, Mbeya Substation was selected in place which is near to human settlements, Iganjo primary school and graves which makes TANESCO to find alternatives location for Substation (out of settlements and social services). The location is in same village of Iganjo but out of town. Also it is noted that ESIA which was prepared 2014 i.e. it is 3 years since 2014 and hence update of the previous baseline data collected is required.

[1] Iringa Substation already exists. Expansion of the substation will be required to accommodate the new line to Mbeya

[2] Land for Mbeya Substation (Iganjo) has already been acquired on 2017. An audit of acquisition process is being undertaken under separate assignment

Due to that change of location of Substation and other reasons above therefore it is decided that TANESCO to update the previous ESIA report to accommodation new location of Mbeya Substation and to comply with existing national laws and WB safeguard policies and requirements for project disclosures. The ESIA for the Mbeya-Tunduma-Sumbawanga TL Power project has been published as a separate volume, while the present ESIA report covers the Iringa-Mbeya TL component.

The objectives of this updated ESIA Study are to:

- ✓ Update the existing ESIA Study (2014) with the most current E&S impacts associated with the project;
- ✓ Ensure that the ESIA Study complies with the requirements of the latest Tanzanian environmental legislation and the World Bank Group E&S safeguard policies;
- ✓ Undertake relevant baseline studies in order to predict and analyze the potential E&S impacts associated with the project; and
- ✓ Produce a draft ESIA Study report for review and consideration by World Bank.

TANESCO as developer will required notifying National Environmental Management Council (NEMC) on change of location of Mbeya Substation by apply the variations of EIA certificate as per requirements of the Tanzanian Environment Management Act (2004) and Environmental Impact Assessment and Audit Regulations of 2005.

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[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

[3] Breakdown of RAP cost are provided in the RAP report but will be updated on 2018

	Impact	Option 1	Option 2	Option 3	Option 4	Impact phase
	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

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 Iganjo 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 Sections are:

Line Segment	Total Length (km)	Tower Total	Angle Tower	No. of substations
Iringa - Kisada Section	106	251	25	1
Kisada – Mbeya Section	186	439	43	1
TOTAL	**292**	**690**	**68**	**2**

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.

The Iringa-Kisada section will pass through 24 villages within 3 District Councils of the Iringa Region (Iringa DC, Mufindi DC and Mafinga TC). Total population for all 24 villages is 62,928 of which male is about 28, 973 (46.1%) and female is 33,955 (53.9%). Most economic activities are agriculture and livestock keeping. It is estimated that over 80% of residents are engaged in agriculture as source of income. Other economic activities include small businesses, forest products (i.e. timber), fishing and handicrafts. Also some of the population is employed at the largest agricultural investors.

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 furthest location from the Zambia -Tanzania Highway.

The Kisada-Mbeya section will pass through 36 villages within 4 District Councils of Njombe and Mbeya Regions (Makete DC, Mbarali DC, Mbeya DC and Mbeya CC). Total population for all 36 villages is 88,292, of which male is about 38,216 (43.3%) and female is 50,076 (56.7%). Most of economic activities are agriculture and livestock keeping. It is estimated that over 83% of residents are engaged in agriculture as source of income. Other economic activities are small businesses, forest products, fishing and handcraft

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 numerous sources of information including the original ESIA Study carried out for the proposed project in 2014, currently Districts socio-economic profile for all districts which TL passed, inputs from the E&S Safeguards team of the World Bank, the updated ESIA Study carried out for Mbeya-Sumbawanga 400kV TL by M/S. Kurrent Technologies of Kenya and various ESIA studies for same nature of TL as shown in reference page.

In addition to the above secondary sources, the experts carried out a field survey of the proposed transmission line between Mbeya and Sumbawanga on January 13-21, 2018. The experts' specialists included an Environmentalist, Socio experts and Ecologist. Also TANESCO team get assistance from District Environmental, Forest, Community Development experts.

Physical/Environmental

Iringa, Njombe 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, and Uyole uplands.

The temperature around Iringa Town varies between 15^{o}C and 25^{o}C. In Njombe highest temperature in November, at around 18.0 °C and at June is coldest with average temperature 12.8 °C on average. In Mbeya, average temperatures range from 12^{o}C in Mbeya Mountains to about 25^{o}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 2012 Population and Housing Census the population of Iringa project region (consisting of Iringa, Mufindi Town and Mufindi) is around 571,763 at region population growth rate of 1.1. Total population to Njombe project region consisting Makete districts is around 97,266 at region population growth rate of 0.8. Total population in Mbeya region (Mbeya rural, Mbarali and Mbeya districts) is about 991,115 at region population growth rate of 2.7.

Also team of TANESCO experts collected population of the villages affected by the proposed TL project during field work on January, 2018. Normally in each of village office there are data of population found at village office where by each of sub-village submit to village office population data once per year as shown in chapter four (table 4.10) and Appendix II.

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 Njombe Region in Makete District. 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 agricultural tools and small animals. This makes a big difference in levels of income between men and women since men are the ones who owned farms and valuable animals are make more than 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 labour as their main occupation. Landless labours 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

The aim of the public consultation process is to solicit public views and concerns on the project, explore ways of avoiding or minimizing 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.

Consultation with PAPs was done during ESIA study in 2012 and then TANESCO team carried consultation to village level during updating of the previous ESIA study in January, 2018 and will be continued through the EIA process and during project implementation phases to ensure regular communication between the project proponent and PAPs. This allows for the provision of updates, changes, alteration, and new concerns where necessary from both the project proponent and I&APs such that both parties have a common perception as to what the project entails.

Team of TANESCO experts had discussions with local leaders in all villages and streets which are passed by project in all three regions and all district councils. Aims of discussion were to inform them about the project and also to collect the currently data especially population and socio-economic data within the villages. Team of TANESCO experts was accompanied by District Environmental Officers, District Land Officers and District Community Development Officers on each district.

General Concern obtained from the local villages

- ✓ Most of village and street leaders that are nearby the proposed project accept the project and mostly of them are aware are on this project since they have consulted during ESIA study on 2012-2013 but they wonder why project delayed since that year no activity. They appreciate the education which they have received from TANESCO regarding this project from initials stage but they request TANESCO to give them feedback so as they can inform villagers on status of the project.
- ✓ They insist that TANESCO should provide fair and prompt compensation to identified PAPs to avoid complains.
- ✓ Some of villages which do not have electricity they request TANESCO and REA to consider for electrification.
- ✓ They request land acquisition and resettlement (identify and quantify categories of project affected people who would require some form of assistance, compensation, rehabilitation or resettlement).

Impact Assessment

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

- ✓ Transmission line including the way leave with conductors, towers and access ways;

- ✓ 2 new substations at Kisada and Iganjo (40.6Ha) near Mbeya City with capacitors, transformers, switching facilities and workshops; and
- ✓ 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 and Social Management Plan (ESMP) which will be updated with site specific mitigation measures once the detailed design is completed.

Most of the biophysical impacts of the Project are expected to be minimal and short term only during Construction phases. The proposed TL will cross at the edge of Chimala FR and MKGR near to TanZam highway. The current status of the areas which TL will pass is disturbed by settlements and human activities including vegetation clearance, fire burning, cultivation and grazing. Also existing 220kV line (60m RoW) from Iringa-Mbeya is passing both FR and MKGR, whereby this proposed TL project will run parallel to existing TL (only 30meter will be add and utilise 30m from existing RoW). Hence there will be no significant degradation of natural habitat only a small fraction amount of *Afro-montane forest-grassland mosaic* and *miombo* woodland within the FR and MKGR may be affected. Also this section of the reserves 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.

TANESCO, TAWA and Tanzania Forest Service will conduct an inventory study to verify the boundary, assess the size affected areas within MKGR and Chimala Scarp FR and propose proper mitigation and compensation measures which could involve preparation of wildlife corridor management plan and forest management plan. This inventory study will be undertaken during valuation of properties of all affected properties.

Also proposed TL will pass through Igando-Igawa wildlife corridor (about 5km) whereby potential impact of the proposed TL could include collapse of the Igando-Igawa corridor because of additional clearing and more poaching as a result of better access roads and influx of people. Proper mitigation measures and commitment by TANESCO will be addressed in Chapter 7 and in a Wildlife Corridor Management Plan to be included in an updated ESMP to enhance the corridor to minimize its deterioration and make the corridor secure and safe for animal movements between the protected areas.

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. Also collision of birds and bats will be among the impacts during operation 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.

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 the people in surround the project area may be presented in the form of temporary employment, as well as through income generated by the sale of food to immigrant workers. Also during operation phase, villages where TL pass and does not have electricity; TANESCO will supply electricity to those villages as part of rural electrification package of this proposed project.

Cumulative impacts of the proposed project on protected areas

The main positive or beneficial cumulative impact to the social environment is the availability of reliable electricity to the Mbeya region. Some of the negative cumulative impacts include a loss of use of agricultural land, loss of or damage to habitat and fauna at Chimala Scarp FR and Mpanga/Kipengele Game Reserve, and additional disturbance to or displacement of wildlife attempting to use the Igando-Igawa wildlife corridor. Because the proposed project traverses within and close to mentioned protected areas already affected by the existing 220-kV transmission line, settlements, roads and agriculture, it may add additional increments of stress.

An assessment of the cumulative impacts of the proposed project vis-à-vis the existing 220kV TL and ongoing projects around proposed TL project area will be carried out in parallel with final design and prior to construction and made part of the updated ESMP. Also detailed potential cumulative impacts will be addressed in the forest management plan and wildlife corridor management plan prepared by TANESCO incollaboration with other experts such as foresters from TFS and wildlife experts from TAWIRI/TAWA.

Mitigation Measures

The most important environmental mitigation measure is minimizing the extent of clearing natural areas along the way leave area for construction work and inspection activities. After finalisation of construction work, areas not needed anymore shall be replanted and rehabilitated in a manner that does not affect transmission line security. Compensation shall be provided where towers or right-of-way:

- ✓ affects residential dwellings or social services (the loss of which will pose health and safety problems);
- ✓ involves take of peoples land,
- ✓ fragments cultivated fields and compromises productivity and income; and
- ✓ Involves the removal of fruit-bearing trees and other economically valuable natural resources.

Site specific mitigation measures will be proposed during updating of ESMP prior the construction start. The mitigation measures will be incorporated in the design and bid documents. Also attention should take into consideration during design and construction phases on areas where possibility of birds migratory routes special Usangu IBA to avoid on impacts on birds collisions. Some of key mitigation measures proposed in this ESIA report are:

- ✓ TANESCO will protect and enhance wildlife corridor (Igando and Igawa) during both phases of project by developing wildlife corridor management plan incollaboration with wildlife expert from TAWIRI/TAWA during updating of ESMP which will submitted to the WB for clearance;
- ✓ TANESCO will set funds for enhancement of wildlife corridor based on developed Wildlife Corridor Management plan;
- ✓ TANESCO and Tanzania Forest Service (TFS) will conduct an inventory study to verify the boundary, assess the size affected areas within Chimala Scarp FR and propose proper mitigation and compensation measures which could involve preparation of forest management plan as part of updated ESMP;
- ✓ During designing consideration of use taller towers where the TL crosses the Wildlife Corridor so that bushes and shrubs could be allowed to grow higher without endangering the line;
- ✓ TANESCO will hire experts to identify and plant shrubs, bushes and grasses which would attract and enhance the movement of wildlife through the Corridor;
- ✓ TANESCO will appoint ornithologists and bat specialists from recognized institutions to undertake a survey of birds and bats and collision study within the Area of Influence of the transmission line project. The study will be undertaken to inform the final design and routing of the new TL and the recommendations will be reflected in the updated ESMP that will be cleared by the WB prior to construction;
- ✓ TANESCO or by using independent environmental will conduct noise level measurements annually at each Iringa, Kisada and Mbeya substations. Where the

noise levels exceed the Tanzanian environmental noise legislative limits and the World Bank EHS Guidelines, TANESCO will create berms high enough to shield the noise from travelling outside the property line.

- ✓ TANESCO will develop and implementing Grievance Redress Mechanism which also will be available to the communities. The GRM should be administered by TANESCO.

- ✓ During design phase, it recommended design of TL should be subjected to an aesthetic review by an Architect or an expert specializing in Landscape /Aesthetic reviews

Other key mitigation measures as proposed are:

- ✓ Mitigation against impact on natural vegetation and tree cutting shall include replanting of disturbed sites by use of desirable species and use of selective clearings for vegetation along the proposed corridor.
- ✓ The width of TL way leave 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.
- ✓ Birds' collision will be averted by placing markers on shield wires in areas where collision is potentially high. The developer shall attach special devises to conductors/towers to scare climbing animals.
- ✓ 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 way leave 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 shall 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).
- ✓ 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 shall apply best practices regarding health and safety for, example, fencing and prevention of noise and dust pollution.
- ✓ 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 shall supply condoms to workers and neighbourhood communities and assist voluntary HIV testing, pre-and post-test counselling.
- ✓ Contractors' will have an honor Code of interacting with the local population. TANESCO will make close follow-up to contractors.

According to RAP report, 2014 (currently TANESCO is in process of updating RAP report in 2018), the cost or budget estimate for resettlement includes the following:

- ✓ Compensation for private and village land; Structures; fruit crops; graveyards requiring relocation; common property
- ✓ Allowances
- ✓ Cost of contracting an NGO for HIV/Aids mitigations and Income Restoration d) Cost of Publicity material;
- ✓ Cost of Disclosure Workshops
- ✓ Cost of Training for District Committees and
- ✓ Cost of preventive measures (condom distribution); estimated Cost will be established during Updating of the previous RAP and valuation process.

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 will be provided in the Updated Resettlement Action Plan (RAP).

Environmental and Social 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 and Social Management Plan (ESMP) 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 ESMP has been included in this ESIA Report to depict the range of environmental impacts/issues and associated mitigation measures envisaged for this Project. The ESMP also identifies responsibilities and indicative cost for implementing the mitigation and monitoring measures. Later TANESCO will update the proposed ESMP with site specific mitigation measures once the detailed design is completed. The mitigation measures will be incorporated in the design and bid documents and the updated ESMP will including Community Health, Safety and Security Plan, Traffic Management Plan, Labour Influx Management Plan etc. The updated ESMP will be submitted to the financier (WB) for approval and clearance. All mitigation measures, the updated and cleared ESMP will be included in the final Contract documents so that they are legally binding on the contractor during project implementation.

TANESCO`s Environmental and Social Management Unit will oversee implementation of the ESMP including all operation-related management plans and community relations activities. Also TANESCO will be responsible for review and approval of Specific ESMP prepared by Contractors. ATANESCO will designate two appropriately experienced and qualified persons in charge of the environmental and social management to oversee the implementation of the ESMP. The two staff shall be assigned as Environmental Officer and Sociologist and be supported by a minimum of two field assistants. In some of items of ESMP, TANESCO will collaborate with experts from recognized institutions such as TAWIRI/TAWA/TFS to implement the Environmental and Social aspects of the project during construction and operation phases.

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

Decommissioning of structural and technical installations comprises dismantling, decontamination of materials and site, shipment and final disposition of materials as well as site rehabilitation. A qualified team of experts such as engineers and environmentalists shall have to be involved in case some components or members are considered for demolition and to ensure there is no conflict with existing environmental safeguard laws including EMA 2004.

Metal components from the transmission line will be turned into scrap. Because of high transportation costs and the lack of a scrapping infrastructure in Tanzania, external buyer or scrapping company have to be sought to ensure the materials are well disposed off from the site. Adequate measures have to be implemented to ensure no contamination of soils and air. The most risk components will be the substation because of likely pollutant substances such as hydrocarbons from transformers and heavy metals from electrical materials. Therefore, a very careful dismantling, decontamination of materials and the soil to the deeper underground, shipment and recycling or dumping shall be obligatory.

Conclusion
The proposed transmission line is a project of major importance for the infrastructure development and the socio-economic development of Iringa, Njombe, Mbeya regions and Tanzania in general. This project also provide future link with a 400kV Backbone Iringa to Shinyanga. Zambia and Sumbawanga via proposed 400kV TL from Mbeya – Tunduma – Sumbawanga 400kV Transmission Line (320 km) and associated substations at Mbeya,

Tunduma and Sumbawanga. The project has a regional impact as it will link NBI/Eastern Africa Power Pool (EAPP) countries to Southern Africa Power Pool (SAPP).

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 updated ESMP will ensure that the overall benefits from the Project will greatly outweigh any adverse impacts. Sensitive impacts are land acquisitions and effects on the MKGR and Chimala forest reserves where by wildlife corridor management plan and forest management plan will be prepared and be part of updated ESMP.

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 shall be necessary to improve the knowledge basis for the preparation of the final Resettlement Action Plan. Monitoring shall 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.

ACKNOWLEDEMENT

TANESCO wishes to thank all stakeholders at various capacities during this study who were ready to assist the project achieve the planned goals. This included making themselves available for the consultation, expressing their opinions and concerns about the proposed project and advising the project proponent in various issues which were important in identifying issues of concerns, areas that need detailed assessment and other suggestions that focused on enriching the project and preparation of Environmental and Social Impact Assessment (ESIA) to make the project sustainable.

TANESCO is grateful with the cooperation given by Iringa DC, Mufindi DC, Mafinga TC, Makete DC, Mbarali DC, Mbeya DC and Mbeya CC experts and village leaders who provided the needed information in their villages in the project area and support during the whole process of updating ESIA report.

TANESCO also expresses appreciation to all institutions, agencies and individuals who availed required information to this project. The list is long but wishes to recognize the effort made by TANESCO staff at Head Office and Iringa, Njombe and Mbeya Region offices on seeing this project goes ahead in spite of many hurdles.

Last but not least TANESCO recognizes the effort made by Consultants from **M/S. SMEC International Pty Ltd** for their constructive and professional contributions in carrying out this ESIA study on 2014. Also TANESCO wishes to thank EIA Experts i.e. Mr. Fikirini Mtandika, Mr. Edward P. Kiringo and Ms. Vaileth Kimaro who worked to update the original ESIA on 2017-2018 and incorporated comments raised from World Bank to make a final ESIA report as required by the Tanzania Environmental Management Act No. 20, 2004 and the World Bank Group Environmental and Social (E&S) Safeguards requirements for their valuable professional input to ensure completion of this updated ESIA report.

CHAPTER 1: INTRODUCTION

1.1 Background

The Government of Tanzania, through Tanzanian Electric Supply Company Limited (TANESCO) updated power system master plan in 2016 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 2016 TANESCO updated and finalized the master plan whereby the Generation and Transmission Projects for short to long term were identified including 400 kV Iringa-Mbeya transmission line project.

The overall objective of the PSMP is to re-assess short-term (2016 – 2020), mid-term (2021 – 2025) and long term (2026 – 2040), generation and transmission plan requirements and the need for connecting presently off-grid regions; options for power exchanges with neighbouring countries; and increased supply of reliable power. While the short-term plan requires an immediate decision and actions, the mid – long term plan requires coordinated planning and project development studies to ensure that future electricity supply utilises the least cost projects in consistent with sound planning criteria in order to address national interests.

The proposed 400 kV Iringa-Mbeya transmission line project will in future link with a 400kV Backbone Iringa to Shinyanga which will facilitate the smooth power transfer to the northern part of the country and neighboring countries such as Zambia in south and Kenya and Uganda in North. The proposed project is in line with other projects currently under implementation including the 400 kV Iringa - Shinyanga (through Singida) and the 400 kV Kenya (Nairobi) – Tanzania (Arusha – Singida). Currently the segment between Mbeya and Iringa there is a 220kV transmission line which appears a weak link which needs to be reinforced. Also, in terms of power quality and reliability issues most of power lines here in Tanzania suffer from voltage depressions, surges and sometimes total outages. The situation calls efforts for construction of new power transmission lines in addition to improve the power transferring capabilities.

In addition, TANESCO is in process of implement construction of Mbeya – Tunduma – Sumbawanga 400kV Transmission Line (320 km) (Phase 1 of 400 kV transmission line (TL) from Nyakanazi to Mbeya (1080 km) and associated substations at Mbeya, Tunduma and Sumbawanga. The project will enter at the proposed Tunduma (Nkangamo area) substation whereby one circuit will interconnect with Zambia at Tunduma (Zambian border) and the other circuit will proceed to Sumbawanga. The project has a regional impact as it will link NBI/Eastern Africa Power Pool (EAPP) countries to Southern Africa Power Pool (SAPP).

Currently, Government of Tanzania through TANESCO is in the process of obtaining financial assistance from World Bank (WB) for implementation of energy projects including the proposed construction of this Iringa-Mbeya-Tunduma-Sumbawanga 400kV Power Transmission line (TL) whereby this section of Iringa-Mbeya 400kV Power Transmission line (TL) is part of it. This will cover about 292km with Right of Way (RoW) of 52m for 400kV Power Transmission line (TL) from Iringa to Mbeya. Also this project will include construct of 3 Substations as follows:

- Iringa Substation[4]
- Kisada Substation
- Mbeya Substation[5]

Before implementation of this project, Environmental and Social Impact Assessment (ESIA) is among of the relevant document needed by the WB for project appraisal.

Previous, TANESCO, through the Nile Basin Initiative / Nile Equatorial Lakes Subsidiary Action Program (NBI/NELSAP), were carried out a Feasibility Study (FS), Environmental and

[4] Iringa Substation already exists. Expansion of the substation will be required to accommodate the new line to Mbeya

[5] Land for Mbeya Substation (Iganjo) has already been acquired on 2017. An audit of acquisition process is being undertaken under separate assignment

Social Impact Assessment (ESIA), Resettlement Action Plan (RAP), Conceptual Design and Preparation of Tender Documents for Iringa to Mbeya, 292km long transmission line.

An Environmental and Social Impact Assessment (ESIA) for the segment of Iringa – Mbeya was initiated in 2012 and completed in July 2014 and the EIA Certificate issued in September, 2014. This ESIA report is in the process of being updated.

1.2 Project Summary and Scope of the ESIA

1.2.1 Project summary

The proposed 400kV transmission line project from Iringa to Mbeya is approximately 292km long and includes the construction of the following project components:

- ✓ 106km long 400kV transmission power line between the proposed substations at Iringa to Kisada;
- ✓ 186km long 400kV transmission power line between Kisada and Mbeya;
- ✓ Substations at Kisada and Mbeya;
- ✓ Associated infrastructure to integrate the new transmission power lines and substations into the Transmission Grid (such as access roads, communication tower, etc.) and accommodate the new lines at the proposed substations.

Based on the above construction components, the scope of the updating ESIA Study is as follows:

- ✓ Introduce the project and collect views and concerns from village leaders where TL is pass;
- ✓ Consultation with decision making authorities at local levels;
- ✓ Collection the currently socio-economic data from District up to villages level where TL is pass;
- ✓ Collect and compare the Environmental baseline data with those collected during previous ESIA study on 2014;
- ✓ Updating ESIA Study report in accordance with the requirements of Tanzanian Environment Management Act (2004), Environmental Impact Assessment and Audit Regulations of 2005 and the World Bank Group Environmental and Social (E&S) Safeguards.

1.3 ESIA Process

1.3.1 Aims and objectives

The ESIA study for 400 kV Iringa – Mbeya Transmission Line was prepared in 2014 by **M/S. SMEC International Pty Ltd.** Subsequently, limited action had been taken to progress the project until recently when the Government of Tanzania approached the World Bank for financial support to implement the project. WB reviewed it in 2017 and come put with comments.

Also it is noted that ESIA which was prepared 2014 i.e. it is 3 years since 2014 and hence update of the previous baseline data collected is required. In addition to that it is noted that during ESIA study carried out on 2014, Mbeya Substation was selected in place which is near to human settlements, Iganjo primary school and graves which makes TANESCO to find alternatives location for Substation (out of settlements and social services). The location is in same village of Iganjo but out of town.

Due to that change of location of Substation and other reasons above therefore it is decided that TANESCO to update the previous ESIA report to accommodation new location of Mbeya Substation and to comply with existing national laws and WB safeguard policies and requirements for project disclosures. The ESIA for the Mbeya-Tunduma-Sumbawanga TL Power project has been published as a separate volume, while the present ESIA report covers the Iringa-Mbeya TL component.

The objectives of this updated ESIA Study are to:

- ✓ Update the existing ESIA Study (2014) with the most current E&S impacts associated with the project;
- ✓ Ensure that the ESIA Study complies with the requirements of the latest Tanzanian environmental legislation and the World Bank Group E&S safeguard policies;
- ✓ Undertake relevant baseline studies in order to predict and analyze the potential E&S impacts associated with the project; and
- ✓ Produce a draft ESIA Study report for review and consideration by World Bank.

TANESCO as developer will required notifying National Environmental Management Council (NEMC) on change of location of Mbeya Substation by apply the variations of EIA certificate as per requirements of the Tanzanian Environment Management Act (2004) and Environmental Impact Assessment and Audit Regulations of 2005.

1.3.2 Environmental and social data sources

As part of this ESIA Study, the Consultant has used numerous sources of information including the original ESIA Study carried out for the proposed project in 2014, currently Districts socio-economic profile for all districts which TL passed, inputs from the E&S Safeguards team of the World Bank, the updated ESIA Study carried out for Mbeya-Sumbawanga 400kV TL by **M/S. Kurrent Technologies** of Kenya and various ESIA studies for same nature of TL as shown in reference page.

In addition to the above secondary sources, the experts carried out a field survey of the proposed transmission line between Mbeya and Sumbawanga on January 13-21, 2018. The experts' specialists included a Environmentalist, Socio experts and Ecologist. Also TANESCO team get assistance from District Environmental, Forest, Community Development experts.

Each specialist undertook their respective study in accordance with international standards associated with their specialty and generally in accordance to Environmental Management Act CAP 191 (2004), the Regulations for EIA and Auditing (2005) and The World Bank Operational Policies on Environmental and Social Safeguards;

1.4 Scope and Objectives of Final ESIA

The objective of the final ESIA 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 in 2012, four alternative options were thoroughly investigated and analyzed 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 has 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.

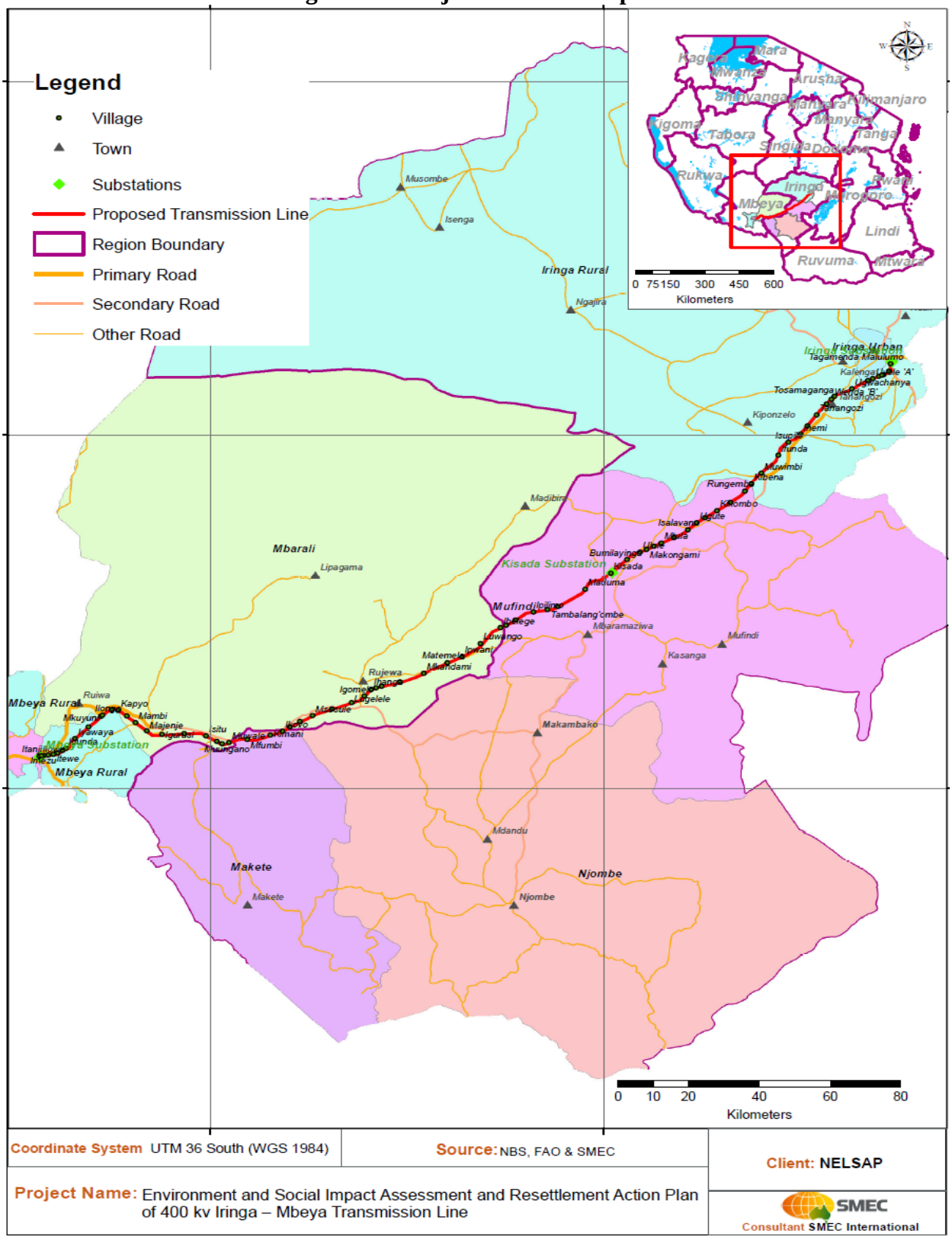
The final ESIA intends to achieve the following objectives:

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

- ✓ Enhancement and identification of social and biophysical environment impacts including identification of alternatives (including the no project alternative) on the chosen option;
- ✓ Identification of stakeholders and project affected population related to chosen option and initiation of a public consultation process;
- ✓ Identification of measures required to prevent, minimize, mitigate or compensate for adverse impacts and for social and environmental enhancement;
- ✓ Preparation of 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.

Government of Tanzania (GoT) through TANESCO is currently seeking for financial assistance from World Bank in order to implement the proposed project; 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.

Figure 1.1: Project Location Map



1.4 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 minimize any adverse impacts and maximize benefits.
- ✓ Chapter 8: Analysis of alternative.
- ✓ Chapter 9: Summary of the environmental and social management and monitoring plan
- ✓ Chapter 10: Cost Benefit Analysis
- ✓ Chapter 11: Decommissioning
- ✓ Chapter 12: Conclusion.
- ✓ References

The report has separate appendices containing maps and list of stakeholders consulted during updating of the ESIA study.

CHAPTER 2: PROJECT DESCRIPTION

2.1 Project Location

The proposed **IRINGA-MBEYA** 400kV transmission line is located in south-western part of Tanzania as shown in Figure 2.1. It will pass in three regions i.e. Iringa Region, Njombe Region and Mbeya Region. Also project passes through various districts and villages as indicated in the Table 2.1.

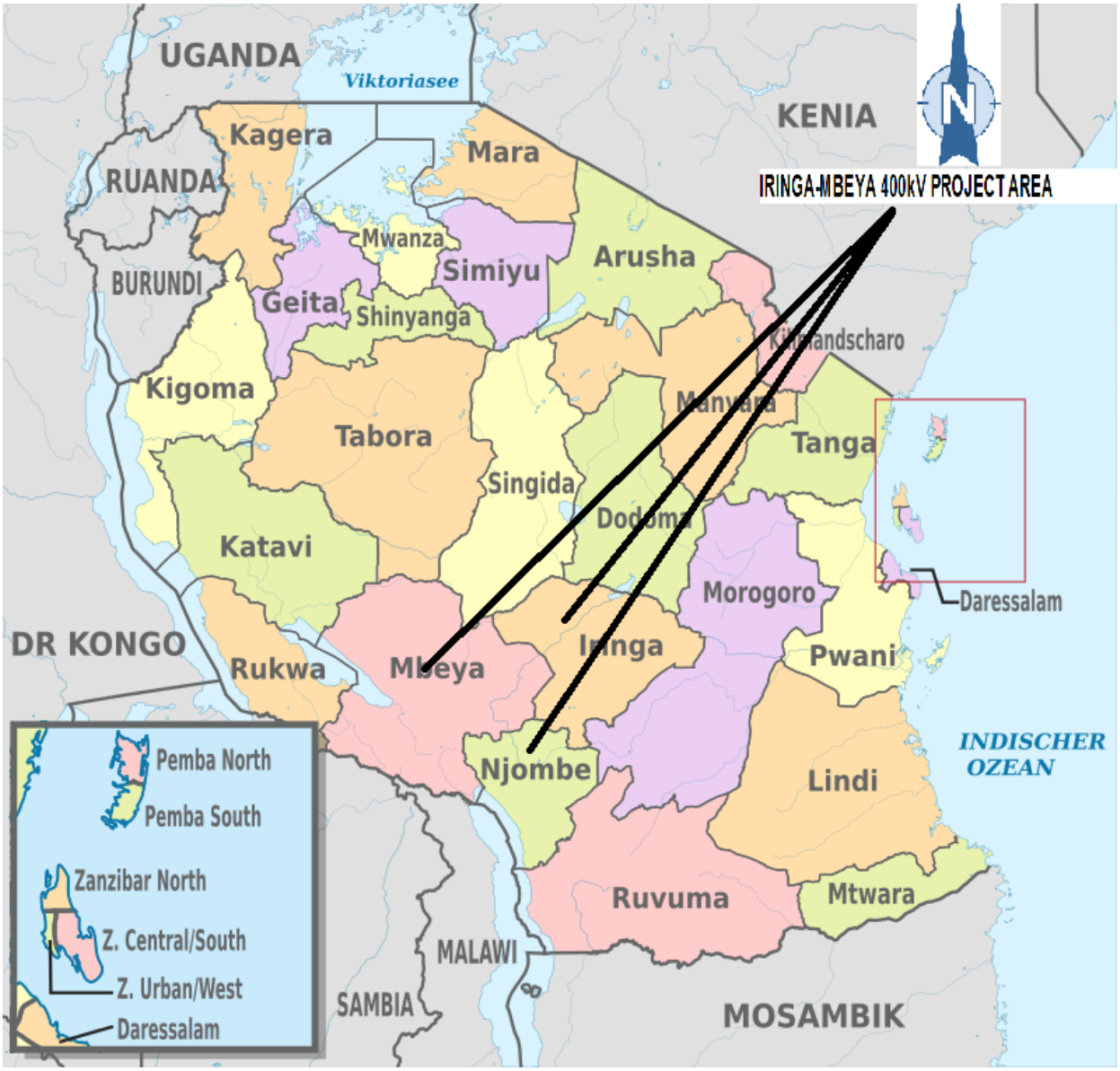


Figure 2.1: Project location in Tanzania Map
(Source: https://en.wikipedia.org/wiki/Regions_of_Tanzania, 2017)

Table 2.1: Regions, Districts and Villages along the Proposed Transmission Line (TL)

Region	Districts	Villages	Number of villages
Iringa	Iringa DC	Muwimbi, Bandabichi, Ulete, Kibena, Isupilo, Ugwachanya, Uwenda, Tagamenda, Ihemi, Tanangozi and Mlandege	11
	Mufindi DC	Ihowanza, Tambalangombe, Isalanavu, Ipilimo, Kiponda and Maduma	6
	Mafinga Town Council	Majengo, Rungemba, Kitelewasi, Kikombo, Ugute, Kisada and Bumlayinga	7
Njombe	Makete DC	Kimani and Mfumbi	2
Mbeya	Mbarali DC	Igomelo, Soniyaga, Lugelele, Ihango, Luwango, Isitu, Ipwani, Madabaga, Itamboleo, Lyambogo, Matemela, Itamboleo, Kapyo, Mengele, Maendeleo, Mbuyuni, Itipingi, Uhamila, Isongwa, Mambi, Lunwa, Lusyesye, Majenje, Lwanyo and Nsonyanga	25
	Mbeya DC	Iyawaya, Mtangano, Itewe, Tembela, Isongwa and Idunda	6
	Mbeya CC	Iganjo, Itanji and Ikhanga	3
		TOTAL	**60**

2.1.1 Project Rationale

The proposed 400 kV Iringa-Mbeya transmission line project will in future link with a 400kV Backbone Iringa to Shinyanga TL which will facilitate the smooth power transfer to the northern part of the country and neighboring countries (other regional power system) such as Zambia in south and Kenya and Uganda in North. The proposed project is in line with other projects currently under implementation including the 400 kV Iringa - Shinyanga (through Singida) and the 400 kV Kenya (Nairobi) – Tanzania (Arusha – Singida).

In addition, TANESCO is in process of implementing construction of Mbeya – Tunduma – Sumbawanga 400kV Transmission Line (320 km) (Phase 1 of 400 kV transmission line (TL) from Nyakanazi to Mbeya (1080 km) and associated substations at Mbeya, Tunduma and Sumbawanga. The project will enter at the proposed Tunduma (Nkangamo area) substation whereby one circuit will interconnect with Zambia at Tunduma (Zambian border) and the other circuit will proceed to Sumbawanga. In addition, TANESCO is updating the feasibility study for the 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). Where by links of Iringa-Mbeya TL with Backbone Iringa to Shinyanga TL will help transmit power from Iringa to Sumbawanga and Zambia via Mbeya and Tunduma Substations.

Source of power generation to link these proposed TL are main existing TANESCO plants of Kidatu HPP 204MW and Mtera HPP 80MW and future proposed generation plants of Stieglers Gorge HPP 2100MW and Mbeya Geothermal Plant 300MW. (Source: Ministry of Energy`s Updated PSMP, 2016).

2.1.2 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 up to Ugwachanya village. 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 from left hand side to right hand side between Ugwachanya and uwenda villages. It then traverses in Mlandege 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 Bandabichi 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 maize, beans, sunflowers, irish potato, sweet potato, bamboo, tomatoes and onions.

Also for Iringa-Kisada section will pass through 24 villages within 3 District Councils of Iringa Region (Iringa DC, Mufindi DC and Mafinga TC). Total population for all 24 villages is 62,928 of which male is about 28, 973 (46.1%) and female is 33,955 (53.9%). Most economic activities are agriculture and livestock keeping. It is estimated that over 80% of residents are engaged in agriculture as source of income. Other economic activities include small businesses, forest products (i.e. timber), fishing and handicrafts. Also some of the population is employed at the largest agricultural investors.

2.1.3 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. The TL corridor section in Mengele, Isitu, Lyambogo up to Itipingi village passes at the edge of Chimala Forest Reserves which is predominantly miombo and acacia woodland. At Madabaga the line crosses the tarmac road and remains on the Southern part of the highway up to Iganjo substation in Mbeya City.

The Kisada-Mbeya 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 Igawa, Lunwa, 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 streets of Itanji, Ikhanga and Iganjo on Mbeya-Uyole plateau in Mbeya city.

Also for Kisada-Mbeya section will pass through 36 villages within 4 District Councils of Njombe and Mbeya Regions (Makete DC, Mbarali DC, Mbeya DC and Mbeya CC). Total population for all 36 villages is 88,292 of which male is about 38,216 (43.3%) and female is 50,076 (56.7%). Most of economic activities are agriculture and livestock keeping. It is estimated that over 83% of residents are engaged in agriculture as source of income. Other economic activities are small businesses, forest products, fishing and handcraft.

2.2 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:

2.2.1 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 60m wayleave of the 220kV transmission line from Iringa to Mbeya when running parallel to the existing line up to between Ugwachanya and uwenda villages where by addition of 30m new permanent RoW will acquired by TANESCO to portion of Iringa to Tanangozi (15.2km) and also portion of Igawa town to Iganjo Substation at Mbeya City (87.6km) where proposed 400kV will run parallel to existing 220kV TL of Iringa – Mbeya.

For other remain part of proposed TL, TANESCO will acquire complete 52m RoW whereby permanent land acquisition will take place. 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 30m added to the existing RoW to place where the proposed line runs parallel to the existing 220kV line, and a 52m axis distance for the wayleave corridor where the proposed lines run through a new area.

Table 2.2: The clarifications for wayleave corridors from Iringa-Mbeya

Line Segment	Wayleave corridor size (m)	Total Length (km)	Size of Land to be Acquired (Ha)
Iringa Substation-Tanangozi area	30	15.2	45.6
Tanangozi area-Igawa town	52	189.4	984.9
Igawa town-Iganjo Substation	30	87.4	262.8
	TOTAL	**292**	**1,293.3**

Source: EIA Expert calculation, 2018

Trees which will impact the safe operation of TL within the band range of approximately 10-15 m from the centreline of the transmission line will be cleared if the route passes through any tree canopy area for convenience of stringing the conductors. Examples of vegetation cleared in the ROW are shown in Figure 2.2.

Figure 2.2: Vegetation clearing around the tower for existing 220kV TL
(Source: Field work, January, 2018)

2.2.2 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 especially at Usangu Flats IBA.

Table 2.3: Characteristics of the Proposed Transmission Line

Line Segment	Total Length (km)	Tower Total	Angle Tower	No. of substations
Iringa - Kisada Section	106	251	25	1
Kisada – Mbeya Section	186	439	43	1
TOTAL	**292**	**690**	**68**	**2**

Figure 2.3: Examples of 400kV towers
(Source: https://en.wikipedia.org/wiki/Transmission_tower, 2018)

2.2.3 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 without PCBs. 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 Iganjo (40.614 Ha). 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. For Kisada and Iganjo Substations TANESCO will acquire complete 40.614Ha, whereby permanent land acquisition for Iganjo (Mbeya) Substation (17.5Ha) already completed and area are owned by TANESCO since April, 2017.

2.2.4 Access Roads

Some permanent and semi-permanent road reaches will have to be improved/maintained/ 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. This diversion will be up to acquired RoW whereby no need of acquiring lands since will be already owned by TANESCO. Other existing access roads have their wayleave owned by Districts authorities, no needs of land acquisition for acess roads.

In some areas of TL, contractor will use acquired RoW to construct and rehabilitate the access road which will be used during construction of TL and hence after complete those access road will be used for maintenance and operation of the TL by TANESCO. Vegetation clearing and/or re-contouring of land may be required for access road construction. Most of the existing access roads are District roads with 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. No impact to people or farmers due to recountering since construction of access roads will be within existing wayleave of access roads.

For substation, the contractor will use existing access roads whereby minor rehabilitation will take place as detailed shown below:

Table 2.4: Features for possible existing access roads to be used during construction of the proposed TL project

District	Location of Access road	Approximated distance of access road	Condition of access road
Iringa DC	Iringa Substation	1km from Ipogoro to Kilolo District	Good
	Ugwachanya village	~2 km from Tanzania – Zambia Highway	Good minor Rehabilitation
	Tanangozi village	~3km from Tanzania – Zambia Highway	Good minor Rehabilitation
	Isupilo Village	~3km from Tanzania – Zambia Highway	Fair but need major rehabilitation
	Ulete Village	~3km from Tanzania – Zambia Highway	Good minor Rehabilitation
Mafinga Township	Kitelewasi Village	~8km from Tanzania – Zambia Highway	Good minor Rehabilitation
	On the way to Saadani Village (Makongorosi Road)	~12km from Tanzania – Zambia Highway	Good minor Rehabilitation
	Bumlayinga village via Matanana Village	~20km from Tanzania – Zambia Highway	Good minor Rehabilitation
	Kisada Substation	14.9km from Makambako-Mafinga Road	Good minor Rehabilitation
Mufindi DC	Ihowanza village via Malangali and Tambalangombe village	~35km from Tanzania – Zambia Highway	Good minor Rehabilitation
Mbarali DC	Igawa centre to Rujewa centre	2km from Tanzania – Zambia Highway	Good
	Igurusi Centre	~2km from Tanzania – Zambia Highway	Fair but need major rehabilitation
	Chimala to Makete Road	~2km from Tanzania – Zambia Highway	Good minor Rehabilitation
	Madabaga village	~2km from Tanzania – Zambia Highway	Fair but need major rehabilitation
Mbeya City	Mbeya Substation (Iganjo)	2.2km from Mbeya-Kyela road	Fair but need major rehabilitation

Source: Field visit on January, 2018 (All distance are measured by vehicle odometer)

At Isupilo Village

At Igawa Centre

At Kisada Substation

At Chimala Village

Figure 2.4: Some of existing access roads which will be used during construction of the proposed TL project

(Source: Field work, January, 2018)

2.2.5 Camps, Storage and Workshops

The proposed transmission line project will be undertaken in lots; it is envisaged that one lot includes the line from Iringa to Kisada (about 106km long) and the second lot includes the line from Kisada to Mbeya (about 186km). Based on TANESCO's past experience with other 400kV transmission line projects, it is anticipated that there will be three construction camps set up for each lot awarded to a contractor, one on either end of the line and one in the middle. Also for substation contractor will have their camps near to substations if contractor will be different from TL. Each construction camp will be sited near the ROW for easy access to the construction workspace areas. The land used for campsite is normally temporary whereby contractor agrees with respectively village to lease certain size of land for establishing campsiteThe number of the people who will be residing in the camp is minimal due to the fact that skilled workers who will be hired by the contractor are not expected to exceed 30 workers and unskilled laborers will be

hired on a daily basis and will be recruited in villages where TL is passing. It is expected that most of these unskilled laborers will be coming from home in the morning and go back at their home premises in the evening. In other implemented projects workers camps were established in the industrial area and other are far from the centers of selected village (>1km) so in this project that criteria will adopted. The project contractor will be advised accordingly.

Site establishment shall take place in an orderly manner and all required amenities shall be installed at Camp sites before the main workforce move onto it. The Construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction. The Project Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.

The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of using NEMC approved waste handlers. A Waste Tracking Sheet will be obtained by the Project Contractor each time waste is disposed of through a third party and kept on file. The disposal of waste shall be in accordance with Tanzanian Waste Management Regulations. Under no circumstances may solid waste be burnt on site.

2.2.6 Equipment and Machines

Most of the equipment and machinery required for the construction of the proposed transmission line project will be imported into Tanzania. There will be local procurement for portion of small scale apparatus, tools and materials available in Tanzania market. Based on experience from other 400kV TL project of the same nature to this, it is estimated that the construction plant and equipment required for the project is as shown in Table 2.5.

Table 0.5: Equipment and Machines required for the proposed project

Bulldozer	220KW	4
Excavator	1m³ bucket capacity	6
Loader	wheel type, 3m³bucket capacity	6
Wheel type crane	25t	3
Wheel type crane	50t	1
Water cart	6~10m³capacity	5
Oil tanker	10t capacity	3
Concrete mixer truck	0.5~0.8 bucket capacity	6
AC welder	250A~500A	6
Vibrating roller	18t	1
Platform lorry	20t	6
Dumper	20t	20
Platform lorry	30~40t	2
Diesel generator	60~120KW	8

SUV	Toyota Land Cruiser VX 4.0L	10
Steel bar straightening machine	TQ4-14	1
Steel bar shearing machine	GT3/8	1
Steel bar bender	GJ7-40	1
Argon-arc welder	YZ-5000W*3	1
Brick press	YX-26	2
Vacuum oil filter	Bipolar	1
Pressure oil filter	LY-150	1
Cutting machine	J3GQ-400	3
Diehead threading machine	CNS25A	2
Churn Drill	GSB16	1
Electric hammer	GBHZ-26RE	2
Angle grinder	GWS8-100C	3
Hydraulic pipe bender	YML-125*12	1
Forklift	CTCD50E	1
Wire barrow	15t	3
Cable stretching machine	10~15t	3
Optical fibre welding machine	500W	1

Source: Updated ESIA study for Mbeya-Sumbawanga 400kV TL done by Kurrent Technologies (2017)

2.3 Project Implementation

2.3.1 Manpower requirements

The project activities will include a range of operations that are aimed at ensuring that the 400 kV power transmission line from Iringa to Mbeya is completed on time and is operational as required. Given in Table 2.4 is the approximate staff strength required for the various phases of the project up to the commissioning phase.

Table 2.6: Approximate staff strength for the construction and commissioning phases

Project Phase	Approximate number of staff
Mobilization	~100
Construction	~500

Commissioning	~100

The anticipated ratio of local workers against other workers coming from parts of Tanzania is expected to be 70% local/unskilled workers and 30% skilled workers coming from other parts of Tanzania include foreign expert. The implementation of the proposed project will involves the following activities based on the project phases.

2.3.2 Mobilization Phase

The mobilization phase is the initial phase of project implementation. In general, this phase will commence when all necessary permits and processes have been acquired by the Project Contractor. For example, mobilization shall only commence after the way leave has been demarcated and, project affected persons (PAPs) and institutions have been compensated according to the Resettlement Action Plan (RAP) developed for the project. The RAP will be developed and implemented in accordance with Tanzanian national laws and the World Bank's Operational Policy 4.12.

During mobilization (pre-construction), the Project Contractor will recruit necessary administrative and engineering staff for the project and procure and transport construction equipment to the site. It is envisaged that the construction materials will be sourced both locally and from overseas. Local procurement will be considered as much as possible for construction materials available in Tanzania including the workers required for the project. Also Project Contractor will recruit locally from the neighboring communities as per requirements of activities. This will be done together will village leaders to identify the required workers.

Mobilization also entails establishing camps and offices on site, assembling equipment, geotechnical investigation works, construction workforce and materials for securing the way leave.

2.3.3 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 Mbarali and 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. The construction phase will take about 3 years (36 months) to construct a transmission line of about 292 km from Iringa to Mbeya.

The Project Contractor will to the extent practical, recruit construction workers from local communities where the proposed transmission line will pass. The Project Contractor should engage the administrative structures at the village level for this type of recruitment. However, the main contractor will be responsible for the recruitment of the work force since he will be aware of the work schedule, quality of the work that is needed, the budget for the work force and safety issues. Contactor is expected to give priority for recruitment of temporary workers to the communities located in the areas where the construction occurs.

Also Project Contractor will recruit locally from the neighboring communities as per requirements of activities. This will be done together will village leaders to identify the required workers.

Contractor and TANESCO should ensure that women are highly considered during employment opportunities and children (<14years) are not employed.

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.

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 risks 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) may be higher during 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.

In addition, positive opportunities to the people in surround the project area may be presented in the form of temporary employment, as well as through income generated by the sale of food to immigrant workers. Also during operation phase, villages where TL pass and does not have electricity; TANESCO will supply electricity to those villages as part of rural electrification package of this proposed project.

2.3.4 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).

2.3.5 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. However, if decommissioning is required, TANESCO will develop a formal decommissioning plan to NEMC 90 days prior to the start decommissioning for consideration.

2.4 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:

- ✓ 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;
- ✓ All the local community and commercial activities at Iringa, Njombe and Mbeya region as well as at the population at the national level will benefit from improved power supply.

2.5 Project Cost

Based on the feasibility study conducted in 2012, the approximately cost of the project is **USD 81.47 Million**. It is understood that TANESCO is in process of updating Feasibility study on 2018 and due to currency inflations of money from 2012 to 2018, there are will be further fine-tuned on this project cost at the final stage.

CHAPTER 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:

- ✓ land degradation;
- ✓ lack of access to good quality water;
- ✓ environmental pollution;
- ✓ loss of wildlife habitat and biodiversity;
- ✓ deterioration of aquatic ecosystems; and
- ✓ 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:

- ✓ More land being taken up for the right of way by TANESCO to build the towers and the transmission line.
- ✓ 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:

- ✓ to raise significantly the contribution of the mineral sector in the national economy and increase Gross Domestic Product (GDP);
- ✓ to increase the country's foreign exchange earnings;
- ✓ to increase government revenues;
- ✓ to create gainful and secure employment in the mineral sector and provide alternative source of income to the rural population; and
- ✓ to ensure environmental protection and management (URT, 1997: 8).
- ✓ 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, economic, 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:

- ✓ lack of solid and liquid waste management, leading to environmental deterioration;
- ✓ emission of noxious gases from vehicles and industrial activities as a major cause of air pollution in urban areas;
- ✓ encroachment into fragile and hazardous lands (river valleys, steep slopes and marshlands) leading to land degradation, pollution of water sources, etc.;
- ✓ 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
- ✓ 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.

In addition to that project must help people who support it to develop their capacity and enhance their desire to participate in decision maing related to greater social and economic development. Government, donors, NGOs and other related organizations are most responsible in supporting the commnuties to achieve the envisioned capacity.

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 utilization 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;

- ✓ 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.
- ✓ 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.
- ✓ 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:

- ✓ "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" ;

- ✓ "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."
- ✓ 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.
- ✓ 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:

- ✓ monetary compensation;
- ✓ plot to plot compensation
- ✓ 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:

- ✓ the Village Land Council
- ✓ the Ward Tribunal
- ✓ district Land and Housing Tribunal
- ✓ the High Court (Land Division)
- ✓ 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:

- ✓ water quality,
- ✓ discharge of effluent into water,
- ✓ air quality,
- ✓ control of noise and vibration pollution,
- ✓ sub sonic vibrations,
- ✓ soil quality,
- ✓ control of noxious smells,
- ✓ light pollution, electromagnetic waves and microwaves, and
- ✓ 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 shall 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:

- ✓ 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;
- ✓ 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;
- ✓ 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 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.

- ✓ To register all accidents and its causes at construction site.
- ✓ 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 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 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 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 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 shall compel the developer to comply with the provisions in this Act.

3.2.21 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 shall 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 3.1.

Table 3.1: 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 3.2: The WB Safeguard Policies that are likely to be triggered

Ops	Description	Comments
OP/BP 4.01 Environmental Assessment	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	This safeguard Policy is relevant because of the size of the nature and size of the Project and its potential to

	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.	cause significant adverse impacts potentially including the need for involuntary resettlement.
OP/BP 4.04 Natural Habitats	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	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 may be relevant to this proposed TL because the Project will pass at the edge of Chimala Scarp Forest Reserve, and the actual boundary is unclear. But part of FR at this boundary is already degraded by human activities and existing 220kV, whereby proposed TL project will run parallel to existing TL which might not produce any additional impact even if it were inside the boundary. TANESCO and Tanzania Forest Service will conduct an inventory study to assess the size of any potentially affected areas within Chimala Scarp FR and propose proper mitigation and compensation measures, which could involve preparation of forest management plan.
OP/BP 4.11 Physical Cultural Resources	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	Numbers of graves have been identified in the project area. Thus this policy is triggered.

	that will significantly damage non-replicable cultural property and assists only those projects that are sited or designed so as to prevent such damage.	
OP/BP 4.12 Involuntary Resettlement	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 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.	This safeguard Policy is relevant since the Project will result in loss of land and other private assets and possibly resettlement.
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

3.3.1: World Bank Group Industry Sector Guidelines for Electric Power Transmission and Distribution, April 2007

The Environmental, Health, and Safety (EHS) Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. Annex A provides a summary of industry sector activities. This document is organized according to the following sections:

- ✓ Section 1.0 — Industry-Specific Impacts and Management
- ✓ Section 2.0 — Performance Indicators and Monitoring
- ✓ Section 3.0 — References and Additional Sources
- ✓ Annex A — General Description of Industry Activities

But Section 1.0 of Industry-Specific Impacts and Management describes the following key issues:

- ✓ ***Environment,***

Environmental issues during the construction phase of power transmission and distribution projects specific to this industry sector include the following:

- o Terrestrial habitat alteration
- o Aquatic habitat alteration
- o Electric and magnetic fields
- o Hazardous materials

- ✓ ***Occupational Health and Safety***

Most occupational health and safety issues during the construction, operation, maintenance, and decommissioning of electric power distribution projects are common to those of large industrial facilities, and their prevention and control is discussed in the General EHS Guidelines. These impacts include, among others, exposure to physical hazards from use of heavy equipment and cranes; trip and fall hazards; exposure to dust and noise; falling objects; work in confined spaces; exposure to hazardous materials; and exposure to electrical hazards from the use of tools and machinery. Occupational health and safety hazards specific to electric power transmission and distribution projects primarily include:

- o Live power lines
- o Working at height
- o Electric and magnetic fields
- o Exposure to chemicals

- ✓ ***Community Health and Safety***

Community health and safety impacts during the construction and decommissioning of transmission and distribution power lines are common to those of most large industrial facilities, and are discussed in the General EHS Guidelines. These impacts include, among others, dust, noise, and vibration from construction vehicle transit, and communicable diseases associated with the influx of temporary construction labor. In addition to general health and safety standards outlined in the General EHS Guidelines, the operation of live power distribution lines and substations may generate the following industry-specific impacts:

- o Electrocution
- o Electromagnetic interference o Visual amenity
- o Noise and Ozone

- Aircraft Navigation Safety

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.

- ✓ The Government of Tanzania has ratified the UN Convention on the Rights of the Child. Consequently, it has ratified the International Labour Organization (ILO) Convention No. 59 (Fundamental Conventions, 2002) regarding the minimum age for the admission to employment.
- ✓ 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.
- ✓ 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.
- ✓ 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.
- ✓ 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 recognized Ramsar sites: Malagarasi / Moyovosi (32,500 Km^2), Lake Natron Basin (2250 Km^2), Kilombero valley flood plain (7,950 Km^2) and Rufiji-Mafia-Kilwa (5,969.7 Km^2).

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:

- ✓ National Environment Advisory Committee;
- ✓ Minister Responsible for Environment;
- ✓ Director of Environment (DOE);
- ✓ National Environmental Management Council (NEMC);
- ✓ Sector Ministries;
- ✓ Regional Secretariats; and
- ✓ 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:

- ✓ Director of Environment – Secretary;
- ✓ Director General of NEMC;
- ✓ Commissioners for Minerals and Energy;
- ✓ Representatives from the Office of the Attorney General and the Ministry of Community Development;
- ✓ Directors of sector ministries, including Local Government, Disaster Management, Roads, Human Settlement and Health (Preventive Services), etc.;
- ✓ Chief Government Chemist; and
- ✓ 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:

- ✓ A Chairperson appointed by the President;

- ✓ The Director General – as the Secretary to the Council;
- ✓ The Director of Environment; and
- ✓ 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:

- ✓ Overseeing the enforcement of the Environment Act;
- ✓ Advising the Environment Management Committee;
- ✓ Promoting environmental awareness;
- ✓ Reviewing by-laws on environmental management and on sector specific activities related to environment; and
- ✓ 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:

- ✓ Management of the environment within their jurisdictions;
- ✓ Performing duties assigned by the Minister of Councils;
- ✓ 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:

- ✓ The approval, Issuing and revoking of water rights and permits.
- ✓ Enforcement of water rights and
- ✓ Pollution control measures
- ✓ 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 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 (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 (ME) 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 (ESMP) 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 Manger Environment (1), Environmental officers /Engineers (8), Social Scientists (5) and Surveyors (7).

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 which is under construction. 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.

CHAPTER 4: BASELINE DATA

4.0 Introduction

This chapter provides physical, biological and socio-economic characteristics pertaining to the core project area and area of influence for the construction of the proposed project. Information provided in this chapter will be superimposed in the project concept and components for impact identification, evaluation and development of mitigation measures during the impact assessment.

4.1: Overall Approach and Methodology

The following methodologies for collecting baseline environmental and social information for the proposed project covered area have been formulated on the basis of:

- ✓ Relevant documents, including World Bank directives, the original ESIA Study of the proposed Iringa – Mbeya 400KV power TL by SMEC in the year 2014, guidelines and other documents, relevant national and local legislation, policy papers and guidelines of Tanzania.
- ✓ Practical considerations including timeframe for ESIA, and the accessibility of routes by road.

4.1.1: Environmental and social Aspect

The existing environmental and social information was gathered from the following sources:

- ✓ Secondary literature review;
- ✓ The original ESIA Study of the proposed Iringa – Mbeya 400KV power TL study undertaken by SMEC in the year 2014;
- ✓ Site survey plus District, Village consultations and stakeholder involvement carried out by TANESCO expert in January 2018.

4.2: Physical and Biological Environment

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

The proposed 400Kv TL will pass through villages from Tagamenda Substation located in Iringa to Mbeya but avoiding settlement centers 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.

4.2.1: Physical Aspect

4.2.1.1: Administrative units

The proposed Transmission lines will involve among others Iringa, Njombe and Mbeya region. The administrative structure in Tanzania is governed by Part I, Article 2.2 of the Constitution of Tanzania. Administratively, Tanzania is divided into thirty-one regions (mkoa in Swahili); each region is subdivided into districts (wilaya in Swahili); the districts are sub-divided into divisions (tarafa in Swahili) and further into local wards (kata in Swahili). Wards are further subdivided for management purposes: for urban wards into streets (mitaa in Swahili) and for rural wards into

villages (kijiji in Swahili). The villages may be further subdivided into hamlets (vitongoji in Swahili).

Each region is headed by a Regional Commissioner, each district by a District Commissioner, each division by a Divisional Officer, each ward by a ward executive officer and each village by a village executive officer. There are also local authorities that generally deal with local service provision led by appointed director under the Local Government Regional administration.

1. Iringa Region

Iringa is one of Tanzania's 31 administrative regions. The regional capital is Iringa. The region's population is 941,238. It is primarily agricultural and boasts the second-highest per-capita GDP in the country. Iringa Region is home to Ruaha National Park, Tanzania's second largest park, which has an abundance of wildlife.

Iringa region has a total area of 35,743 square kilometres. It is surrounded by Singida and Dodoma in the north, Morogoro to its east, Mbeya to its west and Njombe towards the south. The region is drained by the Little Ruaha and the Great Ruaha rivers. The lake created by the Mtera Dam is the other significant water body here. The region can be divided into three zones - highland, midland and lowland. The highland zone is towards the east of the region.
About 16% of the land in Iringa region is forested. The region is host to the Ruaha National Park, famous for its large herd of elephants and over 400 species of birds. Other animals include lions, sable antelopes and kudu. A second park, Udzungwa Mountains National Park in Iringa Rural District, is less visited (Source: https://en.wikipedia.org/wiki/Iringa_Region, as seen on January 2018)

Moreover the proposed 400KV Transmission line passes through Iringa district, Mufindi district, and Mafinga township of Iringa region

- ✓ **Mufindi District**

Mufindi District is among five District authorities of Iringa Region located 80 km South of Iringa Municipal. Other Districts authorities in the Region are Iringa Urban, Iringa rural, Mafinga Township and Kilolo. The District is bordered by Njombe District (Njombe Region) to the south, Mbarali District (Mbeya Region) to the West and Iringa District to the North. To the North East lies Kilolo District.The headquarters is located at Mafinga town along Mbeya road. In terms of international identification, the District lies between latitudes 8^{o}.0' and 9^{o}.0' south of the Equator and between longitudes 30^{o}.0' and 36^{o}.0' east of Greenwich. (Source: Mufindi district social economic profile, 2013)

- ✓ **Iringa District**

The District is divided into 6 divisions and 25 wards with a total of 123 villages and 718 hamlets distributed unevenly as shown in Table 1.1. Isimani Division covers about 14.0 percent of total area of the district followed by Kiponzero Division with about 10.6 percent of the total area. Pawaga Division has the smallest area in the district constituting only 3.4 percent of the total district area. Idodi Division, though has the largest percentage share of district area, most of the area is occupied by the Ruaha National Park (10,411.3 sq.km) leaving only 2,427.6 sq. km. for human activities. (Source: Iringa district social economic profile, 2017)

✓ **Mafinga Township**

This place is situated in Iringa, Iringa, Tanzania, its geographical coordinates are 7° 15' 0" South, 35° 4' 0" East and its original name is Mafinga.

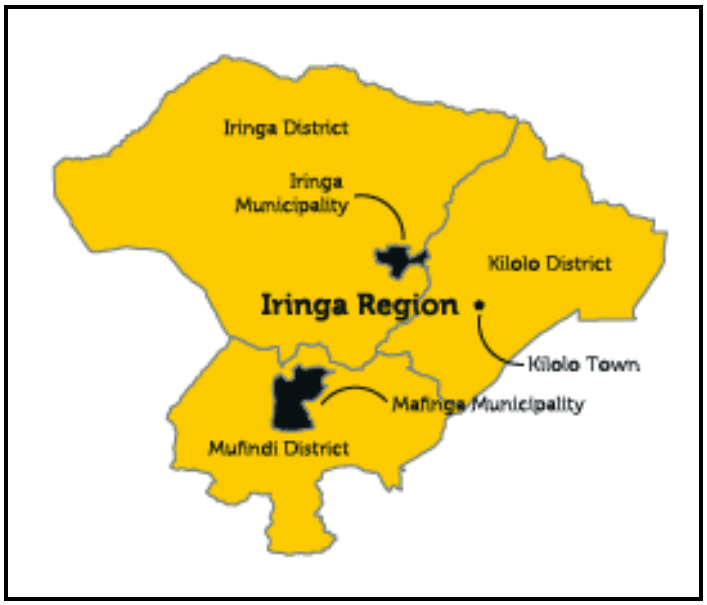


Figure 4.1: Map of Iringa region showing the districts borders (Source: Iringa region social economic profile, 2017)

2. Mbeya Region

Mbeya Region is one of Tanzania's 31 administrative regions. It is located in the country's southwest. Mbeya Region is now bordered to the northwest by Tabora Region, to the northeast by Singida Region, to the east by Iringa Region, to the south by Songwe Region and Malawi, and to the west by Songwe Region. It covers an area of 35,954 square kilometers. (Source: https://en.wikipedia.org/wiki/Mbeya_Region).

The proposed 400KV Transmission line passes through Mbeya city, Mbeya district and Mbarali district of Mbeya region

✓ **Mbeya City**

Mbeya City lies between latitude 8^0 50' - 8^0 57' South of Equator and Longitude 33^0 30' - 35^0 35' East of Greenwich. The City is surrounded by Mbeya district in all directions except in the North-East part of which is boarded by Mbarali district.

✓ **Mbeya District**

Mbeya District Council is one of the seven District Council of Mbeya Region, it is bordered to the north by Chunya District, to the east by Mbarali District, to the south by Rungwe District, Ileje District and Busokelo District, to the west by Mbozi District and to the north east by Songwe District.

✓ **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.

Figure 4.2: Mbeya region map showing the district administrative units' borders
(Source: Mbeya region social economic profile 2017)

3. Njombe Region

Njombe Region is one of the 31 administrative regions of Tanzania. It was established in March 2012, when it was split off from Iringa Region. The region's capital is Njombe town. The newly established Njombe region is an upcoming tourism attractive area, ideal for domestic and international visits in Southern Highlands.

✓ Makete district

Makete District is one of the six districts of Njombe Region of Tanzania. Its administrative seat is the town of Iwawa. It is bordered to the North and West by the Mbeya Region, to the East by the Njombe District and to the South by the Ludewa District. It is divided into six divisions and 17 wards. Makete District was founded in 1979 with the policy of the Ujamaa. Before, this part of Iringa Region belonged to Njombe District.

The area of the district is 5800 km^2 however; only 371 km^2 is agriculturally useful land. The region is at an altitude of 1500 to 3000 m above sea level, being crossed by both the Livingstone Mountains and the Kipengere Range

The proposed transmission line project traverses the regions, districts and Villages as shown in Table 4:1. TANESCO and the Project Contractor will be engaging the administrative leadership in the regions, districts and wards listed in the table for the proposed transmission line project.

Table 4.1: Regions, Districts and villages where the proposed transmission line passes

Region	Districts	Villages	Number of villages
Iringa	Iringa DC	Muwimbi, Bandabichi, Ulete, Kibena, Isupilo, Ugwachanya, Uwenda, Tagamenda, Ihemi, Tanangozi and Mlandege	11
	Mufindi DC	Ihowanza, Tambalangombe, Isalanavu, Ipilimo,	6

		Kiponda and Maduma	
	Mafinga TC	Majengo, Rungemba, Kitelewasi, Kikombo, Ugute, Kisada and Bumlayinga	7
Njombe	Makete DC	Kimani and Mfumbi	2
Mbeya	Mbarali DC	Igomelo, Soniyaga, Lugelele, Ihango, Luwango, Isitu, Ipwani, Madabaga, Itamboleo, Lyambogo, Matemela, Itamboleo, Kapyo, Mengele, Maendeleo, Mbuyuni, Itipingi, Uhamila, Isongwa, Mambi, Lunwa, Lusyesye, Majenje, Lwanyo and Nsonyanga	25
	Mbeya DC	Iyawaya, Mtangano, Itewe, Tembela, Isongwa and Idunda	6
	Mbeya CC	Iganjo, Itanji and Ikhanga	3
		TOTAL	**60**

4.2.1.2: Climate

- ✓ **Iringa Region**

Iringa region has warm climate and temperate. The summers here have a good deal of rainfall, while the winters have very little. This location is classified as Cwb by Köppen and Geiger. The average annual temperature in Iringa is 20.1 °C. In a year, the average rainfall is 690 mm.

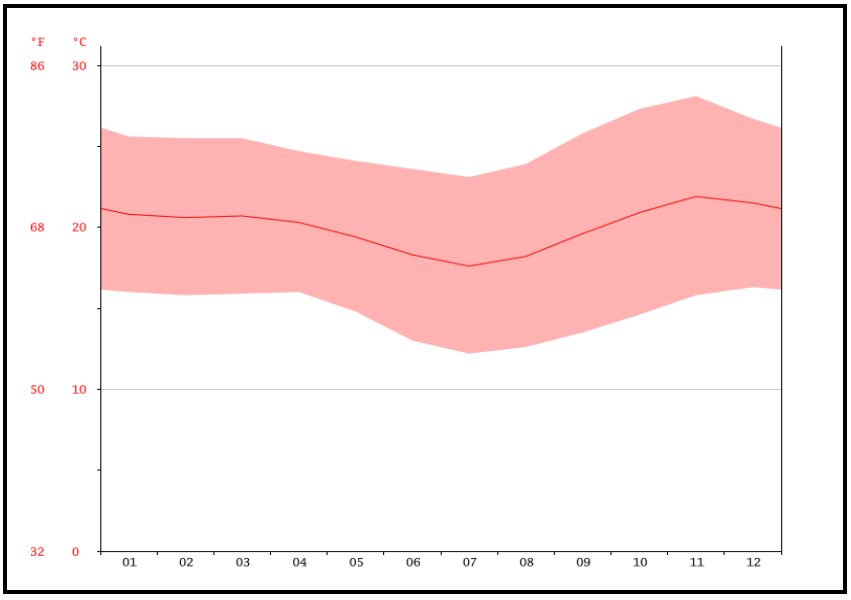


Figure 4.3: Average Annually Temperature of Iringa region (Source: https://en.climate-data.org/location)

- ✓ **Mbeya region**

In Mbeya region, the average temperatures range is between 12^{o}C in Mbeya Mountains to about 25^{o}C in the lowlands areas.

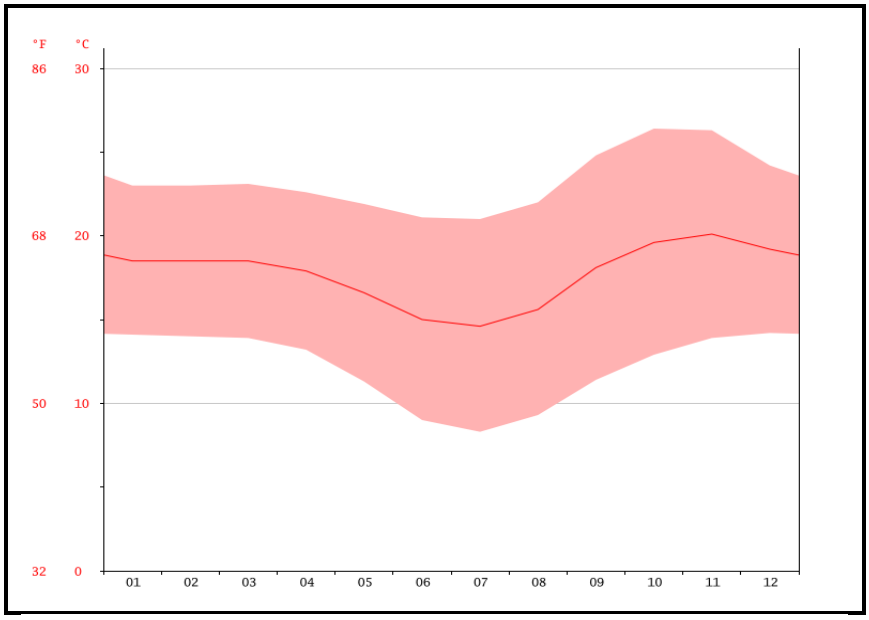


Figure 4.4: Average Annually Temperature of Mbeya region
(Source: https://en.climate-data.org/location)

- ✓ **Njombe region**

In njombe region the temperatures are highest on average in November, at around 18.0 °C. At 12.8 °C on average, July is the coldest month of the year. The annually average temperature is 16.1 °C

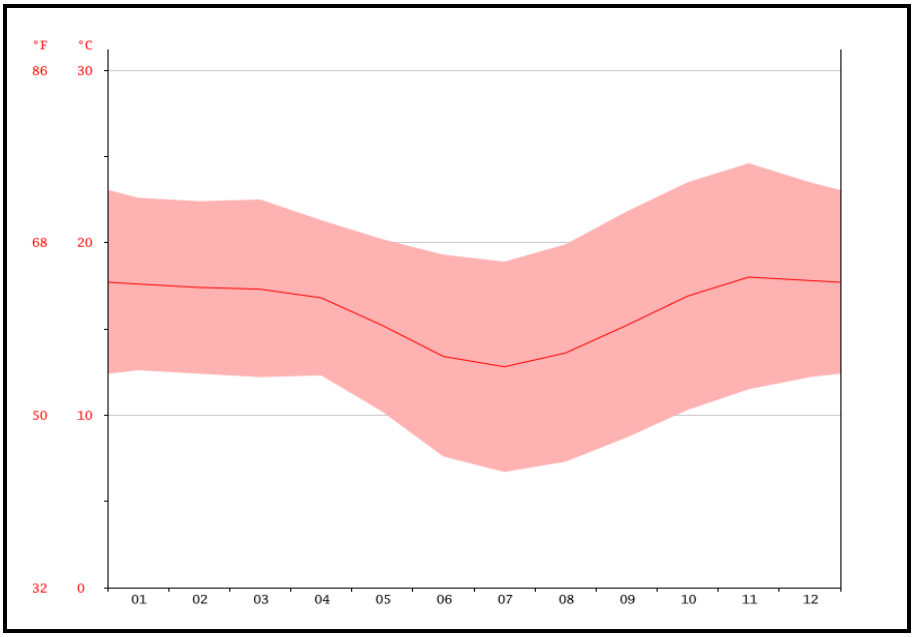


Figure 4.5: Average Annually Temperature of Njombe region
(Source: https://en.climate-data.org/location)

4.2.1.3: Hydrology (River basins & Irrigation)

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 4.2.

Table 4.2: Hydrological characteristics along the proposed TL

Section	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 Igurusi and Mambi Mlowo River drains Uyole highlands and Inyala - Iyawaya ravine before

Figure 4.6: Igurusi River

Figure 4.7: Chimala River.

(Source: Site survey, Jan 2018)

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).

4.2.1.4: 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.

4.2.1.5: Land use and Area
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.

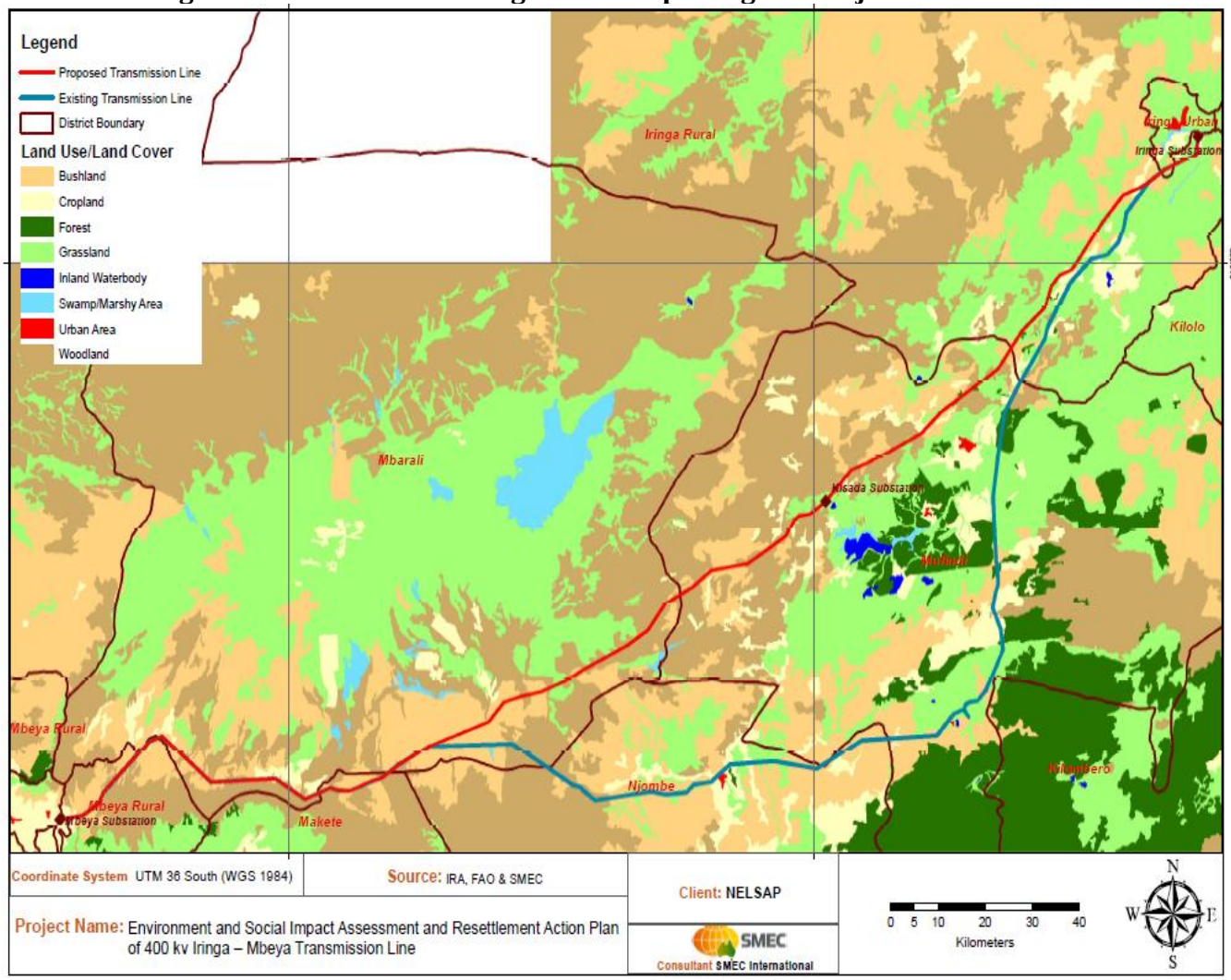
In all districts, total land area is divided into arable land ideal for agricultural production, forests, water bodies, flat land and grasslands. In most cases land in villages belong to individuals and villages. Due to population pressure, many district councils do not have land to offer to investors, 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: 4.3: Land area (in ha) by land use by district

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

(Source: Iringa D.C Social Economic Profile 2013, Mafinga T.C social economic profile 2017, Mufindi D.C Social Economic Profile, 2015, Mbeya City social economic profile 2015, Makete D.C economic profile 2017, Mbarali D.C social economic profile, 2015 and Mbeya district Profiles 2017, Government of Tanzania publication)

Figure 4.7: Land use and Vegetation Map along the Project Area



4.2.1.6: 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.

4.2.1.7: Topography

Iringa, Njombe 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.

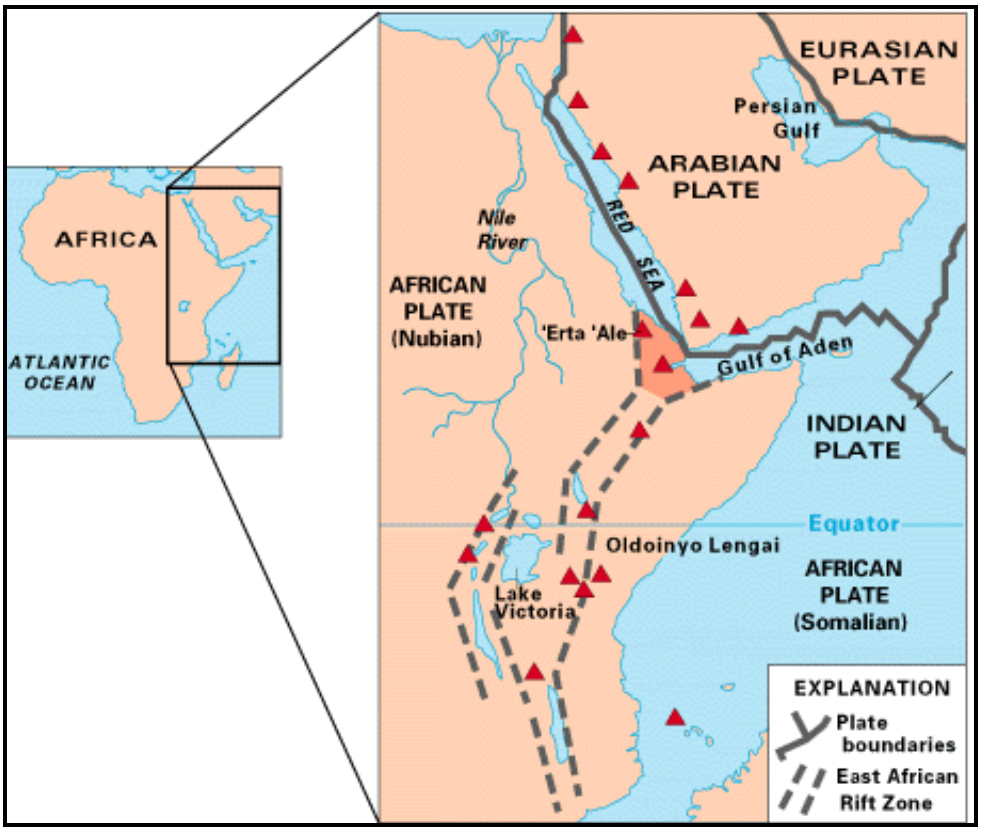


Figure 4.8: The grift rift Valley

(Source: https://en.wikipedia.org/wiki/Great_Rift_Valley as seen of January 2018)

Table 4.4: 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 kibena, isalanavu 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 Iganjo at 1839m a.s.l. The Chimala –Igurusi-Mambi section of the line 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.

4.2.2: Biological Environmental

4.2.2.1 Floral diversity

The plant taxon along the proposed electric power transmission line can be described into five different taxon levels which include phylum, class, order, family and genus. There are four common plant phylum described as Ascomycota, Bryophyta, Marchantiophyta and Tracheophyta. Tracheophyta is common within the landscape and is subdivided into five distinct classes; while others have one taxon class. Within this phylum, the class Magnoliopsida has considerably high number of taxon orders. The class Magnoliopsida has 34 orders, Liliopsida – 7 orders, Polypodiopsida – 6 orders; while Lycopodiopsida and Pinopsida, each have one taxon order. However, orders Magnoliopsida and Liliopsida are the most common taxon classes on the landscape. On the other side, taxa classes Bryopsida and Jungermanniopsida are the rarest on the landscape as illustrated on table 4.5.

Table 4.5: taxon level of species found along the proposed 400Kv TL

Class	Order	Family	Genus	Species
Bryopsida	1	1	3	3
Jungermanniopsida	1	1	1	1
Lecanoromycetes	3	3	9	17
Liliopsida	7	19	114	266
Lycopodiopsida	1	1	1	1
Magnoliopsida	34	104	456	864
Pinopsida	1	2	2	2
Polypodiopsida	6	10	12	14
				1168

The most common plant species is Brachystegia speciform is observed along the electrical power transmission line. This species was observed in over 95% of the sites visited along the proposed transmission line from Iringa – Mbeya.

4.2.2.2 Floral diversity

- ✓ ***Birds***

A total of 136 bird species it 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 of* Appendix V of Wildlife Report in Appendices Report.. It 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 V of Appendices Report.

- ✓ ***Birds of 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. Most records of water birds are from a tiny area around the Mbarali and Kapunga rice-schemes and numbers of water birds in the whole site are likely to be larger than given. Most information is qualitative; 'acres' of Dendrocygna bicolor, for example. Balearica regulorum certainly occurred until recently in thousands and the population of Plectropterus gambensis may number tens of thousands. Among species likely to meet 1% thresholds are Egretta garzetta, Ardeola ralloides, Ardeola rufiventris, Mycteria ibis, Anastomus lamelligerus, Plegadis falcinellus, Dendrocygna bicolor, Plectropterus gambensis, Himantopus himantopus, Charadrius asiaticus and Vanellus albiceps. This is the only regular site known in East Africa for significant numbers of Glareola nordmanni. Grus carunculatus occurs at the Mbarali rice-scheme. Acrocephalus griseldis is only known from a single record in 1995, but it may winter in reasonable numbers. Falco naumanni (passage) and Gallinago media (winter visitor) have been recorded in small numbers and there are several recent records of Circus macrourus.

The Usangu is the only known locality in Tanzania that holds populations of four species of coucal; Centropus cupreicaudus, C. superciliosus, C. senegalensis and C. grillii all breed at Mbarali and the first three are likely to be resident there. Burned grassland is utilized by a small population of *Ardeotis denhami* that are probably cold-season altitudinal migrants from the nearby Kitulo plateau (TZ073) via chimala escarpment. *Ardeotis denhami* is considered migratory bird of not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival as classified on the cites, appendix V.

Figure 4.9: Example of Denham's bustard that migrate from Kitulo plateu to Usangu Flats IBA during dry season (Source: https://www.google.com/search?=bustard+birds)

- ✓ ***Bats***

Even though bats have been known since 1960s to be affected by wind turbines and associated structures, it is only recently when systematic studies mostly in US and Europe have begun to show specific causes and how the bats are affected (Hortker et al 2005). As a result guidelines for protecting bats from wind power and transmission line projects have the developed. The WB OP/BP and International Finance Corporation (IFC) Policy and Performance Standards articulate and compel members and stakeholders to uphold Environmental and Social Sustainability. WB OP/BP 4.04 (Natural Habitats) and IFC's PS 6 (Biodiversity Conservation and Sustainable Living Natural Resources) in particular covers safeguards for habitat and species in general terms and covers bats especially those listed in IUCN and national lists.

Tanzania is one of the few countries that do not have specific safeguards for bats with regards to power generation and transmission. However, EMA 2004, EIA and Regulations 2005 compel certain projects to undergo environmental impact assessment, which includes bats among other environmental elements specified. In general, the natural habitat of the Tanzanian woolly bat is subtropical or tropical moist lowland forests. It is threatened by habitat loss through the conversion of coastal wetlands to subsistence agriculture and coastal forests being subject to logging by the timber industry and local use. Habitat loss impacts this bat fairly drastically as its area of occupancy is estimated to be less than 500 square kilometers. Additionally, all members of this species are estimated to live in only five different locations within the 500 square kilometers. This species is currently classified as endangered by the International Union for Conservation of Nature Red List.

Tanzania is rich in small mammal species such as Bats (97 species), shrews (32 species) and rodents (100 species) (Source: Tanzania State of Environment Report, 2006). It is noted that the proposed 400 kV transmission line will not pass and cross along any areas with high species of bats since in Tanzania bats found most at subtropical or tropical moist lowland forests which is far from Iringa and Mbeya Region.

Table 4.6: Endemic Species, Groups, Category and their Numbers in Coastal Forests

Endemism of various groups		Endemism in Coastal Forests (biological groups)		
Type of Spp	Endemic	Biological group	No. of Endemic Species	%
Duikers	Abbot's Duiker	Plants	400	80.8
Shrews	Peter's musk Shrew, Amani Musk shrew, Uluguru Musk Shrew, Usambara Musk Shrew, Tanzania Mouse Shrew and Uluguru Forest Shrew	Mammals	5	1.01
Fruit-eating bats	Pemba flying fox	Birds	5	10.1
Insect-eating bats	Tanzania Woolly bat, Dar-es-Salaam Pipistrestle	Reptiles	20	4.04
Primates	Sanje Crested Mangabey (endemic subspecies), Uhehe (Gordon's Bay) Colobus, Zanzibar Colobus	Frogs	5	1.01
Rodents	Mt. Kilimanjaro Mole Rat, Swynnerton's Bush Squirrel	Butterflies Millipedes	40 20	8.08 4.04

Source: Burgess and Muir, 1994 and Tanzania State of Environment Report, 2006

- ✓ ***Amphibians***

During the study it 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 amphibians are presented in the Wildlife Report of Iringa-mbeya 400kV TL, 2012 in Appendix V of Appendices Report..

Figure 4.10: Amietophrynus maculata, one of the toads in wetlands at Uyole (left) & Ptychadena sp. in wetlands at Igurusi (right) (Source: Wild life report for Iringa – Mbeya 400kv TL, 2012)

- ✓ ***Mammals***

During the study it 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 Report of Iringa-mbeya 400kV TL, 2012 in Appendix V of Appendices Report

Figure 4.11: Olive baboon in Chimala Forest Reserve
(Source: Wild life report for Iringa – Mbeya 400kv TL, 2012)

- ✓ ***Reptiles***

During the study it 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 Wildlife Report *of Iringa-mbeya 400kV TL, 2012 in* Appendix V of Appendices Report.

Figure 4.12: Trachylepis striata sat on rock in usangu flats (left side) & Trachylepis varia found in Igando-Igawa wildlife corridor (right side) (Source: site survey, Jan 2018)

4.2.3 Wildlife Protected Areas

The proposed transmission line covers a total length of about 292km 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, Mpanga/Kipengele Game Reservs and Chimala Scarp forest reserve. 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.

4.2.3.1 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.

Figure 4.13: Wetland near the existing 220 kV at Igurusi in Mbeya region (Wild life report for Iringa – Mbeya 400kv TL, 2012)

4.2.3.2 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). The proposed TL will cross within this corridor which is greatly disturbed by settlements and 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. Also existing 220kV line (60m RoW) from Iringa-Mbeya is passing through corridor. Hence there will be no significant degradation of natural habitat only a small fraction amount of this type of *miombo* woodland remained with the corridor.

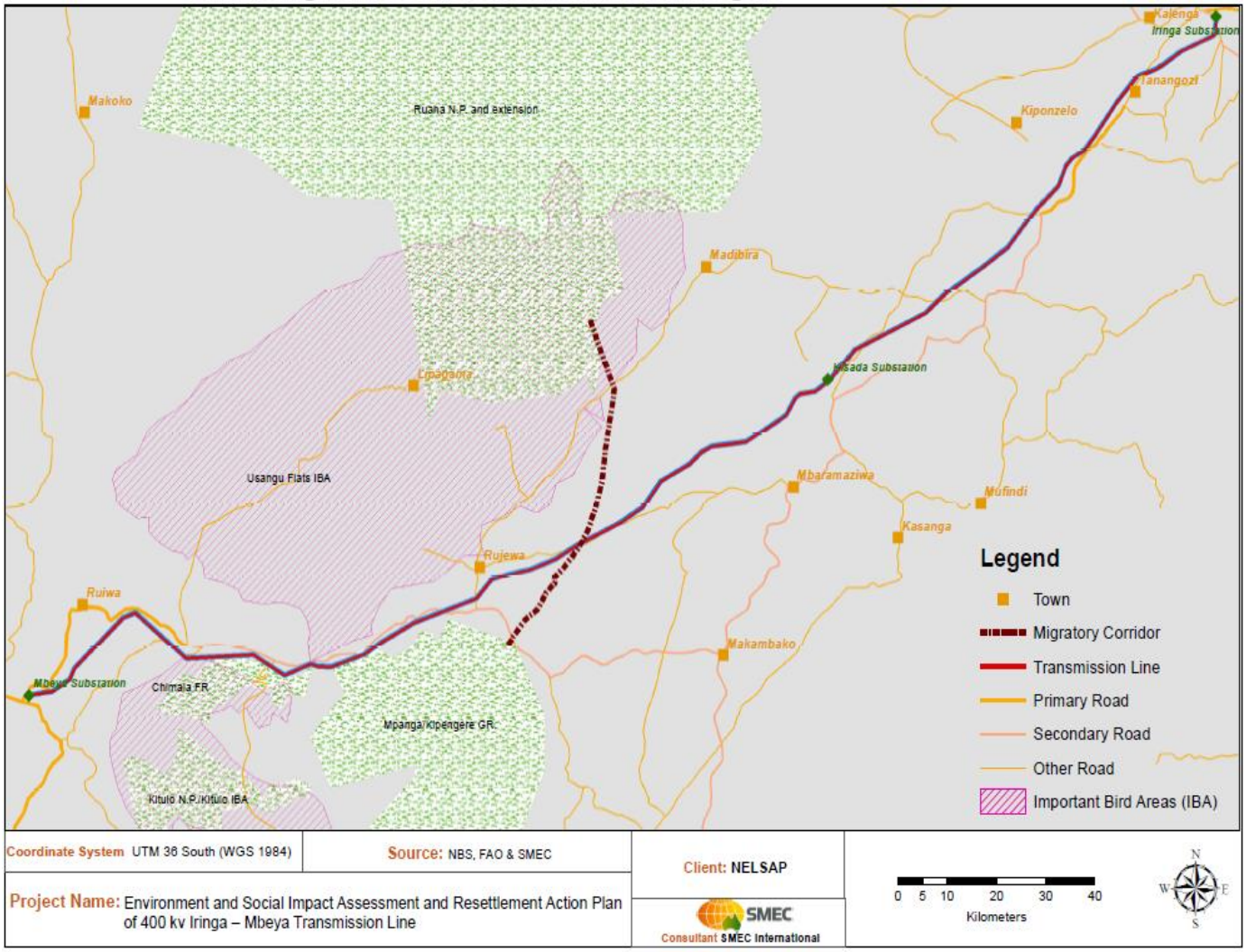
4.2.3.3 Ruaha National Park

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. The proposed TL project does not go through a Ruaha national park (about 26km far).

4.2.3.4 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. The proposed TL project does not go through a Usangu IBA (about 10km far).

Figure 4.14: The wildlife corridor align the TL



4.2.3.5 Iganjo Ritual Forest

Iganjo Ritual Forest is an important protected area of social value near the 17.5Ha proposed Iganjo 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 or sub-station will be constructed close to this forest. Accordingly the ESIA and Design Consultant proposed the TL or substation will be located about 500m from the Forest's northern border, which is fine with the locals. See figure 4.15 for reference. The proposed TL and substation project does not go through Iganjo Ritual Forest (about 500m far).

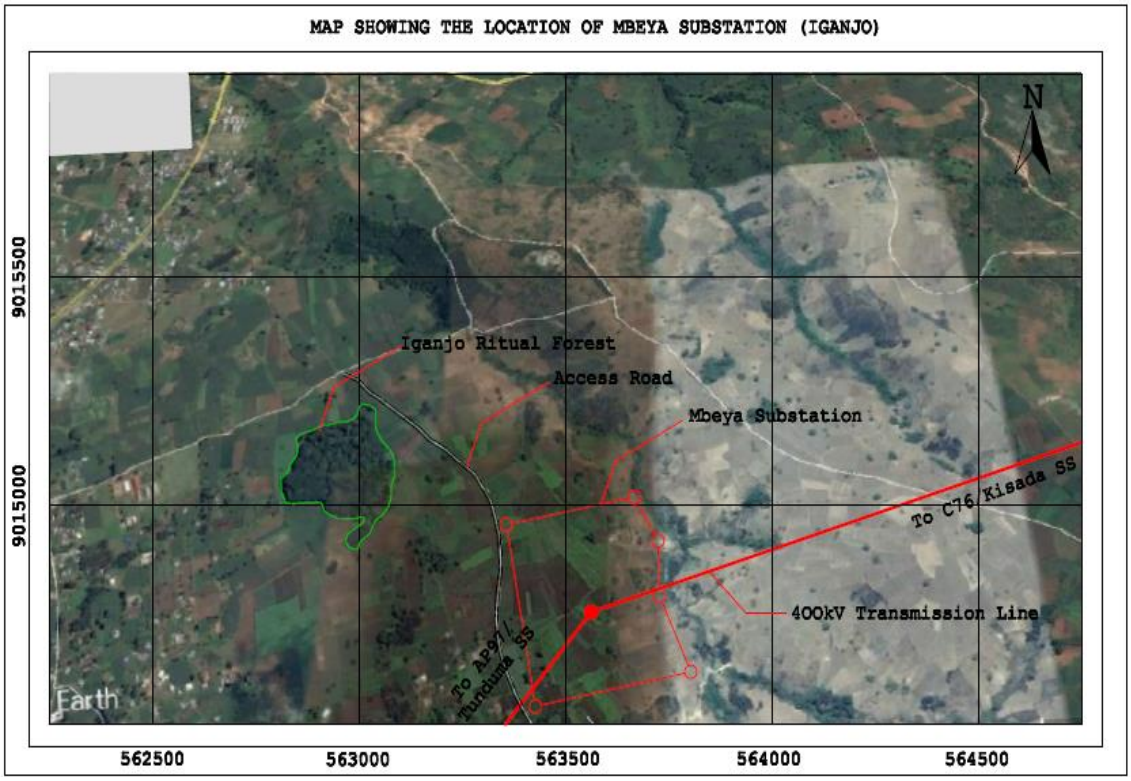


Figure 4.15: Location of Iganjo Ritual Forest (Source: Google map, 2017)

4.2.3.6: 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. The proposed TL will cross at the edge of this FR near to TanZam highway (FR boundary is still uncertain). The FR along this boundary is currently disturbed by settlements and human activities including vegetation clearance, fire burning, cultivation and grazing. Also the existing 220kV line (60m RoW) from Iringa-Mbeya is passing through FR whereby proposed TL project will run parallel to existing TL. Hence there will be no significant degradation of natural habitat only a small fraction of this type of *miombo* woodland within the FR may be affected.

TANESCO and Tanzania Forest Service will conduct an inventory study to verify the boundary, assess the size affected areas within Chimala Scarp FR and propose proper mitigation and compensation measures which could involve preparation of forest management plan. This inventory study will be undertaken during valuation of properties of all affected properties.

Figure 4.16: *Mioimbo* wood land within chamala scarp forest reserve. (Source: Site survey, 2018)

4.2.3.7: Mpanga/Kipengere Game Reserve

Mpanga/Kipengere Game Reserve (MKGR) was gazette 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 km2 and an altitudinal range of 1080 m asl to 2858m asl with two main habitat types, afro-montane forest-grassland mosaic and midaltitude *miombo* woodland (Frontier-Tanzania, 2003). It is managed by the Wildlife Division, Ministry of Natural Resources and Tourism. Existing 220kV line from Iringa-Mbeya is passing on north-western border of this game reserve near to TanZam highway whereby proposed TL project will run parallel to existing TL. Hence there will be no significant degradation of natural habitat in MKGR, and only a small fraction amount of this type of *Afro-montane forest-grassland mosaic* found along the north-western border of this game reserve may be affected.

Figure 4.17: Afro-montane forest-grassland mosaic within MKGR (Source: Site survey, 2018)

4.2.3.8: Kitulo National Park

Kitulo National Park that covers an area of 465.4 sq km 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 stock, Open-billed stock, Blue swallow and European white stock that use the park between November and April. The proposed TL and substation project does not go through Kitulo National Park (about 13km far).

4.2.4: Social Baseline

A baseline that describes the Social, Cultural and Economic characteristics of the key districts covered by the proposed Iringa - Mbeya 400 KV transmission Line is provided below. The information is derived from various sources including the Tanzania National Bureau of Statistics and Districts and Regions Socio-economic profile. The purpose of collecting this information is to provide a basis upon which the impact assessment can be conducted, and to enable the monitoring and measurement of changes over time. The proposed Iringa - Mbeya 400KV power transmission line traverses three regions namely; Iringa, Njombe and Mbeya.

A baseline that describes the Social, Cultural and Economic characteristics of the key districts covered by the proposed Iringa - Mbeya 400 KV transmission Line is provided below. The purpose of collecting this information is to provide a basis upon which the impact assessment can be conducted, and to enable the monitoring and measurement of changes over time.

Methodology

The methodology for the social baseline is based on the following:

- Review of a previous environmental and social assessment undertaken in 2014 for the proposed project;
- Review of data available from the Tanzania Bureau of Statistics for the regions, districts and wards through which the proposed transmission line project will traverse;
- Information gotten from the village office meetings held on January, 2018 along the Iringa – Mbeya 400kVA transmission line route.
- Use of currently Districts Socio-economic profile for all districts project area (Iringa DC, Mufindi DC, Mafinga TC, Makete DC, Mbaralali DC, Mbeya DC and Mbeya CC).

Area of influence

The socio-economic baseline description is focused at a local level about along the proposed transmission line corridor. This is because it is expected that although the proposed Project may result in macro-economic benefits at a national level through establishment of the transmission line, the primary socio-economic impacts of the Project will be experienced at a district, ward and village level. The socio-economic area of influence has been divided into the Direct Area of Influence and the Indirect Area of Influence. Community members living within the 30m (in areas where TL runs parallel with existing 220kV) and 52m wide ROW and extending 1km on either side of the proposed transmission line project including those living immediately adjacent to the substations have been considered within the Direct Area of Influence.

4.2.4.1 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 Region while Kinga are in Makete.

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 Sukuma and Gogo who are specifically identified as nomadic and predominantly agro-pastoralists.

4.2.4.2 Indigenous people (IPs)

There is no specific national policy on indigenous peoples (IPs) in Tanzania. In 2007, Tanzania voted in favor of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) but the Government does not recognize the existence of any IPs in the country. The Pastoralists Indigenous Non-Governmental Organizations (PINGO) Forum was first established in 1994. PINGO is an advocacy coalition of more than 50 indigenous people's organizations working in Tanzania for the rights of the marginalized indigenous pastoralists and hunter-gatherer communities. According to their website and a 2016 status report compiled by the PINGO coordinator, there are four groups self-identifying as indigenous peoples in Tanzania: two hunter-gatherer groups, namely the **Akie** and **Hadzabe**; and two pastoralist groups, namely the **Barabaig** and **Maasai** where are not within Mbeya region. Aslo as per IFAD 2012, four among of 125 different ethnic communities in Tanzania are identify themselves as indigenous peoples (Hadzabe, the Akie, the Maasai and the Barabaig). But the concept of indigenous peoples is not officially acknowledged in Tanzania and the determination of which ethnic groups should be recognised as Indigenous Peoples is still in the process (IFAD 2012).

The proposed TL project area will take place at sites where the following ethnic groups: Hehe, Bena, Kinga, Pangwa, Kisi and Manda for Iringa Region and Nyakyusa, Safwa, Malila, Sangu, Kinga, Wanji, Ndali and Nyika for Mbeya Region; none of the ethnic groups residing in the project area meet the four criteria listing in the WB OP 4.10 and as a result cannot be characterized as indigenous people. Hence the policy is not triggered by this proposed project. While not addressed as IPs according to WB OP 4.10 based on the Government of Tanzania's stance and PINGO's analysis, these ethnic minorities are addressed as community members.

4.2.4.3 Administrative structure

The administrative structure in Tanzania is governed by Part I, Article 2.2 of the Constitution of Tanzania. Administratively, Tanzania is divided into thirty-one regions (*mkoa* in Swahili); each region is subdivided into districts (*wilaya* in Swahili); the districts are sub-divided into divisions (*tarafa* in Swahili) and further into local wards (*kata* in Swahili). Wards are further subdivided for management purposes: for urban wards into streets (*mitaa* in Swahili) and for rural wards into villages (*kijiji* in Swahili). The villages may be further subdivided into hamlets (*vitongoji* in Swahili).

Each region is headed by a Regional Commissioner, each district by a District Commissioner, each division by a Divisional Officer, each ward by a ward executive officer and each village by a village executive officer. There are also local authorities that generally deal with local service provision led by appointed director under the Local Government Regional administration. For example, all development issues at district level are managed by the District Executive Director after the approval of the District Council led by the council chairperson elected among councilors. The District Council with its relevant officers, have the mandate to manage and supervise developmental activities under various sectors representing the sector ministries. Some

of the services provided by the local authorities include water and sewerage, health, education which are supported by the Central Government through its Ministries of Water, Health and Education respectively.

The proposed transmission line project from Iringa – Mbeya Region will be undertaken under the administrative structure described above. In fact, for all public/stakeholder consultation meetings, the Village Executive Officer (VEO), Village Chairperson and Ward Executive Officer (WEO) are the grassroots leadership that must be engaged initially. Leadership at this level will also be important for the Project Contractor to engage with when recruiting workers from the community. The proposed transmission line project traverses the regions, districts and villages as shown in Table 4.7. TANESCO and the Project Contractor will be engaging the administrative leadership in the regions, districts and wards listed in the table for the proposed transmission line project.

Table 4.7: Regions, Districts and villages where the proposed transmission line passes

Region	Districts	Villages	Number of villages
Iringa	Iringa DC	Muwimbi, Bandabichi, Ulete, Kibena, Isupilo, Ugwachanya, Uwenda, Tagamenda, Ihemi, Tanangozi and Mlandege	11
	Mufindi DC	Ihowanza, Tambalangombe, Isalanavu, Ipilimo, Kiponda and Maduma	6
	Mafinga TC	Majengo, Rungemba, Kitelewasi, Kikombo, Ugute, Kisada and Bumlayinga	7
Njombe	Makete DC	Kimani and Mfumbi	2
Mbeya	Mbarali DC	Igomelo, Soniyaga, Lugelele, Ihango, Luwango, Isitu, Ipwani, Madabaga, Itamboleo, Lyambogo, Matemela, Itamboleo, Kapyo, Mengele, Maendeleo, Mbuyuni, Itipingi, Uhamila, Isongwa, Mambi, Lunwa, Lusyesye, Majenje, Lwanyo and Nsonyanga	25
	Mbeya DC	Iyawaya, Mtangano, Itewe, Tembela, Isongwa and Idunda	6
	Mbeya CC	Iganjo, Itanji and Ikhanga	3
		TOTAL	**60**

4.2.4.4 Land use and tenure

The predominant land use along most of the length of the transmission line routing between Iringa and Njombe and Mbeya is agricultural and few section of the transmission line routing would be considered part of built up environment such as cities and towns (e.g. Mbeya city, Mafinga Town in Iringa region and their environs where the land use is residential, commercial or industrial.

Land tenure falls under three categories, namely reserved land (Under the jurisdiction of the Land Commissioner), village land and general land. Reserved land is set aside for wildlife, forests, marine parks, etc., and the way these areas are managed is explained in the laws regarding 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. 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 on how this is to be done. General land is neither reserved land nor village land and is therefore managed by the Commissioner. The Land Act is governing this land.

Iringa region – Land Area, Land Use Pattern and Administrative Units

Iringa Region covers an area of 35,743 sq. km out of which 2,704.2 sq km. or 7.6 percent is covered by water bodies of Mtera Dam, the little and Great Ruaha Rivers. The remaining area of 33,038.8 sq km. is land area. About 16% of the land in Iringa region is forested. The region is host to the Ruaha National Park, famous for its large herd of elephants and over 400 species of birds. Other animals include lions, sable antelopes and kudu. A second park, Udzungwa Mountains National Park in Iringa Rural District, is less visited.

Iringa District – Land Area, Land Use Pattern and Administrative Units

Iringa Rural District has a total area of 20,413.98 sq. kms which is about 34.9 percent of the total area of Iringa region most of which is plain land with very few hills or valleys. Only 9,857.5 sq.km are habitable, leaving the remaining land either as national parks, Rocky Mountains or water bodies. About 9,437.5 sq. kms covered by Ruaha National Park and 1,119 sq. km by water bodies. The arable land available is 479,258 hectares or about 23.5 percent of the district area. Out of the arable land in the district, only 184,465 hectares are actually cultivated annually.

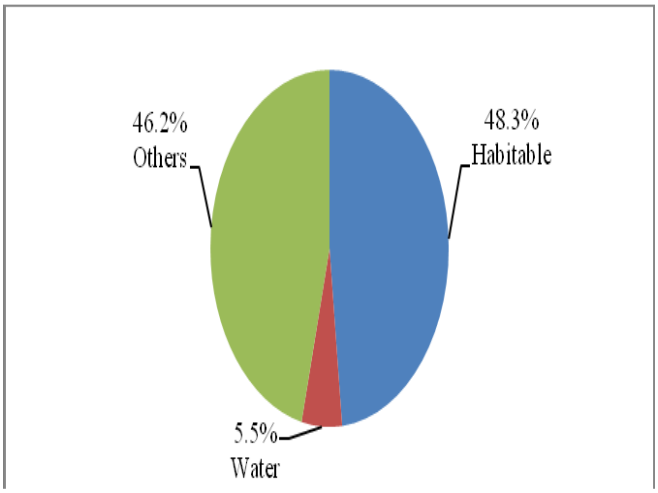


Figure 4.18: Shows land use pattern of the district.

Source: Iringa Rural District Executive Director‟s Office –Land, Natural Resources and Environment Department, 2013

Mufindi District – Land Area, Land Use Pattern

This segment discusses land area by wards in Mufindi District Council for the year 2015, however, it was not possible to get estimates of area covered by water at wards level. Therefore, it should be noted that, the estimates of area covered by water in Mufindi DC is given at the

Council level. Mufindi DC has a total surface area of about 6,170 sq. km, of which the estimates of area covered by water bodies is 10 percent. Moreover, Kiyowela ward has the largest land area of 11.0 sq. km followed by Kibengu (9.4 sq. km) and Igombavanu (7.6 sq. km). On the other hand, Mpanga Tazara has the lowest land area of about 0.6 sq. km.

Makete District – Land Area, Land Use Pattern

The area of the district is 5800 km^2, however, only 371 km^2 is agriculturally useful land. The region is at an altitude of 1500 to 3000 m above sea level, being crossed by both the Livingstone Mountains and the Kipengere Range. Major rivers originating from the mountains are Numbi, Kimani, Luvanyila and Ijangala. Smaller portions of the Great Ruaha River Basin lie within Makete District.

Mbeya region – Land Area, Land Use Pattern and Administrative Units

Mbeya Region covers a total 35,954km^2, which is 4.1% of the total area of the United Republic of Tanzania excluding sea area of 883,343km^2. Out of the Region's total surface area, 35,201km^2 is dry land and 753km^2 is covered with water bodies of Lake Nyasa and rivers Kimani, Chimala, Igurusi, Kiwira, Lufilyo, Mmbaka and Zira. The distribution of land and water area by councils in Mbeya region is given in Table 4.8.

Table 4.8: Distribution of Land Area and Water Area by Councils in Mbeya Region, 2016

Council	Dry Land Area (km^2)	Percent of Land Area (km^2)	Water Area (km^2)	Percent of Water Area (km^2)	Total Surface Area (km^2)	Percent of Surface Area (km^2)
Chunya	13,143	37.0	0	0	13,143	36.6
Mbeya District Council	2,432	6.9	0	0	2,432	6.8
Kyela	872	2.5	450	97.6	1,322	3.7
Rungwe	1,231	3.5	11	2.4	1,242	3.5
Mbarali	16,632	46.9	0.1	0	16,632	46.3
Busokelo	969	2.7	0	0	969	2.7
Mbeya City	214	0.6	0	0	214	0.6
Total	**35,493**	**100**	**461**	**100**	**35,954**	**100**

Source: Regional Commissioner's Office, Mbeya Region, February 2016

4.2.4.5 Population

According to the 2012 census in Tanzania, the total population in the mainland was 43,625,364. Population of the regions affected by the project based on the national census conducted in 2012 is as follows: Iringa region had a total population of 941,238 at region population growth rate of 1.1, Njombe region had a total population of 702,097 at region population growth rate of 0.8and Mbeya region had a total population of 2,707,410 at region population growth rate of 2.7.

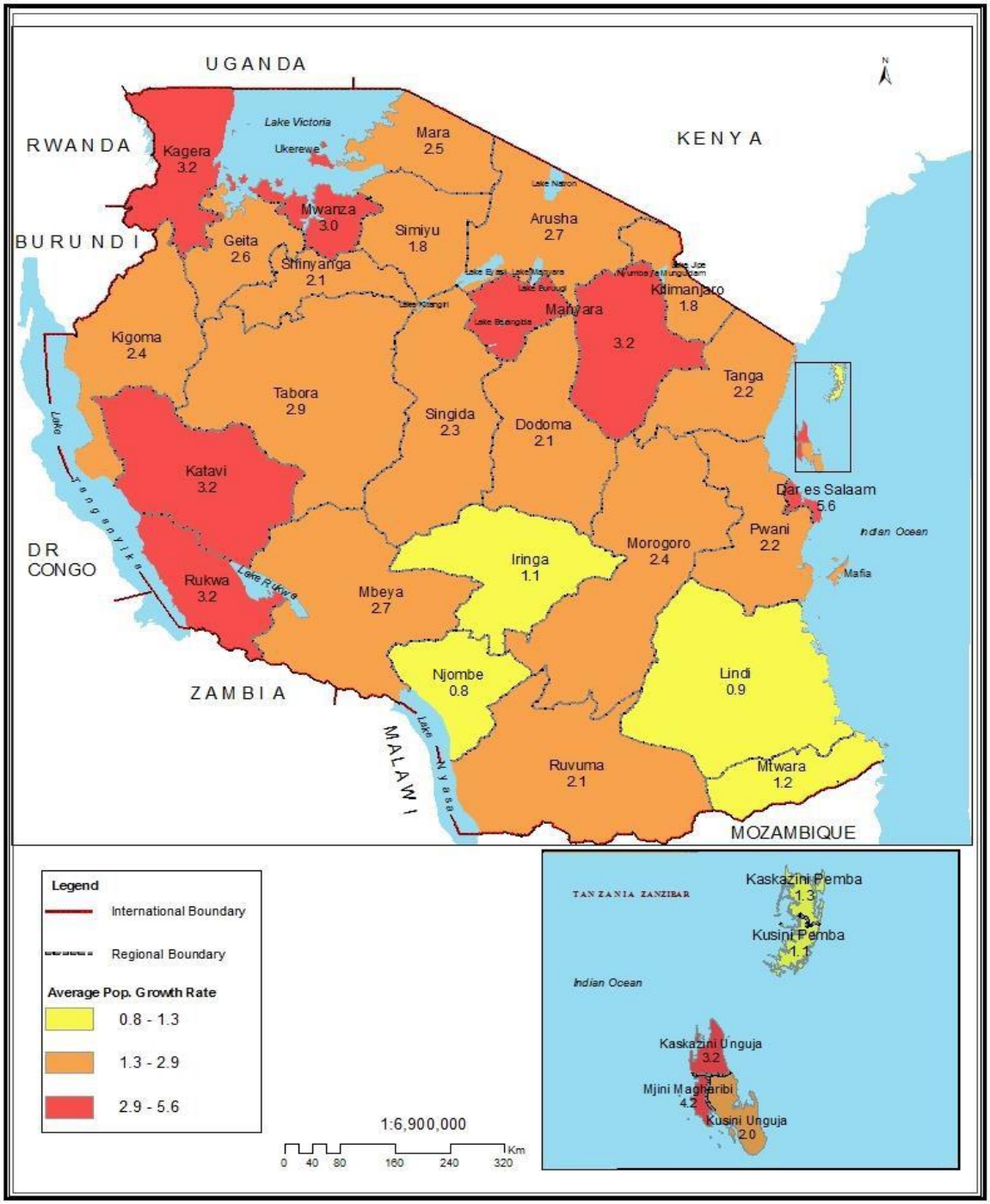


Figure 4.19: Average Annual Population Growth Rate by Region, 2002 – 2012 Censuses
Source: 2012 Population and Housing Census – Tanzania

In Iringa region, the proposed transmission line will pass through the districts of Iringa DC, Mufindi DC and Mafinga TC. The districts and their respective population in 2012 are shown in figure 4.20.

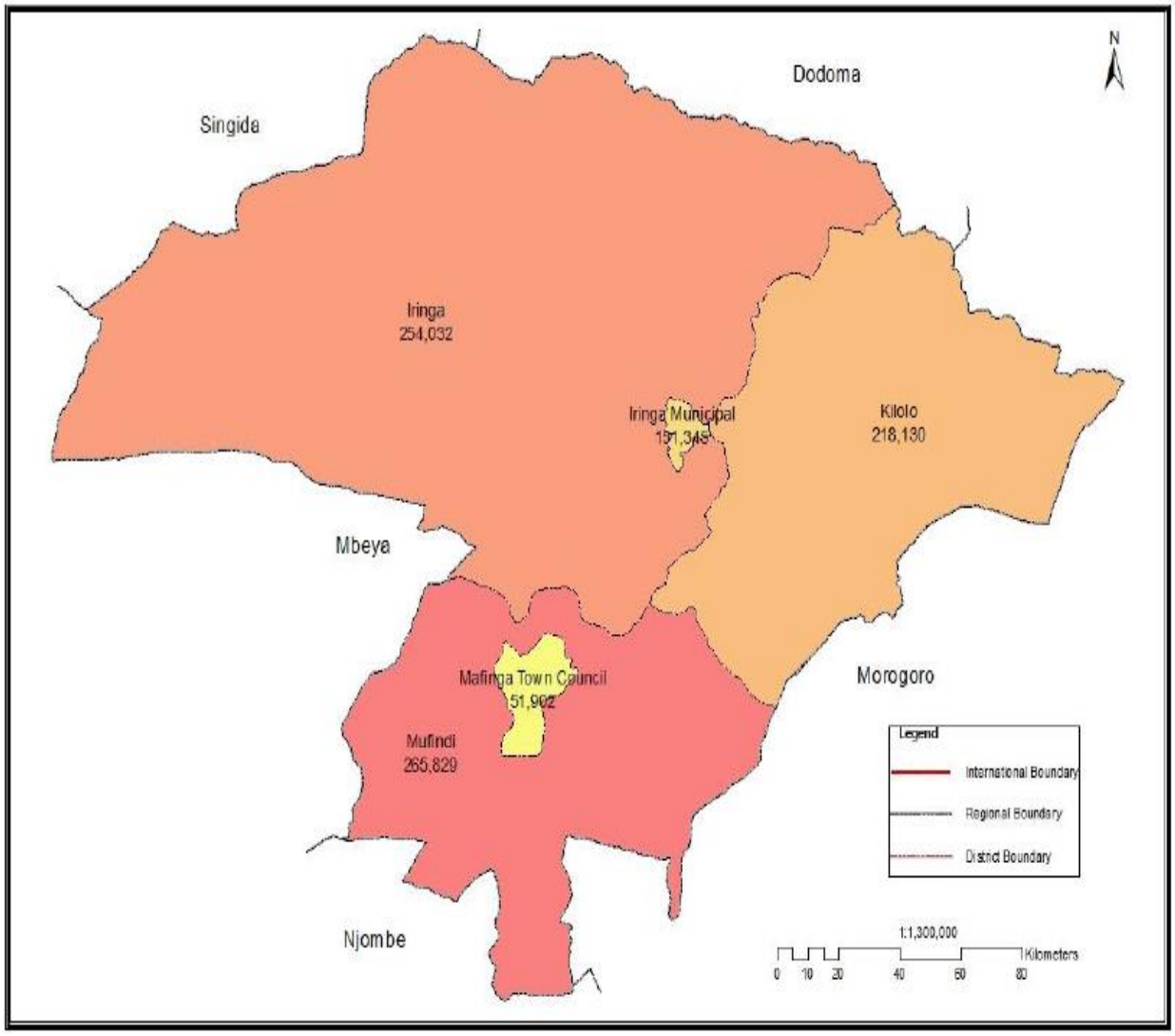


Figure 4.20: Location of districts in Iringa Region with their 2012 population Source: 2012 Population and Housing Census – Tanzania

In Njombe region, the proposed transmission line will traverse through one district known as Makete DC. A map showing the location of the Makete district relative to the entire region is given in figure 4.21.

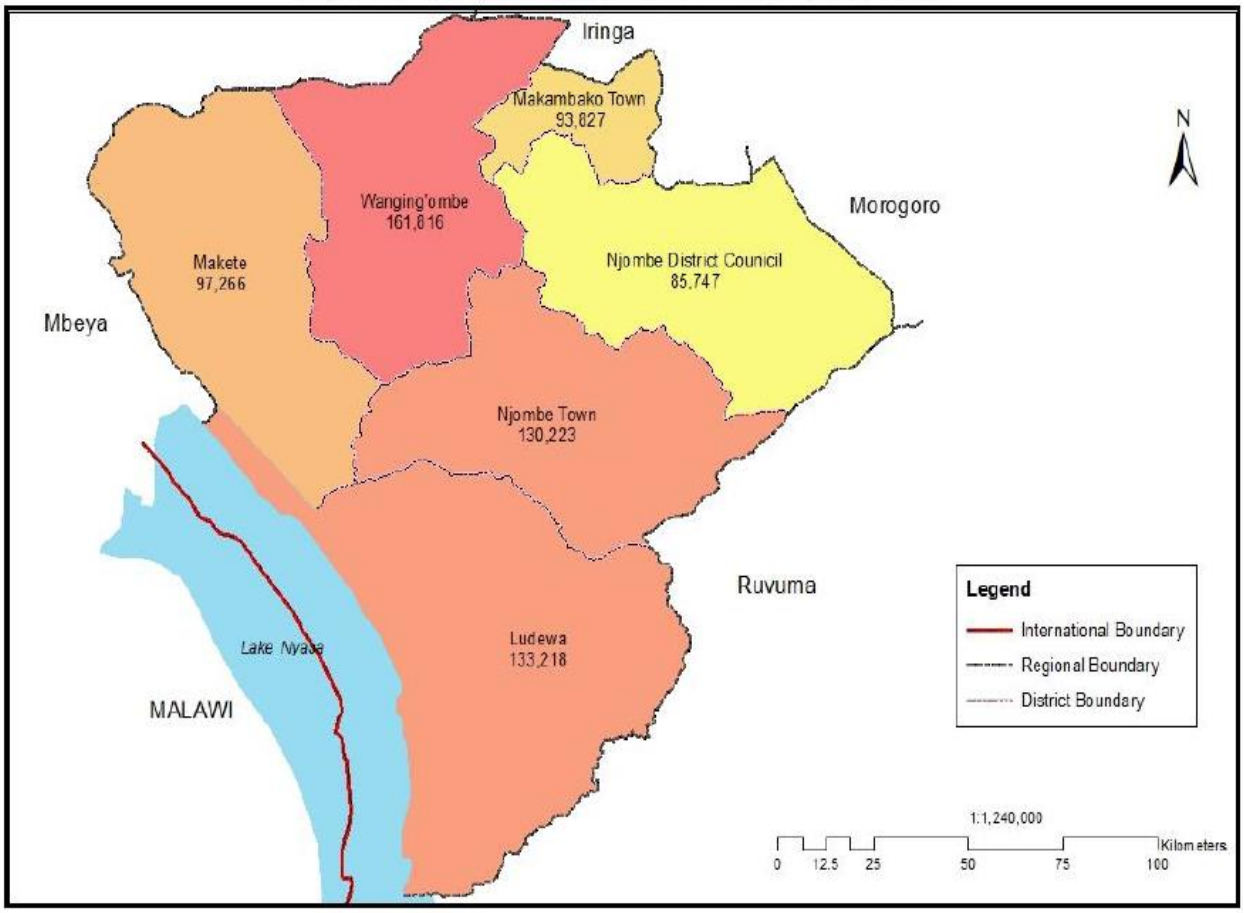


Figure 4.21: Location of Makete district in Njombe Region with their 2012 population
Source: 2012 Population and Housing Census – Tanzania

In Mbeya region, the proposed transmission line will traverse through three districts known as Mbarali DC, Mbeya DC and Mbeya CC. A map showing the location of the three districts relative to the entire region is given in figure 4.22.

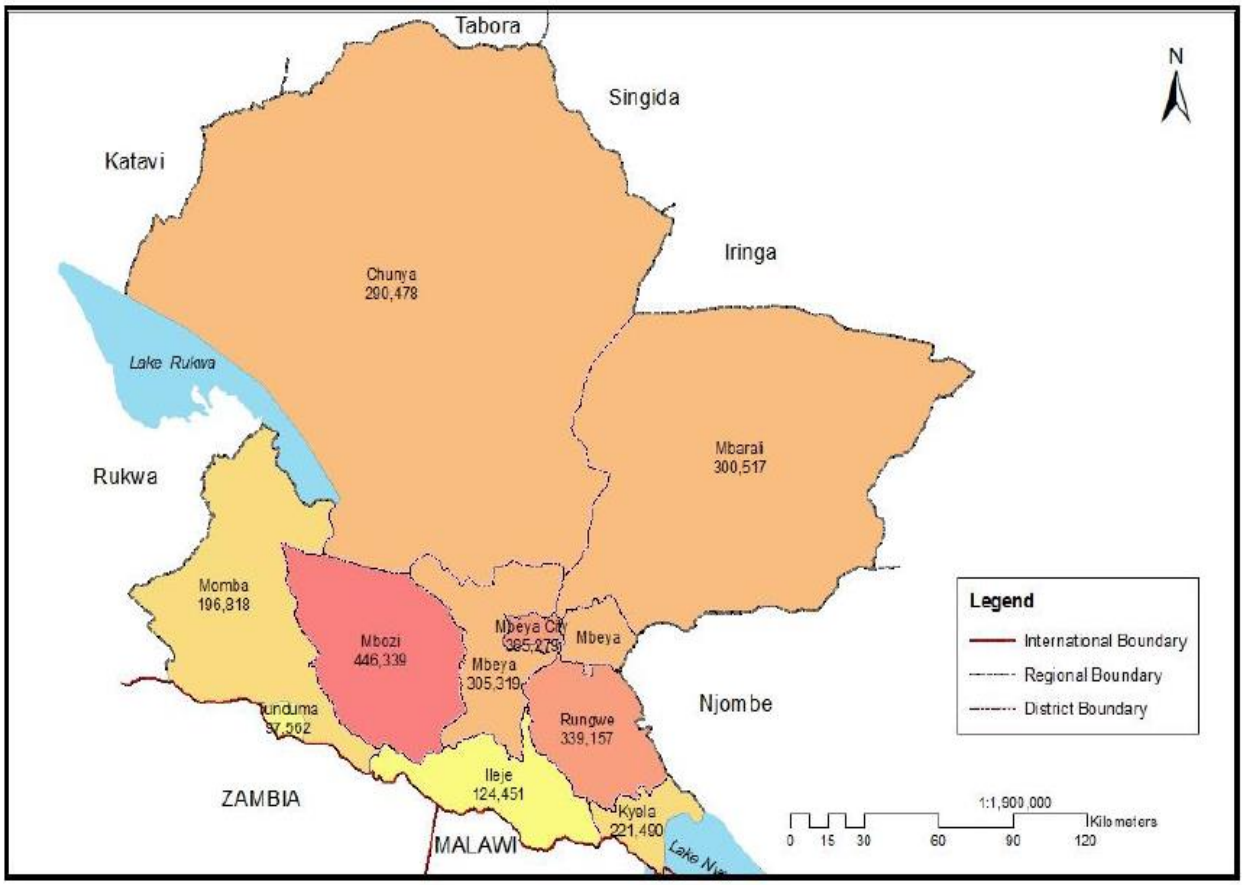


Figure 4.22: Location of districts in Mbeya Region with their 2012 population
Source: 2012 Population and Housing Census – Tanzania

Population of the councils affected by the proposed project based on the national census conducted in 2012 is illustrated more on table 4.9.

Table 4.9: Population Number for the districts along the proposed transmission line RoW

No.	Council	Population Number			Ave. House hold size	Sex ratio
		Male	Female	Total		
1	Iringa D.C	123,243	130,789	254,032	4.2	94
2	Mufindi D.C	125,896	139,933	265,829	4.2	90
3	Mafinga T.C	25,125	26,777	51,902	4.0	94
4	Mbeya D.C	143,779	161,540	305,319	4.1	89
5	Mbeya City	182,620	202,659	385,279	4.2	90
6	Makete D.C	97,266	51,966	97,266	3.7	87
7	Mbarali D.C	145,867	154,650	300,515	4.3	94

Source: National Bureau of Statistics, National Census, 2012

Also team of TANESCO experts collected population of the villages affected by the proposed TL project during field work on January, 2018. Normal in each of village office there are data of population found at village office where by each of sub-village submit to village office population data once per year as shown in table below and pictures in Appendix II.

Table 4.10: Population Number for the villages affected by the proposed project

No.	Council	Village/Mtaa	Population Number			House hold
			Male	Female	Total	
1	Iringa D.C	Tagamenda	1656	1834	3490	798
		Muwimbi	1423	1986	3409	876
		Bandabichi	1324	1257	2581	652
		Mlandege	2345	2314	4659	543
		Isupilo	1277	1525	2802	765
		Ulete	865	988	1853	688
		Kibena	986	1243	2229	843
		Ugwachanya	1243	2463	3706	865
		Uwenda	1423	1786	3209	1087
		Ihemi	1432	1567	2999	900
		Tanangozi	1954	1689	3643	722
2	Mufindi D.C	Ihowazi	1645	1567	3212	974
		Tambalang'ombe	1432	1876	3308	879
		Isalanavu	829	1420	2249	613
		Ipilimo	1432	1567	4122	645
		Kiponda	1645	1864	4122	1002
		Maduma	726	979	1705	615
3	Mafinga T.C	Majengo	238	436	674	453
		Rugemba	876	987	1863	765
		Kitelewasi	1209	965	2174	865
		Kikombo	1012	1650	2662	660
		Ugute	511	652	1163	267
		Kisada	490	604	1094	100
		Bulyaminga	787	850	1637	130
4	Mbeya D.C	Iyawaya	654	786	1440	862
		Ntangano	197	864	1061	278
		Itewe	964	1004	1968	1234
		Idunda	876	986	1862	786
		Tembela	772	985	1757	606
		Isongwa	389	392	781	781
5	Mbeya City	Itanji	658	862	1520	930
		Iganjo	657	666	1323	650
		Ikhanga	605	746	1351	812
6	Makete D.C	Kimani	965	1245	2210	1200
		Mfumbi	865	1121	1986	673
7	Mbarali D.C	Igomela	1432	1465	2897	765
		Soniyaga	1325	1864	3189	1003

No.	Council	Village/Mtaa	Population Number			House
		Lugelele	605	746	1351	983
		Ihango	1211	1653	2864	758
		Luwango	1321	967	2288	768
		Isitu	1233	1650	2883	1300
		Ipwani	867	1324	2191	1192
		Madabaga	2032	2346	4378	1232
		Lyambogo	1153	1867	3020	1215
		Majenje	987	1423	2410	768
		Matemela	876	1230	2106	756
		Itamboleo	982	1040	2022	911
		Kapyo	1002	1234	2236	956
		Mengele	1400	1300	2700	1200
		Maendeleo	1007	1910	2264	653
		Mbuyuni	1748	1743	3491	917
		Itipingi	1203	1654	2857	567
		Uhamila	1687	1756	3443	705
		Manjenje	2027	2618	4645	950
		Mambi	850	902	1752	250
		Lunwa	1440	2433	3873	863
		Lusyesye	1311	2693	4004	689
		Lwanyo	1221	1830	3051	472
		Nsonyanga	907	1921	2828	703

Source: Village data, January, 2018

4.2.4.6 Population migration

Migration is a complex demographic variable involving uncertainty. The measurement and analysis of migration however, are important in the preparation of population estimates and projections for a Region.

Both project Regions are among Regions in the country that have experienced persistently positive net migration. There are several reasons that cause positive net migration in these Regions. Among them are water and food availability at all times, strong industrial and commercial base, large scale plantations, and availability of social services including school facilities and health infrastructures. As the Iringa, Njombe and Mbeya Regions have fertile agricultural land, it attracts seasonal workers from neighbouring Regions and districts such as Songea and Songwe Regions. Another reason for migration is the electrification rates; the electrification rate in Iringa, Njombe and Mbeya Region is high i.e. Iringa (53.4 %), Njombe (36.6%) and Mbeya (80.5%)

For the proposed transmission line project, it is envisaged that the Project Contractor will engage the services of skilled, semi-skilled and unskilled workers. The approximate staff strength required for the proposed project is shown in Table 4.11. Most skilled workers will likely be

expatriate workers and therefore immigrant to the areas where the proposed project will be constructed while semi-skilled and unskilled labor will likely be sourced from the local areas (wards and villages) where the project will be undertaken. Where semi-skilled and unskilled workers are unavailable in the wards and villages where the transmission line traverses, such workers may come from other parts of Tanzania. It is expected that the ratio between skilled and unskilled workers will be 30% skilled workers and 70% unskilled workers (local).

Table 4.11: Approximate staff strength for the construction and commissioning phases

Project Phase	Approximate number of staff
Mobilization	~100
Construction	~500
Commissioning	~100

4.2.5 Regional economy

Agriculture is the largest sector of the economy in Tanzania. According to the 2012 Population and Housing Census, the majority of the population (about 70%) lives in rural areas where their livelihood depends on agriculture either directly or indirectly. It contributes about 25% of Gross Domestic Product (GDP) and accounts for half of the employed labor force. Agriculture is the largest source of foreign exchange earnings and it feeds both the rural and urban populations.

4.2.5.1 Agriculture

According to the 2015 data from the Ministry of Agriculture, Livestock and Fisheries, Tanzania, the production of food crops on the mainland produced a mixed bag of results as shown in table 4.12 and figure 4.23.

Table 4.12: Production of Food Crops in Tanzania Mainland, 2009–2015 ('000 Tons)

Crop	2009	2010	2011	2012	2013	2014	2015	% change in yield 2014/15
Maize	3,324	4,733	4,341	5,104	5,174	6,734	5,903	-12.3%
Rice	885	2,650	1,461	1,170	1,307	1,681	1,937	15.2%
Wheat	94	62	113	109	92	167	72	-56.9%
Millet	204	1,034	1,119	1,053	1,041	1,246	1,007	-19.2%
Cassava	1,759	4,548	1,549	1,821	1,943	1,664	1,962	17.9%
Beans	1,184	1,254	1,632	1,827	1,641	1,697	1,808	6.5%
Banana	991	3,156	1,048	842	1,307	1,064	1,195	12.3%
Potatoes	1,381	3,897	1,710	1,418	1,259	1,167	1,090	-6.6%

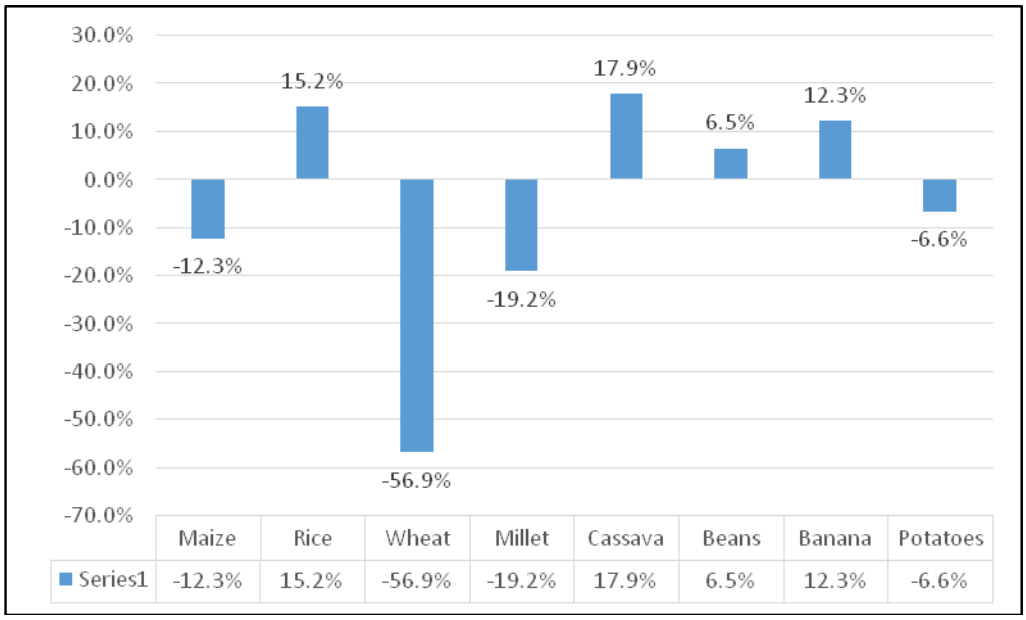


Figure 4.23: Percentage change in yield of food crops production – 2014/15

In Iringa Region, Agriculture is the mainstay of Iringa's economy accounting for 85% of its GDP. Between 2011 and 2015, an average 345,000 hectares (1,330 sq mi) of land was planted with food crops annually. Maize is the dominant cereal with about 245,000 hectares (950 sq mi) of land devoted to it. Beans are second most important food crop being grown on 56,000 hectares (220 sq mi). Cash crops take about 56,000 hectares with sunflower being the major output.

In Njombe region, Agriculture provides the livelihood of most people in Njombe region. Because of the temperate climate, wheat and potatoes are widely cultivated; they are often intercropped with pumpkin, Phaseolus beans and peas. Because of the temperate climate, also fruit trees, such as plums, peaches, apples and pears, are being cropped in the district. The region is well known for its bamboo wine (ulanzi), which is prepared from the fermented juice of the wine bamboo (Oxytenanthera). People from Makete District traditionally worked as pluckers on tea plantations of the country. Maize has only recently been introduced. Diverse livestock species are held. While cattle are usually kept on communal grazing land, goats, pigs and poultry are reared close to the homesteads. Inside the houses, a large proportion of the rural population also keeps domestic cavies (i.e., Guinea pig, Cavia porcellus) for meat production, although they are rarely mentioned in statistics. Locally, the animals are called simbilisi, which is a Kihehe word. In Njombe region, cavies are largely fed with bamboo leaves.

In Mbeya Region, agriculture is the back bone of residents of which about 80% depend on as their main source of livelihood. Agriculture is dominantly peasantry farming with a small number of commercial scale farming of tea in Rungwe, coffee in Mbozi and rice in Mbarali Districts. Agriculture contributes about 69% of the Region's GDP. Weather conditions continue to be the major determinant of agriculture performance in the Region. The Region has about 3,810,441 hectares (59.8% of the total Regional land area) suitable for cultivation of both cash and food crops. The major food crops grown in the Region are maize, paddy, sorghum, beans, round potatoes, sweet potatoes, cassava, bananas, groundnuts, simsim, fruits and vegetables. Main cash crops are coffee, tea, tobacco, pyrethrum, wheat, sunflower, and palm oil.

During the field visit conducted on January, it was observed that most of the communities where the transmission line traverses from Iringa to Mbeya practice peasant and/or small scale farming as shown. They tend to grow crops such as maize, beans, potatoes, ground nuts, rice, etc.

4.2.5.2 Livestock keeping

Livestock keeping is the second most predominant economic activity in the Iringa, Njombe and Mbeya and Rukwa Regions. The sector plays a significant role in the rural economies of the two regions. In Mbeya region, a dairy cattle rearing is highly practiced in Rungwe District with 56% of the total cattle population in the region. Other livestock kept include pigs, chicken, ducks and pigeons. Based on 2014 statistics from the Ministry of Agriculture, Livestock and Fisheries, the census of livestock in project area is shown in Table 4.13.

Table 4.13: Livestock population in 2014 in Iringa, Njombe and Mbeya Regions

Region	District	Cattle	Sheep	Goats	Pigs	Chicken
Iringa	Iringa DC	**59,915**	**5,839**	**37,255**	**35,170**	**384,927**
	Mufindi DC	**107,186**	**7,315**	**36,577**	**78,084**	**535,454**
Njombe	Makete	**39,219**	**8,763**	**55,740**	**8,476**	**150,842**
Mbeya	Mbarali	**171,200**	**24,980**	**79,229**	**20,564**	**359,179**
	Mbeya DC	**104,708**	**15,436**	**111,232**	**31,190**	**448,429**
	Mbeya CC	**9,848**	**792**	**9,094**	**8,905**	**106,936**

4.2.6 Socio-economic factors

4.1.6.1 Occupation

During the field survey and public/stakeholder consultation meetings held on January, 2018 from Iringa to Mbeya, it was established that most men living in the project area practice subsistence and cash crop farming. For subsistence farming, it was observed that the main crops grown include maize, potatoes, beans and groundnuts. For cash crops, a few of the farmers were observed to be growing sunflower; they also sell maize, potatoes and beans as a cash crop. As an occupation, the men in rural areas also partake in animal husbandry of cows, goats, sheep, chicken, and pigs.

Women in the rural areas practice farming of maize, beans and potatoes coupled with daily duties like chicken rearing, fetching water and taking care of children and household chores.

In the towns of Iringa, Mafinga and Mbeya and their environs, predominant occupations for men include formal and informal trade and formal employment in the government and private sector. The urban women mainly engage in readymade food vending, fruits, soft drinks, fish, potatoes, rice, beans, vegetables trade and taking employments as bar attendants and house maids.

Income level with project area

According to socio-economic data collected during RAP study on 2012 for PAHs showed that monthly income varied across districts. While 31.5% of the PAHs reported income under TShs. 60,000/month, only 7.6% were reported to have an income above TShs. 400,000. The rest of the PAHs (60.9%) reported to have an income between TShs. 60,000 and TShs. 400,000. Among all districts, Iringa rural was reported to have an income exceeding TShs. 400,000 by 10.2%, Makete by 12.8% and Mbeya City by 10%. This data based on RAP report of 2012 and will be updated after updating RAP report on 2018.

4.1.6.2 Education

Education services in Tanzania are provided through different levels. These are pre-primary level, primary level, secondary level and tertiary levels. Pre-primary education is for children of age between five and six years. It lasts for two years with no examinations for promotion purpose. The primary education is a seven years education cycle after pre-primary. It is universal and compulsory to all children from the age of seven years. The formal secondary school education consists of two sequential cycles. The first cycle is a four year ordinary level (Form I to Form IV). The second cycle is a two year program of advanced level (Form V to Form VI).

The level of education to the project area is about 80% attained basic primary schools, 30% have attained secondary. Less than 3% of the affected population has college or university education. With the current emphasis by the government to ensure that Tanzanian children attend schools (free education), the rate of school enrolment has also increased in most parts of the country. The rate of illiteracy was relatively high in Makete DC and Iringa DC.

According to the data presented in Districts socio-economic profile of each DC and data collected during field visit on January, 2018, the total number of schools (public and private) in the project area of Iringa, Njombe and Mbeya are shown in table 4.14 and table 4.15 below.

Table 4.14: Number of available Education Services in the Project Impacted Area on the district and council level

No.	District	Secondary school	Primary school	University	Technical school	Total
1	Iringa D.C	06	16	-	3	25
2	Makete D.C	1	2	-	-	2
3	Mufindi D.C	1	5	-	3	26
4	Mbeya City	2	1	-	-	3
5	Mbeya D.C	3	6	-	-	9
6	Mbarali D.C	8	22	-	-	30
7	Mafinga T.C	5	7	-	2	14

Source: Iringa D.C Social Economic Profile 2013, Mufindi D.C Social Economic Profiles, 2015, Mbeya City social economic profile 2015 and Mbeya district Profiles 2017, Government of Tanzania publication

Table 4.15: Number of available Education Services in the Project Impacted Area on the district and council level

No	District	Village	Primary Schools	Secondary school	Total
1	Iringa D.C	Tagamenda	3	-	3
		Muwimbi	1	2	3
		Bandabichi	1	2	3
		Mlandege	1	-	-
		Isupilo	2	-	2

No	District	Village	Primary Schools	Secondary school	Total
		Ulete	1	-	1
		Kibena	2	1	3
		Ugwachanya	2	-	2
		Uwenda	1	-	1
		Ihemi	1	0	1
		Tanangozi	1	1	2
2	Mufindi D.C	Ihowazi	-	-	-
		Tambalang'ombe	1	-	1
		Isalanavu	1	1	2
		Ipilimo	1	-	1
		Kiponda	1	-	1
		Maduma	1	-	1
3	Mafinga T.C	Majengo	1	-	1
		Rugemba	1	1	2
		Kitelewasi	1	2	3
		Kikombo	2	1	2
		Ugute	1	1	2
		Kisada	1	-	1
		Bulyayinga	-	-	-
4	Mbeya D.C	Iyawaya	1	-	1
		Ntangano	1	1	2
		Itewe	1	1	2
		Idunda	1	-	1
		Tembela	1	-	1
		Isongwa	1	1	2
5	Mbeya City	Itanji	-	1	1
		Iganjo	1	-	1
		Ikhanga	1	1	2
6	Makete D.C	Kimani	1	-	1
		Mfumbi	1	1	2
7	Mbarali D.C	Igomela	2	1	3
		Soniyaga	-	-	-
		Lugelele	1	1	2
		Ihango	1	-	1
		Luwango	1	-	1
		Isitu	-	-	-
		Ipwani	1	1	2
		Madabaga	1	-	1
		Itamboleo	1	-	1
		Lyambogo	2	1	3
		Majenje	1	-	1
		Matemela	1	-	1
		Itamboleo	1	-	1
		Kapyo	1	-	1

No	District	Village	Primary Schools	Secondary school	Total
		Mengele	1	1	2
		Maendeleo	1	-	1
		Mbuyuni	1	1	2
		Itipingi	1	-	-
		Uhamila	1	-	1
		Manjenje	1	-	1
		Mambi	1	-	1
		Lunwa	1	1	2
		Lusyesye	1	-	1
		Lwanyo	1	1	2
		Nsonyanga	2	-	2

Source: Data collected at village office during survey, January 2018

4.2.6.3 Health

In Tanzania, health services are provided by a number of complementary institutions. These institutions are dispensaries, health centers, district/regional hospitals and referral consultant hospitals. The dispensaries are staffed by clinical officers and clinical assistant with one or two helpers and in some cases a nurse and/or midwife is also provided. The clinical assistant receives a 3-year training course in anatomy, physiology and hygiene with good training in diagnostic methods and treatment of common diseases.

Supporting the dispensaries are health centers. These give priority to preventive measures and hygiene but in practice they are extensively used for the treatment of common diseases. Most health centers have a room for minor surgery and have 20-30 beds for in-patients including maternity cases. A health center is run by a clinical officer, with a secondary school education and more elaborate education in diagnosis and treatment as well as training in minor surgery. He/She is of higher grade than clinical assistant. The clinical officer is usually assisted by one or two clinical assistants, a nurse/midwife with one or two maternal and child health aids, a health aid and a health assistant.

Above the health center, there is the district hospital. It is the base for staffing and supplying medical provision to all dispensaries, health centers and a hospital (mostly private or faith based) where difficult or serious cases are referred to. Generally there is one district hospital per administrative district but in certain cases a district may have more than one district hospital. District hospitals are provided with medical doctors (one or more according to size), stores for drugs and equipment, a diagnostic laboratory, x-ray, operation facilities and beds for referred patients.

According to the data presented in Districts socio-economic profile of each DC and data collected during field visit on January, 2018, the total number of schools (public and private) in in the project area of Iringa, Njombe and Mbeya are shown in table 4.16 and table 4.17 below.

Table 4.16: Number of available Health Service in the district level along the proposed TL

No.	District	No. of Hospital	No. of Dispensary	No. of Health centers
1	Iringa District	-	8	2
2	Makete District	-	2	-
3	Mufindi District	-	4	1
4	Mbeya City	-	1	-
5	Mbeya District	-	2	-
6	Mbarali District	2	15	4
7	Mafinga Township	-	2	-
	Total	**5**	**32**	**7**

Source: Iringa D.C Social Economic Profile 2013, Mufindi D.C Social Economic Profiles, 2015, Mbeya City social economic profile 2015 and Mbeya district Profiles 2017, Government of Tanzania publication

Table 4.17: Number of available Health Service in the villages along the proposed TL

No	District	Village	No. of Hospital	No. of Dispensary	No. of Health centers
1	Iringa D.C	Tagamenda	-	1	-
		Muwimbi	-	1	-
		Bandabichi	-	-	-
		Mlandege	-	-	-
		Isupilo	-	1	1
		Ulete	-	-	-
		Kibena	-	1	1
		Ugwachanya	-	-	-
		Uwenda	-	1	-
		Ihemi	-	1	-
		Tanangozi	-	1	-
2	Mufindi D.C	Ihowazi	-	-	1
		Tambalang'ombe	-	1	-
		Isalanavu	-	1	-
		Ipilimo	-	-	-
		Kiponda	-	1	-
		Maduma	-	1	-
3	Mafinga T.C	Majengo	-	-	-
		Rugemba	-	1	-
		Kitelewasi	-	1	-
		Kikombo	-	-	-
		Ugute	-	-	-
		Kisada	-	1	-
		Bulyayinga	-	-	-
4	Mbeya D.C	Iyawaya	-	1	-
		Ntangano	-	-	-
		Itewe	-	-	-

No	District	Village	No. of Hospital	No. of Dispensary	No. of Health centers
		Idunda	-	1	-
		Tembela	-	-	-
		Isongwa	-	-	-
5	Mbeya City	Itanji	-	1	-
		Iganjo	-	-	-
		Ikhanga	-	-	-
6	Makete D.C	Kimani	-	1	-
		Mfumbi	-	1	-
7	Mbarali D.C	Igomela	1	1	-
		Soniyaga	-	-	-
		Lugelele	-	1	-
		Ihango	-	-	-
		Luwango	-	1	-
		Isitu	-	-	-
		Ipwani	-	1	1
		Madabaga	-	1	-
		Itamboleo	-	1	-
		Lyambogo	1	-	-
		Majenje	-	-	-
		Matemela	-	1	-
		Itamboleo	-	1	-
		Kapyo	-	1	-
		Mengele	-	1	-
		Maendeleo	-	-	-
		Mbuyuni	-	1	1
		Itipingi	-	1	1
		Uhamila	-	-	-
		Manjenje	-	1	-
		Mambi	-	1	1
		Lunwa	-	-	-
		Lusyesye	-	1	-
		Lwanyo	-	-	-
		Nsonyanga	-	-	-

Source: Data collected at village office during survey, January 2018

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.

4.3Energy Use

More than 95% of the rural population in all districts depends on firewood and charcoal 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 led 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, Njombe 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. The 2016 Energy Access Situation Survey collected information on accessibility of grid electricity at community level. Findings show that, overall, 67.5 percent of the Tanzania Mainland population had access to grid electricity with rural (49.3 percent) and urban (97.3 percent).
Also as per Energy Access Situation Report, 2016 Tanzania Mainland, Level of Households Connected to grid Electricity in the project area is about Iringa (53.4 %), Njombe (36.6%) and Mbeya (80.5%) as shown in map below.

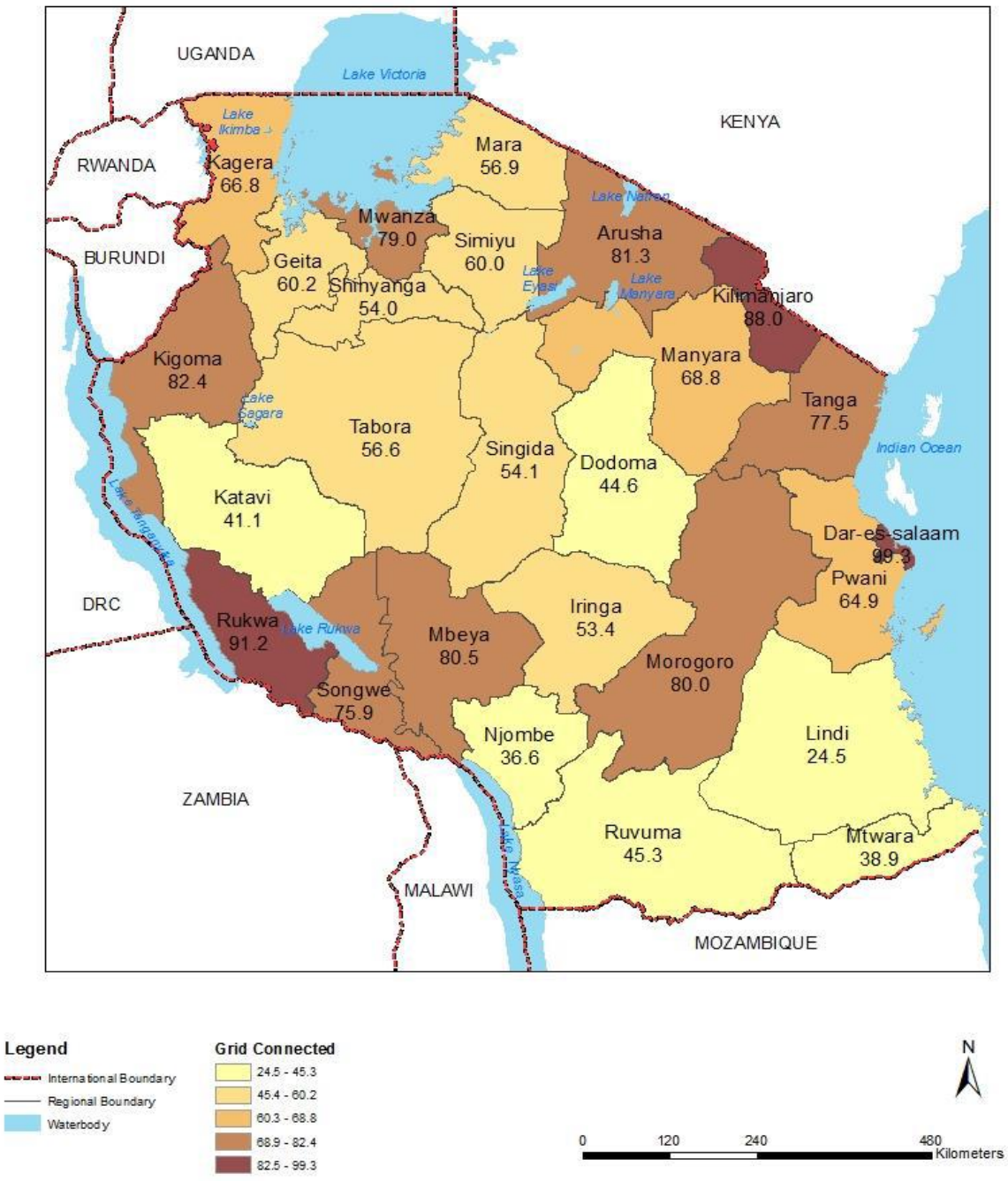


Figure 4.24: Percentage Distribution of Households Connected to Grid Electricity by Region

CHAPTER 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 minimizing 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

Consultation with PAPs was done during ESIA study in 2012 and then the TANESCO team carried consultation at village level during updating of previous ESIA study on January, 2018 and will be continued through the EIA process and during project implementation phases to ensure regular communication between the project proponent and PAPs. This allows for the provision of updates, changes, alteration, and new concerns where necessary from both the project proponent and I&APs such that both parties have a common perception as to what the project entails.

In 2012-2014, 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 project 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 channeled 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

During ESIA study conducted in 2012, 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 5.1: Consultation at Tembela village (2012)

5.2.3 Official Meetings with Village Leaders

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 5.2: Meeting with Villagers and Leaders (2012)

5.2.4 Meetings with Districts Officials

Meetings were held with different officials in the 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 5.3: Meeting with Kibena Leaders, Iringa District (2012)

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 5.1, 5.2 and 5.3 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 in 2012

During ESIA study conducted in 2012, village consultation meetings were conducted in fifty three (53) 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:

- ✓ 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;
- ✓ Compensation should consider enabling PAPs to get alternative land for agriculture or livestock keeping;
- ✓ Proper valuation of properties and payment to be made in time;
- ✓ Employ more local workers i.e. from the village and thereby avoid bringing persons from outside to help to minimize risks of HIV transmission;
- ✓ TANESCO has to set money aside for environmental conservation;

- ✓ 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.

- ✓ 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;
- ✓ The project has to help to ensure water supply in the village since TANESCO has restricted them from accessing its water;
- ✓ 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;
- ✓ The project must employ youth in the village during construction;
- ✓ TANESCO has to dedicate some amount of money for environmental conservation;
- ✓ Compensation has to be done based on current life situation; and
- ✓ 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 5.1: Concerns expressed by Government Ministries/ Public Sector

Title and Organization	Concerns	Proposed Mitigations
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.
Director of Antiquities MNRT 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.
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 shall cooperate with RAS office for support and advice. ▪ Payment of compensation for land properties.
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 shall be paid

Title and Organization	Concerns	Proposed Mitigations
Regional commissioner, Mbeya.	▪ Mbeya region is officially aware about the project. ▪ 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.	
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 shall be provided for any damages according to the law. ▪ The developer shall involve and educate people about the proposed project. ▪ Key stakeholders shall be involved in the project implementation. ▪ Careful assessment of property before compensation.
Town Executive Officer Makambako Township. 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.
District Planning Officer,	▪ Displacement of farm and house properties inevitable. ▪ Positive benefits to the nation than	▪ Compensation for farm and house properties. ▪ Careful design to avoid or

Title and Organization	Concerns	Proposed Mitigations
Mufindi. District Forest Office, Mufindi	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. ▪ 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.	reduce negative impacts.
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	▪ The project shall cooperate with RAS office and local administrations for support and advice. ▪
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 shall be provided
Town Planner, Ministry of Lands, Housing and Hunan Settlements Development. (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	▪ Compensation for land and property including government and individual forests. ▪ Use official government rates for compensation. ▪ The project design should

Title and Organization	Concerns	Proposed Mitigations
Town Planner, MLHHSD	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.	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.
Zonal Manager, Occupational safety and Health Authority (OSHA) Occupational Health and Safety (OHS) Inspector OHS Inspector, OSHA Dar es Salaam	▪ 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. ▪ 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.	▪ 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 electromagnetism. ▪ Provision of education about corona and electrocution accidents.
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
Principal. Uyole Agricultural Training	▪ Peoples land will be taken by the project ▪ Possible interference with infrastructures for Urban Waste water.	▪ The project shall cooperate with RAS office and local administrations for support and advice.

Title and Organization	Concerns	Proposed Mitigations
Institute	▪ Planted trees will be cut down.	
Zonal Director Uyole Agricultural Research and Development 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 sofiscated 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.	▪ Work closely with community leaders on local employment issues. ▪ Implement specific measures to safeguard women employment. Provide public information about project scope and activities. Adequatly ensure stakeholders participation.
DED, Mbeya Rural District. Mbeya	▪ Educate the affected people from the start of the project. ▪ Pay promptly to avoid disputes with PAPS.	▪ Education and awareness raising about project activities will be undertaken before the start of the project.
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.	▪ Share drawings with managers of public utilities. ▪ Abide to existing laws regarding compensation. ▪ Collobarate with regional, districts and local administrations on land and social matters.

Title and Organization	Concerns	Proposed Mitigations
	▪ 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.	
WEO Ilembula Njombe	▪ Compensate people for land taken. ▪ Safeguard youth employment during construction.	▪ Compensation for land and property including government and individual forests ▪ Work closely with local admisistration on employment issues.
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 shall be compensated
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 shall be properly compensated. ▪ People shall participate effectively in the process.
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 shall be participatory evaluation of properties to reduce complains. ▪ Compensations shall be properly assessed and timely paid.
Cartographer, Iringa District Council	▪ Income generation will be affected due to forestry cut	▪ Compensate affected land and properties according to the law.
District	▪ Land will be taken up thus affecting	▪ Farmers shall participate in

Title and Organization	Concerns	Proposed Mitigations
Agricultural and Livestock and Livestock Development Officer ,Iringa District Council	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.	the whole compensation processes ▪ Compensations shall be transparent and timely
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 shall be properly assessed and timely paid
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 shall be properly and timely effected
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 shall be effected to avoid disturbance of food production cycles
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 shall be properly assessed and timely done
Councillor – Iganjo Ward Pulayimu	▪ Follow legal procedures in compensation. ▪ Pay compensation in time to avoid	▪ Compensation legal procedures shall be

Title and Organization	Concerns	Proposed Mitigations
Waya - Secretary Traditional Chiefs -Iganjo Ward, Mbeya City Ward executive Officer Traditional Chief Proposed site for Iganjo Substation	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. ▪ Land will be taken by the project without compensation ▪ Not be easy to find alternative land, land is expensive ▪ Stop order will be issued before removing their produse or properties. ▪ Compensation will not be fair or less compared to the market process. ▪ Participatory approaches will not be applied in compensation process	followed. ▪ The developer shall involve and educate people about the proposed project. ▪ Stop order shall be issued according to the law. ▪ Compensation shall observe market prices and laws ▪ There shall be openness in compenstion process according to the law
Street Chairmen, Street Extension Officer, Ikhanga,Ilowe, Itanji streets, Iganjo Ward, Mbeya City	▪ 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.	▪ Compensations shall be properly assessed and timely paidInvolve stakeholders in the whole process

Table 5.2: Concerns expressed by Utility organizations

Title and Organization	Concerns	Proposed Mitigations
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	▪ The design shall provide enough ground clearance at railway crossings. ▪ Proper safeguards measures shall be used against electrocution. ▪ Designer shall share final design/drawings and

Title and Organization	Concerns	Proposed Mitigations
	is 100m.	identify crossing points
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 shall take place.
TANESCO 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.
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 2011.	▪ The design shall 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 shall implement close consultation with community elders regarding relocation of ancestral graves.
Regional Manager, TANROADS Mbeya Head of Engineering TAROADS Mbeya	▪ 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. ▪ Make careful design in urban areas to minimise impacts.	▪ The project shall implement close consultation with community and utility companies including TANROADS

Title and Organization	Concerns	Proposed Mitigations
	▪ Respect road RoW during project design, ask for permit if construction will interfere with RoW. ▪ Provide adequate clearance in road crossings.	
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	▪ The project shall share design and ensure close collaboration with utility companies.
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.
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 5.3: Concerns expressed by Conservation Institutions, private companies and NGOs

Title and Organization	Concerns	Proposed Mitigations
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.

Title and Organization	Concerns	Proposed Mitigations
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.	▪ Carefull design to minimise impact on wetlands and irrigation infrastructures. ▪ Pay compensation according to law.
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.	▪ Public information about project activities. ▪ Create awareness about HIV/AIDS.
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.	▪ Avoid cutting of trees and vegetation by careful design. ▪ Compensate affected trees or replant.
MKGR	▪ There are no many animals in MKGR. ▪ The area of the reserve passes close TAZAM highway in Luhowelo village.	▪ The design shall try to avoid wildlife areas.
Logistics and Labour Officer, Unilever Tea Company.	▪ Projects should be peoples centred	▪ Consultation shall take place.

5.2.7 Issues and Concern raised during meetings with village leaders during data collection for updating ESIA study by TANESCO experts on January 13-21, 2018

Team of TANESCO experts had discussions with local leaders in all villages and streets which are passed by project in all three regions and all district councils. Aims of discussion were to inform them about the project and also to collect the currently data especially population and socio-economic data within the villages. Team of TANESCO experts was accompanied by

District Environmental Officers, District Land Officers and District Community Development Officers on each district.

Table 5.4: General key issues raised by local leaders from all villages and streets visited during data collection for updating ESIA study

ISSUES/CONCERNS	RESPONSES
Most of village and street leaders that are nearby the proposed project accept the project and mostly of them are aware are on this project since they have consulted during ESIA study on 2012-2013 but they wonder why project delayed since that year no activity. They appreciate the education which they have received from TANESCO regarding this project from initials stage but they request TANESCO to give them feedback so as they can inform villagers on status of the project.	Noted and TANESCO will work on it especially on providing feedback and status of the project. This project will be implemented soon after all procedures are done including the ESIA and land acquisition and getting financial assistance from World Bank.
They request TANESCO to redone awareness again up to village general meetings to their villages so as most of the villages understand about the project because some of them they not aware since it is about 4-5 years was passed from the previous awareness conducted.	Noted and awareness will be one again by TANESCO as part of public disclosure. Local leaders will be informed on date of those community meetings.
They insist that TANESCO should provide fair and prompt compensation to identified PAPs to avoid complains. No construction to start without compensation.	Noted and compensation will be done as per national land laws and World Bank OP/BP 4.12 on Involuntary Resettlement. Also compensation due to the Project Affected Persons (PAPs) should be paid well in advance and prior to construction of the project.
Also they insist about their concern on how developer (TANESCO) is going to consider youths and women employment during construction of the projects.	Noted and we ensure that contractor to considered first local community regarding employment on activities which they are capable to carry out (unskilled and semi skilled labors).
They thanks TANESCO for providing their villages some amount of money for security of existing 220kV, so they believe this proposed project will add source of income to their villages.	Noted and for this project same arrangements on security will take place.
Some of villages which do not have electricity they request TANESCO and REA to consider for electrification.	Noted and we will represent concerns to our management to see how to accommodate this request with assistance from REA but

	nowadays TANESCO introduce rural electrification project to those areas where high voltage (TL) passes.
They request land acquisition and resettlement (identify and quantify categories of project affected people who would require some form of assistance, compensation, rehabilitation or resettlement).	Noted and compensation will be done as per national land laws and World Bank OP/BP 4.12 on Involuntary Resettlement.
They request TANESCO to see possibility of supporting of the adjacent communities services such as schools, health centers etc	Noted and we will represent concerns to our management.
Are graves going to be compensated?	Graves will be reallocated and compensated as per Grave Removal Act, 1969. The detailed process will be described in the RAP.
They asked if their children could be provided with education; about HIV/AIDS issues and how to take care of themselves during project implementation.	During all phases of this project, it will have HIV/AIDS campaigns and awareness to educate communities on risks of HIV/AIDS. Those awareness can be conducted by Contractors during construction and TANESCO during operation phase.

Names, position and their signature taken during meetings by consulted peoples are shown in **Appendix III of Appendices Report.**

Figure 5.4: Various pictures taken during meeting with village and streets leaders during updating ESIA study (January, 2018)


At Mlandege Village

At Igomelo village

At Lusyesye village

At Isitu village

At Ugute village

5.3 Communication Strategy Plan

Communication strategy plan implies one-way communication. The Communication strategy should be complemented by a Grievance Redress Mechanism and public consultations where people can voice their opinion. Reports of these consultations and the GRM should be made publically available on regular basis. Timely and accurate information dissemination requires a set of proactive measures be taken to instill confidence amongst PAPs and communities as well. Therefore the communication strategy requires direct interaction with the project affected households, and the whole community. An appropriate communication strategy shall require critical elements:

- ✓ have an enabling and supportive environment within the existing institutional setup; and
- ✓ take support from existing avenues such as *barazas* to inform, coordinate, disseminate information and facilitate activities and help build rapport;
- ✓ 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:

- ✓ to create a shared understanding of the objectives of the current project
- ✓ to create a sense of appreciation of the efforts to address and alleviate the impacts caused by taking of land for the transmission line;
- ✓ to create awareness empower and build capacity;
- ✓ 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:
- ✓ 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:

- ✓ 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 and and communities 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.

- ✓ 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.
- ✓ 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:
    - o information (in digital and non-digital form), Project reports, and line route over village maps;
    - o database of affected households, consisting primarily of non-confidential information collected from surveys; and
    - o information pertaining to the compensation and allowance payment process; entitlement notifications
- ✓ 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.
- ✓ 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), 220,000 Voltage (220 kV) and 400,000 Voltage (400 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 shall make available the ESIA report to the World Bank for review and comment and public disclosure in accordance with the World Bank Policy on Disclosure of Information, 2002. The disclosure shall be in Swahili and English as appropriate.

Once the updated final ESIA is approved by WB (on February, 2018), the Executive Summary and Full ESIA 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, Njombe and Mbeya and also at TANESCO's District 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 ESIA at World Bank's Infoshop.

Before commencing Project implementation a project launch and ESIA disclosure workshop will be conducted at both these locations to launch the ESIA 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:

- ✓ to provide information, and bring clarity on issues raised relating to entitlements and benefits;
- ✓ to provide information on compensation payable and processes involved therein.
- ✓ consult and create awareness amongst local community members about rehabilitation;
- ✓ to ensure that vulnerable groups understand the process, and that their needs are specifically taken into consideration; and
- ✓ to solicit help from local government officials and other bodies, and encourage their participation in RAP implementation.

TANESCO will additionally distribute the final ESIA reports to Municipal/District Councils, in libraries where the TL or project exist. Additionally distribute Non technical Executives summary to all villages or Street "*Mitaa"*. Subsequently, they advertise in the public media particularly on newspaper informing the public to go and review or read the reports or documents. Comments from public if any, they are submitted to TANESCO or NEMC.

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 3 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) will be permanently acquired by TANESCO and therefore no crops, trees or structures or other activity is permitted within this wayleave.

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.

5.5 Grievance and Redress Mechanism

The proposed project will include the development and implementation of a Grievance Redress Mechanism (GRM). TANESCO has their own GRM and it should be updated to include the requirements of multilateral finance institutions such as the World Bank Group. TANESCO Environmental department will update and share with project financiers (WB) an updated GRM before construction phase (i.e. during mobilization phases). The update GRM should be in place before construction phase in order to deal with all E&S issues that may arise. There will be designated specialists at TANESCO who will manage the GRM and the GRM will be operational before (payment of compensation) and contractor is hired.

That existing TANESCO`s GRM which they have been using for other transmission line projects and will apply it to the proposed transmission line projects. The purpose of the GRM is to respond to community concerns about the project during the planning, pre-construction, construction, operations and decommissioning phases of the project in a timely manner. The existing GRM will be strengthened to improve its efficiency, and to respond more effectively to feedback from the communities.

5.6 Next Steps

5.6.1 Stakeholder Engagement Plan

Based on the meetings held with village leaders and some of district officers during data collection for updating ESIA Study in stakeholder consultation meetings held on January 13-21, 2018, they requested for consistent communication from TANESCO regarding the status of the proposed transmission line project. In order to practice this, TANESCO will develop a written Stakeholder Engagement Plan (SEP) complete with a Communication Strategy Plan for the project. The SEP will include a Grievance Redress Mechanism (GRM) for addressing grievances and inquiries from the population.

TANESCO Environmental department will develop SEP and Communication Strategy Plan and share it with project financiers (WB) before hiring Project Contractors.

5.6.2 On-going stakeholder engagement

TANESCO will continue stakeholder engagements before, during and after the project so that key stakeholders are informed of the project's activities. The process of consultation and engagement, along with the grievance redress mechanism will enable all stakeholders, local, regional and national to provide feedback to TANESCO with any complaints or comments throughout the project.

CHAPTER 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 6.1) 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

- ✓ natural resources,
- ✓ socioeconomic issues and
- ✓ 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 6.1: Impact Rating Scale

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

Ranking of Impact	Symbol
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 1,293.3Ha out of which around 60% (775.98Ha) are private cultivable land. TANESCO will acquire permanent the total 1,293.3Ha RoW for TL and S/S areas as per national land acquisition requirements and WB OP/BP 4.12 Involuntary Resettlement.

For access road to substation site no land acquire since existing roads already have it own RoW. Access road for TL will use acquired RoW of TL to construct and rehabilitate the access road which will be used during construction of TL and hence after complete those access road will be used for maintenance and operation of the TL by TANESCO.

The land acquisition for campsite normal is temporary acquire whereby contractor agrees with respectively village to lease certain size of land for establish campsite during construction period.

Table 6.2: Percentage of losses of Vegetation Cover / Land Use along the TL

Cultivable land	Forest and game reserve	Grassland	Bush land & woodland	TOTAL
60%	Unknown yet until inventory studies between TANESCO and TFS and MKGR	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 6.2.

Table 6.3: Impact on Trees by Type

Table 5.8 – Impact on Trees by type									
District*	**Bamboo**	**Banana**	**Orange**	**Guava**	**Avacado**	**Peaches**	**Mango**	**Coffee**	**Others**
Iringa Rural	2,961	27	88	113	3	8	947	-	-
Mufindi	754	34	167	105	7	7	94	-	-
Mbarali	134	733	363	30	80	16	74	-	-
Mbeya Rural	2	5	2	2	1	2	2	-	-
Mbeya City	1	-	-	-	123	-	-	1080	
Total	**3,852**	**799**	**620**	**250**	**214**	**33**	**1,117**	**1080**	**9644**
Source: SMEC, Aug-Sept, 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 Uwenda 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 Mlimanyoka/ 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

During the mobilization and construction phase of the project there will be a minor impact on Green house gas emissions. Construction will involve transport and heavy machinery as well as quarrying of materials. This will give rise to increased vehicle emissions (CO2 and SO2) associated with transport, excavation and construction, CO2 and SO2 emissions associated with the winning of materials from quarries and slight loss of vegetative cover with loss of CO2 sequestration.

During operation phase the vegetation will be allowed to grow but trees of high height will not be permitted to re-grow. Due to the site clearance there will be a net loss of CO2 sequestration due to the TL permanent presence. The loss CO2 sequestration in comparison with the overall natural environment of Tanzania will be small. During operation phase the transmission line produce the corona effect which might lead to production of Ozone (O3) around the conductors. Corona effect is a phenomenon associated with all energized transmission lines. Under certain conditions, the localized electric field near an energized conductor can be sufficiently concentrated to produce a tiny electric discharge that can ionize air close to the conductors. Transformers and other capacitors at the substation may release sulfur hexafluoride (SF6) gas during maintenance, emissions during removal of equipment, and leakage from equipment in operation. Leaks generally increase as equipment ages. SF6 has been described as the most potent greenhouse gas ever evaluated by the scientists of the Intergovernmental Panel on Climate Change (IPCC), with a global warming impact of 23,900 times CO2. 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 and Visual Amenity

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	-	-
Operational Phase	-	-

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. The potential impact of the proposed TL could include collapse of the corridor because of additional clearing and more poaching as a result of better access roads and influx of people. Proper mitigation measures and commitment by TANESCO will be addressed in Chapter 7 and in updated ESMP to enhance the corridor to minimize its deterioration and making the corridor secure and safe for animal movements between the protected areas.

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 90metres of TL (60m for existing 220kV TL and 30m for addition for this proposed TL project) 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. TANESCO will apply for permission to Ministry of Natural Resources and Tourism to construct the proposed project in MKGR.

More details are provided in the Wildlife Report for Iringa – Mbeya 400kv TL, 2012 *in Appendix III of Appendices Report.*

Figure 6.1: Existing 200 kV Line crossing inside Mpanga Game Reserve, see border beacon on the left (Source; Field work, 2013)

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 Impacts on protected areas

As explained in section 4.2.3, the proposed TL will cross at the edge of Chimala FR and MKGR near to TanZam highway. The current status of the areas which TL will pass is disturbed by settlements and human activities including vegetation clearance, fire burning, cultivation and grazing. Also existing 220kV line (60m RoW) from Iringa-Mbeya is passing both FR and MKGR, whereby this proposed TL project will run parallel to existing TL (only 30meter will be add and utilise 30m from existing RoW). Hence there will be no significant degradation of natural habitat only a small fraction amount of *Afro-montane forest-grassland mosaic* and *miombo* woodland within the FR and MKGR may be affected.

TANESCO, TAWA and Tanzania Forest Service will conduct an inventory study to verify the boundary, assess the size affected areas within MKGR and Chimala Scarp FR and propose proper mitigation and compensation measures which could involve preparation of wildlife corridor management plan and forest management plan. This inventory study will be undertaken during valuation of properties of all affected properties.

This will be insignificant impact during both phases i.e. construction phases and operational phase due to presence of settlements, human activities and existing 220kV TL (60m).

6.3.7 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	- - -	- -

6.3.8 Collision of Bats with the infrastructures of the Transmission Line

Development of electricity transmission line to transmit electric energy from Iringa to Mbeya 400kV TL will involve two Phases: 1) constructing the infrastructure and 2) operating the transmission line. The construction phase will involve constructing concrete foundation and erecting metal towers or pylons before establishing overhead electric cables on the towers or pylon. The operation phase will involve putting high voltage electric current through the cables, maintaining vegetation on the right-of-way and using coolants in the transformers (presumably at the beginning and end of the transmission line).

The assessment of impacts to bats at construction and operational phases of Power transmission line between Iringa to Mbeya is done taking into consideration the following published authorities and sources of data and information:

- ✓ WB OP/BP 4.04 and PS 6 of IFC Performance Standards Guidelines as guide to important environmental issues such as critical habitats of bats (e.g for breeding, roosting, foraging etc)
- ✓ Environmental Health and Safety Guidelines for Power Transmission lines (IFC 2007) as a guide to characterize mechanisms by which transmission power lines may impact on bats
- ✓ Secondary data sources from reference collection in report of Tanzania State of Environment, 2006
- ✓ Guidelines by International Commission on Non-Ionizing Radiotion Protection (ICNIRP) for limiting Exposure to time varying electric, magnetic and electromagnetic fields (ICNIRP 1998).

The following are mechanisms through which Transmission line between Iringa to Mbeya potentially may impact on bats during the construction and operational phases of the development.

- ✓ Habitat alteration and disturbance
- ✓ Construction site waste generation
- ✓ Fugitive dust and waste generated by heavy machines, trucks and vehicles
- ✓ Noise from heavy construction and transport machines and vehicles
- ✓ Potential oil spill and other hazardous materials

Noted that the proposed 400 kV transmission line will not pass and cross along any areas with high species of bats since in Tanzania bats found most at subtropical or tropical moist lowland forests which is far from Iringa and Mbeya Region.

Suitable mitigation measures are described in Chapter 7.

Overall impact rankings are:

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

6.3.9 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		

6.3.10 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. Sitting 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. The proposed power line is also likely to affect water source in Shemwengo if proper measures will not be undertaken. 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

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

6.3.11 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 600 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 60 villages of which 24 fall within the Iringa region, 2 in Njombe and 34 in the Mbeya region. Altogether there are 5,188PAPs, of which approximately 60% live in the Iringa region, Njombe 3% and the rest 37% in the Mbeya region. This approximated data of PAPs are based on the old RAP report (2012). Current TANESCO are in the process of updating it on 2018 and the report will provide the current number of PAPs.

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 6.4). Proposed mitigation measures are described in Chapter 7 but detailed impact and mitigation measures will be described in the updated RAP.

Table 6.4: Number of Affected Structures

District	Name of Village	No. of Structures
Iringa Rural	Tagamenda	2
	Kibena	1

Mbarali	Uhamila	4
	Majenje	1
	Kapyo	1
Makete	Mfumbi	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 6.5.

Table 6.5: 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

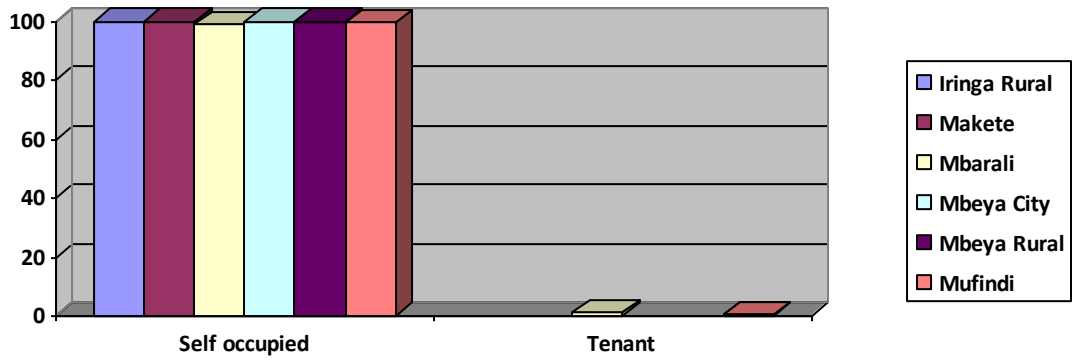


Fig 6.2: Pattern of Ownership of Structures (%) Source: SMEC Survey 2012

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 6.3: Types of Structures Impacted (Source; Field work, 2012)

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 5acres 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 small impact on rural settlements as it is passing significantly far from the village centres. Notably, following the 1967 villegalization 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 2.0 Km). 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 Iganjo 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 40.6 Ha proposed Iganjo substation the land is mainly used for cultivation of food and cash crops. The permanent crops are timber tress, Bamboo, avocado and coffee. 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:

- ✓ Around Tagamenda substation outside Iringa Town
- ✓ Igomelo outside Rujewa Town (plots surveyed)
- ✓ Around Chimala sub-town and Isitu village
- ✓ Iganjo ward near Iganjo substation.

Cultivated areas

It is estimated that a total of 1,293Ha of land will be affected out of which 877Ha of cropland and game reserves, forest, bushland, grassland and woodland.

Approximately 877Ha of private farm land/plantation land will be impacted by the project. 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.

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 and Iganjo 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 Impacts of land acquisition on vulnerable groups

Female headed households are perceived as vulnerable households, with low economic positions. Special attention would be required when they are affected as PAPs in the project. Some Female headed households may not have secure tenure for the land they occupy. They have limited scope to engage in surplus economic activities. They may be easily taken advantage of during the valuation of their land or residential homes. They may not have the opportunity to build homes with high valuation to be able to attract sufficient compensation.

Overall impact ranking are:

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

6.4.5 Gender requirements

Women in the rural areas are subjected to traditional cultural norms which play an important role in women and girls' education, gainful employment and other social benefits. With little education, women have had little access to formal employment. Hence, they represent a negligible proportion of persons currently employed in professional, technical and administrative occupations, which the proposed project will – to some extent – provide. Should this pattern continue with the onset of the project, it will inevitably lead to an increase in men/women inequality through heavy employment of men as opposed to women. During the public/stakeholder consultation meetings, it was observed that women tend to subsistence farming activities. During the dry season when crop yields may not be good, women may suffer more than men as they provide food for the families. Consequently, the loss of crops resulting from the transmission line vegetation clearance could adversely impact women during the construction phase.The ESIA Study assessed the potential impacts on gender requirements for the proposed project and found that the impact is considered low with mitigation measures. The RAP will take into account gender aspects in designing the process of compensation payment to ensure that both men and women have active voice in receiving compensation payments.

Overall impact ranking are:

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

6.4.6 Impacts on Gender Based Violence

The proposed transmission line project from Iringa-Mbeya is expected to employ several individuals from local communities, other parts of Tanzania and overseas for executing the project. The vast majority of those employed in unskilled, semi-skilled and skilled jobs will be younger males as well as those that are married.

While they are away from their homes, these workers may exhibit inconsistent social behaviors that can potentially lead to sexual harassment of women and girls, exploitative sexual relations and illicit sexual relations with minors (individual below the age of 18 years) from the local community. Additionally, as the proposed project for the most part traverses rural settings, the presence of law enforcement is low and consequently, the risk of sexual harassment for local women is likely to be higher, particularly for younger women and girls and, to a certain extent boys.

Also ESIA study recommend that TANESCO in collaboration with gender NGOs should assess gender bias and gender violence within project areas so as to come up with recommendations on gender requirements before payment of compensation and construction phase.

This will give women equal opportunities in decision making on how to spend compensation money paid out by TANESCO as part of the RAP and, supply of catering services to construction workers which most women prefer to do based on the stakeholder feedback.

Overall impact ranking are:

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

6.4.7 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 Iganjo substation is located about 200m from the proposed corridor and Iganjo substation. The number of impacted CPRs, in the form of graves, is 16, out of which 9 are in Mbeya and 7 in Iringa region.

Overall impact ranking are:

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

6.4.8 In-migration of workers (Labor influx)

During the construction phase, a number of temporary camps will be constructed between Iringa, Kisada and Mbeya. The Project Contractor will design and build the accommodation, cooking and sanitary facilities for the construction workers, laydown areas and parking areas. The lack of proper citing criteria of the construction camps could lead to tensions between community members and construction workers especially the migrant ones. This situation will be exacerbated if the construction camps are set up in populated areas where migrant workers have convenient and easy access to the community.

The project is expected to impact the social fabric in the project area in the following ways:

- ✓ Broken family bonds from migration of workers to the project area;
- ✓ Rise in prevalence of sexually transmitted infections (STIs); and
- ✓ Increase in crime.

The extent of the potential impacts to demographics will largely be contained within the project-affected communities and subsequently, will be local in scale. The duration of impacts associated with the construction phase will largely be short-term, lasting about 36 months (the anticipated construction period of the project).

In some cases, impacts will be of shorter duration, particularly if opportunistic job seekers who are unable to secure work leave the area. The probability of impacts, however, is highly likely, based on past experience in the region and current conditions.

The communities living in the project area are ethnically homogenous; subsequently any influx of "foreigners" whether expatriates or those from other parts of Tanzania, will be keenly felt. Before hiring Project Contractors, TANESCO will develop strategic plan on minimizing the labor influx within project area. This will be developed in collaboration with Districts labor office. The number of the people who will be residing in the camp is minimal due to the fact that skilled workers who will be hired by the contractor are not expected to exceed 30% and unskilled laborers (70%) will be hired on a daily basis and will be recruited in villages where our TL is passing. It is expected that most of these unskilled laborers will be coming from home in the morning and go back at their home premises in the evening. In other implemented projects workers camps were established in the industrial area and other out of centres of selected village (>1km) in this project that criteria will adopt. The project contractors will be advise accordingly. The ratio will be 30% skilled workers and 70% unskilled workers.

Overall impact ranking are:

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

6.4.9 Access Road

There will be a need for substantial construction of new roads and some of them need maintenance and improvement which will result in job opportunities in the area. But also during construction and maintenance of access road, there will be negative impacts on dust and possibility of accidents to local communities.

Overall impact ranking for job opportunities are:

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

Overall impact ranking for dust and accidents to local communities are:

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

6.4.10 Impacts on construction traffic and road accidents

The influx of construction workers will entail an increase in the traffic to and from the project area. Construction activities will potentially increase traffic at the various construction sites as

construction vehicles will have to go to the ROW and lay down areas to deliver construction materials and equipment.

The increase in the number of road users is not an impact, but merely a change process. However, the number of construction vehicles, increased public transport vehicles and project-related traffic may change the movement patterns of other road users in such a way that their movement patterns are disrupted, and their safety levels are impacted on.

The community will be exposed to increased safety risks during the construction phase. The most obvious sources of safety hazards include traffic and population influx and its associated effects. The increased traffic will occur only during the relatively short construction period.

The above impacts will be felt for transporting construction materials between Dar es Salaam and various locations between Iringa to Mbeya where construction activities occur.

Overall impact ranking are:

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

6.4.11 Employment and Income Level

The project will engage local people to work as casual labourers. Based on previous experience, it is estimated that 7 out of 10 will recruited from villages (local workers) along and near the transmission line during the constriction period. The recruiting of local workers is the responsibility of the Contractor, as the Contractor shall be responsible for the working schedule, quality of the work, budget, safety etc. A work camp will serve approximately 600employees. About 70% 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 and security. 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	+ + +	

Phases	Without Mitigation	With Mitigation
Operational Phase	+	

6.5 Impacts on Health and Safety

6.5.1 Worker health and safety

The proposed transmission line project will employ about 100 workers during the mobilization phase, over 500 workers during the construction phase and over 100 workers during the commissioning phase. The majority of the unskilled workers will be drawn from the local communities where construction occurs; these workers will most likely have minimal safety and health (S&H) knowledge, skills and competencies. Some of the key project activities include clearing the ROW, digging foundation pits, casting reinforced concrete foundations, erecting steel towers, stringing conductors and building of substations. Each of these activities has several sub-activities where construction workers will be involved.

Consequently, the lack of activity based risk assessments followed by the development and implementation of risk control measures such as Safe Work Procedures, adequate supervision, trained workforce could potentially lead to safety and health incidents.

Overall impact ranking are:

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

6.5.2 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
Operational Phase	-	0

6.5.3 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

6.5.4 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	0	0
Operational Phase	-	0

6.5.5 Electromagnetic Fields

Electric and Magnetic Fields

Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Electric fields are produced by voltage and increase in strength as the voltage increases. Electric field strength is measured in volts per meter (V/m). Magnetic fields result from the flow of electric current and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T), where 1T equals 10,000G. Electric fields are shielded by materials that conduct electricity, and other materials, such as trees and building materials. Magnetic fields pass through most materials and are difficult to shield. Both electric and magnetic fields decrease rapidly with distance. Power frequency EMF typically has a frequency in the range of 50 – 60 Hertz (Hz), and is considered Extremely Low Frequency (ELF).

Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects

from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.

Recommendations applicable to the management of EMF exposures include:

- ✓ Evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Average and peak exposure levels should remain below the ICNIRP recommendation for General Public Exposure
- ✓ Considering sitting new facilities so as to avoid or minimize exposure to the public. Installation of transmission lines or other high voltage equipment above or adjacent to residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or offices), should be avoided;
- ✓ If EMF levels are confirmed or expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples of these techniques include:
    - o Shielding with specific metal alloys
    - o Burying transmission lines
    - o Increasing height of transmission towers
    - o Modifications to size, spacing, and configuration of conductors

Several institutions and countries have developed guidelines and standards for exposure to EMF, referring to the recommendation of the above WBG Industry Sector Guidelines for Electric Power Transmission and Distribution and 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.

Tables below lists exposure limits for general public exposure to electric and magnetic fields published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Table 6.6: ICNIRP exposure limits for general public exposure to electric and magnetic fields.

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	5000	100
60 Hz	4150	83
Source: ICNIRP (1998) : "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).		

Table 6.7: ICNIRP exposure limits for occupational exposure to electric and magnetic fields.

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	10,000	500
60 Hz	8300	415
Source: ICNIRP (1998) : "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)		

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

- ✓ 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
- ✓ Sweden also requests 0.2 μT for kindergarten and schools
- ✓ 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

- ✓ is a private organization not authorized by any government or UN organization (also not by WHO)
- ✓ accepts only the effect that EMF may warm up the tissue
- ✓ 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 also magnetic field will below the ICNIRP standard at the edge of a 50meter wayleave.

Overall impact ranking:

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

6.5.6 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	- -	-

6.5.7 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. But TANESCO in collaboration with districts health office and NGOs should carryout detailed baseline survey regarding HIV/AIDS within project area before starting of construction. This survey will be done by visiting health centres in villages to have prior information of how many people are affected and monitoring will be done so as to note if there are new infections after completion of the project.

Overall impact ranking are:

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

6.5.8 Impacts on increase in prostitution and teenage pregnancies

This impact relates to the social interaction of household members with other people in the community especially workers. A huge portion of the community is poor and there is a high unemployment rate. An influx of people with disposable income might lead to an increase in prostitution, which can impact on the HIV and unwanted pregnancy rate in the area. There can be a number of spin-offs like alcohol abuse and disintegration of families.

Overall impact ranking are:

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

6.5.9 Labor and working conditions

The proposed project will employ about 100 workers during the mobilization phase, over 600 during the construction phase and over 100 during the commissioning phase of the project. These workers will be exposed to a variety of risks such as exposure to varied climatic conditions and occupational health and safety risks associated with clearing the ROW of vegetation and trees, excavations for the foundations, working at heights, etc. The semiskilled and unskilled workforce will most likely be acquired from within Tanzania and engaged directly by the Project Contractor. The lack of a trained workforce for the project, the lack of a documented HR Management System and a Project Contractor that does not conform to the labor laws in-country was identified as a Medium significance risk without mitigation; with mitigation measures implemented, the significance of the risk was established as **Low**.

6.6 Cumulative impacts of the proposed project on Chimala Scarp FR, Igando-Igawa Wildlife Corridor, and Mpanga/Kipengele Game Reserves Parks:

A cumulative impact is an incremental impact on the environment that results from the impact of a proposed action when added to existing (220kV TL) and reasonably foreseeable future actions. Cumulative effects can be both positive and negative. Also, the nature of cumulative impacts can be both temporary in nature (restricted to the construction phase) and permanent (occurring in both the construction and operation phases).

The main positive or beneficial cumulative impact to the social environment is the availability of reliable electricity to the Mbeya region. Some of the negative cumulative impacts include a loss of use of agricultural land, loss of or damage to habitat and fauna at Chimala Scarp FR and Mpanga/Kipengele Game Reserve, and additional disturbance to or displacement of wildlife attempting to use the Igando-Igawa wildlife corridor.

Because the proposed project traversing within and close to mentioned protected areas and already affected by the existing 220-kV transmission line, settlements, roads and agriculture may add additional increments of stress, an assessment of the cumulative impacts of the proposed project vis-à-vis the existing 220kV TL and ongoing project around proposed TL project area will be carried out in parallel with final design and prior to construction and made part of the updated ESMP in order to inform design and alignment decisions. Also detailed potential

cumulative impacts will be addressed in the forest management plan and wildlife corridor management plan prepared by TANESCO incollaboration with other experts such as foresters from TFS and wildlife experts from TAWIRI/TAWA.

6.7 Summary of Project Impacts

The summary of adverse impacts on land take and properties is presented below:

Table 6.8 Summary of Impact on Land Take and Properties

Impact on land due to the project	1,293Ha									
Impacted land by type in Ha	775.98Ha of cropland and the rest are game reserves, forest, bushland, grassland and woodland									
No. of PAHs/PAPs	PAHs – 1034 and PAPs – 5284									
Trees or fruit crops affected	Bamboo	Banana	Orange	Guava	Avacado	Peaches	Mango	Coffee	Others	Total
	3,852	799	620	250	214	33	1,117	1080	9644	16406
Residential and related structures impacted	28 structures across 12 villages; total area of 1470.31 squre meters of structures All the structures have thatched roof, bamboo walls/non-plastered bricks and mud floors.									
Affected Graves	16									
Common property affected	1 water storage tank with gates and semi-constructed cement walls at Nsoniyaga village									
Villages affected	60 villages across 6 districts and 1 township.									

Table 6.9: Summary of identified project sensitive receptors and why they are considered sensitive to the project

Sensitive Receptors	Reasons
Habitats	Physical impact from land clearing resulting in death, injury and loss of habitat. This is due to vegetation clearance with RoW during construction phases and operation phases.
Flora	Due to vegetation clearance with RoW during construction phases and operation phases.
Birds and bats	Vegetation clearance during construction phase. Presence of TL especially around Usangu IBA will lead to possibility of birds and bats collision.
Land	Construction of proposed TL which may lead to erosion and

	landslides. Can lead landlessness to the land owners.
Fauna	Due to vegetation clearance with RoW during construction phases and operation phases. Also TL will pass through wildlife migratory route between Igando and Igawa.
Residential houses	TL will pass across 28 structures with 12 villages which may lead social disarticulation.
Social facilities such as water tanks	One water tanks will be impacted by proposed TL which will lead loss of community facilities
Graves	TL will affect about 16 graves which means needed to reallocate.
Mpanga/Kipengere Game reserves	Due to vegetation clearance with RoW during construction phases and operation phases. Also possibility of hunting and disturbance to wildlife especially during construction phase.
Migratory bird species	Presence of TL especially around Usangu IBA will lead to possibility of birds and bats collision.
Iganjo Ritual Forest	It is near to Iganjo Substation i.e. 1km.

CHAPTER 7: MITIGATIONS MEASURES

7.1 Introduction

This chapter presents mitigation measures to avoid, reduce or compensate for unwanted negative impacts of the proposed exploration drilling project. It also describes opportunities for enhancement of positive impacts. The structure of the chapter follows the structure used in chapter 6, i.e. mitigation measures are described for each identified impact.

This is in line with any relevant requirements in the Bank's OSs; whereby the assessment considers real alternatives to the project's location and/or design to avoid adverse impacts. It applies the mitigation hierarchy: if avoidance is not possible, reduce and minimize potential adverse impacts; if reduction or minimization is not sufficient, mitigate and/or restore and as a last resort compensate for and offset. Also the experts use the WBG Industry Sector Guidelines for Environmental, Health, and Safety (EHS) Guidelines for Electric Power Transmission and Distribution for guidance on potential impacts and mitigating measures.

The mitigation measures described in this chapter include both actions that have been incorporated in the project design and additional proposals developed through the ESIA process. Once design completed, all site specific mitigation measures and updated ESMP will be cleared by WB and will be inclusive in the final Contract documents so that they are legally binding on the contractor during project implementation. The implementation and monitoring of the mitigation measures are further described in the Environmental and Social Management Plan (chapter 8) and the Environmental and Social Monitoring Plan (chapter 9) respectively.

7.2 Natural Environment

7.2.1 Vegetation Cover

- ✓ TANESCO will ensure that all maintenance works for clearing vegetation are carried out within the ROW and not outside of it
- ✓ TANESCO will provide all chopped woody trees to the communities after they have been cut down
- ✓ TANESCO will ensure that pesticides and chemicals are not used within the ROW for maintenance of the flora
- ✓ TANESCO will implement an Alien Invasive Species (AIS) monitoring program following project construction and site re-vegetation in sensitive areas as forested patches and montane grasslands and swamps.
- ✓ 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.
- ✓ Permanent loss of vegetation should be compensated by adequate planting activities in neighbouring areas. Low height vegetation along the TL corridor will be allowed as long as they are not overgrown to jeopardize the safety of people and the line.
- ✓ 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.
- ✓ Where both transmission lines will run parallel, the chance to use a single common way for inspection and maintenance should be examined.

- ✓ 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.
- ✓ Forest authorities together with the developer in the concerned areas should devise ways to increase protection of the areas in collaboration with local communities.
- ✓ 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 Terrestrial Habitat

- ✓ Installation of transmission lines above existing vegetation to avoid land clearing;
- ✓ Revegetation of disturbed areas with native plant species;
- ✓ Implementation of an integrated vegetation management approach (IVM). The selective removal of tall-growing tree species and the encouragement of low-growing grasses and shrubs is the common approach to vegetation management in transmission line rights-of-way. Alternative vegetation management techniques should be selected based on environmental and site considerations including potential impacts to non-target, endangered and threatened species;
- ✓ Removal of invasive plant species, whenever possible, cultivating native plant species;
- ✓ Scheduling activities to avoid breeding and nesting seasons for any critically endangered or endangered wildlife species;
- ✓ Observing manufacturer machinery and equipment guidelines, procedures with regard to noise and oil spill prevention and emergency response;
- ✓ Avoiding clearing in riparian areas;
- ✓ Avoiding use of machinery in the vicinity of watercourses.

7.2.3 Forest/bush Fires

During operation phases, if underlying growth is slash from routine maintenance is left to accumulate within right-of-way boundaries, sufficient fuel can accumulate that may promote forest/bush fires. Recommended measures to prevent and control risk of forest fire include:

- ✓ Monitoring right-of-way vegetation according to fire risk;
- ✓ Removing blowdown and other high-hazard fuel accumulations;
- ✓ Time thinning, slashing, and other maintenance activities to avoid forest fire seasons;
- ✓ Disposal of maintenance slash by truck or controlled burning. Controlled burning should adhere to applicable burning regulations, fire suppression equipment requirements, and typically must be monitored by a fire watcher;
- ✓ Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow fire fighting access.

7.2.4 Soil Erosion

- ✓ The contractor has to apply best environmental practise in constructing the foundations for the towers/access roads.
- ✓ Construction activities should not take place in erosion prone land and close to rivers and watercourses in the rainy season.

- ✓ 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 shall have to be preserved against grazing and wild fire during the first years. Developer to designate people or administration for suitable surveillance.

Other mitigation measures

Additional recommendations of the IFC EHS Guidelines (Construction and Decommissioning) to reduce or prevent soil erosion should be implemented and are as follows:

- ✓ Scheduling to avoid heavy rainfall periods (i.e. during the dry season) to the extent practical;
- ✓ Contouring and minimizing length and steepness of slopes;
- ✓ Mulching to stabilize exposed areas;
- ✓ Re-vegetating areas promptly;
- ✓ Designing channels and ditches for post-construction flows;
- ✓ Lining steep channel and slopes (e.g. use jute matting);
- ✓ Reducing or preventing off-site sediment transport through use of settlement ponds, silt fences, and water treatment and modifying or suspending activities during extreme rainfall and high winds to the extent practical;
- ✓ Limiting access road gradients to reduce runoff-induced erosion; and
- ✓ Providing adequate road drainage based on road width, surface material, compaction, and maintenance

7.2.5 Climate Change

To minimize/compensate loss of CO2 sequestration the following are mitigation measures:

- ✓ Allowing low re-vegetation along the TL route thereby compensating for loss of CO2 sequestration to some extent
- ✓ Minimizing land take for the TL corridor by employing other types of transmission line towers
- ✓ Consideration will be given to planting of native tree species at alternative locations to offset the loss of trees from the footprint of the TL.
- ✓ CO2 and SO2 from vehicles cannot be eliminated but will be minimized to the extent possible. This can be achieved by:
- ✓ Ensuring that all construction vehicles, including transport vehicles are routinely serviced and maintained in good working order.

7.2.6 Landscape Aesthetics and Visual Amenity

To mitigate the visual impact of power distribution projects, the following mitigation measures should be implemented:

- ✓ During design phase, it recommended design of TL should be subjected to an aesthetic review by an Architect or an expert specializing in Landscape /Aesthetic reviews
- ✓ Location of the towers should be carefully selected during design stage to minimise impact on landscape aesthetics.
- ✓ Extensive public consultation during the planning of power line and power line right-of-way locations;
- ✓ Accurate assessment of changes in property values due to power line proximity;

- ✓ Sitting power lines, and designing substations, with due consideration to landscape views and important environmental and community features;
- ✓ Location of high-voltage transmission and distribution lines in less populated areas, where possible;

7.2.7 Wildlife

- ✓ TANESCO will protect and enhance wildlife corridor (Igando and Igawa) during both phases of project by developing Wildlife Corridor Management Plan during updating ESMP which will submitted to the WB for clearance. This will be done in collaboration with TAWIRI/TAWA. TANESCO should earmark funds for enhancement of wildlife corridor based on developed Wildlife Corridor Management plan.
- ✓
- ✓ During operation phase, TANESCO should maintain vegetative cover in wildlife corridor (Igando and Igawa) especially in areas with immense benefits for animal movement and habitat whereby low shrubs and bush should be left in place. In additional tree plantings could be done to enhance the vegetation cover. TANESCO should hire wildlife experts from a recognized institution such as TAWA or TAWIRI who can identify any plant species that would be particularly attractive to wildlife moving through the corridor, so as to be included in the planting.
- ✓ Use of taller towers could be considered where the line crosses the corridor so that bush could be allowed to grow higher without endangering the line.
- ✓ 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. 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 through careful design.
- ✓ 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 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 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 VOL II of ESIA study 2014, Appendix 3.

7.2.8 Birds and Bat Collisions and Electrocutions

Recommended prevention and control measures to minimize birds and bat collisions and electrocutions include:

- ✓ TANESCO will appoint an ornithologists and bat specialists from a recognized institution to undertake a survey of birds and bats and collision study within the Area of Influence of the transmission line project. The study will be undertaken to inform the final design and routing of the new TL and recommendations will be reflected in the updated ESMP that is cleared by WB prior to construction. The recommendations may include alignment changes, installing and locations of bird diverters on the conductors, deflectors based on the baseline surveys as needed, so that these will be included in the designs. There are three general types of line marking devices: aerial marker spheres, spirals, and suspended devices. An example of aerial markers is shown below:


Source: Google pictures, 2017

- ✓ Based on the results of the bird and bat survey, consider rerouting the proposed transmission line taking into consideration migratory patterns and high bird-use areas into account e.g. parallel to land features which could be potential bird routes, such as ridges and valleys, and not cutting across them, going over wetlands, etc;
- ✓ In areas with high birds and bats activities after baseline survey and where the new line runs parallels the existing 220kV line, towers and conductors should have at the same height as those of the existing 220 kV line to reduce bird an bat collisions. This should be used that will avoid having the new conductors at different heights than the old one.
- ✓ Maintaining 1.5 meter (60-inch) spacing between energized components and grounded hardware or, where spacing is not feasible, covering energized parts and hardware;
- ✓ Avoiding establishing power lines close and adjacent to hills and over wetlands, maintaining a minimum buffer distance of 5 km
- ✓ Bird and Bat specialist from a recognized Tanzanian institution should undertaken at least three seasonal surveys over a period of 2 years to get an understanding of the migratory patterns of this bird and bat species and adjusted thereafter if no new information is being collected. The two year survey should proceed as a monitoring program to (a) identify additional mitigation measures needed (and feasible) and (b) to increase TANESCO's knowledge about impact of T-lines on birds and bats.

7.2.9 Hydrocarbons

- ✓ Construct and use oil resistant sealing of 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
- ✓ Store hydrocarbons in oil resistant containments in the field, refuelling of vehicles and machines in the field will be done using portable oil collection pans only.
- ✓ 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.
- ✓ Provision of second containments for big transformers
- ✓ Proper use and response to SF6 gas pressure or density alarms that are furnished with SF6 equipment
- ✓ Permanent installation and use of SF6 gas monitoring alarms, located where SF6 gas could accumulate
- ✓ Strategy for evacuating SF6 gas from accumulation locations including use of SF6 warning signage
- ✓ Adequacy and availability of PPE, including protective clothing and respiratory devices.
- ✓ Ensure that all new transformers and other electrical equipment are free from PCBs

7.2.10 Waste and Waste water

- ✓ 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.
- ✓ Solid waste especially plastics at all project sites such as workers or office camp, workshops and crasher sites should be well controlled and safely disposed of into approved sites. Measures shall include 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.

7.2.11 Water Resources

- ✓ No access roads will be constructed in close proximity (say 100m) to any wetland encountered during the construction phase;
- ✓ The Project Contractor will develop and implement a waste management plan for proper management of all types of wastes in order to prevent contamination of surface or groundwater;
- ✓ The Project Contractor will develop and implement emergency response procedures for accidental spills that may occur and end up contaminating surface or groundwater;
- ✓ Additionally, the contactor shall avoid any discharge of effluent from campsites during construction to avoid pollution risks to streams;
- ✓ Works should avoid interfere on water sources in particular clearing around or cutting of natural trees and all kind of earth works around water sources.

Attention should be paid to water sources in Shemwengo village in Mbeya Rural. Equally, the construction works should be well supervised near important river crossings especially along

Ndembera, Mbarali, Kimani, Ruaha, Chimala, Mambi and Mlowo rivers. Contractor should also be aware of irrigation canals which are located at Igomelo/Rujewa and Igurusi/Manjenje.

Other mitigation measures are:

- ✓ Deposition of excavated materials away from all watercourses and rivers
- ✓ Storage of bulk fuel, drums and other chemicals in bunded storage areas to prevent oil pollution
- ✓ Provision of drip-pans for catching oil to vehicles being fuelled or repaired, and stationery machinery. New and waste oil and fuel to be stored carefully and safely on-site until used, or removed from site to an appropriate facility for its safe disposal, or re-used in an environmentally safe and sound procedure.
- ✓ Except in an emergency, no vehicle will be fuelled, lubricated or repaired except within the bounds of a project camp or depot. Similar precautions will be applied to paint or other chemicals or potentially toxic materials of any sort.
- ✓ Prohibition of washing vehicles in any watercourse
- ✓ Prohibition of disposal of any waste material in an uncontrolled manner and especially into the rivers.

7.3 Socioeconomic Issues

7.3.1 Land use

- ✓ Compensation will be done fair and prompt as per national land laws and World Bank OP/BP 4.12 on Involuntary Resettlement.
- ✓ 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.
- ✓ TANESCO should develop and rollout a Stakeholder Engagement Plan (SEP) for the project including a Communications Plan to keep all PAPs abreast of their latest activities.
- ✓ As part of the above SEP, TANESCO should develop and implement a Grievance Redress Mechanism for the PAPs. The structure and scale of the GRM will be aligned to the Tanzanian legislation. The GRM will also include judicial recourse and community and traditional dispute settlement mechanisms
- ✓ TANESCO should plan for maintenance activities to be conducted outside of the growing and grazing seasons.

7.3.2 Impacts of land acquisition on vulnerable groups

- ✓ TANESCO should advocate for direct and indirect business opportunities to vulnerable groups such as Female headed households with its Project Contractor. Some of the opportunities include provision of catering and associated hospitality services to the workers that will be employed during the construction phase of the project.
- ✓ TANESCO should implement a Grievance Redress Mechanism (GRM) for the project which should include addressing the needs of vulnerable groups and be sensitive in handling any grievances raised by such groups. TANESCO will carefully administer and monitor the GRM throughout the project life cycle
- ✓ TANESCO should implement a developed Communication Strategy Plan on issues regarding vulnerable groups and be prompt in handling and resolving issues associated with vulnerable groups.

7.3.3 Impacts on gender requirements

- ✓ When paying compensation to project affected persons (PAPs), TANESCO should make an effort to impress upon male headed households to include women in the discussions and decision making process.
- ✓ As TANESCO will pay compensation via accounts, it will advocate for the account being a joint account where both spouses have a say as to how compensation funds should be spent.
- ✓ TANESCO and the Project Contractor will implement a Grievance Redress Mechanism (GRM) that incorporates gender equality and grievances raised by women. The GRM for women must include processes for speedily addressing grievances raised by women during the construction phase without any victimization
- ✓ The Project Contractor will develop and implement an organizational Gender Policy before start of construction that will ensure employment and business opportunities are accorded to men and women equally, and where necessary, affirmative actions are applied to bridge gender gaps that may exist
- ✓ The Project Contractor's Human Resource Management System and terms of employment will include an honor code in the contract document
- ✓ The Project Contractor will develop and implement a comprehensive Violence and Sexual Harassment Policy and ensure all employees are adequately sensitized on its provisions
- ✓ The Village administration will impress upon the Project Contractor that women be given equal opportunities in employment, or provision of catering or hospitality related services for the workers.
- ✓ The Project Contractor will provide a work environment that is safe and conducive to both women and men, considering gender-disaggregated differences and vulnerabilities
- ✓ The Project Contractor will ensure gender considerations in allocating work-shifts, such as avoiding, where necessary, placing female workers on night shift if work will be carried out at night
- ✓ The Project Contractor will take into consideration local culture (dressing, family roles and inter-gender interactions) in allocation of roles
- ✓ Wherever women are employed, the Project Contractor shall ensure that separate accommodation and ablution facilities are provided for women. The Project Contractor will further ensure that these facilities are regularly sanitized to prevent communicable diseases.

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

7.3.4 Housing

- ✓ 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 shall be provided as per all project adopted norms.
- ✓ Compensation of all assets and grievances to the project affected people as well as to the villages concerned. Monetary compensation for structures lost shall be estimated at current market price index. Towards restoring livelihood / income impacted due to

demolishing commercial structures shall 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.

- ✓ The developer should prevent damage or dislocation of houses/ structures owned by vulnerable groups in the community such as widows, orphanage and elderly persons as those have little strength to replace affected properties. Otherwise they should be given livelihood replacement rather than monetary compensation.

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

7.3.5 Cultural Property Resources

- ✓ 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 shall be done with utmost care and respect to people's sentiments on heritage. For this, affected communities shall be consulted before taking any decision on relocating the CPRs.
- ✓ 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
- ✓ 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.
- ✓ Report relevant observations during exploration and construction work immediately to the Antiquity Department
- ✓ Interrupt the work at the sites concerned and not restart without approval from the Antiquity Department.

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

7.3.6 In-migration of workers (Labor influx)

- ✓ TANESCO and project contractor will develop and implement a Labor Influx Management Plan on how to minimize labor influx as part of the overall Construction Environment and Social Management Plan. Contractor will collaborate with TANESCO safeguards, Districts labor office and local leaders in implementation of Labor Influx Management Plan;
- ✓ The Project Contractor will develop and implement a transparent recruitment process and communicate the same through the area Village Executive Officer and Village Chairperson to manage expectations and opportunistic influxes;
- ✓ Priority for employment and other economic opportunities will be given to the local community to minimize in-migration;
- ✓ The Project Contractor will develop and implement camp and workforce management protocols which are clearly communicated to the workforce and enforcement measures implemented;

- ✓ The Project Contractor will develop and implement a written grievance mechanism for the construction phase of the project;
- ✓ The Project Contractor and TANESCO will facilitate small and medium enterprise (SME) development in the local communities and surrounding region.

7.3.7 Tree Crops

- ✓ The plantation lands to be acquired shall 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.
- ✓ Permanent loss of trees should be compensated by adequate planting activities in neighbouring areas.
- ✓ 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 shall not only be minimized but also will over compensate the project related impacts.

7.3.8 Access Road and Public Infrastructure

- ✓ 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, but this will be in small size since most of access roads are under district council and have it own RoW.
- ✓ 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.

7.3.9 Impacts on construction traffic and road accidents

- ✓ The Project Contractor should develop a Traffic management plan for the construction phase of the project. The contents of the Traffic Management Plan will include:
    - o Construction plant, equipment, vehicle and driver licensing procedures
    - o Use of existing road infrastructure
    - o Maintenance of vehicle and access roads
    - o routing of traffic, speed limits and signage
    - o Pedestrian and passenger safety
    - o Transport of equipment and materials
    - o Emergency response and reporting of hazards
    - o Review of the plan
- ✓ The contractor should develop a transport risk and accident mitigation plan, especially for night time traffic
- ✓ TANESCO and its Project Contractors will undertake a risk management appraisal of their road transport carriers.
- ✓ The Project Contractor will regularly inspect the access roads conditions and whenever necessary, promptly repair damages related to construction traffic
- ✓ Abnormal loads will be timed to avoid times of the year when traffic volumes are likely to be higher e.g. start and end of school holidays, long weekends, etc.
- ✓ Dust suppression measures must be implemented for heavy vehicles such as wetting of murram roads on a regular basis to prevent negative impacts to communities

- ✓ Prepare detailed plan for signage along the Construction Areas to facilitate traffic movement, provide directions to various components of the Works, and provide safety advice and warnings. Details regarding maximum permissible vehicular speed on each section of road. All signs will be in both English and Swahili language
- ✓ TANESCO and its Project Contractor will advance public awareness programs on traffic safety campaigns to identify areas of particular risk such as schools, health centres or village centres and approaches to reduce risk. This is expected to include awareness programs along roads leading to the ROW site to frequent users on traffic dangers. Traffic calming and speed control measures will be instigated in consultation with the relevant authorities
- ✓ TANESCO and Contractor should consider using the Railway to transport some of the larger equipment thus minimizing congestion on the road.

7.3.10 Employment

- ✓ The developer shall 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.
- ✓ Developer shall not employ children under the age fourteen (14) to be employed or be engaged in any proposed project area.
- ✓ 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.
- ✓ The contractor shall give preference to local labour to females from vulnerable households. For example widows and disabled women as found fit.
- ✓ These measures should be implemented during construction phase when chances are available for skilled and semi-skilled people to be employed.

7.4 Worker health and safety

- ✓ The Project Contractor will develop and implement an Occupational Safety and Health (OSH) Management System which is in alignment with Tanzanian Occupational Health And Safety legislation, OHSAS 18001 and the IFC General EHS Guidelines and will outline OSH procedures including:
    - o Provision of occupational safety and health orientation training to all employees;
    - o Periodic safety inspections;
    - o Employment of health and safety personnel;
    - o Development of a worker safety programme;
    - o Development and implementation of safe systems of work.
- ✓ The Project Contractor will comply with all applicable legislative requirements of the OSH legislation throughout the construction phase of the project.
- ✓ The Project Contractor will conduct an occupational safety and health risk assessment for construction phase activities in accordance with the requirements of ISO 31000 and submit the report to TANESCO for consideration
- ✓ The Project Contractor will ensure that there is an effective and efficient fire fighting system together with an adequately trained Emergency Response Team

- ✓ The Project Contractor will develop and implement a S&H training program for all workers that are employed during the construction phase of the project. The S&H training program will be based on training needs analysis carried out of the workforce. Internal and external S&H trainers will be engaged for provision of project and site specific S&H training courses in order to prevent accidents and injuries.
- ✓ The Project Contractor will develop and implement a documented HR management system comprising the attributes mentioned above for the construction phase;
- ✓ The Project Contractor and sub-contractors will ensure that every employee working at the project site is provided with appropriate and adequate PPE and maintain a register indicating the issuance, control and use of PPE.
- ✓ All Project employees will be provided with induction in human resources policies, employment conditions, workers' camp policies and associated requirements.
- ✓ The Project Contractor will establish a comprehensive worker Grievance Mechanism
- ✓ All employees will receive a copy of their employment agreement, which will, at a minimum, address the following: job title, job duties, remuneration period and amounts, labor conditions, employment duration and the conditions for hiring and layoff.
- ✓ The Project Contractor will document and communicate working conditions and terms of employment to all workers directly contracted both local and expatriate
- ✓ TANESCO will conduct appropriate monitoring and inspections to ensure worker safety including tracking rates of injury, occupational diseases, lost days and number of work-related fatalities.
- ✓ The Project Contractor will ensure that the subcontractors have appropriate E&S Management system in place.
- ✓ The Project Contractor will monitor the performance of the sub-contractors and ensuring that the subcontracted workforce has access to the grievance mechanism.
- ✓ The Project Contractor will ensure provision of guidance on the detrimental effects of drug and alcohol abuse, the risk and concerns relating to HIV/AIDS and other health risk-related activities.
- ✓ Local communities will be made aware of rules governing the workers accommodation camp, worker-community interaction regulations and the consequences of workers breaking such rules.
- ✓ The Project Contractor will reasonably limit worker movements outside the project colony and within the community with an aim to limit interactions of construction workers with the local communities, and local ecological and cultural resources
- ✓ The Project Contractor will ensure provision of key facilities and services within the project colony in order to minimize worker's needs to exit the colony.
- ✓ TANESCO's HR Policies will be included the Project Contractor's contract to address any gaps that may exist in informal employment

7.4.1 Impacts of Electromagnetic Waves on Human Health

Mitigation against EMFs exposure (as per IFC) has been undertaken through the establishment of the TL way leave. This means that there will be no residential properties or other buildings within nearby the TL. In addition to this, TANESCO can undertake the following mitigation:

- ✓ The recommended safety distance from power line (way leaves) regarding the resettlement of the population along the servitude of the transmission line should be observed. Ensure that the TL is constructed with the minimum required height clearance to ground level which is 7-8m

- ✓ TANESCO in collaboration with local authorities should alert people about the risks that may result from the establishment of residences in the right of way and under the power line.
- ✓ Periodic monitoring should be carried out to ensure that no one is establishing a residence in the right of way and under the power line.

Other mitigation measures:

- ✓ Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities;
- ✓ Training of workers in the identification of occupational EMF levels and hazards;
- ✓ Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers;
- ✓ Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the Institute of Electrical and Electronics Engineers (IEEE). Personal exposure monitoring equipment should be set to warn of exposure levels that are below occupational exposure reference levels (e.g. 50 percent). Action plans to address occupational exposure may include limiting exposure time through work rotation, increasing the distance between the source and the worker, when feasible, or the use of shielding materials.

7.4.2 Electrocution

- ✓ Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education / public outreach to prevent public contact with potentially dangerous equipment;
- ✓ Grounding conducting objects (e.g. fences or other metallic structures) installed near power lines, to prevent shock.

7.4.3 Impacts associated with subsurface soil and surface water contamination on Substations areas

- ✓ All areas of the substation footprint where operational spills could occur will be made out of an impermeable surface;
- ✓ The design of each proposed substation in Kisada and Mbeya should incorporate an oil water separator. During the operational phase, effluent from each oil water separator should be collected for quantitative analysis in a laboratory. The parameters which should be monitored should include pH, Oil and Grease, PAH, PCBs, COD, BOD, etc.
- ✓ TANESCO will develop and implement a spill prevention control and countermeasures plan and a waste management plan for the proposed substation sites in Iringa, Kisada and Mbeya
- ✓ All hazardous chemical spills will be handled, stored and disposed in accordance with Tanzanian environmental legislation and in its absence, with the World Bank's waste management guidelines

7.4.4 Impacts on noise quality from Substations area

- ✓ An independent environmental noise level survey will be undertaken on an annual basis at each of the three substations in Iringa, Kisada and Mbeya, Both nocturnal and diurnal measurements will be undertaken. The noise mapping results will be compared with Tanzanian environmental noise legislative limits and the World Bank EHS Guidelines. This can be done by external experts hired by TANESCO
- ✓ Where measured noise levels exceed the stipulated limits, TANESCO will create berms high enough to shield the noise from travelling outside the property line.

7.4.5 HIV/AIDS

The following mitigation measures in the same line with GoT strategies on tackle HIV/AIDS:

- ✓ Contractor may use District health experts or NGOs to carry out an HIV/AIDS awareness campaign along the project area before start of construction.
- ✓ Collaborate with the local health centres and NGOs to conduct preventive health campaigns for HIV/AIDS
- ✓ 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.
- ✓ Develop Code of Conduct for workers to prevent unwanted behaviour based on the outline provided in Appendix I.
- ✓ Distribution of good quality condoms etc.

7.4.6 Impacts on increase in prostitution and teenage pregnancies

- ✓ TANESCO must work with district authorties, village leaders and schools leaders to create awareness on the issues at early stage before project start.
- ✓ Target hiring large percent of unskilled labour from the Project-affected communities to minimise the number of people coming to the area to find work.
- ✓ The construction camp (s) will be cited away from populated areas and fenced off. Additionally, the camp sites must be securely fenced and strict security control measures implemented for management of workers staying in the camp (s).
- ✓ The Project Contractor will use Peer Educators for implementing regular campaigns on prostitution and teenage pregnancies. These campaigns will be targeted towards all construction workers and schools and communities in which construction works will occur.
- ✓ The Project Contractor will include a code of conduct in the employment contract for each staff member recruited in order to inculcate the correct behaviors when working on the project throughout the construction phase of the project
- ✓ Local communities will be made aware of rules governing the workers accommodation camp, worker-community interaction regulations and the consequences of workers breaking such rules.

7.4.7 Impacts on Gender Based Violence

- ✓ The Project Contractor will conduct awareness raising for the workers about refraining from unacceptable conduct toward local community members, specifically women;
- ✓ TANESCO and the Project Contractor will raise awareness to sensitize host communities with special attention to women, about the social and health risks of sexual engagement with the workforce. Also the campaign will includes information about cultural norms in the communities, HIV and GBV.
- ✓ The Project Contractor will inform their workers about national laws that make sexual harassment, exploitation of children, and gender-based violence a punishable offence which is prosecuted and which will be reported to the authorities;. Country wise the Government of Tanzania in dealing with GBV have introduced a special desk for gender based violence in each police office in Region, District and in Ward level if there is a police office.
- ✓ As a condition of employment, the Project Contractor will develop a Worker Code of Conduct to be made a part of employment contracts, and including sanctions for non-compliance (e.g., termination). Appendix I contain and outline for the Code of Conduct.
- ✓ The Project Contractor's HR Management System will include a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.
- ✓ Women will have priority to get jobs;
- ✓ Worker camps will be set away from the communities and socially structures such as schools

7.5 Summary of Mitigation Measures

Table 7.1: 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. ✓ Collaboration between developer and stakeholders on environmental protection.
Terrestrial Habitat	✓ Avoid habitat through use of existing utility and transport corridors for transmission and existing roads and tracks for access roads, ✓ Installation of transmission lines above existing vegetation to avoid land clearing; ✓ Revegetation of disturbed areas with native plant species; ✓ Implementation of an integrated vegetation management approach (IVM). ✓ Removal of invasive plant species, whenever possible, cultivating native plant species; ✓ Scheduling activities to avoid breeding and nesting seasons for any critically endangered or endangered wildlife species; ✓ Observing manufacturer machinery and equipment guidelines,

Type of Impact	Proposed Mitigations
	procedures with regard to noise and oil spill prevention and emergency response; ✓ Avoiding clearing in riparian areas; ✓ Avoiding use of machinery in the vicinity of watercourses.
Forest/bush Fires	✓ Monitoring right-of-way vegetation according to fire risk; ✓ Removing blowdown and other high-hazard fuel accumulations; ✓ Time thinning, slashing, and other maintenance activities to avoid forest fire seasons; ✓ Disposal of maintenance slash by truck or controlled burning. ✓ Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow fire fighting access.
Soil erosion	✓ Scheduling to avoid heavy rainfall periods (i.e. during the dry season) to the extent practical; ✓ Contouring and minimizing length and steepness of slopes; ✓ Mulching to stabilize exposed areas; ✓ Re-vegetating areas promptly; ✓ Designing channels and ditches for post-construction flows; ✓ Lining steep channel and slopes (e.g. use jute matting); ✓ Reducing or preventing off-site sediment transport through use of settlement ponds, silt fences, and water treatment and modifying or suspending activities during extreme rainfall and high winds to the extent practical; ✓ Limiting access road gradients to reduce runoff-induced erosion; and ✓ Providing adequate road drainage based on road width, surface material, compaction, and maintenance
Climate Change	✓ Allowing low re-vegetation along the TL route thereby compensating for loss of CO_2 sequestration to some extent ✓ Minimizing land take for the TL corridor by employing other types of transmission line towers ✓ Consideration will be given to planting of native tree species at alternative locations to offset the loss of trees from the footprint of the TL. ✓ CO2 and SO2 from vehicles cannot be eliminated but will be minimized to the extent possible. This can be achieved by: ✓ Ensuring that all construction vehicles, including transport vehicles are routinely serviced and maintained in good working order.
Landscape Aesthetics and Visual Amenity	✓ During design phase, it recommended design of TL should be subjected to an aesthetic review by an Architect or an expert specializing in Landscape /Aesthetic reviews ✓ Location of the towers should be carefully selected during design stage to minimise impact on landscape aesthetics. ✓ Extensive public consultation during the planning of power line and power line right-of-way locations; ✓ Accurate assessment of changes in property values due to power line proximity; ✓ Sitting power lines, and designing substations, with due consideration to

Type of Impact	Proposed Mitigations
	landscape views and important environmental and community features, based on aesthetic review by qualified architect engaged by TANESCO; ✓ Location of high-voltage transmission and distribution lines in less populated areas, where possible;
Wildlife	✓ TANESCO will protect and enhance wildlife corridor (Igando and Igawa) during both phases of project by developing and implementing a Wildlife Corridor Management Plan. ✓ TANESCO should maintain vegetative cover in wildlife corridor (Igando and Igawa) especially in areas with immense benefits for animal movement and habitat whereby low shrubs and bush should be left in place. ✓ Uses of taller towers where the line crosses the corridor so that bush could be allowed to grow at certain higher without endangering the line. ✓ Share corridors to allow passage of migratory animals. ✓ Do not clear natural trees/vegetation (miombo) >/=1.5m height. ✓ Create awareness about wildlife values among workers. ✓ Collaboration of stakeholders regarding alignment of TL inside MKGR.
Birds and Bat Collisions and Electrocutions	✓ TANESCO will appoint ornithologists and bat specialists from a recognized institution to undertake a survey of birds and bats and collision study within the Area of Influence of the transmission line project. The study will be undertaken to inform the final design and routing of the new TL and recommendations will be reflected in the updated ESMP that is cleared by WB prior to construction. The recommendations may include alignment changes, installing and locations of bird diverters on the conductors, deflectors based on the baseline surveys as needed, so that these will be included in the designs. There are three general types of line marking devices: aerial marker spheres, spirals, and suspended devices. ✓ Based on the results of the bird and bat survey, consider rerouting the proposed transmission line taking into consideration migratory patterns and high bird-use areas into account e.g. parallel to land features which could be potential bird routes, such as ridges and valleys, and not cutting across them, going over wetlands, etc; ✓ In areas with high birds and bats activities after baseline survey and where the new line runs parallels the existing 220kV line, towers and conductors should have at the same height as those of the existing 220 kV line to reduce bird an bat collisions. This should be used that will avoid having the new conductors at different heights than the old one. ✓ Maintaining 1.5 meter (60-inch) spacing between energized components and grounded hardware or, where spacing is not feasible, covering energized parts and hardware; ✓ Avoiding establishing power lines close and adjacent to hills and over wetlands, maintaining a minimum buffer distance of 5 km ✓ Bird and Bat specialist from a recognized Tanzanian institution should undertaken at least three seasonal surveys over a period of 2 years to get

Type of Impact	Proposed Mitigations
	an understanding of the migratory patterns of this bird and bat species and adjusted thereafter if no new information is being collected. The two year survey should proceed as a monitoring program to (a) identify additional mitigation measures needed (and feasible) and (b) to increase TANESCO's knowledge about impact of T-lines on birds and bats.
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.
Water Resources	✓ Deposition of excavated materials away from all watercourses and rivers ✓ Storage of bulk fuel, drums and other chemicals in bunded storage areas to prevent oil pollution ✓ Provision of drip-pans for catching oil to vehicles being fuelled or repaired, and stationery machinery. ✓ Except in an emergency, no vehicle will be fuelled, lubricated or repaired except within the bounds of a project camp or depot. ✓ Prohibition of washing vehicles in any watercourse
Land use	✓ Careful design to avoid serious impact on land and individual properties. ✓ Pay compensate for affected properties
Impacts of land acquisition on vulnerable groups	✓ TANESCO should advocate for direct and indirect business opportunities to vulnerable groups such as Female headed households with its Project Contractor. ✓ TANESCO should implement a Grievance Redress Mechanism (GRM) for the project which should include addressing the needs of vulnerable groups and be sensitive in handling any grievances raised by such groups. ✓ TANESCO should implement a Communication Plan for vulnerable groups and be prompt in handling and resolving issues associated with vulnerable groups
Impacts on gender requirements	✓ When paying compensation to project affected persons (PAPs), TANESCO should make an effort to impress upon male headed households to include women in the discussions and decision making process. ✓ As TANESCO will pay compensation via accounts, it will advocate for the account being a joint account where both spouses have a say as to how compensation funds should be spent. ✓ TANESCO and the Project Contractor will implement a Grievance Redress Mechanism (GRM) that incorporates gender equality and grievances raised by women. ✓ The Project Contractor will develop and implement an organizational Gender Policy that will ensure employment and business opportunities are accorded to men and women equally. ✓ The Project Contractor will develop and implement a comprehensive

Type of Impact	Proposed Mitigations
	Violence and Sexual Harassment Policy and ensure all employees are adequately sensitized on its provisions ✓ The Village administration will impress upon the Project Contractor that women be given equal opportunities in employment, or provision of catering or hospitality related services for the workers. ✓ The Project Contractor will take into consideration local culture (dressing, family roles and inter-gender interactions) in allocation of roles ✓ Wherever women are employed, the Project Contractor shall ensure that separate accommodation and ablution facilities are provided for women.
Housing	✓ Avoid residential structures during the design stage. ✓ Compensate assets and put up mechanism for grievances resolution.
Cultural Property Resources (CPR)	✓ Minimize impact through design and consult people about any relocation. ✓ Report any findings for any CPR to Antiquity Department.
In-migration of workers	✓ The Project Contractor will develop and implement a transparent recruitment process and communicate the same through the area Village Executive Officer and Village Chairperson to manage expectations and opportunistic influxes ✓ Priority for employment and other economic opportunities will be given to the local community to minimize in-migration ✓ The Project Contractor will develop and implement camp and workforce management protocols which are clearly communicated to the workforce and enforcement measures implemented ✓ The Project Contractor will develop and implement a written grievance mechanism for the construction phase of the project. ✓ The Project Contractor and TANESCO will facilitate small and medium enterprise (SME) development in the local communities and surrounding region.
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.
Impacts on construction traffic and road accidents	✓ The Project Contractor should develop a Traffic management plan for the construction phase of the project ✓ TANESCO and its Project Contractors will undertake a risk management appraisal of their road transport carriers. ✓ Abnormal loads will be timed to avoid times of the year when traffic volumes are likely to be higher e.g. start and end of school holidays, long weekends, etc. ✓ Dust suppression measures must be implemented for heavy vehicles such as wetting of murram roads on a regular basis to prevent negative impacts to communities

Type of Impact	Proposed Mitigations
	✓ Prepare detailed plan for signage along the Construction Areas to facilitate traffic movement, provide directions to various components of the Works, and provide safety advice and warnings. ✓ TANESCO and its Project Contractor will advance public awareness programs on traffic safety campaigns to identify areas of particular risk such as schools, health centres or village centres and approaches to reduce risk. ✓ TANESCO and Contractor should consider using the Railway to transport some of the larger equipment thus minimizing congestion on the road.
Employment	✓ Implement proper measures to employment of local people.
Health and Safety	✓ 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.
Impacts of Electromagnetic Waves on Human Health	✓ Identification of potential exposure levels in the workplace, ✓ Training of workers in the identification of occupational EMF levels and hazards; ✓ Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers;
Electrocution	✓ Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education / public outreach to prevent public contact with potentially dangerous equipment; ✓ Grounding conducting objects (e.g. fences or other metallic structures) installed near power lines, to prevent shock.
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.

Type of Impact	Proposed Mitigations
Impacts on increase in prostitution and teenage pregnancies	✓ TANESCO must work with district authorties, village leaders and schools leaders to create awareness on the issues at early stage before project start. ✓ Target hiring large percent of unskilled labour from the Project-affected communities to minimise the number of people coming to the area to find work. ✓ The construction camp (s) will be cited away from populated areas and fenced off. Additionally, the camp sites must be securely fenced and strict security control measures implemented for management of workers staying in the camp (s). ✓ The Project Contractor will use Peer Educators for implementing regular campaigns on prostitution and teenage pregnancies. These campaigns will be targeted towards all construction workers and schools and communities in which construction works will occur. ✓ The Project Contractor will include a code of conduct in the employment contract for each staff member recruited in order to inculcate the correct behaviors when working on the project throughout the construction phase of the project ✓ Local communities will be made aware of rules governing the workers accommodation camp, worker-community interaction regulations and the consequences of workers breaking such rules.
Impacts on Gender Based Violence	✓ The Project Contractor will conduct mandatory awareness raising for the workers about refraining from unacceptable conduct toward local community members, specifically women; ✓ TANESCO and the Project Contractor will raise awareness to sensitize host communities with special attention to women, about the social and health risks of sexual engagement with the workforce; ✓ The Project Contractor will inform their workers about national laws that make sexual harassment, exploitation of children, and gender-based violence a punishable offence which is prosecuted and which will be reported to the authorities; ✓ As a condition of employment, the Project Contractor will develop a Worker Code of Conduct based on the outline in Appendix I to be made a part of employment contracts, and including sanctions for non-compliance (e.g., termination) ✓ The Project Contractor's HR Management System will include a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.\ ✓ Develop Code of Conduct for workers to prevent unwanted behaviour ✓ Women will have priority to get jobs; ✓ Worker camps will be set away from the communities and social structures such as schools
Impacts associated with subsurface soil and surface water contamination on	✓ All areas of the substation footprint where operational spills could occur will be made out of an impermeable surface; ✓ The design of each proposed substation in Kisada and Mbeya should incorporate an oil water separator. During the operational phase, effluent

Type of Impact	Proposed Mitigations
Substations areas	from each oil water separator should be collected for quantitative analysis in a laboratory. The parameters which should be monitored should include pH, Oil and Grease, PAH, PCBs, COD, BOD, etc. ✓ TANESCO will develop and implement a spill prevention control and countermeasures plan and a waste management plan for the proposed substation sites in Iringa, Kisada and Mbeya ✓ All hazardous chemical spills will be handled, stored and disposed in accordance with Tanzanian environmental legislation and in its absence, with the World Bank's waste management guidelines
Impacts on noise quality from Substations area	✓ An independent environmental noise level survey will be undertaken on an annual basis at each of the three substations in Iringa, Kisada and Mbeya, Both nocturnal and diurnal measurements will be undertaken. The noise mapping results will be compared with Tanzanian environmental noise legislative limits and the World Bank EHS Guidelines. This can be done by external experts hired by TANESCO ✓ Where measured noise levels exceed the stipulated limits, TANESCO will create berms high enough to shield the noise from travelling outside the property line

CHAPTER 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. Also will be no connection of power network to Zambia and North West of Tanzania i.e. Sumbawanga and Katavi regions. 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 8.1) 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 A104 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.

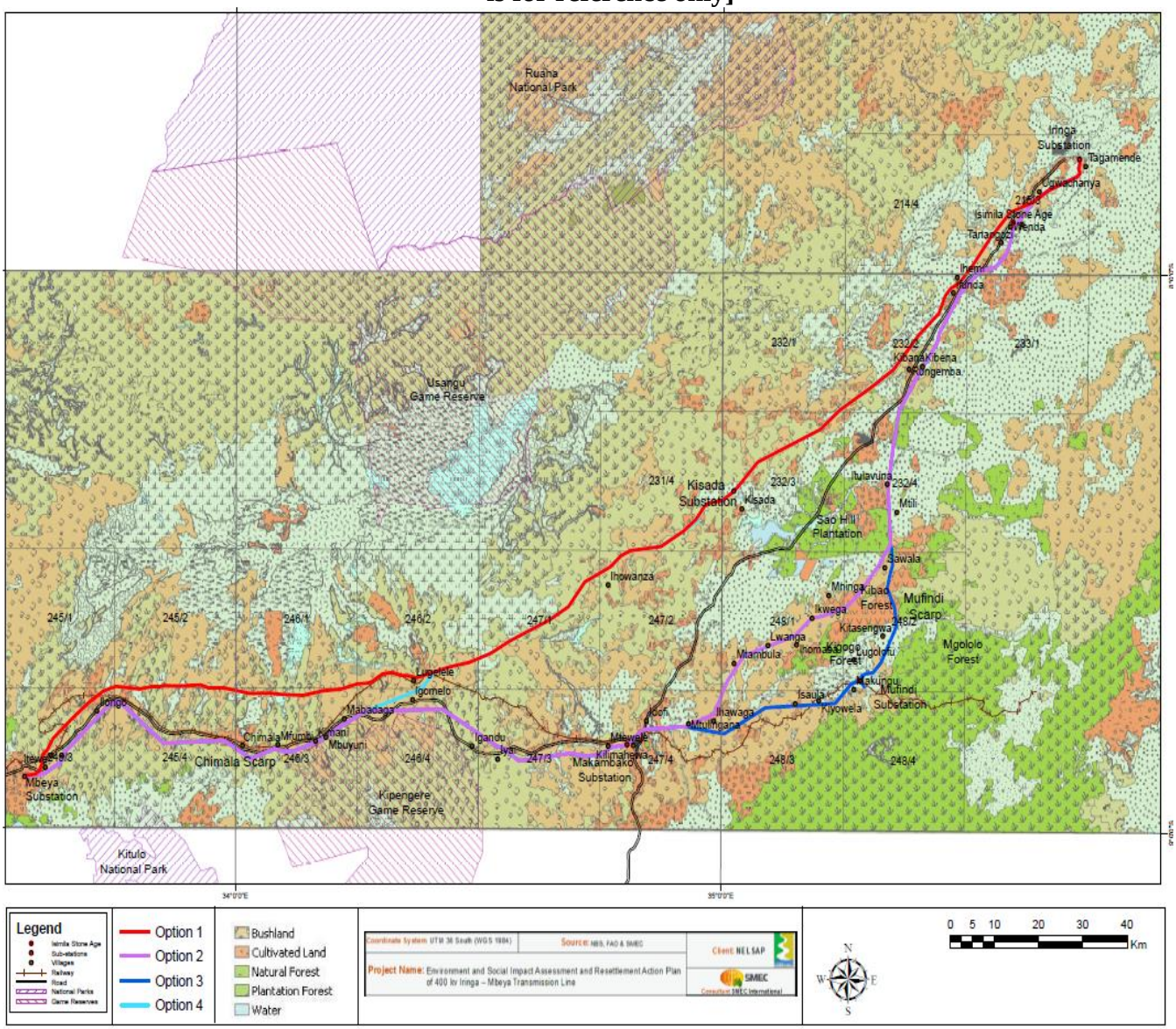
8.3.2 Environmental and Social Impacts

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 19km segment in poorly drained soil with weak bearing capacities, which will cause soil erosion in those areas.
Summary of social impacts are provided below:

- ✓ The proposed Option 1 of the transmission TL has an overall impact on 16 villages in Iringa region and 13 villages in Mbeya region.
- ✓ Altogether there are 369 PAHs, out of which 59% live in Iringa region and the rest 41% in Mbeya region.
- ✓ 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.
- ✓ 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.
- ✓ The number of impacted CPRs, in the form of graves is 16.

Figure 8.1: Proposed Four Options (Transmission lines) [map will be printed on A3 – this is for reference only]



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:

- ✓ The proposed Option 2 of the transmission TL has an overall impact on 34 villages in Iringa region and 20 villages in Mbeya region.
- ✓ Altogether there are 742 PAHs, out of which 73% live in Iringa region and the rest 27% in Mbeya region.
- ✓ PAHs would lose 323 residential structures as these are getting impacted for the proposed transmission TL.
- ✓ 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 8.1) 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 lyayi. 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.

- ✓ 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.
- ✓ 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.
- ✓ 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.
- ✓ PAHs would lose 264 residential structures as these are getting impacted for the proposed transmission TL. All the residential structures need to be relocated.
- ✓ 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 8.1) 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 292km 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 (292km) 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.

- ✓ The proposed Option 4 of the transmission TL has an overall impact on 53 villages of which 25 are in Iringa region and 29 in Mbeya region.
- ✓ Based on the detailed survey during Phase II, a total of 5188 PAHs have been identified.
- ✓ In terms of impact on land and properties, it has been estimated that about 6382 acres of land belonging to PAHs will be impacted.
- ✓ PAHs would lose 21 houses/structures.
- ✓ 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 8.1 provides a comparison in terms of physical aspects while Table 8.2 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 8.1: Physical Comparison among all Proposed Options

Aspects	Option 1	Option 2	Option 3	Option 4
Distance (km)	287.3	323.4	336.8	292
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 8.2: Summary 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
	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[6].	
	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	+++	+++	+	++ +	c,o

[6] Breakdown of RAP cost are provided in the RAP report which will be updated on 2018.

	Impact	Option 1	Option 2	Option 3	Option 4	Impact phase
	Public Infrastructure					
	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

Based on analysis of data, out of the four alternative TLs the in 2012, TANESCO has chosen Option 4 as the most preferred option and advised the Consultant to carryout detailed ESIA on this chosen option.

CHAPTER 9: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

This Section addresses mitigation measures, monitoring and institutional arrangements for the Environmental and Social 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 ESMP 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 9.6.

9.2 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 shown in table 9.1.

The proposed ESMP below will be updated with site specific mitigation measures once the detailed design is completed. The mitigation measures should be incorporated in the design and bid documents and the updated ESMP including Community Health, Safety and Security Plan, Traffic Management Plan, Labour Influx Management Plan etc. The updated ESMP will be submitted to the financier (WB) for approval and clearance. All mitigation measures, the updated and cleared ESMP will be included in the final Contract documents so that they are legally binding on the contractor during project implementation.

The contractor is responsible for fully complying with the mitigation measures stated within the updated ESMP which are implemented by the Project Manager during the construction phase. Also during construction phase, contractor will be responsible on develop Specific ESMP and sub-plans for specific E&S issues depend on activities, it can be quarterly whereby will be reviewed and approved by proponent (TANESCO). It should also form the basis of the Construction Contractors' ESMP. Additionally, the Contractor should prepare and implement:

- ✓ A drainage and erosion control plan;
- ✓ Emergency Responses Plan;
- ✓ A rehabilitation plan for disturbed areas;
- ✓ A waste management plan;
- ✓ An intervention plan for contaminants accidental spills;
- ✓ A fuel and other hazardous materials management plan.

Table 9.1: Environmental and Social 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
Landscape Aesthetics and Visual Amenity	During design phase, it recommended design of TL and S/S should be subjected to an aesthetic review by an Architect or an expert specializing in	Throughout ROW	During Design phase	TANESCO, Consultant and Contractor	TANESCO and Consultant

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	Landscape /Aesthetic reviews. Location of the towers and S/S should be carefully selected during design stage to minimise impact on landscape aesthetics. Extensive public consultation during the planning of power line, locations of S/S and power line right-of-way locations; Accurate assessment of changes in property values due to power line and S/S proximity.				
Clearances, Approvals and Permits	Only licensed quarries and sand suppliers shall be used.	Throughout ROW	Before the commencement of construction	Contractor	Project 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	Project Engineer
	Provide a copy of all necessary permits to the Engineer.	Throughout ROW	Before the commencement of construction	Contractor	Project Engineer
	Adhere to all permit terms and conditions.	Throughout ROW	Throughout contact period	Contractor	Project 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	Project 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
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	On site	At least 1 month prior to commencement of construction	Supervision Consultant / Contractor	TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	attend the training.				
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 ancillary site prior to the commencement of related activities.	Throughout ROW	Before commencement of construction	Contractor	Engineer
	Inspect and approve, if correct, all pegged ancillary sites.	Throughout ROW	Before commencement of construction	Engineer	Engineer
CONSTRUCTION STAGE					
Soil erosion	Scheduling to avoid heavy rainfall periods (i.e. during the dry season) to the extent practical; Contouring and minimizing length and steepness of slopes; Mulching to stabilize exposed areas;	Throughout ROW Through the Access roads	Before and after clearing the vegetation along a section of the RoW	Contractor	TANESCO and Consultant

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	Re-vegetating areas promptly; Designing channels and ditches for post-construction flows; Lining steep channel and slopes (e.g. use jute matting); Limiting access road gradients to reduce runoff-induced erosion;	At campsite			
Terrestrial Habitat	Avoid habitat through use of existing utility and transport corridors for transmission and existing roads and tracks for access roads, Installation of transmission lines above existing vegetation to avoid land clearing; Scheduling activities to avoid breeding and nesting seasons for any critically endangered or endangered wildlife species; Observing manufacturer machinery and equipment guidelines, procedures with regard to noise and oil spill prevention and emergency response; Avoiding clearing in riparian areas; Avoiding use of machinery in the vicinity of watercourses.	Throughout ROW	Before clearing the vegetation along a section of the RoW	Contractor	TANESCO and Consultant
Forest/bush Fires	Monitoring right-of-way vegetation according to fire risk; Removing blowdown and other high-hazard fuel accumulations; Disposal of maintenance slash by truck or controlled burning. Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow fire fighting access.	Throughout ROW	Before and after clearing the vegetation along a section of the RoW	Contractor	TANESCO and Consultant
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	Throughout ROW	Before clearing the vegetation along a section of the RoW	Contractor	TANESCO and Consultant

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	that exceed an acceptable height for line safety are removed elsewhere has immense benefits. Seek approval for clearing from the Supervision Engineer before clearing.				
	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	Consultant and Contractor	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	TANESCO and Consultant
	Stockpile cleared shrub foliage where possible within the ROW for later use as a brush layer.	Throughout ROW	Throughout construction period	Contractor	TANESCO and Consultant
	Contractor to submit their ESMP to the Engineer for review and approval and then they have to follow the plan.		Throughout construction period	Contractor	TANESCO and Consultant
Construction Traffic and road accidents Management	The Project Contractor should develop a Traffic management plan for the construction phase of the project TANESCO and its Project Contractors will undertake a risk management appraisal of their road transport carriers. Abnormal loads will be timed to avoid times of the year when traffic volumes are likely to be higher e.g. start and end of school holidays, long weekends, etc. Dust suppression measures must be implemented for heavy vehicles such as wetting of murram roads on a regular basis to prevent negative impacts to communities Prepare detailed plan for signage along the Construction Areas to facilitate traffic movement, provide directions to various components of the Works, and provide safety advice and warnings. TANESCO and its Project	Throughout Project area	Throughout Construction period	Contractor	Engineer and TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	Contractor will advance public awareness programs on traffic safety campaigns to identify areas of particular risk such as schools, health centres or village centres and approaches to reduce risk. TANESCO and Contractor should consider using the Railway to transport some of the larger equipment thus minimizing congestion on the road.				
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
	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	Throughout alignment	Prior to commencement of construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	appropriate sediment control structures and install structures prior to commencement of work.		work		
	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. • Carry out noisy construction activities during daylight. • Advise local people when there will be unusually high levels of noise.	Throughout alignment	Throughout construction period	Contractor	Engineer
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.	Throughout alignment	Prior to commencement of works Throughout construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	• 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.				
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 issues	• Advise the local community of project plans in advance of construction, and involve them in the site / construction planning process.	For the whole Project	Prior to commencement of works	Contractor	Engineer
	• 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

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	• 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. • 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.	Throughout Alignment	Beginning with and continuing throughout construction	Contractor Engineer / Contractor Contractor Contractor	Engineer TANESCO Engineer 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	Throughout Alignment	Throughout construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	top-soiling.				
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. • Inspect and certify the adequate reinstatement of services.	Throughout Alignment	Prior to interruption of any services Following construction	Contractor/Engineer	Engineer/TANESCO
Workforce Camps	• Workers camps will established in the industrial area and other are far from the centers of selected village (>1km) as per experience from other TANESCO`s TL projects. The project contractor will be advised accordingly. • Locate, peg and seek approval from the Engineer for workforce camp sites. • Inspect and approve all correctly located camp sites.	Construction camp lease area	Throughout construction	Contractor Engineer Contractor	Engineer TANESCO Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	• 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.				
Workforce Management	• Engage local people to work as casual labourers. About 70% 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 Pollution	• Vehicles and machinery shall be regularly maintained so that emissions conform to National Standards.	Throughout Alignment	Beginning with and continuing throughout construction	Contractor	Engineer
Noise	• Workers in vicinity of strong noise shall wear earplugs and their working time should be limited. • Construction would be	Throughout Alignment	Beginning with and continuing throughout construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	stopped from 21:00 to 06:00 hrs at construction sites located within 150 m of residential areas. • Machinery and vehicles shall be maintained to keep noise at a minimum.				
Siltation	• Construction materials containing fine particles e.g. aggregates, limestone etc. shall 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 shall 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 shall 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 shall be taken in the construction camps, i.e. provision of garbage tanks and sanitation facilities including septic tank and soak pits • Drinking water shall 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 Diseases	• Make certain that there is good drainage at all construction areas, to avoid creation of stagnant water bodies especially in urban/industrial areas, including water in old tires. • Provide adequate sanitation and waste disposal at construction camps. • Provide adequate health care for workers and locate camps	At all construction and camp sites	During construction	Contractor	Engineer

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	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 shall 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 Supervising 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 shall be informed at once and shall deal with it in accordance with the spill contingency plan.	Throughout Alignment Substations	Throughout construction as and when required	Contractor Contractor Contractor Contractor Contractor	Engineer Engineer Contractor Contractor Contractor Contractor
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 areas	During Construction	Contractor	Engineer
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 shall 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

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
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 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	Throughout Alignment but especially near MKGR and Ruaha national park.	Construction and Operation	Contractor	Engineer / TANESCO/TAWA/TAWIRI

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	developer and Ministry of Natural Resources and Tourism are required to identify the best method to align the proposed TL inside MKGR.				
Birds and Bat Collisions and Electrocutions	• TANESCO will appoint an ornithologists and bat specialists from a recognized institution to undertake a survey of birds and bats within the Area of Influence of the transmission line project; Then an ornithologist and bat specialist should give their recommendations on alignment changes, installing and locations of bird diverters on the conductors, deflectors based on the baseline surveys as needed, so that these will be included in the designs. • Based on the results of the bird and bat survey, consider rerouting the proposed transmission line taking into consideration migratory patterns and high bird-use areas into account e.g. parallel to land features which could be potential bird routes, such as ridges and valleys, and not cutting across them, going over wetlands, etc; • In areas with high birds and bats activities after baseline survey and where the new line runs parallels the existing 220kV line, towers and conductors should have at the same height as those of the existing 220 kV line to reduce bird an bat collisions. This should be used that will avoid having the new conductors at different heights than the old one. • Maintaining 1.5 meter (60-inch) spacing between energized components and grounded hardware or, where spacing is not feasible, covering energized parts and hardware; • Avoiding establishing power lines close and adjacent to hills and over wetlands, maintaining a minimum buffer	Throughout Alignment but especially in wetland areas	Construction and Operation	Contractor and TANESCO	Engineer / TANESCO and ornithologist and bat specialist

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	distance of 5 km • Bird and Bat specialist from a recognized Tanzanian institution should undertaken at least three seasonal surveys over a period of 2 years to get an understanding of the migratory patterns of this bird and bat species and adjusted thereafter if no new information is being collected. The two year survey should proceed as a monitoring program to (a) identify additional mitigation measures needed (and feasible) and (b) to increase TANESCO's knowledge about impact of T-lines on birds and bats.				
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 60 villages and surrounding areas	Construction and Operation	Contractor	Engineer / TANESCO
OPERATION PHASE					
Impacts associated with subsurface soil and surface water contamination on Substations areas	• All areas of the substation footprint where operational spills could occur will be made out of an impermeable surface; • The design of each proposed	Substation areas	Operation phases	TANESCO	TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	substation in Kisada and Mbeya should incorporate an oil water separator. During the operational phase, effluent from each oil water separator should be collected for quantitative analysis in a laboratory. The parameters which should be monitored should include pH, Oil and Grease, PAH, PCBs, COD, BOD, etc. • TANESCO will develop and implement a spill prevention control and countermeasures plan and a waste management plan for the proposed substation sites in Iringa, Kisada and Mbeya • All hazardous chemical spills will be handled, stored and disposed in accordance with Tanzanian environmental legislation and in its absence, with the World Bank's waste management guidelines				
Impacts on noise quality from Substations area	• An independent environmental noise level survey will be undertaken on an annual basis at each of the three substations in Iringa, Kisada and Mbeya, Both nocturnal and diurnal measurements will be undertaken. The noise mapping results will be compared with Tanzanian environmental noise legislative limits and the World Bank EHS Guidelines. • Where measured noise levels exceed the stipulated limits, TANESCO will create beams high enough to shield the noise from traveling outside the property line.	Substation areas	Annually	TANESCO	TANESCO
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	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	TANESCO` Engineer	TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	measures.				
Terrestrial Habitat	• Revegetation of disturbed areas with native plant species; • Implementation of an integrated vegetation management approach (IVM). • Removal of invasive plant species, whenever possible, cultivating native plant species; • Scheduling maintenance of ROW activities to avoid breeding and nesting seasons for any critically endangered or endangered wildlife species;	Along ROW	During clearance of ROW	TANESCO` Engineer	TANESCO
Impacts on health and safety at the proposed substations	***Emergency response plan*** • Upon completion of the construction phase, TANESCO will develop and implement an operational phase emergency response plan (ERP) for the transmission line to ensure the safety of the staff and surrounding land owners in case of an emergency. • A site specific emergency response plan should be developed and implemented for each of the new substations in Iringa, Kisada and Mbeya; • The contents of the ERP will include the following: 1. Administration (policy, purpose, distribution, definitions, etc.) 2. Organization of emergency areas (command centers, medical stations, etc.) 3. Roles and responsibilities 4. Communication systems 5. Emergency response procedures 6. Emergency resources 7. Training and updating 8. Checklists (role and action list and equipment checklist) 9. Business Continuity and Contingency	Substation areas	Annually	TANESCO	TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	• All permanent staff at each substation must undergo appropriate safety training; ***<u>Maintenance and housekeeping</u>*** TANESCO will ensure that housekeeping standards at each of the substations are maintained always. In this regard, TANESCO will develop and implement a maintenance schedule and records of all maintenance on the project kept for inspection and review. ***<u>Fire safety</u>*** A fire risk assessment should be carried out at each of the proposed substations in Iringa, Kisada and Mbeya to determine the firefighting requirements. Based on this, firefighting equipment should be procured and installed as part of the Project Contractor's remit. Firefighting drills should be conducted at least twice a year at the substations. The firefighting equipment must be regularly maintained by an appropriate fire service company. ***<u>Storage and handling of hazardous waste</u>*** • A spill kit needs to be kept at each proposed substation to address any unforeseen spillages; • Transport of all hazardous substances must be in accordance with the relevant environmental legislation.				
Forest Fires	• Monitoring right-of-way vegetation according to fire risk; • Time thinning, slashing, and other maintenance activities to avoid forest fire seasons; • Disposal of maintenance slash by truck or controlled burning.	Along ROW	During clearance of ROW	TANESCO` Engineer	TANESCO
Management Plan for Maintenance of ROW	• The ROW shall require periodic maintenance to maintain adequate clearance between conductors and vegetation	Along ROW	Prior to the start of operations	TANESCO` Engineer	TANESCO
Site decommissioning	• Establish a site revegetation plan. Where possible involve local community to provide materials and implement	All ancillary sites	Immediately following completion of construction	Contractor	TANESCO

Environmental Impact / Issue	Mitigation Measures	Location	Timing	Responsible Org - Implementation	Responsible Org- Supervision
	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.		work		
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

9.3 Approximate Budget for ESMP

An estimated ESMP budget based on the feasibility report carried out in 2012 is provided below. It is understood that TANESCO is in process of updating Feasibility study on 2018 and due to currency inflations of money from 2012 to 2018, there are will be further fine-tuned on this estimated ESMP cost at the final stage.

Please note that the costs of the compensation and resettlement measures are addressed in the distinct RAP report.

Table 9.2: Estimated ESMP Cost

Impact on/by	Mitigation/enhancement measures associated with cost	Responsible institutions	Project phase	Estimated cost* (USD)
Vegetation clearance,	• Selective clearing in the wayleave • If possible use manual clearing instead using heavy machinery	Contractor	C & O	30,000
Terrestrial Habitat	• Vegetation re-plantation • Implementation of an integrated vegetation management approach (IVM). • Scheduling activities to avoid breeding and nesting seasons for any critically endangered or endangered wildlife species;	TANESCO, communities Contractor	O	15,000
Forest/Bush Fires	• Monitoring right-of-way vegetation according to fire risk; • Removing blowdown and other high-hazard fuel accumulations; • Time thinning, slashing, and other maintenance activities to avoid forest fire seasons;	TANESCO, communities Contractor	C & O	15,000

Impact on/by	Mitigation/enhancement measures associated with cost	Responsible institutions	Project phase	Estimated cost* (USD)
Birds and Bat Collisions and Electrocutions	• Use marked devices and other means on wires. • Install bird diverters in areas • Fit flapper devices on the shield devices	Contractor, TANESCO and ornithologists	C	25,000
	• Minimize number of conductor levels • Shield wires should be as low as possible • Remove fruit trees along the TL in areas identified as migratory routes of the E. helvum.	Design Consultant, TANESCO and wildlife experts from TAWA/TAWIRI.	C	1,000,000
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.			
Landscape Aesthetics and Visual Amenity	• Design of TL and S/S should be subjected to an aesthetic review by an Architect or an expert specializing in Landscape /Aesthetic reviews. • Location of the towers and S/S should be carefully selected during design stage to minimise impact on landscape aesthetics. • Extensive public consultation during the planning of power line, locations of S/S and power line right-of-way locations; • Accurate assessment of changes in property values due to power line and S/S proximity.	Design Consultant, TANESCO and Architect	Design Phase	20,000
Construction Traffic and road accidents Management	• The Project Contractor should develop a Traffic management plan for the construction phase of the project. • TANESCO and its Project Contractors will undertake a risk management appraisal of their road transport carriers. • TANESCO and its Project Contractor will advance public awareness programs on traffic safety campaigns to identify areas of particular risk such as schools, health centres or village centres and approaches to reduce risk. • TANESCO and Contractor should consider using the Railway to transport some of the larger equipment thus minimizing congestion on the road.	Contractor	C	15,000
Impacts associated with subsurface soil, surface water contamination	• All areas of the substation footprint where operational spills could occur will be made out of an impermeable surface; • The design of each proposed substation in Kisada and Mbeya should incorporate	Contractor, TANESCO and hired Consultant	C & O	25,000

Impact on/by	Mitigation/enhancement measures associated with cost	Responsible institutions	Project phase	Estimated cost* (USD)
and noise quality on Substations areas	an oil water separator. During the operational phase, effluent from each oil water separator should be collected for quantitative analysis in a laboratory. • TANESCO will develop and implement a spill prevention control and countermeasures plan and a waste management plan for the proposed substation sites in Iringa, Kisada and Mbeya • All hazardous chemical spills will be handled, stored and disposed in accordance with Tanzanian environmental legislation and in its absence, with the World Bank's waste management guidelines • An independent environmental noise level survey will be undertaken on an annual basis at each of the three substations in Iringa, Kisada and Mbeya, Both nocturnal and diurnal measurements will be undertaken. Where measured noise levels exceed the stipulated limits, TANESCO will create beams high enough to shield the noise from traveling outside the property line.			
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 and NGOs	C	10,000
Impacts of Electromagnetic Waves on Human Health	• Identification of potential exposure levels in the workplace, • Training of workers in the identification of occupational EMF levels and hazards; • Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure,	TANESCO	O	Operation Cost
Electrocution	• Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas) • Education / public outreach to prevent public contact with potentially dangerous equipment; • Grounding conducting objects (e.g. fences or other metallic structures)	TANESCO and communities	O	Operation Cost

Impact on/by	Mitigation/enhancement measures associated with cost	Responsible institutions	Project phase	Estimated cost* (USD)
	installed near power lines, to prevent shock.			
Employment	• Implement proper measures to employment of local people.	Contractor, TANESCO, District Labour office and Local leaders	C	100,000
HIV/AIDS	• NGO shall be hired to carry out an awareness campaign along the project area within all 60 villages. • 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	70,000
Other complaints	• Rural electrifications of villages	Design Consultant, TANESCO	O	1,500,000

*at this stage, the estimated cost is provided based on the feasibility report carried out in 2012 and experience from experts, but will be revised when the updated feasibility report completed.

C: construction phase; O: operation phase

9.4 Institutional Arrangements

The proposed 400 kV Iringa-Mbeya transmission line project will in future link with a 400kV Backbone Iringa to Shinyanga and Tanzania-Zambia Interconnector. Also will facilitate the smooth power transfer to the western part of the country i.e. Sumbawanga Region. So this ESIA study covers only 400kV Iringa-Mbeya TL as part of Iringa-Mbeya-Tunduma-Sumbawanga. Therefore, institutional arrangements for the proposed project have not yet been finalized. Nevertheless, in order to guide the EMSP process, a generic framework and the key project partners have been identified:

- ✓ Government / Regulator
- ✓ Owner (TANESCO)
- ✓ Owner's Engineer
- ✓ Contractor

- ✓ Consultants and NGOs
- ✓ Financiers / Lenders

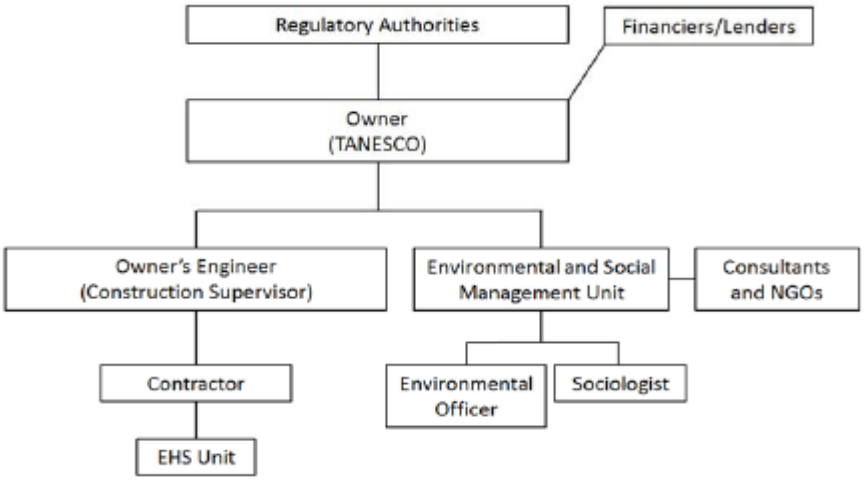


Figure 9.1: Institutional arrangements for the implementation of the ESMP for proposed 400 kV Iringa-Mbeya transmission line project (Source: EIA expert-January, 2018)

Regulatory Authorities

For purposes of this project, the regulating body will include all those government institutions responsible for enforcing compliance with national standards in the different areas of specialization. These will include but not be limited to the following:

- ✓ Vice President's Office (Division of Environment, DoE)
- ✓ National Environment Management Council (NEMC)
- ✓ Ministry of Energy
- ✓ Ministry of Lands, Housing and Human Settlements Development
- ✓ Ministry of Livestock and Fisheries Development
- ✓ Ministry of Natural Resources and Tourism

The roles and responsibilities of the government institutions are described in chapter 3.

Owner (TANESCO)

The Owner (TANESCO) will have the primary overall responsibility for the implementation of the ESMP and for ensuring compliance with Tanzanian legislation and international lenders' guidelines for environmental and social performance. The capacity to manage and monitor environmental and social issues needs to be developed through recruitment of competent staff. Alternatively, the Owner might delegate the responsibility to an Owner's Engineer (see below).

For the purpose of ESMP implementation, the Owner (or the Owner's Engineer) will be expected to establish an Environmental and Social Management Unit and designate two appropriately experienced and qualified persons in charge of the environmental and social management. The two staff shall be assigned as Environmental Officer and Sociologist, and be supported by a minimum of two field assistants.

The Environmental and Social Management Unit will implement the Owner's ESMP, including all operation-related management plans and community relations activities. Also owner will be responsible for review and approval of Specific ESMP prepared by Contractor. However, the responsibility for implementing environmental and social mitigation, compensation and monitoring actions will in some cases be delegated to service providers, e.g. non-governmental organizations (NGOs) or consultants, while the Construction Contractor's ESMP will be implemented by the respective Contractors under the supervision of the Environmental and Social Management Unit.

Although TANESCO`s Environmental and Social Management Unit will implement and supervise the ESMP as stated above, but they will consider strengthening its in-house resources by hiring external consultants and provide training to its staff to implement the Environmental and Social aspects of the project during construction and operation phases. In order to do this, TANESCO will either recruit or train Environmental and Social (E&S) Officers and deploy them in the field to enforce implementation of the ESMP discussed in this ESIA Study and the project specific Construction Environment and Social Management Plan (CESMP). Alternatively, TANESCO may wish to recruit a consulting firm that can provide E&S manpower services for enforcing the construction phase ESMP and CESMP.

Owner's Engineer

The Owner will possibly appoint an Owner's Engineer to supervise and manage the overall implementation of the proposed 400 kV Iringa-Mbeya transmission line Project. The Owner's Engineer will act as a construction manager during the construction phase.

The Owner's Engineer team in the field will include staff with environmental and social impact management expertise to provide real-time oversight of the Contractor's implementation of the ESMP and the related sub-plans.

Contractor

The Contractor will be responsible for avoiding or minimizing environmental impacts caused by construction activities. The Owner's requirements for construction-related environmental and social management have been specified in a general ESMP (see Table 9.1 and 9.2). Also Contractor shall require developing specific ESMP before construction stage and that ESMP will be approved by Owner.

The Contractor should be required to have an Environmental, Health and Safety (EHS) Unit, which will be responsible for managing and monitoring the environmental and social mitigation measures in accordance with the contractual obligations. The Contractor will also be responsible for ensuring that all sub-contractors are in compliance.

Consultants and NGOs

The Owner is likely to delegate certain tasks to external consultants and non-governmental organizations (NGOs). Consultants will be needed for some of the specialized monitoring and evaluation activities, while NGOs might be assigned to deliver community health and safety services among others.

Financiers/Lenders

TANESCO plan to request financial assistance from World Bank for implementation of proposed 400 kV Iringa-Mbeya-Tunduma-Sumbawanga transmission line Project and the associated Substations at Kisada, Mbeya, Tunduma and Mbeya which are likely to be loans or grants. However, until the financing structure has been agreed, the roles and responsibilities of financiers and lenders are unknown but will be as per World Bank `s guidelines and requirements.

During project implementation, Owner is responsible for the implementation of the ESMP and reports to the World Bank on key management or monitoring tasks set out in the ESMP. The World Bank will coordinates with relevant national authorities such as NEMC to ensure that implementation of environmental and social mitigation measures contained in the ESMP, Resettlement Action Plan, and other relevant loan covenant is duly and jointly monitored and reported during project supervision missions. The World Bank may through its Compliance and Safeguards function, conduct compliance audits or appoint an independent monitoring team to the project if there is a serious risk of noncompliance with World Bank policies and procedures or in other cases that the Bank deems appropriate.

Some of requirement of lender policies is usually that the Owner engages a Panel of Experts to provide regular oversight of compliance with the relevant safeguard policies and performance standards. The financiers will normally also request for quarterly progress reports.

9.5 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 9.3: Training for TANESCO and Contractor Staff

S/N	Training Recipients	Mode of Training	Environmental Aspects to be Covered	Training Conducting Agency	Cost (USD) and Funding source
1	TANESCO Environmental Staff	Lecture System Workshops Group Discussion Visit to case study	• WB Environmental and Social Safeguards issues • Environmental overview • Environmental regulations & acts • Resettlement issues • Environmental issues associated with power transmission projects • Environmental Management Plans • Environmentally sound construction management	WB specialists or Consultants Environmental and Social Specialists, Supervision Consultant	100,000 By Developer and WB
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	Environmental and Social Specialists, Supervision Consultant TANESCO Environmental Units	10,000 By Contractor

S/N	Training Recipients	Mode of Training	Environmental Aspects to be Covered	Training Conducting Agency	Cost (USD) and Funding source
			projects • Environmentally sound construction management • Power transmission projects and environmental issues		
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	50,000 By Developer

9.6 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:

- ✓ Visual observations;
- ✓ Selection of environmental parameters at specific locations;
- ✓ 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 ESMP 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 shall 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 shall have to be controlled by one of the above mentioned parties. The self – monitoring shall 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.

9.6.1 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.

9.6.2 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.

9.6.3 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.

9.6.4 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.

9.6.5 Monitoring of Bird and Bats 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.

9.6.6 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.

9.6.7 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:

- ✓ Measures to create awareness regarding sexually transmitted diseases, primarily HIV/AIDS, and other diseases such as malaria, schistosomiasis, leishmaniasis, and onchocerciasis are taken;
- ✓ Preventive measures to reduce/eliminate malaria, schistosomiasis, leishmaniasis, onchocerciasis and other infections where/when ever appropriate are put in place;
- ✓ Periodic health surveys are carried out along the transmission route;

TANESCO shall 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:

- ✓ Presence of posted visible signs on towers, etc.;
- ✓ Presence of sanitary facilities at campsites;
- ✓ Level of awareness of communities pertaining to dangers/risks associated with power lines;
- ✓ Presence/absence of unique stands of indigenous trees along the power line establishment route; and
- ✓ 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 9.4: Monitoring Plan

Environment Component	Project Stage	Parameter	Standard	Location	Frequency	Duration	Implementation	Supervision
Land Acquisition and Compensation	Pre-construction	Ensure compensation paid as per RAP and valuation reports.	RAP and Compensation schedules.	Along ROW for all PAPs	Monthly until complete		TANESCO	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
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 ESMP	ESMP	Along ROW and works areas	As required		Contractor	Supervision Consultant
Bird and Bats collisions	Construction and Operation	Monitor the bird population/ movement around the wetland and bird hot spot.	ESMP	Along ROW and wetlands	Once a year, preferably in the rainy season		Contractor	TANESCO

Environment Component	Project Stage	Parameter	Standard	Location	Frequency	Duration	Implementation	Supervision
Rehabilitation of Work Sites	Construction	Monitoring to ensure all work sites are progressively rehabilitated	ESMP	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	ESMP	Along ROW, work camps and surrounding areas	Monthly		Contractor	TANESCO
Accidents	Construction	Safety training for workers, accident reports, community consultation	ESMP	Along ROW	Monthly		Contractor	TANESCO

Table 9.5: Approximate estimated budget for monitoring

Parameters	Item	Unit Cost (USD)	Quantity	Approximate Total Cost (USD)
land acquisition and compensation	Ensure compensation paid as per RAP and Valuation reports.	Lump sum		As per approved Compensation Schedules
vegetation clearing	Monitor clearing to ensure consistent with ESMP	Lump sum		25,000
Grievance Redress Mechanism	Enable timely settlement of grievances to the PAPs.	Lump sum		30,000
Bird and Bats collisions	Monitor the bird population/movement around the wetland and bird hot spot	Lump sum	Once a year	40,000
rehab of site works	Monitoring to ensure all work sites are progressively	Lump sum		10,000

Parameters	Item	Unit Cost (USD)	Quantity	Approximate Total Cost (USD)
	rehabilitated			
Accidents	Safety training for workers, accident reports, community consultation	Lump sum		10,000
Contractor Staff	Environmental Inspectors	1,500 / person / month	2 full time equivalent staff for duration of Construction (10 months)	36,000
TANESCO Staff	Environmental and Social monitoring staff who will monitor E&S risks	2,000 / month	2 full time equivalent staff (E&S) for duration of Project (20 months)	50,000[7]
Capacity Building and Training	As per training program		Transport, equipment etc.	50,000[8]

[7] This was discussed with TANESCO representatives.
[8] This was discussed with TANESCO representatives.

CHAPTER 10: COST BENEFIT ANALYSIS OF THE PROJECT

The consultant for the feasibility study has worked out the economic analysis for the Iringa-Mbeya Transmission project on 2012. The analysis has included cost for capital and labour. Prior to the selection of the final route option, four alternatives were comparatively analysed on the basis of technical, economical and social-environment criteria. Following, the developer selected the most feasible option, the 292km route. The 4 alternatives are presented in detail in Chapter 8 (Figure 8.1).

Major components of the planned project include line transmission (conductors and towers), substations and rural electrification. Technically, the ruling span would be 400m giving tower height (from top of the foundation to the bottom cross arm) varying between 23.4 to 35.4 m for the suspension tower. The project will operate two substations; new 400 kV substation at Kisada and new 400/220 kV substation at Uganjo Mbeya and the extension of existing Iringa 220 kV substation.

The substations are included in the scope of this present study, their rated voltage are 400 kV AC service and 400/220 kV for Mbeya substation. The selected transmission line will use composite insulators which is of low cost and easier to install. One of the advantages of Kisada substation is that it will be capable of connecting power to the nearby villages through a Single Wire Earth Return (SWER) system. SWER is a social pro technology that can be used to provide power supply to villages along the route during the initial stages. In future, increasing power demand could be easily met by expanding this to a full conventional High Voltage or Low voltage three phase AC system.

The Kisada substation will be installed with 1 transformer bay for 400/33 kV-5 MVA and Medium voltage switchgear of 33 kV to enable connection to the nearby villages. Detailed technical information about the proposed line is found in the feasibility study report (conceptual Design and Tender Documents.

The assessment period of the economic analysis is 30years. The lifespan of the line is expected to be 50years and the lifespan of the equipment 30years. The overall investment costs have been calculated.

The economic feasibility study (2012) show that future costs, benefits and electricity deliveries have been discounted using a 10% rate (variation 4%-12%) in order to compare the present values (PV) of the costs, benefits and electricity deliveries over the 30years reporting period. The Present Value has been calculated on the basis of the following components;

- ✓ Substations Cost
- ✓ Transmission Line cost.
- ✓ Rural electrification
- ✓ Conventional 33 kV technology

The present values of operation and management (O & M) costs have been estimated at 1-2.0%. The present value of compensation for losses is estimated 0.06USD/KWh.

The project assumes consideration of two options as follow;

Option 1 – The double circuit line is commissioned in 2016, with 2 years of construction. The corresponding investment is 30% in 2014 and 70% in 2015.

Option 2 – A single circuit line for Mbeya Kisada and double circuit line with only one installed for Kisada-Iringa are commissioned in 2016. The construction time is 2years and the corresponding investment is 30% in 2014 and 70% in 2015. Then the second circuit of the line Kisada-Iringa is commissioned in 2024 with one year of construction. The corresponding investment is 100% in 2023.

The Economic Internal Rate of Return (EIRR) is the value of the discounted rate for which the NPV of the project is zero. This cannot be applicable to Option 2, therefore its EIRR has not been determined. To this regard, the comparison between the two options is based on NPV. The EIRR for Option 1 is 3.8% hence considered low. The costs/ benefits figures were discounted from year 2035 to 2014. The Net Present Value (NPV) of the two options take into account the Investment, RAP and ESIA cost, the Operation and Management cost. The costs are expressed in USD or M USD (106). Option 1 came up with 180.5 M USD total cost and 156.5 M USD total benefits, In contrast, Option total cost amounted to 141.5 M USD and total benefit of 156.5 M USD total benefits. The summary of NPV calculation is shown in the table below.

NPV	Option 1: M USD	Option 2: M USD
Total Benefits (B)	156.5	156.5
Total Cost (C)	180.5	141.5
B–C	- 24.0	15.0

Source: SMEC Calculations, 2014

Resultantly, Option 2 proved to be significantly more economical with ration B/C above 1 or >1 than Option 1. Thus, the consultant for the feasibility analysis has recommended option 2 as the most economically viable. However, when compared on technical and reliability terms, option 1 outweigh option 2.

The proposed project will positively contribute to in the power transit between North-West of Tanzania (Sumbawanga Region) in order to create a market for regional energy market in terms of export and import. More importantly, market with the neighbouring countries of Kenya and Zambia. The development will be a major one for the regional grid of East Africa. Notably, the conclusion made here is based purely on economical analysis as financial analysis will be carried out at a later stage.

Note: All calculations based on data provided in Feasibility Study, 2012 but currently TANESCO plan to update the Feasibility Study in 2018. The Cost Benefit calculations will revise.

CHAPTER 11: DECOMMISSIONING

11.1 Introduction

The lifespan of the proposed transmission line is expected to be substantially long. At the end of its lifespan, decommissioning of the project would occur. This is because, as with any project, the facilities, such as towers and cables used in this project will have a lifetime after which they may no longer be cost effective to continue operation.

Closure activities may be prompted by change of technical or engineering technology in energy sectors therefore the need to replacement with more efficient and environmentally friendly techniques. The requirement may lead to total closure of the proposed project. Decommissioning will require the dismantling and removal of transmission and equipment. This will be like reversal of construction process. As such, the affected sites will undergoes restoration to appear as it was before the construction. The restoration works must be acceptable to NEMC and other relevant authorities.

TANESCO in collaboration with relevant authorities such as NEMC and Ministry of Energy must prepare a decommissioning plan to be approved by relevant authority.

- ✓ The decommissioning plan have to provide the following;
- ✓ Show actions and a schedule for decommissioning of the project.
- ✓ Present steps and procedures to restore or rehabilitate the project area to acceptable conditions.
- ✓ Elaborate important actions and strategies to avert negative impact on surface and ground water resources.
- ✓ Present safeguard against other environmental resources
- ✓ Identify how project materials would be recycled.

During decommissioning, there will be a programme for restoration of rehabilitation of the land around the pylons including removal of ground anchors and foundations. Also rehabilitation of access roads in respect to its surrounding environment. Before any intervention landowners, the vicinity must be consulted and involved in the process.

Legal aspects of the ROW regarding ownership status must be considered during decommissioning. The rights of ownership must be retained by TANESCO because compensation was paid to the original land owners. However, any further alternative use of RoW must be approved by relevant authorities.

TANESCO shall be obliged to mitigate any resulting effects of decommissioning works. The important aspects for mitigation will include analyses of risk management and required emergency response. The decommissioning agent shall implement and monitor environmental, health, and safety issues with regards to legislations and regulations which have been sighted in this ESIA chapter 3.

TANESCO shall undertake environmental audit and inspections before and after decommissioning. The outcome report must be submitted NEMC for evaluation and approval. The decommissioning contractor must observe safety and health requirements such as PPEs, safety at workplace, fire prevention. Generally, the contractor must observe OSHA requirements.

The decommissioning contractor must reveal to relevant authority or the client the safety plans. The safety plan shall subsequently be incorporated· into the decommissioning plan.

Other important responsibilities for contract will include;

- ✓ Checking of potential hazards and risks,
- ✓ Development of a risk registers to update and record risks and their mitigation measures as they surface.

- ✓ Regular observation of work practices for employees or the environment at risk.
- ✓ Provision of positive reinforcement and guidance to fellow employees to eliminate or substantially reduce the risk.

11.2 Action plan for Decommissioning works

The important tasks of decommissioning are to remove installed power towers, cables, and line equipment and return the site to a condition as close to a preconstruction state as feasible. The major activities for the decommissioning of the transmission line are removal of the following members or infrastructure:

- ✓ Towers
- ✓ Electrical system
- ✓ Substation equipment
- ✓ Demolition of structures and buildings as necessary

Following the contractor will rehabilitate the disturbed sites by planting or re-vegetation.

The specific requirements and approach for each activity may not be as exactly as it was before commissioning because the technologies and construction techniques available when the project will be decommissioned may have changed. The disassembly and removal of substation equipment will essentially be the same as its installation, but in reverse order.

Potential environmental effects which were caused during decommissioning and those which will be mitigated according to the requirement of environmental management plan are dust, noise, waste, soil and water contamination. In addition, public safety issues and loss of employment hence income.

11.3 Removal of Transmission Line

The contractor will dismantle and remove all structures of transmission line and associated equipment. The action will be followed by environmental restoration of the disturbed sites to its near original conditions. NEMC together with relevant authorities have to approve the restored site conditions. Prior to any decommissioning activity, the power lines have to be de-energised followed by disconnection of conductors. The contractor will remove all conductors from support poles or pylons before the support poles/pylons are taken down and pole footings dismantled.

Tower members and scrap metal can be recycled or sold out for reuse locally or outside if such markets are available. The contractor will close and restore access roads or routes which were serving the transmission line and associated equipments or infrastructures (substations). The measures has to be approved by relevant authority especially NEMC.

11.4 Removal of Structural Foundation

The contractor will remove the foundation for various structures as directed and guided by relevant authority or body. Subsequent environmental restoration including re-vegetation or replanting will be commissioned. Any concrete and steel in the foundations will be totally broken-up and removed. Following the contractor will clean the site by removing all concrete and steel debris.

11.5 Decommissioning impacts and mitigation activities

11.6 Public safety

The decommissioning contractor will hire a safety officer to keep members of the public away from the decommissioning sites. This will be helpful if the public ignores warning signs or official requests for them to observe certain distance from the decommissioning sites.

11.7 Dust effects

There will be localised dust pollution or effects air particles generated by decommissioning works, movement of vehicles and other soil disturbances.

Mitigation: The contractor shall institute practical measures to counter dust pollution in the surrounding or community areas. These will include irrigation of loose soils and control of speeding vehicles. It is crucial that the affected sites the disturbed sites are replanted with indigenous species to stabilise soils and control further dust pollution.

11.8 Noise effects

Noise effect will result from decommissioning activities but will be short lived and localised. This noise will result from vehicles and equipment used in decommissioning works. However, the proposed transmission line passes away from residential areas or settlements. Therefore, the contractor workers will be much affected.

Mitigation: The contractor shall properly scheduled works to avoid dust pollution. It is important that the nearby community if applicable is made full aware of the planned works through local leaders, and risks for dust pollution. Reported cases of dust complaints should be recorded and communicated to TANESCO and contractor. It is important to take measurements of dust levels along the project boundaries followed by proper mitigation actions.

11.9 Fire risks and Oil spill

The contractor will implement measures necessary to prevent accidental occurrence of fire during decommissioning phase. He will ensure availability of fire extinguishers are put in place onsite. In addition, the contractor should provide necessary training to decommissioning workers personnel to enable them implement the required activities with sufficient knowledge and care , In particular should be trained on fire fighting and undergo the required fire grills.

There is also the need for proper and regular maintenance of equipment and machines to prevent oil spill and leakage. Prompt stoppage of oil spills and leaks is important.

11.10 Waste water and waste disposal

Decommissioning works may generate waste water, wastes or hazardous or near hazardous materials such as from transformers or old toilets that need to be immediately disposed off from the site to approved locations. These may additionally include debris, scrap metal or steel from demolished buildings and tower foundations. Others are splits or materials from foundation works, damaged tower members, insulators, conductors, transformers, switch gears and transformer oil.

However, the disposal of materials from the decommissioned power line is not seen as a life threatening activity. There is opportunity to recyclable, reuse or make inert some of materials. Contractor should prevent soil and water contamination by transformer oils from substation through proper handling and dispose-off to authorised sites.

11.12 Manpower Requirement and Loss of Income

Decommissioning works for transmission line including removal and closure activities will require less manpower than compared to construction phase. Following the completion of the planned commissioning works, some people will be retrenched and consequently lose income. The impact may have negative consequences to livelihood. In order to mitigate the effect, awareness creation and prior information/ knowledge are required and shall be disseminated well in advance to the workers and service. This will ensure preparedness so that they can well cope with the resultant impact of loosing job and income. The employer or contractor must observe labour laws of the country regarding retrenchment package.

CHAPTER 12: CONCLUSION

The proposed transmission line is a project of major importance for the infrastructure development and the socio-economic development of Iringa, Njombe, Mbeya regions and Tanzania in general. The proposed 400kV Iringa-Mbeya transmission line project (292km) will in future link with a 400kV Backbone Iringa to Shinyanga which will facilitate the smooth power transfer to the northern part of the country and neighboring countries such as Zambia in south and Kenya and Uganda in North. The proposed project is in line with other projects currently under implementation including the 400 kV Iringa - Shinyanga (through Singida) and the 400 kV Kenya (Nairobi) – Tanzania (Arusha – Singida).

In addition, TANESCO is in process of implement construction of Mbeya – Tunduma – Sumbawanga 400kV Transmission Line (320 km) and associated substations at Mbeya, Tunduma and Sumbawanga. The project will enter at the proposed Tunduma (Nkangamo area) substation whereby one circuit will interconnect with Zambia at Tunduma (Zambian border) and the other circuit will proceed to Sumbawanga. The project has a regional impact as it will link NBI/Eastern Africa Power Pool (EAPP) countries to Southern Africa Power Pool (SAPP).

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 ESMP will ensure that the overall benefits from the Project will greatly outweigh any adverse impacts. Sensitive impacts are land acquisitions, MKGR and Chimala forest reserves.

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 shall be necessary to improve the knowledge basis for the preparation of the final Resettlement Action Plan. Monitoring shall 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.

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