Updated Environmental & Social Impact Assessment Study for the proposed 340km Mbeya –Tunduma– Sumbawanga 400kV Transmission Line and ~4km Tunduma Substation to Tanzania-Zambia Border 330kV Transmission Line

VOLUME I: FINAL UPDATED ESIA STUDY REPORT (ORIGINAL DISCLOSURE DATE WAS 31ST JANUARY, 2018)

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Updated and Disclosed on 11th April, 2018

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DOCUMENT NO: KT/4136/01

1	18.1.2018	ISSUED FOR REVIEW	SG	JNM	
0	23.11.2017	ISSUED FOR REVIEW	SG	JNM	
Rev	**DATE**	**DESCRIPTION**	**PREPARED BY**	**KTL APPROVAL**	**TANESCO APPROVAL**

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Acronyms

Acronym	Definition
ACSR	Aluminium Conductor Steel Reinforced
AIDS	Acquired Immune Deficiency Syndrome
AoI	Area of influence
ARI	Agriculture Research Institute
CESMP	Construction Environmental and Social Management Plan
CR	Critically endangered
DOE	Division of Environment
E&S	Environmental and Social
EcIA	Ecological Impact Assessment
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EN	Endangered
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWURA	Energy and Water Utilities Regulatory Authority
FPIC	Free Prior Informed Consent
GDP	Gross Domestic Product
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
Ha	Hectares
HIV	Human Immunodeficiency Virus
ICP	Informed Consultation and Participation
IFC	International Finance Corporation
ISO	International Standards Organization
KTL	Kurrent Technologies Ltd.
kV	Kilovolt
Masl	Mean Above Sea Level
MATI	Ministry of Agriculture Training Institute
NEMC	National Environment Management Council
NEP	National Environment Policy

Acronyms

Acronym	Definition
NGO	Non-Governmental Organization
NHSDP	National Human Settlements Development Policy
NSGPR	National Strategy for Growth and Poverty Reduction
OHSAS	Occupational Health and Safety Assessment Specification
OPGW	Optical Ground Wire
OSHA	Occupational Safety and Health Agency
PAPs	Project Affected Persons
PCBs	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
REA	Rural Energy Agency
RoW	Right of Way
RPF	Resettlement Policy Framework
SDS	Safety Data Sheet
SIA	Social Impact Assessment
SIDA	Swedish International Development Cooperation Agency
STDs	Sexual Transmitted Diseases
STIs	Sexually Transmitted Infections
TANESCO	Tanzania Electric Supply Company Limited
TAZAMA	Tanzania Zambia Mafuta
TAZARA	Tanzania Zambia Railways
TanZam Border	Tanzania and Zambia Border
TL	Transmission Line
ToR	Terms of Reference
TZS	Tanzania Shillings
URT	United Republic of Tanzania
USA	United States of America
VEO	Village Executive Officer
WBG	World Bank Group

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1 Introduction

This Environmental and Social Impact Assessment (ESIA) is associated with the proposed ~340km 400kV overhead transmission line (TL) between Mbeya, Tunduma and Sumbawanga and segment of ~4km 330kV overhead transmission line (TL) from Tunduma Substation to Tanzania and Zambia Border (TanZam Border) in Tanzania as shown in Figure 1-1 and Figure 1-12. The ESIA Study was commissioned by the Tanzania Electric Supply Company Limited (TANESCO) in fulfillment of the obligations required by the environmental legislation in Tanzania and the World Bank Group (WBG) Environmental and Social (E&S) policies and procedures.

Low-priced and reliable supply of electricity is a critical input for economic growth and employment generation. In this regard, institutions such as the Nile Basin Initiative / Nile Equatorial Lakes Subsidiary Action Program (NBI/NELSAP) have embarked on the creation of a regional power market amongst the NELSAP Countries through the development of a regional power infrastructure and exchange in the Nile Equatorial Lakes (NEL) region.

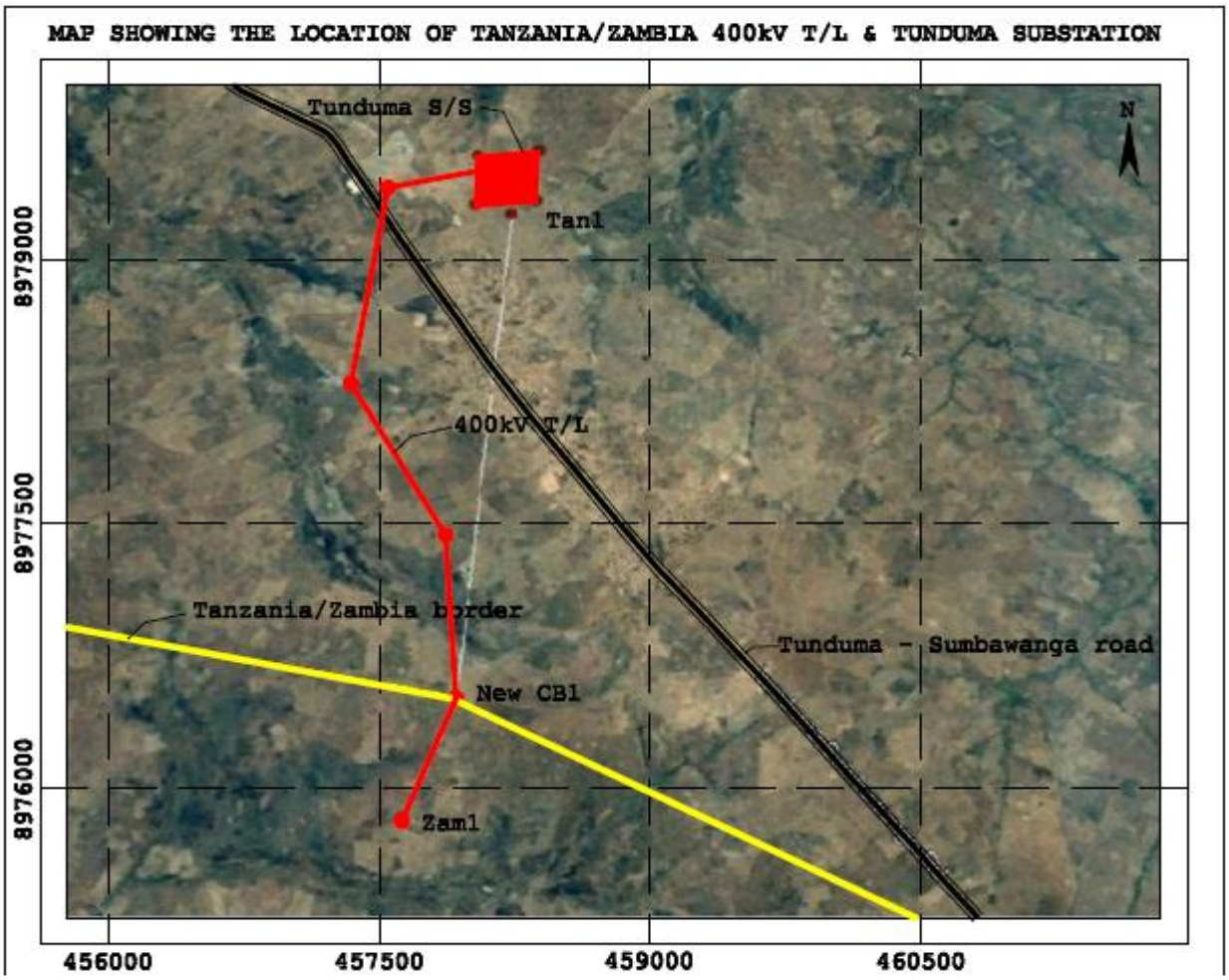
The long term objective of the NBI/NELSAP is the creation of a regional electricity market which can ensure that the hydropower resources of the Nile Basin are developed and managed in an integrated and sustainable manner.

Cooperation, under the framework of the NBI, has made mobilizing considerable resources possible for transmission and interconnection projects. Besides enabling cross-border exchanges of surplus energy between member states, the interconnections are expected to trigger private-sector interest in the development of large hydropower options in some countries, notably Tanzania and Zambia.

An interconnected grid system not only allows peak swapping of surplus power with energy deficient countries, but also results in improved quality and reliability, and reduced price of electricity.

Figure 1-1: Location of the proposed Mbeya - Sumbawanga 400kV power transmission line

Figure 1-2: Location of the proposed Tunduma Substation to TanZam Border 330kV power transmission line



1.1 Background to the project

About 15 years ago, the Governments of Zambia, Tanzania and Kenya agreed to interconnect their power systems with the objective to: (i) promote and enhance electricity trade; (ii) improve the power security and reliability of supply on the three networks; and (iii) contribute to economic development and regional integration. They commissioned interconnection studies which were carried out in 2002 and 2004. The studies concluded that there wasn't sufficient power generation capacity at the time to justify large transmission line interconnection projects.

However, with the increase in demand for electricity among the citizens of the three countries, the objective of the project is no longer purely the importation of electricity from Zambia to Tanzania and Kenya but the transfer of power in both directions depending on the availability with the aim of security and reliability of supply as well as diversification of sources of supply.

For Tanzania, this means increasing the access to electricity to its citizens for economic activities. The Rural Energy Agency (REA) carried out a comprehensive Energy Access Survey in 2016. The results of the survey indicate that overall, 32.8% of Tanzanians are connected to some form of electricity. The survey results further indicated that only 16.9% of the rural households in Tanzania Mainland were connected to electricity of any form compared to 65.3% of their counterparts in urban areas. For example, in the Rukwa region where the proposed transmission line project traverses, only 3% of the rural population were electrified with any form of electricity.

Local and foreign investors would like to invest in locations that have a consistent and reliable access to modern energy services. It is therefore imperative that if Tanzania is to attract more local and foreign investments in the rural areas, the country must provide potential investors with a reliable supply of electricity.

In order to provide its citizens with affordable consistent, reliable modern energy services, the Government of Tanzania proposes to construct and operate a high voltage transmission line from Mbeya to Tunduma to Sumbawanga. Given that this project will attract a large investment, the Government needs to identify a large number of customers to cover the costs associated with the project.

1.2 Project Purpose

Currently, the supply of electricity between Mbeya, Tunduma, Sumbawanga and the towns between these major centers is erratic with insufficient capacity available for business and economic growth in that part of Tanzania. Subsequently, the purpose of the proposed 400kV transmission line between Mbeya and Sumbawanga is to provide reliable and cost effective electricity to users in the west and north-west part of the country. It is expected that with the successful completion of this project, reliable, consistent electricity will be available for economic growth in the western and north-western part of the country.

Additionally, the Tanzanian regional interconnection project between Iringa and Mbeya will allow for the 400 KV network extension towards Zambia which is also a purpose of the current Tanzania-Zambia Electrical Interconnection project. Furthermore, these projects will contribute to the effective linking of the Eastern/Nile Basin Countries to the Southern African Power Pool.

1.3 Project Summary and Scope of the ESIA

1.3.1 Project summary

The proposed 400kV transmission line project from Mbeya to Sumbawanga is approximately 340km long and includes the construction of the following project components:

- ~100km long 400kV transmission power line between the proposed substations at Mbeya and Tunduma;

- ~240km long 400kV transmission power line between Tunduma and Sumbawanga;
- ~4km long 330kV overhead transmission line (TL) from Tunduma Substation to TanZam Border
- Substations at Mbeya, Tunduma and Sumbawanga;
- 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 ESIA Study is as follows:

- Consultation with decision making authorities at local levels;
- Undertaking public consultation meetings with communities living in the vicinity of the proposed transmission line route;
- Preparation of Stakeholder Engagement Logs detailing key issues raised by Interested and Affected Parties (I&APs) as part of the ESIA process;
- Undertaking of independent specialist studies;
- Preparation of a Draft ESIA Study report in accordance with the requirements of Tanzanian Environment Management Act and the World Bank Group Environmental and Social (E&S) Safeguards.

1.4 ESIA Process

1.4.1 Aims and objectives

An ESIA Study for the proposed 400kV transmission line between Mbeya and Sumbawanga was undertaken in 2013 by TANESCO and EIA certificate was issues by NEMC. 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.

The objective of this ESIA Study are to:

1. Validate and update the existing ESIA Study with the most current E&S impacts associated with the project;
2. To include ESIA study for segment of~4km long 330kV overhead transmission line (TL) from Tunduma Substation to TanZam Border
3. Ensure that the ESIA Study complies with the requirements of the latest Tanzanian environmental legislation and the World Bank Group E&S safeguard policies;
4. Undertake relevant baseline studies in order to predict and analyze the potential E&S impacts associated with the project; and
5. Produce a draft ESIA Study report for review and consideration by TANESCO and the World Bank.

TANESCO as developer will be required to notify National Environmental Management Council (NEMC) on the updating of the ESIA study to include the portion of ~4km from Tunduma S/S to TanZam border. This will be done by applying the variations of EIA certificate as per requirements of the Tanzanian Environment Management Act (2004) and Environmental Impact Assessment and Audit Regulations of 2005.

1.4.2 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 October 2013, inputs from the E&S Safeguards team of the World Bank Group, the ESIA Study carried out for the 292 km long Iringa – Mbeya 400kV power transmission line in January 2014, the updated feasibility report by SWECO International on upgrading the Mbeya – Sumbawanga project from 220kV to 400Kv dated November 2016 and Pre-Draft Update of Feasibility Report March 2018 by SWECO International.

In addition to the above secondary sources, the Consultant carried out a field survey of the proposed transmission line between Mbeya and Sumbawanga on November 12 – 18, 2017. The Consultant's specialists included a Team Leader (Physical Environmentalist), Terrestrial Ecologist, Ornithologist and a Bat Specialist and a Sociologist.

Each specialist undertook their respective study in accordance with international standards associated with their specialty and generally in accordance with the following:

- Tanzanian Environmental Management Act CAP 191 (2004) and the Regulations for EIA and Auditing (2005);
- The World Bank Operational Policies on Environmental and Social Safeguards;
- Various environmental and ecological related conventions such as the Convention on Migratory Species (CMS) and Convention on International Trade in Endangered Species (CITES); and
- Queries of international databases such as International Union for Conservation of Nature (IUCN) and the Global Biodiversity Information Framework (GBIF) to identify biodiversity information and hot spots related to the routing of the proposed transmission line project.

1.5 Report Structure

The structure of the ESIA Study is summarized below.

Volume 1: ESIA Study

- Section 1: Introduction to the project
- Section 2: Project description
- Section 3: Policy, legal and administrative framework
- Section 4: Baseline environmental and social conditions
- Section 5: Stakeholder Consultation
- Section 6: Assessment of impacts and mitigation measures

- Section 7: Environmental and social management plan
- Section 8: Analysis of alternatives
- Section 9: Summary and Conclusions
- Section 10: References

Volume II: Appendices

2 Project Description

2.1 Project Location

The proposed 400kV power transmission line from Mbeya to Sumbawanga (~340km) and segment of~4km long 330kV overhead transmission line (TL) from Tunduma Substation to TanZam Border are located in the south-western part of Tanzania as shown in Figure 2-1.

Figure 2-1: Location of the proposed 400kV transmission line project

2.2 Description of the transmission line route

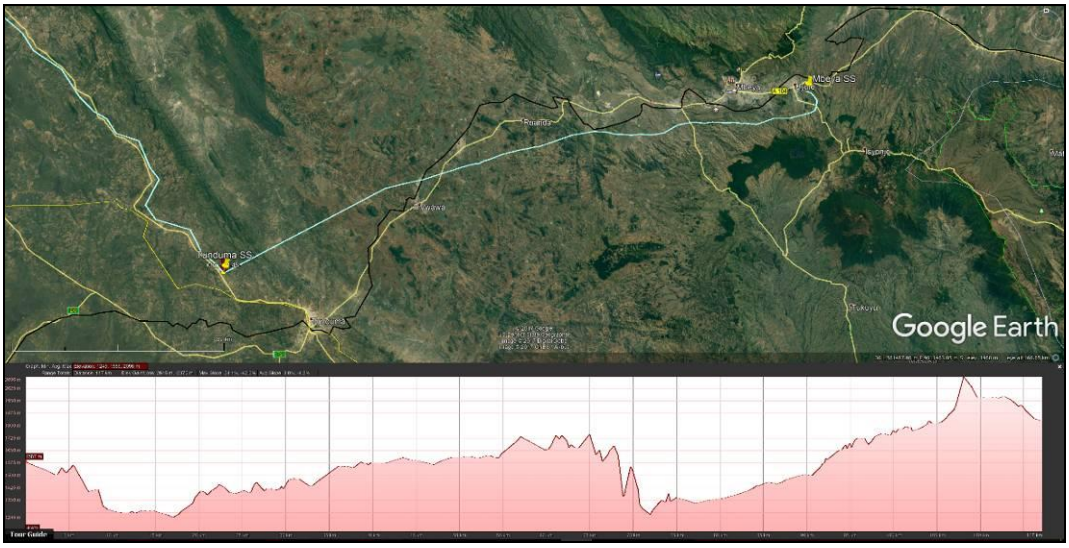
The proposed Mbeya – Tunduma – Sumbawanga transmission line project is part of the TANESCO identified North West Grids (NWG) transmission lines project. This project involves the construction of a ~320km long 400kV transmission line between Mbeya, Tunduma and Sumbawanga in Tanzania and associated substations in Mbeya, Tunduma and Sumbawanga. A brief description of the proposed transmission line route between (i) Mbeya and Tunduma, and (ii) Tunduma and Sumbawanga is given below.

Thesegment of~4km long 330kV overhead transmission line (TL) from Tunduma Substation to TanZam border will allow for the 330kV network extension towards Zambia which is also a purpose of the current Tanzania-Zambia Electrical Interconnection project. Furthermore, these projects will contribute to the effective linking of the Eastern/Nile Basin Countries to the Southern African Power Pool.

2.2.1 Mbeya – Tunduma

The proposed Mbeya substation is situated at an altitude of about 1834m above sea level (masl). From here, the proposed TL is routed southwards away from Mbeya town and moves westwards. The line runs parallel to the base of the Poroto Ridge Forest Reserve to the south of Mbeya. For about 74km from Mbeya, the TL remains on the left hand side of the A104 highway (Mbeya to Tunduma) where it crosses this road and the TAZARA railway line and moves to the right hand side. The line then stays on the right hand side of the A104 highway up to the proposed Tunduma substation. The proposed Tunduma substation is located at an elevation of approximately 1580masl and is situated on the right hand side of the Tunduma – Sumbawanga highway in a sparsely populated area. The elevation profile of the TL routing between Mbeya and Tunduma is shown in Figure 2-2.

Figure 2-2: Elevation profile of TL route from Tunduma to Mbeya



2.2.2 Tunduma – Sumbawanga

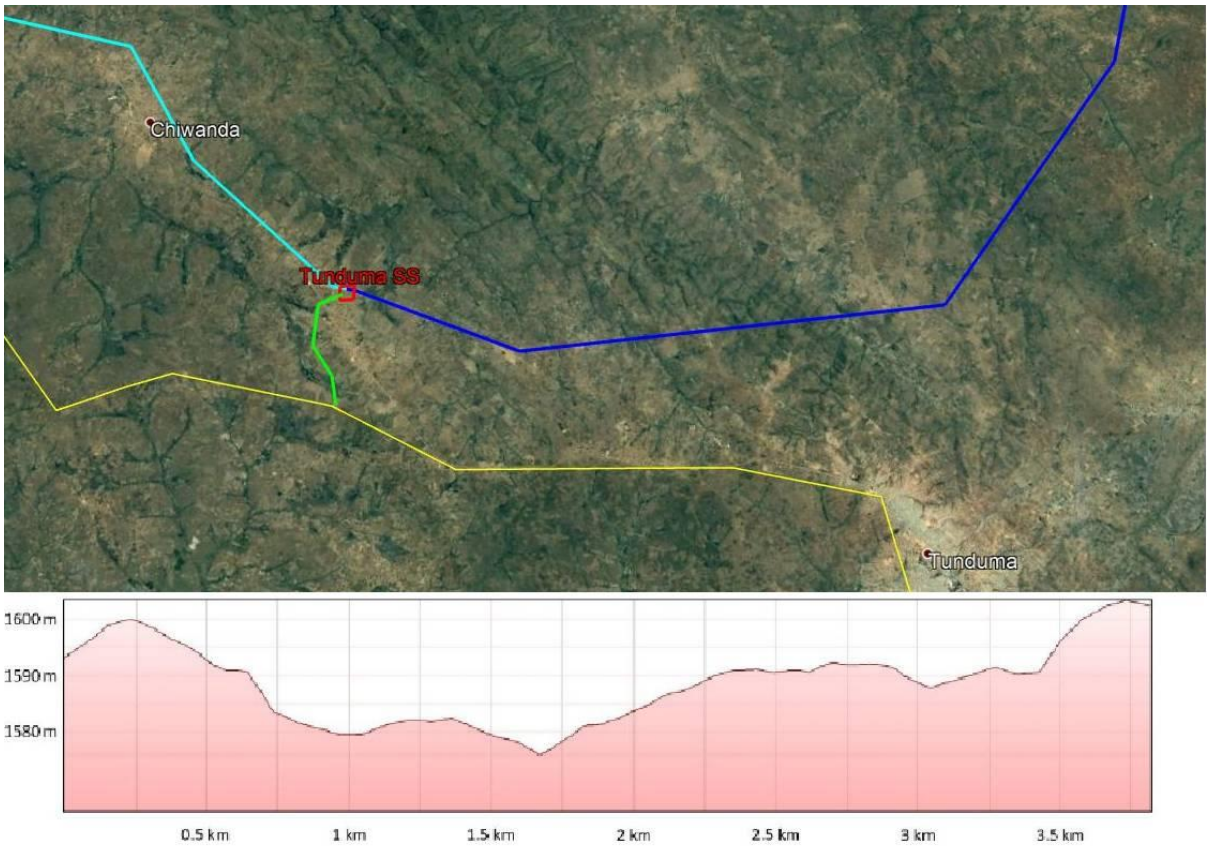
There is a proposed substation to be constructed at Tunduma which is situated at an elevation of about 1592masl. From the proposed substation, the TL is routed north-west towards Sumbawanga, a distance of about 203km. The TL runs almost parallel to the Tunduma – Sumbawanga highway and generally stays on the right hand side for about 43km when it crosses to the left hand side of the highway. For the next 54km, the line then stays on the left hand side of the highway before crossing over to the right hand side. For the next 47km, the line stays on the right hand side of the highway and skirts to the left of Lake Rukwa as it enters Sumbawanga town. For the next 50km, the line stays on the right hand side and crosses the highway for the last time before being routed into the proposed Sumbawanga substation located 10km from this point. The Sumbawanga substation is located at an elevation of 1888masl. Based on the alignment provided by TANESCO, the total length of this TL is about 203km long. The approximate elevation profile of the proposed transmission line between Tunduma and Sumbawanga is shown in Figure 2-3.

Figure 2-3: Elevation profile of TL route from Tunduma to Sumbawanga

2.2.3 Tunduma Substation to TanZam Border

There is a proposed substation to be constructed at Tunduma which is situated at an elevation of about 1592masl. From the proposed substation, the TL crosses the Tunduma – Sumbawanga highway and shifts to the left hand side of the road near the Nkangamo weighbridge at Nkangamo village, thence about 3km to reach the TanZam border which is located at an elevation of 1602masl. Based on the alignment provided by TANESCO, the total length of this TL is about 4km long. The approximate elevation profile of the proposed transmission line between Tunduma and Sumbawanga is shown in Figure 2-4.

Figure 2-4: Elevation profile of TL route from Tunduma S/S to TanZam border



2.3 Technical details of Tower and Transmission Line Designs

2.3.1 Technical details of tower and transmission line designs

All components of a transmission line are interdependent, but are distinct in the roles which they fulfill. The primary components include towers, foundations, insulators and hardware, and conductors.

2.3.1.1 Towers

The proposed transmission overhead line between Mbeya and Sumbawanga will be designed as a 400 kV double circuit line and for Tunduma S/S to TanZam border will be two 330 kV transmission lines heading for the border of Tanzania and Zambia, and further in to Zambia with self-supporting steel lattice towers. Both circuits will be strung from Mbeya to Tunduma; one circuit will strung from Tunduma to Sumbawanga under the project and the other circuit will be strung whenever the demand increased. The towers shall carry two conductors per phase (BLUEJAY - ACSR) in order to reduce the corona effect, with necessary suspension and strain insulator sets as required, one earth

conductor and one optical ground wire (OPGW) together with all fittings to achieve the optimum performance and meet the reliability standards specified.

The base of the tower bodies and body extension shall be square in plane and the tower body shall be the same whether used with or without body extensions and with identical bracings in all directions. All types of towers will contain provisions for the attachment of stringing and maintenance equipment to the cross-arms.

The proposed project will utilize a number of different designs of towers namely:

- Suspension tower (0° to 2° angle);
- Light angle suspension tower (2° to 15° angle);
- Medium angle suspension tower (15° to 30° angle);
- Heavy angle tension tower (30° to 70° angle); and
- Dead end tension tower (up to 30° angle)

2.3.1.2 Wayleave Corridor

The wayleave corridor width has been set to a maximum of 52m in order to meet the Tanzanian 400kV transmission line and 330kV standards; the way leave corridor is also referred to as Right of Way (ROW). TANESCO will purchase and acquire the entire width of 52m from Mbeya – Tunduma – Sumbawanga, a distance of between 320km and 340km and 4km from Tunduma S/S to TanZam border (depending on the final routing). The total way leave area to be covered by the transmission line is about 1,788.8 hectares (344km x 52m). The acquisition of the ROW will have impacts on the Project Affected Persons (PAPs) living within and in the vicinity of the 52m wide corridor; the potential impacts and mitigation measures will be discussed and addressed in Section 6 (Assessment of impacts and mitigation measures) and 7 (Environmental and Social Management Plan) of this ESIA Study. In order to acquire this ROW, TANESCO will compensate Project Affected Persons (PAPs) based on the outcomes of a Resettlement Action Plan (RAP) to be implemented for the proposed project. 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 2-4 and Figure 2-5.

Figure 2-4: Vegetation clearing around the tower

Figure 2-5: Vegetation clearing around the ROW

2.3.1.3 Conductors

Conductors are cables that transport electric current from a power station to the consumers. All conductors contain electric charges which flow when an electric potential difference is applied across separate points on the material. This flow of charge is what is called electric current. Conductors are manufactured primarily of twisted metal strands, but newer conductors may incorporate ceramic fibres in a matrix of aluminium for added strength with lighter weight.

The recommended conductor is an aluminium steel reinforced conductor (ACSR) Class AA according to US standard ASTM B232, code name Bluejay with a total cross section of 604.39 mm², consisting of 39.03 mm² steel and 563.93 mm² aluminium. The recommendation is based on the optimization of corona, power transfer, radio interference and sag/tension characteristics. The Bluejay conductor is also used in the backbone 400 kV Dodoma-Iringa, 400 kV Iringa-Mbeya, 400 kV Iringa-Shinyanga and the 220 kV Makambako-Songea projects.

The phase conductors shall be shielded by one earth wire and one optical ground wire located on the tower peaks between the phase wires. In order to provide adequate shielding from lightning strikes, a shielding angle of 15° is proposed.

2.3.1.4 Ground Wires

The project will use double ground wires which will be arranged on both sides of the tower for protecting the conductor from strike of lightning. One side is common steel wire GJ (GSW)-50 and the other side is optical ground wire (OPGW) for the sake of communication. The number of cores of the OPGW is 24.

A double ground wire solution is recommended due to the fact that, when using two ground wires instead of one, the weight of the tower decreases, and total line costs including earth wires will be a cheaper solution than a higher tower with one ground wire.

2.3.1.5 Transmission Towers

Transmission tower are the most visible component of the power transmission system. Their function is to keep the high-voltage conductors (power lines) separated from their surroundings and from each other.

Transmission line conductors are strung on in-line (suspension) towers and bend (strain) towers. Various designs are available for use by TANESCO on the proposed Mbeya – Sumbawanga power lines. The type of towers which can be used will depend on the final route alignment of the power lines and individual agreement with affected landowners and stakeholders.

Based on the route schemes and the practical topographic feature along the routes, the right series of towers are chosen after comparing and analysing the technical factors and economic factors among different types of towers. About 1000 towers are to be constructed at a minimum distance of 300 m from one another depending on the topography of the area. The towers shall carry two conductors per phase (duplex) in order to reduce the corona effect, with necessary insulator sets, one earth conductor and one optical ground wire (OPGW) together with all fittings under the conditions and with the reliability level specified. Typical tower images are shown in Figure 2-6.

Figure 2-6: Examples of 400kV towers

2.3.1.6 Foundations

Self-supporting lattice steel towers are resting on four foundations at the four tower corners. The necessary foundations are proposed to be made of concrete. Based on the soil investigation, suitable foundation types shall be designed and assigned to each tower type. Allowance shall be made in foundation design for the effects of seasonal rains and drying out of surface soils.

The connection of the tower to the foundations shall be by means of a steel stub angle. The stub angle shall be of the same dimensions as the tower leg member to which it connects. Foundations shall be designed for maximum loads derived from the tower design calculations. The connection of the tower to the foundations is assumed to be by means of steel stub angles. Figure 2-7 and Figure 2-8 shows typical images of tower construction process steps.

[1]Figure 2-7: Construction process of tower foundations


[2]Figure 2-8: Preparation of tower foundation and tying of steel reinforcement


Pad and Chimney Foundation

The pad and chimney foundation has the same slope as the leg of the tower. The reaction of the tower can be delivered to centre of the foundation along the principle column smoothly. Thus, the moment of flexion in the positive district of the column and base slab is minimized and the stress at the base edge is reduced too. Such foundations are suitable for suspension towers and small angle towers located at districts where there is no ground water.

Pile Foundation

The piles are formed by mechanical drilling of steel members having a diameter of more than 600 mm. Single pile and single pile with bearing platform may be adopted based on foundation acting force and hydrographic and geological conditions. The piles are usually used for soft foundation and swamp districts with river crossing and lower bearing capacity.

[1] Source: Opti Powerprojects (Eros-Vuyani 400kV line), October 2014, https://optipower.co.za/eros-vuyani/ and accessed on November 25, 2017

[2] Source: Opti Powerprojects (Eros-Vuyani 400kV line), October 2014, https://optipower.co.za/eros-vuyani/ and accessed on November 25, 2017

Raft Foundations

Compared with pile foundations, the raft foundation has the advantage of easier construction and lower costs. According to foundation acting force and hydrographical and geological conditions, the raft foundations are mainly used for soft foundation and swamp districts.

Raft foundations have the advantage of reducing differential settlements as the concrete slab resists differential movements between loading positions. They are often needed on soft or loose soils with low bearing capacity as they can spread the loads over a larger area.

2.3.1.7 Substations

The substations normally consist of an office, storage and workshop buildings and a fence surrounding the whole area. Substations vary in size and technical configuration and may cover several acres. They are cleared of vegetation and the ground normally consist of gravel or stone aggregates. Substations are fenced to minimize the potential for electrocution to people and animals and are accessible by an all-weather access road. Transformers and capacitors are filled with oil. Larger transformers are always placed on concrete platform to avoid contamination of ground, sub-surface and groundwater from oil leaks. A typical 400kV substation and switch yard is shown in Figure 2-9.

Figure 2-9: Typical 400kV switch yard

For the construction of the proposed 400 kV line, three new substations will be constructed at Mbeya, Tunduma and Sumbawanga. TANESCO will purchase land in the three locations for purposes of building the substations; in this regard, TANESCO has commenced the process of acquisition of the land for the three substations. A Resettlement Action Plan(s) will be prepared in accordance with the Tanzanian national law on land acquisition and Bank Operation Policy 4.12 on Involuntary Resettlement. The

RAP(s) will detail the process of land acquisition and associated mitigation measures. The substation will be securely fenced of to avoid electrocution of people and animals.

Mbeya substation

The area of the proposed Mbeya substation is approximately 200m x 1000m and is assumed to be constructed within this present project in order to be able to connect the 400 kV line to Tunduma. Space for control and protection cubicles will be allocated in the main control building.

The substation is proposed to be constructed with two 400/220kV 200MVA power transformers and one 220/33kV 40 MVA power transformer. Rated power of transformers shall cover the estimated demand as well as the expected future load increase.

It is proposed to install one line shunt reactor on the line towards Tunduma.

Tunduma substation

As the proposed 400kV to Zambia is not to be connected to this substation but will only pass on the outskirt of it, there is redundancy in the network due to multiple feeders. Subsequently, it is proposed to build the substation with a single busbar system.

The size of this substation is planned to be 120m x 200m and will be constructed with one 400/220 kV 120 MVA power transformer and one 220/33 kV 20 MVA power transformer. Rated power of transformers shall cover the estimated demand as well as the expected future load increase.

Sumbawanga substation

The proposed Sumbawanga Substation will be strategic as major transmission lines are expected to meet there. For example the proposed 120 – 240MW coal power plant with an associated 400kV transmission line is expected to be connected to the Sumbawanga substation as is the existing 66kV line from Zambia.

The size of the Sumbawanga substation is planned to be 140m x 200m and will be constructed with one 400/220kV 120MVA power transformer, one 220/66kV 40MVA power transformer and one 66/33kV 40MVA power transformer. The rated power of transformers shall cover the demand and the expected future load increase.

2.3.1.8 Access Roads

Access road will be required during construction and maintenance of transmission line and may be paved or gravelled. Additionally, existing access roads leading to the three proposed substations are narrow in some sections for mobilization of construction plant and equipment and may need to be widened to enable safe transport of construction materials. The widening will be minimal and will utilize the ROW, avoiding any impact on adjacent land. The Resettlement Policy Framework (RPF) and Resettlement Action Plan (RAP) will address any potential impact vis-à-vis land acquisition.

2.3.1.9 Construction Materials

The following main construction materials will be used during construction of the tower foundations and substations:

- Concrete (cast-in place reinforced concrete: C20, C25, C30 and Cushion: C15)
- Steel bar: HPB235, HR335
- Welding rod: E43, E50

- Steel: Q235, Q345b, ASTM A572 GR65
- Marshalling: bricks or bricks commonly used in site area

Other materials that will be used for construction purposes include cement, fuel, aggregate, sand, water and power from local power supply and/or diesel generators.

If there are any new borrow pits that will be required for the construction phase (e.g. for development of new access roads to the ROW), the project contractor will acquire the appropriate permits from the local authorities or other regulatory bodies. The same will apply to any water abstraction permits required during the construction phase of the project.

2.3.1.10 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 information extracted from the original ESIA Study conducted for the proposed project, it is estimated that the construction plant and equipment required for the project is as shown in Table 2-1.

Table 2-1: Typical construction plant and equipment required for the proposed project

No.	Equipment Type	Make	Quantity
1.	Bulldozer	220KW	4
2.	Excavator	1m³ bucket capacity	6
3.	Loader	wheel type, 3m³bucket capacity	6
4.	Wheel type crane	25t	3
5.	Wheel type crane	50t	1
6.	Water cart	6~10m³capacity	5
7.	Oil tanker	10t capacity	3
8.	Concrete mixer truck	0.5~0.8 bucket capacity	6
9.	AC welder	250A~500A	6
10.	Vibrating roller	18t	1
11.	Platform lorry	20t	6
12.	Dumper	20t	20
13.	Platform lorry	30~40t	2
14.	Diesel generator	60~120KW	8
15.	SUV	Toyota Land Cruiser VX 4.0L	10
16.	Steel bar straightening machine	TQ4-14	1
17.	Steel bar shearing machine	GT3/8	1

No.	Equipment Type	Make	Quantity
18.	Steel bar bender	GJ7-40	1
19.	Argon-arc welder	YZ-5000W*3	1
20.	Brick press	YX-26	2
21.	Vacuum oil filter	Bipolar	1
22.	Pressure oil filter	LY-150	1
23.	Cutting machine	J3GQ-400	3
24.	Diehead threading machine	CNS25A	2
25.	Churn Drill	GSB16	1
26.	Electric hammer	GBHZ-26RE	2
27.	Angle grinder	GWS8-100C	3
28.	Hydraulic pipe bender	YML-125*12	1
29.	Forklift	CTCD50E	1
30.	Wire barrow	15t	3
31.	Cable stretching machine	10~15t	3
32.	Optical fibre welding machine	500W	1

2.3.2 Construction related activities

2.3.2.1 Construction camps

As the total length of the transmission line is about 3440km, it is anticipated that TANESCO will tender out the works in LOTs thus needing more than one Project Contractor. Each Project Contractor will need both "permanent" and temporary camps. Permanent camps are those that will be required for the duration of the construction phase while temporary ones are small and referred to as "fly camps"; these will move from one location to another during the construction phase.

In selecting the sites for the permanent camp, the following factors will be taken into consideration:

- The camp should be located strategically so as to be accessible to the ROW and substations so that construction materials and workers can be transported effectively;
- There should be sufficient access for vehicles to enable workers to be transported to and from site within the minimum time possible;
- The site should not be exposed to potential flooding or landslip;
- There should be no stagnant water or potential for the pooling of water therefore reducing the possibility of vector disease transmission;
- Consideration should be given to the prevailing wind direction to reduce the potential for noise, dust and other emissions from the construction site or support facilities;

- The camp should be located away from main highways or other busy access roads to reduce road noise
- The camp should be situated as far away from other residential areas as feasible and be sited with consideration of adverse social impacts i.e the camp site must be located away from villages, schools and community centers where underage children may assemble;

Each contractor may construct a permanent camp to store construction materials, workshops, maintenance workshop and accommodation for some of their workers. The construction camps will be fenced and secured to prevent theft and to control movements of workers. The Project Contractor will seek development planning permission from the relevant Council where the permanent camp is to be set up. Prior to this, the successful Project Contractor will submit a layout plan of their proposed permanent and temporary camp for consideration and approval by TANESCO. The camps will be constructed in accordance with [3]good international industry practices (GIIP) for such types of facilities.

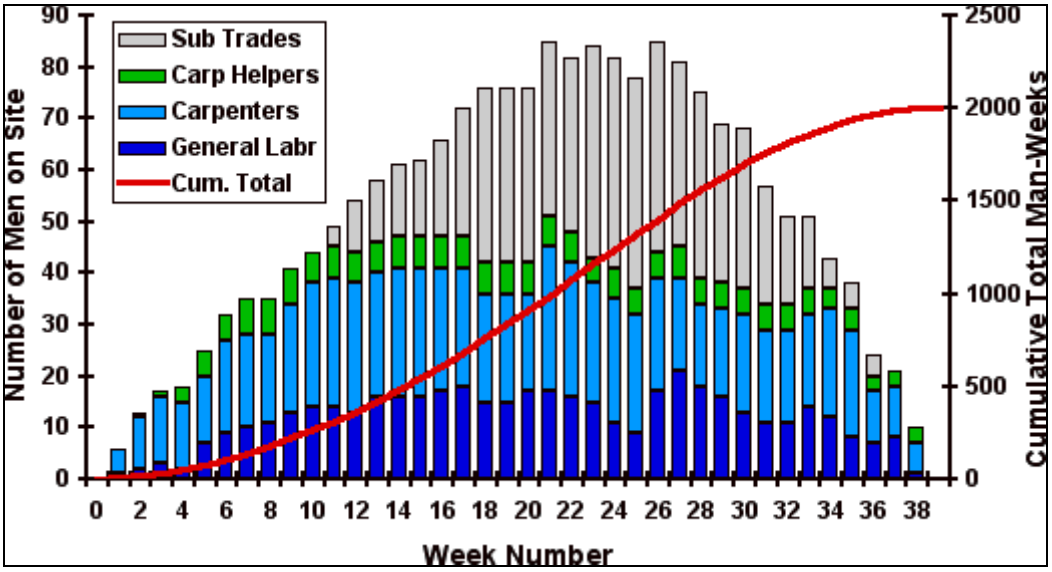
The size of the construction camp is estimated to be about 1 hectare in size and will be used primarily to store construction materials. The Project Contractor will negotiate to either buy or lease the land for the construction camp. The accommodation quarter is expected to house a small percentage of workers that may not come from the local communities. The temporary fly camps will likely be tented and will host those skilled workers needed for construction of the foundations and towers. All other workers will be sourced from the local communities living along the ROW on a needs basis, thus reducing the need for sizable construction camps.

2.3.2.2 Manpower requirements

The project activities will include a range of operations that are aimed at ensuring that the 400 kV power transmission line from Mbeya to Sumbawanga and segment of ~4km from Tunduma S/S to TanZam border are completed on time and is operational as required. The number of construction workers will vary throughout the construction phase. In general, there will be a requirement for construction plant operators (such as excavator, grader and back-hoe operators), masons, steel fixers, welders, etc. The successful contractor will create a manpower histogram (such as the one shown below) showing all types of manpower required for the entire duration of the construction phase. The Project Contractor will work closely with the village administration to identify and maximize sourcing of workers from the communities where the proposed transmission line will traverse.

[3] A good source of GIIP is the International Finance Corporation/European Bank for Reconstruction and Development "Worker accommodation: Processes and Standards" available at www.ebrd.com/downloads/about/history/workers.pdf

Figure 2-10: Example of a manpower histogram



Based on a literature review of an environmental assessment done by TANESCO in 2013, given in Table 2-2 is the estimated number of workers that would be required for the various phases of the project up to commissioning.

The estimates in Table 2-2 are for indicative purposes. The number of expatriate or Tanzanian workers will depend on the Project Contractor awarded the works for each LOT. Secondly, it must be noted that the workers given in the above table

Table 2-2: Approximate staff strength for the construction and commissioning phases

Item	Project phase	Migrant workers	Local community workers
1.	Mobilization	76	100
2.	Construction	220	660
3.	Commissioning	180	260

The implementation of the proposed project will involve the following activities based on the above project phases.

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

2.3.2.4 Construction Phase

The construction phase includes creation of way leave, preparation of tower foundations, tower erection, conductor stringing as well as securing the site and the construction facilities for the substations and transformers. Both machines and manual labor will be involved during construction phase. Some areas will require preparation of access roads to bring equipment, workforce and materials to the designated sites. Given the terrain in some of those areas, this phase could be time consuming and challenging.

The construction phase will take about 3 years (35 months) to construct a transmission line of about 344 km from Mbeya to Sumbawanga including ~4km from Tunduma S/S to TanZam border. 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.

2.3.2.5 Demobilization Phase

Once the construction and commissioning of the new transmission line is complete, the Project Contractor will organize for decommissioning of the project areas. Demobilization phase will involve activities related to completion of the construction phase of the TL project. Activities to be conducted during this phase include, demolition of temporary structures installed to support the construction phase, removal of installations and equipment from the workshop and campsite. If the decommissioning of the worker camps will raise adverse environmental issues, the Project Contractor should consider handing over the same to TANESCO who can then decide how to use the camp site.

On completion of the above, the Project Contractor will conduct a rehabilitation and restoration of the environment disturbed to as near as possible to its original state prior to any construction activities.

2.3.2.6 Operation Phase

During operation, the power line will need periodic inspection and maintenance activities along the ROW (such as vegetation trimming and pruning) as well as occasional maintenance activities due to technical problems, vandalism, wild fires and natural disasters (especially in flood and erosion prone areas).

2.3.2.7 Decommissioning Phase

The expected lifetime of a high voltage transmission line may be estimated to be 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.

2.3.3 Project Boundaries

For purposes of this ESIA Study, the area of influence of the proposed transmission line project and substations in Sumbawanga, Tunduma and Mbeya may be considered under the following categories:

- Sumbawanga Municipal and Sumbawanga Rural districts in the region of Rukwa having a total population of ~181,000 based on the projected 2017 population in these two areas (see section 4.7.5.1 of this ESIA Study for the projected 2017 population statistics where the proposed transmission line project traverses);
- Mbozi, Tunduma and Momba districts respectively in the newly created Songwe Region and having a total population of ~367,000 based on the projected 2017 population in these three areas (see section 4.7.5.1 of this ESIA Study for the projected 2017 population statistics where the proposed transmission line project traverses);
- Mbeya City and Mbeya Rural districts in the region of Mbeya and having a total population of ~196,000 people based on the projected 2017 population in these two areas (see section 4.7.5.1 of this ESIA Study for the projected 2017 population statistics where the proposed transmission line project traverses);
- The access road network which will be linked to the project area in the course of transporting workers to site of works, transferring equipment and construction materials and debris during different phases of the project. Additionally, mechanical and electrical goods will be imported through the port of Dar es Salaam and transferred to the project site via the road network between the port and Sumbawanga.
- Sources of construction materials such as aggregates, sand and cement. All these locations may be considered to be within project boundaries as it may influence its impacts on these locations.

Looking at these areas of influence which will be linked to the project site, it is evident that the boundary of the project may be considered in terms of spatial, temporal and institutional boundaries as presented below in the subsequent sub sections.

2.3.3.1 Spatial Boundaries

Spatial boundaries are important in deciding whether impacts are likely to occur at local, regional, national or international level. The construction of 400 kV and 330kV transmission lines and substations could potentially have wide ranging implications that may be felt locally, regionally, and nationally thus causing impacts in these areas. In the case of the proposed project, the core impact area consists of the proposed wayleave, substations, access roads and the ecosystems and communities living in the vicinity of it.

Outside of the core impact area, there would be an immediate area which is a wider area in which the project could have impacts on social or cultural features, wildlife and their habitat, etc.

Conceptually, there may be direct and indirect impacts resulting from say, clearance of the wayleave in which loss of vegetation occurs, or wildlife is more susceptible to illegal hunting by workers and communities.

2.3.3.2 Temporal Boundaries

Temporal boundaries refer to the lifespan and reversibility of impacts. Some impacts may be short-lived, some could be persistent and might be different depending on the phase of the project (i.e. pre-construction, construction, demobilization, operation and decommissioning phases). For example, during the construction phase, the use of machines such as bulldozers will cause noise and dust pollution that will disappear as soon as construction is finished but existence of the power line and substations will last for many years to come.

2.3.3.3 Institutional Boundaries

The institutional boundaries refer to those administrative and institutional boundaries in which the project lies and interacts. These can be determined from the regulatory framework and mandates of the ministries. The project area spans the districts of Mbeya, Mbozi, Momba and Sumbawanga.

There is a long chain of authority in the local government, with three intermediate levels between the Regional Administrative levels to the Street (Mtaa)/ village Chairman. Each administrative unit is governed by its own council, responsible for environmental measures. Therefore the hierarchy begins at the Ministry of Energy and Minerals, followed by TANESCO (Proponent). TANESCO will subsequently need to interact with the regional, city, municipality, divisions, wards and streets "Mtaa" administrative levels in that order of hierarchy.

When it comes to fulfilment of other legal obligations, there are other institutional frameworks including the Vice President's office which houses the environmental policy and regulatory organs:

1. Minister of Environment responsible for issuing the Environmental Clearance Certificate for the project to be implemented;
2. Division of Environment (DOE), which coordinates environmental management activities like coordination of environmental policy and advises the minister on issuing environmental clearance or EIA approvals.
3. National Environment Management Council (NEMC), which is responsible for coordinating the Environmental Impact Assessments, Monitoring and Auditing.

TANESCO activities are regulated by the Energy and Water Utilities Regulatory Authority (EWURA).

3 Policy, legal and administrative framework

3.1 Introduction

The purpose of this section is to present the applicable regulatory and legislative framework that is relevant to the project.

This chapter describes relevant policies, administrative and legal frameworks that are relevant to this project and must be considered during the planning and implementation of the project. Any development undertaken in Tanzania is indebted to the Environmental Management Act of 2004 requirements. The project has to be screened to determine whether it needs an EIA or not. Environmental Impact Assessment and Audit Regulations of 2005 document provide guidance to the EIA process. Under this regulation, the council shall require the proponent to undertake full EIA if the project falls under category A like the case of this project. .

The EA process is a cross cutting issues linking policies and legislation from other sectors apart from energy, environment and water issues. It is acknowledged that there are many policies and laws that might be linked to this project; however, the following are considered most relevant to this project.

3.2 National

3.2.1 National policies, strategies and action plans

The following policies have been reviewed within this section and are described below how they link to this project:

- National Environment Policy (NEP), 1997;
- The Energy Policy, 2003;
- National Forest Policy, 1998;
- Wildlife policy, 2009;
- The Water Policy, 2002;
- Beekeeping Policy, 1998;
- National Human Settlements Development Policy, 2000;
- National Land Policy, 1997;
- National Strategy for Growth and Poverty Reduction, 2005;
- Rural Development Strategy, 2001;
- National HIV/AIDS Policy, 2001; and

- National Gender Strategy, 2008

3.2.1.1 National Environment Policy (NEP), 1997

This is the main policy document governing environmental management in the country. The NEP defines environmental issues as both natural and social concerns and adopts the key principle of sustainable development. The NEP has also proposed the framework environmental legislation to be taken into account by the numerous agencies of the Government involved in regulating the various sectors. The NEP defines strategic plans for environmental management at all levels and provides an approach for mainstreaming environmental issues for decision-making.

The National Environmental Policy of 1997 outlines six key environmental management and protection problems that include loss of wildlife habitats and biodiversity, environmental pollution, land degradation and deforestation (URT, 1997). The policy stipulates that an EIA shall be mandatory for all major projects to ensure that environmental concerns receive due and balanced consideration in reconciling urgent development needs and long-term environmental sustainability.

The activities of the proposed project may cause land degradation and produce wastes that may pollute water and air. Hence, appropriate mitigation measures will be in place to prevent or reduce the impact if the project is to comply with this policy.

3.2.1.2 The Energy Policy, 2003

The Energy Policy objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The national energy policy, therefore, aims to establish an efficient energy production, procurement, transportation, distribution and end use systems, in an environmentally sound and sustainable.

The Energy Policy recognises that economic development correlates strongly with energy consumption and energy dependence. Efficient use of energy is therefore a necessary condition for sustainable economic development. With increasing energy demand and energy dependence society, energy expansion projects are inevitable. However, the policy recognises the environmental impacts of energy exploitation, production, distribution and consumption. Thus, it calls for environmental and social impacts assessment and addressing the impacts by rigorous environmental management measures on all energy activities including the application of economic instruments for changing market behaviour to adopt energy efficient and clean energy technologies.

On energy supply particularly electricity, the national energy policy provides for the government to ensure sufficient and cost effective energy supply to meet the increasing demand in commerce sector, promote energy management practices and that generation of electric power to be fully open to private and public investors as independent power producers. However, investment shall be based on economic and financial criteria considering open access to regional network, balanced domestic supply and environmental impacts.

The relevancy of this policy towards the proposed project is encouragement to environmental management (sustainability) while fulfilling the responsibility of transmission of electricity for the development of the country.

3.2.1.3 National Forest Policy, 1998

The Policy goal is to enhance the contribution of the forest sector to the sustainable development of the nation and the conservation and management of natural resources for the benefit of present and future generations. To attain this goal the policy focuses on four main areas: (1) land management; (2) forest based industries and products; (3) ecosystem conservation and management; and (4) institutions and human resources.

The forest policy recognises that investment or development in forest areas may cause adverse environmental impacts. The policy recommends environmental assessment as mandatory requirement in order to ensure damage to the environment is avoided and possible mitigation measures are provided. The project proponent and contractor will comply with the requirement of this policy.

3.2.1.4 The Wildlife Policy, 1998

The Wildlife Policy identifies the need to conserve wildlife as a natural resource of great biological, economic, environmental and nutritional value. It recognises the need for involving a broader section of society and various stakeholders in wildlife conservation. This Policy considers the creation of 'Protected Areas' to promote the conservation of wildlife.

Some of the policy objectives for establishing Protected Areas include:

- Preservation of representative examples of Tanzania terrestrial and aquatic habitats and their physical environment;
- Conservation of a viable population of species of flora and fauna with an emphasis on endangered, threatened or endemic species and their habitats;
- Protecting areas of scenic beauty and special or cultural interest; and
- Conservation of water catchments and soil resources.

This Policy does not, however, specify EIA requirements for infrastructure development projects within wildlife conservation areas. Nevertheless, the Tanzania Policy for National Parks stipulates the need for carrying out EIA for any development project in National Parks. The Wildlife Policy vision conforms to the Tanzania Development Vision 2025 on environmental sustainability and socio-economic transformation.

The project does not pass through the national park. However, the project will recognize the need to protect water catchment areas and soil resources in support of the wildlife policy.

3.2.1.5 Water Policy, 2002

The Water Policy recognises water as important requirement for all humans to maintain health, and to restore and maintain the functions of natural ecosystems. It supports availability of water to ensure food security, electricity generation and other economic

activities amongst other important activities. It also advocates for integrated and sustainable river basin management.

The policy, in addition, urges the protection and conservation of water resources in the Country Rivers and basins. In this case, the policy recognizes the need to protect water resources against pollution and environmental degradation. The project proponent and contractor will protect water resources by avoiding water pollution of any sort.

3.2.1.6 Beekeeping Policy, 1998

The beekeeping policy aims to enhance the sustainable contribution of the beekeeping sector to socio-economic development and environmental conservation. The policy takes into account the role of inter-sectoral cooperation and coordination which will enhance the sustainable management of bee and bee fodder resources in and around agricultural farms, forest and wildlife protected areas.

Additionally, the beekeeping policy address the need of ensuring ecosystem stability by practising integrated pest management and carrying out carrying out Environmental impact assessment for investments which will take place inside or around bee reserves and apiaries, and which may cause potential damage to the bees, bee products and bee fodder plants.

The implementation of this project will ensure that where the proposed transmission line crosses bee reserves, all necessary permits are obtained before clearance of vegetation for creation of way leave.

3.2.1.7 National Human Settlements Development Policy, 2000

The overall goals of the National Human Settlements Development Policy (NHSDP) are to promote the development of sustainable human settlement and to facilitate the provision of adequate and affordable shelter to all income groups in Tanzania. The policy outlines a number of objectives including environmental protection within human settlements and protection of natural ecosystems against pollution, degradation and destruction in order to attain sustainable development.

The NHSDP recognises the role of the NEP and other sector policies in achieving urban development. Thus the NHSDP identifies the need for co-ordination and co-operation with other sectors and stakeholders, including CBOs, and NGOs in urban development planning.

The NHSDP recognises environmental planning and management as one of the broad human settlement issues. In that regard the NHSDP identifies environmental protection as one of the strategic issues in human settlement planning and development.

Among the objectives of this policy are to improve the level of the provision of infrastructure and social services for the development of sustainable human settlements and to make serviced land available for shelter to all sections of the community. The project is in support of this policy as it will enable availability of reliable electricity to human settlements in the project area.

3.2.1.8 National Land Policy 1995 (Revised in1997)

The overall aim of a National Land Policy is to promote and ensure land tenure system, to encourage the optimal use of land resources, and to facilitate broad based social and economic development without upsetting or endangering the ecological balance of the environment. The policy emphasises the protection of the environment and natural ecosystems from pollution, degradation and physical destruction.

The policy provides for compensation for land acquired in the public interest to be based on the principal of opportunity cost that consider the principle of equivalence or substitution aimed at obtaining an equally desirable alternative.

The policy also recognises the importance of social services such as water supply, roads, energy which took place on the land for human benefits should be done in a right manner so as to protect land for other uses and avoiding land degradation.

The relevancy of this policy to this project is the nature of the project that it will acquire land for transmission line which is currently used for other purposes particularly farming. The land acquisition process will involve community participation, valuation and compensation processes.

3.2.1.9 National HIV/ AIDS Policy

The overall goal of this policy is to provide for a framework for leadership and coordination of the national multi-sectoral response to the HIV/AIDS pandemic. This includes the formulation by all sectors of appropriate interventions, which will be effective in preventing transmission of HIV/AIDS and other sexually transmitted infections, protecting and supporting vulnerable groups and mitigating the social and economic impacts of HIV/AIDS.

According to the Tanzania HIV/AIDS and Malaria Indicator Survey of 2011-12, the prevalence of HIV in Mbeya region was 9.0% while that in Rukwa region was 6.2%. These two regions are referred to as the Southwest highlands and exhibited one of the highest rates of HIV prevalence in mainland Tanzania in which the national average was 5.1%. In order to manage this potential impact for the proposed transmission line project, TANESCO and the Project Contractor will work with this policy to protect workers and the communities around the project area against HIV/AIDS.

3.2.1.10 National Gender Strategy, 2008

The Ministry of Community Development, Gender and Children facilitated the formulation of the Women and Gender Development Policy (2000). The aim of this policy was to ensure that the gender perspective is mainstreamed into all policies, programs and strategies. In order to meet this objective, the national machinery initiated the establishment of gender focal points in ministries, independent government departments, regional and local authorities. These focal points in turn are responsible for gender mainstreaming in their respective plans and programs, while working with the national machinery, which has a coordinating role in gender development.

In 2008, the Ministry of Community Development, Gender and Children developed a National Gender Strategy. The objectives of this strategy are to (i) provide guidance on

interventions to be made in order to mainstream gender issues into policies, plans and programs, (ii) identify the roles of various actors and stakeholders in implementation of the strategy, and (iii) suggest coordination mechanisms to facilitate the participation of the various actors, and how they could create the requisite linkages.

In order to implement the National Gender Strategy for the proposed transmission line project, the Project Contractor will (i) establish a database on type of employment and positions by sex (ii) improve occupational health and safety control measures to safeguard both men's and women's health, and (iii) provide conducive environment for promoting equal opportunities in accessing employment.

As compensation will be paid out to Project Affected Persons (PAPs) based on the Resettlement Action Plan (RAP) for the project, TANESCO will consider (i) sensitize women and men to establish economic groups such as Savings and Credit Cooperative Societies (SACCOS) and access credits for income generating activities, and (ii) provide training on entrepreneurship to women.

Additionally, the Project Contractor will attempt to address gender issues in order not to disrupt community cohesion and prevent potential abuse of local population.

3.2.1.11 Rural Development Strategy, 2001

The strategies have the primary objectives of stimulating growth in the rural economy by building on gains in the national economy and by empowering rural poor people to overcome poverty through better access to land, water, energy, financial resources and markets.

There is a large population still lacking electricity in Tanzania. The government through Rural Electrification Agency (REA) and TANESCO and development partners such as the African Development Bank and SIDA of Sweden are supporting different energy projects in various regions as part of stimulating rural development and poverty reduction through energy access. This project will expand grid system to the project area and thus making possible to provide reliable power to the villages in the Mbeya and Rukwa regions. Provision of electricity to rural communities is in line with this strategy.

3.2.1.12 National Strategy for Growth and Poverty Reduction (2005)

The National Strategy for Growth and Poverty Reduction (NSGPR) established in 2005 is coordinated under the Poverty Reduction Strategy as a national organising framework. The NSGPR addresses the aspiration of the Tanzania Development Vision (Vision, 2025) for high and shared growth, high quality livelihood, peace, stability, unity, quality education and international competitiveness. NSGPR has been formulated within the context of the United Nation Millennium Development Goals (MDGs) to be achieved by 2015.

The project is in line with this policy as it will contribute to the goals of NSGPR by providing reliable, high quality energy source for economic activities that will result into economic growth, employment, quality education and improved livelihood.

3.2.2 National legislative framework

The following legal documents and Acts were reviewed to have an overview of legal requirement of this project:

- The Constitution of Tanzania, 1977-1995
- Environmental Management Act cap 191, 2004
- The Environmental Impact Assessment and Audit Regulations, 2005
- The Forest Act , 2002
- The Land Acquisition Act, 1967
- The Land Act, 1999
- The Land Regulation, 2001
- Land Use Planning Act, 2007
- Wildlife Conservation Act, 2009
- Beekeeping Act, 2002
- The Local Government (District Authorities) Act 1982 Cap 287 R.E. 2002
- The Local Government (Urban Authorities) Act, (1982) Cap 288 R.E 2002
- Employment and Labour Relation Act, 2004
- The Occupational Health and Safety Act, 2003
- The Industrial and Consumer Chemicals (Management and Control) Act, 2003
- Water Resource Management, 2009
- Antiquities Act, 1964
- Electricity Act, 2008
- Energy and Water Utilities Regulatory Authority Act Cap 414
- Workers Compensation Act, 2008
- Engineers Registration Act Cap 63, 2007
- Public Health Act, 2009
- Fire and Rescue Force Act, 2007

3.2.2.1 The Constitution of Tanzania, 1977-1995

The Constitution of the United Republic of Tanzania (1977 – 1995, Revised 1997) recognises 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) states that "freedom and duties do not invalidate existing legislation or prohibit the enactment of any legislation or the doing of any lawful act in accordance with

such legislation for the purpose of – among others - ensuring the defence, public safety, public order, public morality, public health, rural and urban development and utilisation of minerals or the increase and development of property or any other interest for the purpose of enhancing the public benefit".

3.2.2.2 Environmental Management Act Cap 191, 2004

The Environmental Management Act Cap 191 is the principal legislation governing environmental management in the country. The Environmental Management Act (EMA) recognises "the right of every citizen to a clean, safe and healthy environment, and the right of access to environmental resources for recreational, educational, health, spiritual, cultural and economic purposes."

Thus, the EMA "provides a legal framework for coordinating harmonious and conflicting activities by integrating those activities into overall sustainable environmental management systems by providing key technical support to Sector Ministries."

For effective implementation of the NEP objectives, the EMA has identified and outlined specific roles, responsibilities and functions of various key players. It provides for a comprehensive administrative and institutional arrangement, comprised of:

- National Advisory Committee;
- Minister Responsible for Environment;
- Director of Environment;
- National Environment Management Council (NEMC);
- Sector Ministries;
- Regional Secretariat; and
- Local Government Authorities (City, Municipal, District and Town Councils).

3.2.2.3 The Environmental Impact Assessment and Audit Regulations, 2005

The Environmental Impact Assessment and Audit Regulations No. 349 of 2005 were made pursuant to the Environmental Management Act No. 20 of 2004. The regulations provide the basis for undertaking Environmental Impact Assessments and Environmental Audits for various types of development projects with significant environmental impacts. The following text provides a brief description of some of the provisions that are relevant to this project.

The proposed development of a 400 kV power transmission line falls under the category of projects that require mandatory EIA. Item 7 (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 Fourth Schedule of Regulations provides steps that must be taken to conduct an EIA and Regulation 16 directs the EIA study to take into account environmental, social, cultural, economic and legal considerations as well as identify environmental impacts , analyse project alternatives, propose mitigation measures to be taken during and after implementation of the project and develop environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

3.2.2.4 The Forest Act, 2002

The Forest Act, 2002 provides for the management of forest and its main objectives are to promote and enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of natural resource for the benefit of the present and future generations. In addition the legislation aims to ensure ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility.

According to section 18 of this Act, an EIA is required for certain development in accordance with the modalities and substance as set out in the guidelines by authorities responsible for the protection of the environment. This applies to among others, construction of dams, power stations and electrical or telecommunication installation.

The implementation of this project will ensure that where the proposed transmission line crosses national and local authority forest reserves, all necessary permits are obtained before clearance of vegetation for creation of way leave.

3.2.2.5 The Land Acquisition Act, 1967

Under the Land Acquisition Act, 1967 the President may, subject to the provisions of this Act, acquire any land for any estate or term where such land is required for any public purpose.

Land shall be deemed to be acquired for a public purpose where it is required for example, for exclusive Government use, for general public use, for any Government scheme, also if it is for the development of agricultural land or for the provision of sites for industrial, agricultural or commercial development, social services, or for housing.

The land may be acquired where the President is satisfied that a corporation requires land for the purposes of construction of any work which in his opinion would be of public utility or in the public interest or in the interest of the national economy. The president may, with the approval, to be signified by resolution of the National Assembly and by order published in the Gazette, declare the purpose for which such land is required to be a public purpose and upon such order being made such purpose shall be deemed to be a public purpose; or in connection with the laying out of any new city, municipality, township or minor settlement or the extension or improvement of any existing city, municipality, township or minor settlement; etc.

Upon such acquisition of any Land the President is compelled on behalf of the Government to pay in respect thereof, out of moneys provided for the purpose by Parliament, such compensation, as may be agreed upon or determined in accordance with the provisions of the Land Acquisition Act, 1967.

The President may also revoke a right of occupancy if in his opinion it is in public interest to do so. Accordingly, the land for which a right of occupancy has been revoked reverts back to the Government for re-allocation pursuant to the existing need(s). It should also be noted here that, though the land belong to the government some changes on the land act has taken place. Land has value to the owner; therefore, any land taken from the user or destroyed property has to be compensated. Based on this Act, any individual person or company who will suffer loss of property due to implementation of this project has a constitutional right to claim compensation for the lost properties.

3.2.2.6 The Land Act, 1999

The Land Act, 1999 (No. 4 of 1999): provides for the basic law in relation to land other than the village land, the management of land, settlement of disputes and related matters while Village Land Act, 1999 (No. 5 of 1999) provides for the basic law in relation to land in villages. Since the project is located in Mbeya, Mbozi, Momba and Sumbawanga Districts, the applicable law is Land Act, 1999 (No. 4).Part II of the Act section 3 provides the fundamental principles of the National Land Policy.

The relevancy of this Act to this project is the fact that the project will own the land in way leave and substations legally whereby the conditions of occupancy of the subject land must be complied. In case, there will be a need to take more land then compensation guidelines must be fully complied.

3.2.2.7 The Land Regulations, 2001

According to Section 10 (1) of the Land (Compensation Claims) Regulation 2001, compensation shall take the form of:

- Monetary compensation;
- Plot of land of comparable quality, extent and productive potential to the land lost;
- A building or buildings of comparable quality, extent and use comparable to the building or buildings lost;
- Plants and seedlings; and
- Regular supplies of grain and other basic foodstuffs for a specified time.

The Regulation (Assessment of Value for Compensation) states "…the basis for assessment of the value of any land shall be the market value of such land". The market value is arrived at by the use of the comparative method substantiated by actual recent sales of similar properties, or by use of income approach or replacement cost method, in case the property is of special nature and not saleable.

The assessment of the value of land and any improvements will be done by a Qualified Valuer and verified by the Chief Valuer of the Government or his/her representative.

According to the Regulation, the following are eligible for compensation/resettlement:

- Holder of right of occupancy;
- Holder of customary right of occupancy whose land has been declared a hazard land;
- Holder of customary land who is moved or relocated because his/her land becomes granted to other person;
- Holder of land obtained as a consequence of disposition by a holder of granted or customary right of occupancy but which is refused a right of occupancy; and
- Urban or peri-urban land acquired by the President.

If the person does not agree with the amount or method of payment or is dissatisfied with the time taken to pay compensation, he/she may apply to the High Court. The High Court shall determine the amount and method of payment and determine any additional costs for inconveniences incurred.

3.2.2.8 Land Use Planning Act, 2007

The Land Use Planning Act, 2007 encourages development of technology to prevent, or minimize adverse effect that endangers man's health and his/her welfare. It is also specifies standards, norms and criteria for beneficial uses and maintenance of the quality of the land.

Among other things, the Act recommends measures to ensure that Government policies, including those for development and conservation of land are in harmony. It also takes adequate account of their effects on land use and seeks the advancement of scientific knowledge of changes in land use. The implementation of this project will adhere to the provisions of this act on matters related to land management.

3.2.2.9 Wildlife Conservation Act, 2009

The Wildlife Conservation Act, 2009 provides for the conservation, management, protection and sustainable utilisation of wildlife and wildlife products. In addition, it makes specific provision for the management and conservation of biodiversity, including any species of wild and indigenous animals and plants as well as habitats and ecosystems found on or in land or water. The Act also provides for designation of wildlife corridors, dispersal areas, buffer zones and migratory routes.

Furthermore, the Act provides for the creation of game reserves and the protection and use of vegetation in the reserve i.e. user rights of game reserve residents. Section 31 (5) of the Act provides that the activities to be undertaken in the Wildlife Management Areas must be conducted in conformity with the Forest, Beekeeping, Fisheries, and Environmental Management Acts, and any other relevant and related laws.

3.2.2.10 Beekeeping Act, 2002

Beekeeping Act, 2002 provides for orderly conduct of beekeeping, for the improvement of the products of beekeeping and for the prevention and eradication of diseases and pests amongst bees. Among the objective of this Act is to promote, and enhance the contribution of the beekeeping sector to the sustainable development of Tanzania and the conservation and management of her natural resources for the benefit of present and future generations; and to ensure the sustainable existence of honeybees by the creation, maintenance and effective management of bee reserves and apiaries.

Section 17 of the Act, prohibits activities within gazetted bee reserves without being granted a licence or a permit under this Act to do that act or the doing of that act is a necessary consequence of the grant of a licence or a permit under this Act to do some other related acts such as:

- Take, remove, bum, damage or destroy any bee, colony or any apiary products,
- Cut down, fell, dig up or remove any tree
- Dig up or remove any wild plant
- Erect any buildings or other structures
- Clear land
- Construct any roads, paths, bridges, railways, waterways or runways;

The implementation of this project will ensure that where the proposed transmission line crosses gazetted bee reserves, all necessary permits are obtained before clearance of vegetation for creation of way leave.

3.2.2.11 The Local Government (District Authorities) Act 1982 Cap 287 R.E. 2002

The Tanzania Local Government (District) Authorities Act of 1982 has the objective of making better provisions for, and to consolidate laws relating to, local government, to repeal the Local Government Ordinance, to repeal certain other written laws and to provide for other matters connected with or incidental to the organization of local government in Mainland Tanzania.

Section 146 of the Local Government District Authorities Act of 1982 requires village governments to only enter into agreements which are beneficial to the villagers. To this end, there must be tangible benefits provided by proposed activities that will improve villagers' livelihoods. The commissioning of this project will led to establishment of electric distribution projects to the villages crossed by this project and thus improves the livelihoods of the villagers.

3.2.2.12 The Local Government (Urban Authorities) Act, 1982 Cap 288 R.E 2002

Tanzania is implementing the Local Government Reform Programme (which has instituted "Decentralization by Devolution"). District and Urban councils have extensive powers under the two Acts, both in governance aspects and management of natural resources and land in their respective jurisdictions. The administrative aspects of valuation and payment of compensation are assigned to local government authorities and Regional administration.

It is on the basis of this act that the proponent is determined to ensure continuous conservation of the project site while maintaining environmental and public health safety. Moreover, the project proponent will collaborate with local authorities in terms of waste management, land acquisition processes, public services, city levies, etc.

3.2.2.13 Employment and Labour Relation Act, 2004

In employment and labour Relations Act, section 5-(2) and (3) provide age classification of children labour and type of work to be employed without prejudice his/her social development. Also section 7 provides details on condition of good and reliable employment environment. Furthermore, in section 11-91 provides the provision of this Act on wage determination that stipulates a minimum term and condition of employment as shall be the employment standard.

Section 11(2) and 14(1) give the details on employment contractual conditions. On the other hand section 19-(1), (2), (3) and (5) state the working durations and overtime conditions. Moreover, section 31 provides detailed information on the employment leave and section 32-(1), (2) and (3) provides the information on the risk and maternity employees on payment status, sick and maternity leave.

TANESCO should comply with stipulated conditions in Employment and Labour Relation Act, 2004 so as to fulfil the requirement of the law and to maintain good working relations at workplace.

3.2.2.14 The Occupational Health and Safety Act, 2003

The Occupational Health and Safety Act No. 5 of 2003, deals with regulation of health, safety and welfare of persons at work in factories and all other places of work. The Act also provides for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work. Relevant to this project include part IV Section 43 (1) safe access and safe working place and Part V on health and welfare provisions. The developer is obliged to provide safe working environment, provision of clean and safe water, provision of sanitary facilities and first aid facility.

3.2.2.15 Industrial and Consumer Chemicals (Management and Control) Act, 2003

This is an Act to provide for the management and control of the production, importation, transportation, exportation, storage, dealing, and disposal of chemicals and for matters connected therewith.

In case the project expects to import or use chemicals for its activities then the project proponent or contractor need to declare and obtain authorization from relevant authorities in additions to compliance to other Act requirements particularly importation, storage, use and disposal of those chemical wastes.

3.2.2.16 The Water Resources Management Act, 2009

The Water Resources Management Act, 2009 is an Act to provide for institutional and legal framework for sustainable management and development of water resources. It also outlines the principles for water resources management, prevention and control of water pollution and to provide for participation of stakeholders and the general public in implementation of the National Water Policy. The Act repeals the Water Utilization (Control and Regulation) Act of 1974 and to provide for related matters. Section 4 stipulates the objectives and principles of water resources management. Under subsection (1) of this section, suitable institutions with appropriate stakeholders and gender representation shall be established.

Section 5 states that any person exercising jurisdiction under this Act shall, in relation to any decision, order, exercise of any power or performance of any function, be guided by the following principles of sustainable integrated water resources management and sustainable development.

Section 6.-(1) Any person exercising powers under this Act or under any other written law having a bearing on the provision of water resources management shall strive to promote and have regard to the National Water Policy, in respect of water resources management.

Section 7 stipulates that every person residing in Mainland Tanzania shall have a stake and a duty to safeguard and protect water resources and to inform the relevant authority of any activity and phenomenon that may affect the quantity and quality of the water resources significantly.

Section 8 states that where a major water project is planned, the Director of Water Resources shall carry out a Strategic Environmental Assessment in accordance with the procedure and Regulations made under the Environmental Management Act.

Section 9 states that any proposed development in a water resource area or watershed to which this Act applies, whether that development is proposed by or is to be implemented by a person or organisation in the public or private sector shall carry out an Environmental Impact Assessment in accordance with the provisions of the Environmental Management Act. TANESCO has a duty to ensure that its activities protect water resource in all aspects.

3.2.2.17 Antiquities Act, 1964

The Antiquities Act, 1964 amended in 1979 includes the principle that no archaeological research can be undertaken without the permission of the Director of Antiquities. According to this Act, local government authorities can pass by-laws for the preservation of archaeological heritage in their area of jurisdiction. The relevancy of this Act is for the case where archaeological artefacts will be found in the project area. In that case TANESCO will consult the relevant authorities for guidance on how to proceed with the project.

3.2.2.18 The Electricity Act, 2008

This is an Act to provide for the facilitation and regulation of generation, transmission, transformation, distribution, supply and use of electricity energy. It provides for cross-border trade in electricity and the planning and regulation of rural electrification and for related matters. The Act has given powers to Energy and Water Utilities Regulatory Authority (EWURA) to oversee and grant licenses to generate, and sale of electricity. The Act has the following sections:

- Operating license
- Provisional license and licence
- Rights and obligations of licensee
- Tariffs and charges
- Customer rights and protection
- Monitoring, inspection, investigation and compliance
- Access to land for installation
- Rural electrification
- Reorganization of the electricity market
- Dispute settlement and miscellaneous

The commissioning of this project may influence electricity tariff in the grid system. If this will be the case, then it may need a tariff increase that will need to be applied from EWURA.

3.2.2.19 Energy and Water Utilities Regulatory Authority Cap 414

This Act consolidates the laws in relation to energy and water utilities in Tanzania Mainland. Under this Act, the EWURA with prior approval of the Minister, make rules in respect of the regulated goods and services (being the electricity, petroleum, natural gas, water and sewerage sectors). The Act gives EWURA the legal mandates to issue renew and cancel licenses of service providers in the regulated sectors. Existing license holders and potential license applicants may submit their applications to EWURA for a new license

or license renewal. EWURA considers license applications and decides whether to grant a license renewal by using fair and non-discriminatory procedures.

Cap 414 further makes it mandatory for EWURA to conduct public inquiry before exercising its powers to issue, renew or cancel a license. Since the project will be operated by TANESCO, hence will sell electricity to Tanzania consumers hence EWURA will directly be involved in regulating the electricity tariffs.

3.2.2.20 Workers Compensation Act, 2008

The workers compensation Act No. 20/2008 provides for compensation to employees for disablement or death caused by or resulting from injuries or diseases sustained or contracted in the course of employment. It applies to both workers in the private and public sector; the employer is obliged to pay compensation irrespective of the cause of the accident. It does not matter whether the incapacity or death was due to recklessness of the worker. Where injury occurs, an employee is entitled to recover medical expenses and lost wages resulting from the disability, be it temporary or permanent. The law allows for compensation to dependants or personal representatives where the worker is dead.

3.2.2.21 Engineers Registration Act Cap 63, 2007

This Act No. 15 of 1997 establishes an Engineering Registration Board (ERB) which regulates the conduct of engineers, to provide for their registration and for related matters. The Act provides restrictions that no person other than a registered engineer shall engage in professional engineering work or services which includes professional service consultation, planning, designing or responsible supervision of construction or operation in connection with any public or privately owned public utilities, buildings, machines, equipment, processes, works or projects where public interest and welfare, or the safeguarding of life, public health or property is concerned or involved, and that requires application of engineering principles and data. Additionally, the Act stipulates that no person shall employ or continue to employ any engineer who is not registered as a professional engineer.

3.2.2.22 Public Health Act, 2009

The Public Health Act, 2009 is an Act to provide for the promotion, preservation and maintenance of public health with a view to ensuring the provision of comprehensive, functional and sustainable public health services to the general public and to provide for the related matters.

The act provides for prohibition of nuisance likely to be injurious or dangerous to health, existing on any land, premises, air or water. Nuisance is interpreted by this Act as anything which is in such a condition, used, disposed of, situated, constructed or is not clean as to be- (a) dangerous to human life and limb; (b) injurious to human health or animal; (c) offensive; (d) likely to give rise to or facilitate the spread of diseases; (e) likely to harbour mosquitoes, flies, rats or vermin of any kind; (f) likely to be injurious or to affect food and water supply of any area; or (g) injurious to environment.

Moreover, the act has empowered district and urban authorities in collaboration with other relevant authorities and by taking into consideration of the Environmental Health Impact Assessment recommendations to ensure that construction and industries producing dust and gaseous wastes are situated far from residential areas. The act has also empowered district and urban authorities to manage solid and liquid wastes in their

areas and to undertake studies to gather knowledge of the generation rate and composition of solid and liquid wastes for the purposes of making decisions on suitability of any specific method of collection, treatment or disposal of such wastes.

3.2.2.23 Fire and Rescue Force Act, 2007

Fire and Rescue Force Act, 2007 is an Act to provide for the better organization, administration, discipline and operation of Fire and Rescue Force. Section 22 (1) of this act addresses the need for provision and maintenance of the fire escape in every building which has a storey the floor of which is more than twelve meters above the level of the street or ground surface adjoining any part of the building or a building of two thousand square meters in gross floor area.

The Act makes provisions for management of fire hazards in the factory, workshop, workplace or premises used for business purposes in order to avoid fire outbreak. The project supports this Act by employing of lighting and fire prevention materials and equipment in transmission line and substations.

3.2.3 Institutional and Administrative Framework

According to the EMA of 2004 the institutional set-up for environmental management from national level to village level includes:

- National Environment Advisory Committee;
- Minister Responsible for Environment;
- Director of Environment (DOE);
- National Environment Management Council (NEMC);
- Sector Ministries;
- Regional Secretariats; and
- Local Government Authorities (Municipality and District, Ward and Village)

The Office of the DOE and NEMC are the main regulatory bodies for environmental management in Tanzania. However, other sector ministries and agencies, play an important role in implementing environmental policy objectives. The environmental management functions of each institution are outlined in the Environmental Management Act.

3.2.3.1 Project Proponent

TANESCO as the Proponent will be accountable for enforcing the requirements of the Environmental and Social Management Plan (ESMP) for the project. The Project Contractor(s) will be responsible for developing a Construction Environment Management Plan (CEMP) and associated sub-plans based on the contents of the ESMP in this ESIA Study.

3.2.3.2 National Environmental 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 Environment Management Act of 2004.

3.2.3.3 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. The minister will issue an Environmental Impact Assessment Certificate following the recommendation from NEMC and upon satisfaction that the project will not be an environmental disaster and that the project proponent has prepared measures to address any adverse impacts to the environment and to the society.

3.2.3.4 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.

3.2.3.5 National Environment Management Council

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

The President appoints the Director General of NEMC. 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.

The National Environment Management Council in collaboration with Technical Advisory Committee reviews the Environmental Impact Statement and recommends to the Minister Responsible for Environment to issue an EIA Certificate to project proponent upon fulfilling all the requirements.

3.2.3.6 Sector Ministries

The Environment Section in each the sector Ministries is responsible for ensuring compliance with the requirements of the Environment Management Act. The sections are also responsible for liaising with the Director of Environment and the NEMC.

The Sector Environment Coordinator, who is appointed from within the Sector Ministry, heads the Sector Environment Section. The Coordinator is responsible for:

- Coordination of all activities and performance of the functions relating to environment;
- 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.

3.2.3.7 Regional Secretariats

The Regional Secretariats are responsible for environmental coordination of all advice on environmental management in their respective regions. Regional secretariats have a function to liaise with the DOE and the Director General of NEMC on implementation and enforcement of the EMA. A Regional Environment Management Expert, appointed by the Minister responsible for Regional Administration, heads these Secretariats. 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.

3.2.3.8 Local Government Authorities

Local Government Environmental Management Officers are appointed by each City, Municipal, District and Town Council. Their responsibilities, among others are elaborated in EMA act 2004 part III Section 36 (3). 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 EMCs 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:

- The proper management of the environment within their jurisdictions;
- Performing duties as assigned by the Minister of Councils;
- Carrying out directives given by the Minister to promote and enhance sustainable management of the environment as provided under the Local Government Act; and
- Performing any functions as set out under the Local Government Act.

3.2.3.9 Project Management Team

Different institutions will be involved in the management of the project in one way or the other including providing the authorization during the course of project implementation of this project.

3.2.4 International protocols, agreements and treaties

Table 3-1 identifies relevant international environmental and social development agreements to which Tanzania is a party to or has ratified. Tanzania is also a signatory to a range of International Labor Organization Fundamental (and other) Conventions which are summarized in Table 3-2.

Table 3-1: International environmental agreements relevant to Tanzania

Issue	Convention and Objective	Summary	Tanzania Status
Biodiversity	International Plant Protection Convention - new revised text approved by Resolution 12/97 of the 29th Session of the FAO Conference in November 1997 – Declaration	To prevent the spread and introduction of pests of plants and plant products and to promote measures for their control.	Ratified
	Convention on Biological Diversity	To ensure the conservation of biological diversity; the sustainable use of its components and the fair and equitable sharing of the benefits.	Ratified
	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	To protect migratory species of wild animals and their habitat.	Ratified
	Convention on International Trade in Endangered Species of Wild Flora and Fauna	To ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Ratified
Climate Change	Kyoto Protocol to the UN Framework Convention on Climate Change	To reduce or limit the emission of gases contributing to the "greenhouse effect" and causing climate change in the industrialised countries	Ratified
	United Nations Framework Convention on Climate Change	To achieve stabilisation of greenhouse gas concentrations.	Ratified
Cultural	UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage	To ensure that effective and active measures are taken for the protection, conservation and presentation of the "cultural and natural heritage" on its territories.	Ratified
	UNESCO Convention for the Safeguarding of the Intangible Cultural	To safeguard and ensure respect for the world's Intangible Cultural	Ratified

Issue	Convention and Objective	Summary	Tanzania Status
	Heritage	Heritage, including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance.	
Desertification	United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	To combat desertification and mitigate the effects of drought with a view to achieving sustainable development.	Ratified
Ozone	Amendment to the Montreal Protocol on substances that deplete the ozone layer, adopted at the ninth meeting of the Parties	To ensure effective protection of the ozone layer by regulating trade in substances that depletes it.	Ratified
Waste	Basel Convention on the control of transboundary movements of hazardous wastes and their disposal	To lay down obligations with regard to ensuring that the transboundary movement of wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes.	Ratified

Table 3-2: International Labor Organization (ILO) Fundamental and other conventions

Issue	Convention	Summary	How applied in Tanzania
Human Rights	International Labour Organisation (ILO) Convention No. 89 on Women's Rights and Working Conditions	These conventions set out basic principles and rights at work in regard to gender equality	The principles and rights set out in these Conventions are generally adopted in the Constitution of Tanzania and labor laws and regulations
	ILO Discrimination (Employment and Occupation) Convention 1958 (No. 111)		
	United Nations Convention on the Elimination of all Forms of Discrimination Against		

Issue	Convention	Summary	How applied in Tanzania
	Women		
	ILO Worst Forms of Child Labour Convention, 1999 (No. 182)		
	ILO Child Rights and Working Conditions Convention No. 90		
	ILO Forced Labour Convention, 1930 (no. 29)		
	ILO Abolition of Forced Labour Convention, 1957 (No. 105)		
Labour Rights	ILO Right to Organize and Collective Bargaining Convention, 1949 (No. 98)	These conventions set out basic principles and rights at work in regard to representation	
	ILO Freedom of Association and Protection of the Right to Organize Convention, 1948 (no. 87)*[4]		
Occupational Health and Safety	ILO Occupational Safety and Health Convention, 1981 (No. 155)	These conventions set out basic principles and rights at work in regard to workplace health and safety management	

3.2.5 World Bank Group Operational Policies

The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These

[4] Kenya has not ratified the Freedom of Association and Protection of the Right to Organize Convention, 1948 (no.87).

policies provide guidelines for bank and borrower staffs in the identification, preparation, and implementation of programs and projects.

For the proposed transmission line project, the following Operational Policies will be applicable:

- OP 4.01 - Environment Assessment;
- OP 4.04 – Natural Habitats;
- OP 4.11 - Physical Cultural Resources;
- OP 4.12 - Involuntary Resettlement;

The applicability of the four policies above to the proposed project, are described below.

3.2.5.1 OP 4.01 - Environment Assessment

Operational Policy 4.01 Environmental Assessment 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 ESIA. These categories are presented in Table 3-3.

Table 3-3 : Categories for Environmental Assessment

Category	Requirement
A	A full (comprehensive) EIA is normally required as the project may have significant adverse impacts that may be sensitive, irreversible and diverse. These are mainly new construction projects
B	More limited environmental analysis is appropriate, as the project may have specific environmental impacts and mitigation measures can be more easily designed. Projects under this category entails rehabilitation, maintenance or rehabilitation rather than new construction
C	Environmental analysis is normally unnecessary. Projects focus on education, family planning, health and human resources development

The World Bank Environmental and Social Safeguards Policies classified the proposed project as environmental and social category A project i.e. likely to generate detrimental and site specific environmental and social impacts that can be minimized by the application of mitigation measures. This is due to the fact that the transmission line project will have both positive and adverse impacts on the bio-physical and human environment, some of which could be irreversible.

3.2.5.2 OP 4.04 Natural Habitats

Operational Policy 4.04 aims at protecting natural habitats and their biodiversity and ensuring sustainability of services and products that natural habitats supply to human societies. In principle, the World Bank refuses to finance what may be perceived as causing significant damages to Critical Natural Habitat (CNH). It seeks as much as possible to avoid financing, through projects, conversions or degradations of natural habitats (non-critical), or at least without reconsidering the project even in its size or its extension, or without putting in place acceptable mitigation measures, such as

establishing a protected area or strengthening effective protection of CNHs. Should the project involve the significant conversion or degradation of natural habitats that are not considered as critical, and if there is no alternative solution for the project and its location, and if the complete analysis clearly shows that the project's overall benefits are significantly higher than the environmental costs, then the WB can finance the project on condition that it includes appropriate mitigation measures and offsets.

The World Bank defines natural habitats as land or water zones where biological communities sheltered by ecosystems are in majority made of indigenous plant and animal species, and where human activity did not fundamentally modify the zone's main ecological functions.

CNHs are defined as:-

- Existing protected areas and areas officially proposed by governments to be classified among protected areas, e.g. reserves that meet the criteria of the International Union for Conservation of Nature (IUCN) classifications;
- Areas traditionally recognized as protected by traditional local communities;
- Sites maintaining vital conditions for the viability of such protected areas.

For the proposed transmission line project from Mbeya – Tunduma – Sumbawanga and segment of TL from Tunduma S/S to TanZam border, the zones that are considered CNHs in the project area are by O.P. 4.04 definition, the existing national parks, forest reserves, game reserves, wildlife corridors, dispersal areas and migratory routes some of which are crossed by the transmission line need some analysis to determine whether or not they are CNH.

3.2.5.3 OP4.11 - Physical Cultural Resources

This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

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

This policy is is triggered as there could be physical cultural resources along the proposed transmission line such as shrines, graves, and other tangible and intangible resources that may require relocation. Mitigation measures for potential impacts on graves will be described in the resettlement instruments including the Resettlement Policy Framework (RPF) and the Resettlement Action Plan (RAP). If other physical cultural resources are discovered in the wayleave, management procedures in OP 4.11 will apply.

3.2.5.4 OP 4.12 - Involuntary Resettlement

Regarding resettlement, the Bank guidelines prescribe measures to minimize the negative impacts and ensure that the displaced community (ies) benefit(s) from the project. The Policy requires that displaced persons should be:

- Compensated for their losses at full replacement cost prior to the actual move. Full replacement cost for agricultural land will include the total sum of (i) pre-project or pre-displacement, whichever is higher market value of land of equal productive potential or use located in the vicinity of the affected land, (ii) the cost of preparing the land to levels similar to those of the affected land, and (iii) the cost of any registration and transfer taxes. For houses and other structures, it is the market cost of the materials to build a replacement structure with an area and quality similar to or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor;
- and contractors' fees, plus the cost of any registration and transfer taxes ;
- Assisted with the move and supported during the transition period in the resettlement site;
- Assisted in their effort to improve their former living standards, income earning capacity, and production levels, or at least restore them
- Integrated socially and economically in to host communities so that adverse impacts on host communities are minimized. The best way of archiving this integration is for resettlement to be planned through consultation involving affected people and future hosts and affected people

In accordance with the World Bank Policy and for purposes of the proposed transmission line project, displaced persons are defined as those who:

a) Have formal legal rights to the land they occupy (including customary and traditional rights recognized under the laws of Tanzania); or

b) Do not have formal legal rights to land at the time the census begins but have a claim to such land or assets provided that such claims are recognized under the laws of Tanzania or become recognized through a process identified in the resettlement plan or;

c) Have no recognizable legal right or claim to the land they are occupying.

Additionally, land, housing, infrastructure, and other compensation may be provided to the adversely affected population including vulnerable groups. The absence of legal title to land by such groups will not be a bar to compensation.

This Policy is triggered by the transmission line project as communities (project affected persons) living along the proposed 52m wide Right-of-Way (ROW) shall be relocated from the project area. A Resettlement Action Plan (RAP) will be required to be developed and implemented for the proposed transmission line project and will incorporate the requirements of this World bank Policy.

4 Baseline environmental and social conditions

4.1 Baseline characterization

Existing environmental and social data was gathered from the following sources:

1. Secondary literature review;
2. The original ESIA Study of the proposed Mbeya-Tunduma-Sumbawanga transmission line study undertaken by TANESCO;
3. Site visit carried out by KTL during the period November 12 – 18, 2017.

Based on a synthesis of the above sources of information, given in the sub-sections below is the environmental and social baseline along the proposed route of the 400kV transmission line between Mbeya and Sumbawanga and segment of TL from Tunduma S/S to TanZam border.

4.2 Climate

The proposed project falls within three regions of Tanzania namely Mbeya, Songwe and Rukwa. Songwe is a new region that was carved out of the larger Mbeya region in 2016.

The climate of Mbeya Region (which includes Songwe region) is greatly influenced by physiography and altitude. The climate is generally tropical with marked seasonal and altitudinal temperature variations and sharply defined dry and rainy seasons. Temperature averages range between 16^0C in the highlands and 25^0C in the lowland areas.

The Region enjoys abundant and reliable rainfall. Annual rainfall varies from 650 mm in Usangu plains and Chunya to 2600 mm on the Northern shores of Lake Nyasa and in the highlands. The rains normally start in October and go through to May followed by a dry and cold spell between June and September

Rukwa region falls within the southern highland zone of Tanzania whose climate is greatly influenced by its diverse physiographic features and highly variable topography. The region is characterized by tropical wet climate with mean annual rainfall ranging from about 650 mm in the south to as high as 2,500 mm in the Ufipa highlands. The region experiences one rainy season with most rainfall occurring during November to April. The months of June to September receive virtually no rain.

Temperatures vary according to altitude but generally range from about 12^0C in the highlands to about 30^0C in the lowland areas. Seasonally, temperatures are high during September to December, cool during June and July, and fairly warm for the rest of the year.

4.3 Landscape and topography

The Mbeya to Tunduma to Sumbawanga Electric Power Transmission Line and Tunduma S/S to TanZam border landscape is characterized by different forms of landscape. Landforms common along the proposed transmission line are highlands and low hills, with most sections described as plains, open areas and some sections as low hill areas with relatively large undulations.

Mbeya region is located in the southwestern corner of the Southern Highlands of Tanzania. It is bounded by latitudes 31^0 58′ 18″E and 35^0 0′ 2″E, and, longitudes 6^0 54′ 20″S and 9^0 42′ 42″S as shown in Figure 4-1.

Figure 4-1: Image showing the extent of Mbeya region

The altitude of the region varies between 475 m above sea level in the south-east (on the shores of Lake Nyasa) and sprawls through a narrow highland valley surrounded by a bowl of high mountains with high peaks of 2981 m above sea level (masl) at Mt. Rungwe located about 32km south-east of Mbeya city.

Rukwa region is located in the southwestern part of Tanzania between latitudes 29^0 57′ 29″E and 32^0 44′ 40″E, and, 5^0 10′ 57″S and 9^0 4′ 34″S as shown in Figure 4-2.

Figure 4-2: Image showing extent of Rukwa region

The region lies within the Great Rift Valley i.e. the western branch of the East African Rift Valley. To the north, a large almost flat surface (Inyonga Plain) dominates while the area from Mpanda towards the northwest to the boundary with Kigoma district is dominated by an undulating plateau at 1100 – 1500 masl with isolated hills and small escarpments. In the west and southwest the undulating landscape slopes gently to the west before falling sharply off towards Lake Tanganyika. The Ufipa Plateau forms the central and southern part of the region, while the eastern part is dominated by the Rukwa Valley. Elevations in the region vary from 800 m at Lake Tanganyika to 2400 m in the Mbizi Hills.

The transmission line crosses a number of small rivers, some of which are parallel to the proposed route. The tower location will keep certain safety distance from small rivers. Additionally, the transmission line crosses 4 wetland (swamp) areas which are about 24 km and 27 km southeast of Sumbawanga substation and about 4 km and 7 km northeast of Mushani village. The first wetland (swamp) has a total length of 0.5 km while others have a total length of 1 km. One span crossing of the transmission line on these areas is taken into consideration where feasible.

4.4 Soils and Geology

Soils in most arable areas in Mbeya are commonly of moderate fertility, coarse or medium textured and varying from sandy loams, alluvial solids to cracking rocks. As with the great variation in physiography and climate, so there is much diversity in the geologyand soils type of the region. Crystalline and mainly fersic gneiss and granite rocks predominate in much of the Region, these are covered with thick layers of volcanic and alkali basalt. Limestone lacustrine rocks form the base in much of Kyela and Usangu plains. In main arable areas, soils are most commonly of moderate fertility, coarse of medium texture and varying from sandy loams, alluvial soils to cracking clays.

A vast majority of the area covered by Rukwa region contains leached, tropical ferralitic soils. These soils constitute probably more than 85 percent of all arable soils in the region. The soils are characterized by having a low inherent fertility, being moderately to strongly acidic, having moderate content of available plant nutrients and a fairly low water holding capacity. Careful management of them is necessary and urgently needed in order to retain and improve their long term fertility level and sustain crop production in the long run. Management practices such as fallowing, intercropping with leguminous crop and rotation are recommended agronomic practices. Also agroforestry practices are recommended which may also solve partly the fuel wood problem on the Ufipa plateau.

4.5 Drainage system

The proposed transmission line project from Mbeya to Tunduma to Sumbawanga and Tunduma S/S to TanZam border lies within the Lake Rukwa drainage basin. The Lake Rukwa Basin is an internal drainage basin located in the south-western part of Tanzania (Figure 4-3). The basin lies within the Rift Valley with Lake Tanganyika on the northwest and Lake Malawi (Nyasa) to the southwest. It covers an area of about 88,000 km^2 extending over parts of the following districts: Mbozi, Chunya, Momba, Mbeya Rural, and Mbeya Urban in Mbeya region; Nkasi, Sumbawanga Rural, Kalambo, and Sumbawanga Urban in Rukwa region; and Mpanda Rural, Mpanda Urban, and Mlele in Katavi region. The major urban center is the City of Mbeya with a population of about 385,279 (2012 National Census). Other urban centers include regional and district headquarters and smaller towns such as Tunduma, Mbalizi, Laela, and Vwawa.

[5]Figure 4-3: Main drainage basins in Tanzania

4.5.1 Hydrologic features

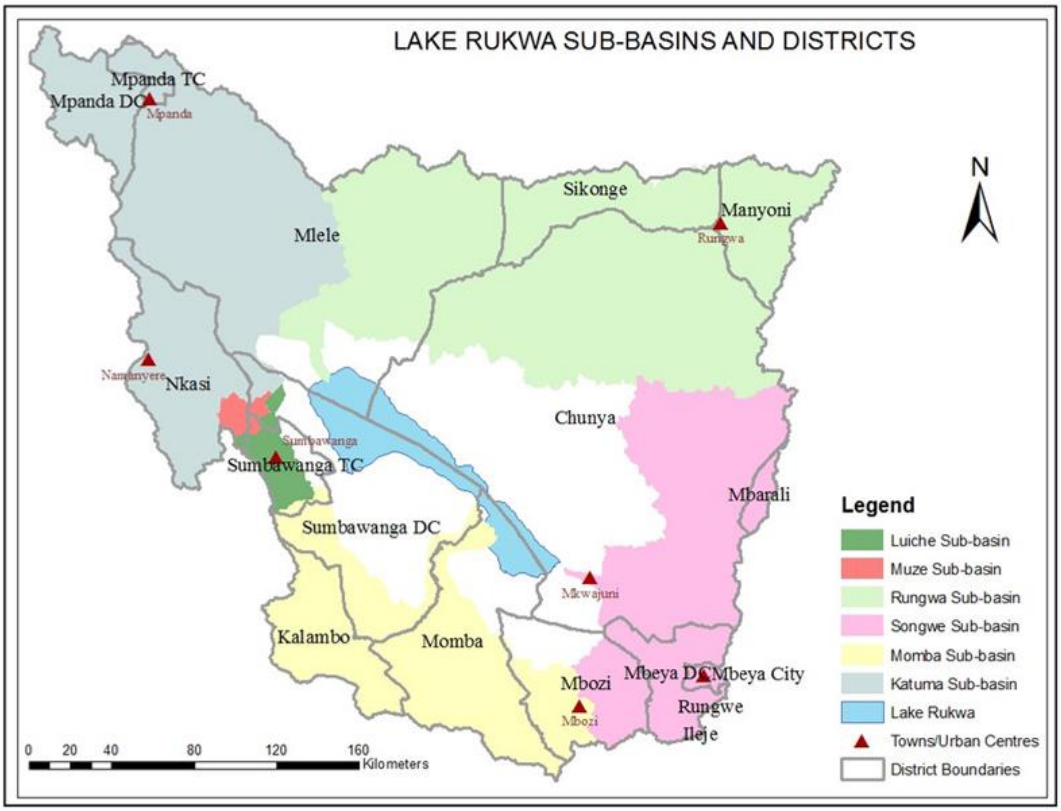
The basin hydrology is characterized by an extensive network of seasonal and perennial rivers that feed and drain several small lakes and large expanses of swamps and wetland systems before discharging into Lake Rukwa. The complex hydrological system enables the basin to support its vast and unique terrestrial and aquatic ecosystems and a great diversity of plant and animal species, many of them endemic to the basin.

4.5.1.1 Lake Rukwa Sub-basins

The Lake Rukwa basin can be sub-divided into five major sub-basins as shown in Figure 4-4 and include Katuma, Songwe, Momba, Rungwa, Luiche, and Muze. A brief description of the hydrology of the individual sub-basins is given below.

[5] Source: Ministry of Water (2010)

[6]Figure 4-4: Sub-basins of Lake Rukwa and districts



The proposed transmission line project traverses the sub-basins of Songwe, Momba and Luiche. A description of each of these sub-basins is given below.

Songwe sub-basin

Songwe sub-basin forms the eastern part of Lake Rukwa basin and extends over an area of about 10,800 km2 covering parts of Chunya, Mbeya DC, Mbeya Urban, Mbozi, Mbarali, and Rungwe districts. It is drained by three major rivers: River Lupa originating from the eastern plateau and draining the northern and central parts of the sub-basin; and Rivers Songwe and Zira which originate from the Poroto Mountains and drain the southern part of the sub-basin. The rivers flow through the gold mine zone, traversing extensive flat low lands and merge before finally discharging into the southern basin of Lake Rukwa. The sub-basin population is about 843,278 (2012 National Census), 40% of whom live in Mbeya City and the surrounding peri-urban areas. The sub-basin forms part of the southern highland zone of Tanzania mostly characterized by a tropical climate.

[6] Source: Lake Rukwa Basin Integrated Water Resources Management and Development Plan, Basin Plan, Final Report: Volume I, WREM International Inc. Atlanta, Georgia, USA, April 2016

Momba sub-basin

Momba sub-basin occupies the southwestern part of Lake Rukwa Basin and extends over an area of about 9,750 km2 covering parts of Sumbawanga DC, Momba, Kalambo, and Mbozi districts. It is drained by four main rivers, Momba, Mtembwa, Saesi, and Nkana. River Mtembwa originates from the Ufipa plateau and drains the northwestern part of the sub-basin. It flows southwards through several vast swamps where it is joined by other smaller rivers before discharging into the Iyunga Samyva swamp. The river then exits the swamp and flows southeastwards before joining River Saesi which originates from the Nthumbe Hills. River Saesi drains the western part of the sub-basin and discharges into Tesa swamp where it is joined by several smaller rivers that drain the southern part of the sub-basin. From the swamp, Saesi River flows northeastwards, is joined by rivers Kipanda and Matonto (originating from Izombo plateau), and crosses the Lyambalyamfipa escarpment into the Rukwa Valley. In the valley, Saesi River is joined by Nkana River to form the Momba River. River Nkana originates from the southern highlands in Mbozi District and drains the southeastern part of the sub-basin. It is fed by several rivers including Mpemba and Mko from the Chingambo Ranges. Momba River flows northeastwards across the Rukwa Valley and finally flows into the western shores of Lake Rukwa.

A small portion of the Momba River watershed (in the southwest) extends into Zambia. Thus, Momba is a transboundary (shared) river, and its integrated planning and management requires the development of mutually agreed upon plans with Zambia.

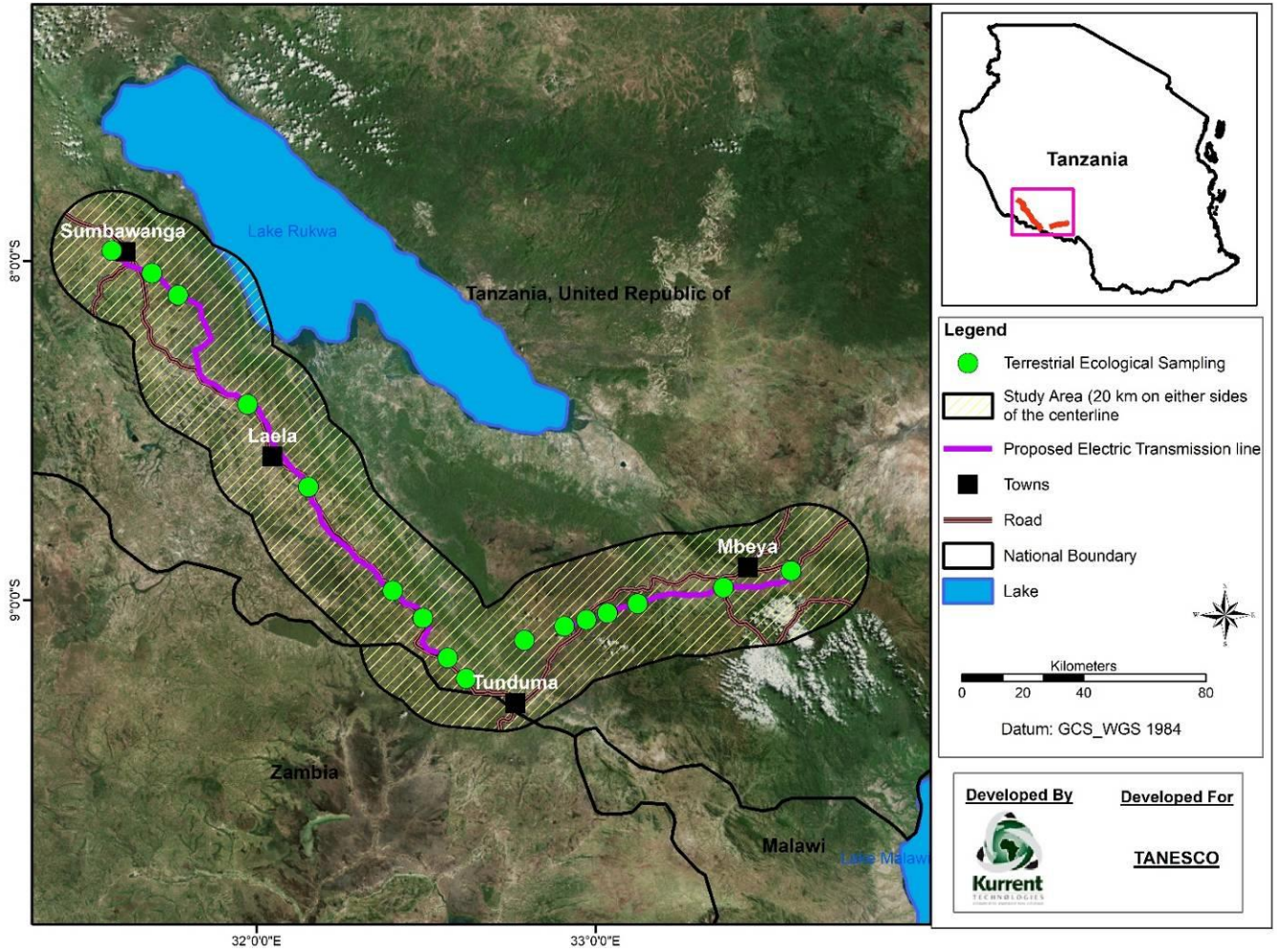
Luiche sub-basin

Luiche is one of the two smallest sub-basins in Lake Rukwa basin covering an area of only 913 km2. The sub-basin covers parts of Sumbawanga MC, Sumbawanga DC, and Nkasi districts. It is drained by River Luiche, which originates from the southern part of the Ufipa Plateau and traverses a vast expanse of swamps before grooving its way through the Lyambalyamufipa escarpment into the Rukwa Valley and finally emptying into swamps on the northwestern shores of Lake Rukwa. The main Luiche tributaries include, among others, River Nantula draining the eastern part of the sub basin, River Lukangau draining the western part, and Rivers Pande and Matusha draining the northwestern part.

4.6 Ecological baseline

The biodiversity baseline was prepared using a combination of primary and secondary data sources gotten from Tanzania. In addition to published and unpublished data, consultation was held with regional experts to gather their input and knowledge of the study area, identify additional data sources, and to gain expert opinions and advice. Primary data sources included land cover mapping and classification along the transmission line route and a limited field programme. The field sampling programme ran from November 13 – 18, 2017, and covered vegetation and flora, herpetofauna, birds and mammals. Figure 4-5 shows the locations of the surveys carried out by the ecological team (terrestrial ecologist, ornithologist and bat specialist) during this period.

Figure 4-5: Locations of ecological observation points along the proposed transmission line



4.6.1 Terrestrial ecology

During the field survey of the proposed transmission line route, minimal wildlife was observed. According to the consultations with local villagers, the surrounding areas of the project do not have wildlife. Commonly seen wildlife in the area includes monkeys and squirrels. Amphibians such as frogs, reptiles (mainly snakes) are common in some parts and there are varieties of birds supported within the forest with patches of vegetation cover.

This covers also the segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border which is within Momba District, Songwe region with same terrestrial ecology as TL from Tunduma S/S to Sumbawanga due to the nature of the vegetation cover. The detailed information will be provided after final design is complete.

4.6.1.1 Methodology for terrestrial ecology baseline survey

The methodology used for collection of information for the baseline terrestrial ecology is outlined below. Sources of information for collecting baseline terrestrial ecology information included secondary literature review and a field survey conducted on November 12 – 18, 2017. Generally, the data collection effort focused on a width of about 1km (500m on either side of the centre line of the transmission line).

The field biodiversity study was conducted to establish baseline information or the current status of biodiversity in the areas proposed power passes. Taxa that were focused on included the flora (all life forms) and fauna (especially mammals and reptiles). Site characterization was considered to ascertain landscape diversity. The potential impacts of the proposed project activities were described in relation to biodiversity issues.

Plant survey

The plot-less method developed by [7]Hall and Swaine (1981) was employed in assessment of plant species. This method was used to study the vegetation types and the plant diversity within the project site and adjacent areas. Random walks were made into various habitat types that are likely to face extreme negative impact such as clearing of vegetation for construction of the Electric Power Transmission Line. Any form of vegetation disturbance such as burning and grazing were noted. Species recorded were evaluated against the IUCN red list of threatened species

Reptiles & Amphibians Richness

A Visual Encounter Survey ([8]Heyer *et. al.*, 1994) protocol was used for for surveying reptiles and amphibians. Systematic searches were carried out within the area by a team of two people walking at a speed of 1 km/hr. To supplement the search efforts, night sampling was also carried out mainly targeted at amphibians and other nocturnal herpetofauna. Verbal communication with local residents was conducted to know whether they had seen any snakes and other reptiles. For each animal observed, identity was recorded, the number of individuals counted and habitat noted. Where no observation

[7] Hall, J. B. and M. D. Swaine. 1981. Distribution and Ecology of Vascular Plants in a Tropical Rain Forest: Forest Vegetation in Ghana. Geobotany 1. Junk, The Hague

[8] HEYER, W.R., DONNELLY, M.A., MCDIARMID, R.W., HAYEK, L.C. & FOSTER, M.S. 1994. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution Press, Washington, DC: 364 pp.

was made on the ground, online biodiversity database such as GBIF were used to account for the distribution of the organism.

Mammals Survey

Physical observation was used to record mammal species. Proxies such as droppings (scat) in the landscape were used for identification of species where mammals were not observed; this involved walking along established transects across the area. Verbal accounts on existence of the mammal species were sought from the locals living along the proposed transmission line. Where no observation was made on the ground, online biodiversity databases such as GBIF were used to account for the distribution of the organism.

Critical habitat assessment

A critical habitat assessment was undertaken as part of the Ecological Impact Assessment associated with the proposed transmission line route. This assessment was undertaken in accordance with the requirement requirements of the Bank's OP 4.04 and the definitions of Critical Natural Habitat provided in Annex A. Additionally, the requirements of the International Finance Corporation (IFC) Performance Standard 6 titled Biodiversity Conservation and Sustainable Management of Living Natural Resources, January 2012 were reviewed in undertaking this assessment.

Identification of critical habitat in the project area adopted an approach by [9]Stefan et al., (2013). Critical habitats was identified using fieldwork data and desktop information on areas. Field data were collected based on the biodiversity taxa plants, mammals, reptiles and amphibians in both terrestrial and aquatic habitats. This provided information on the taxa distribution and habitat associations (Stefan et al., 2013).

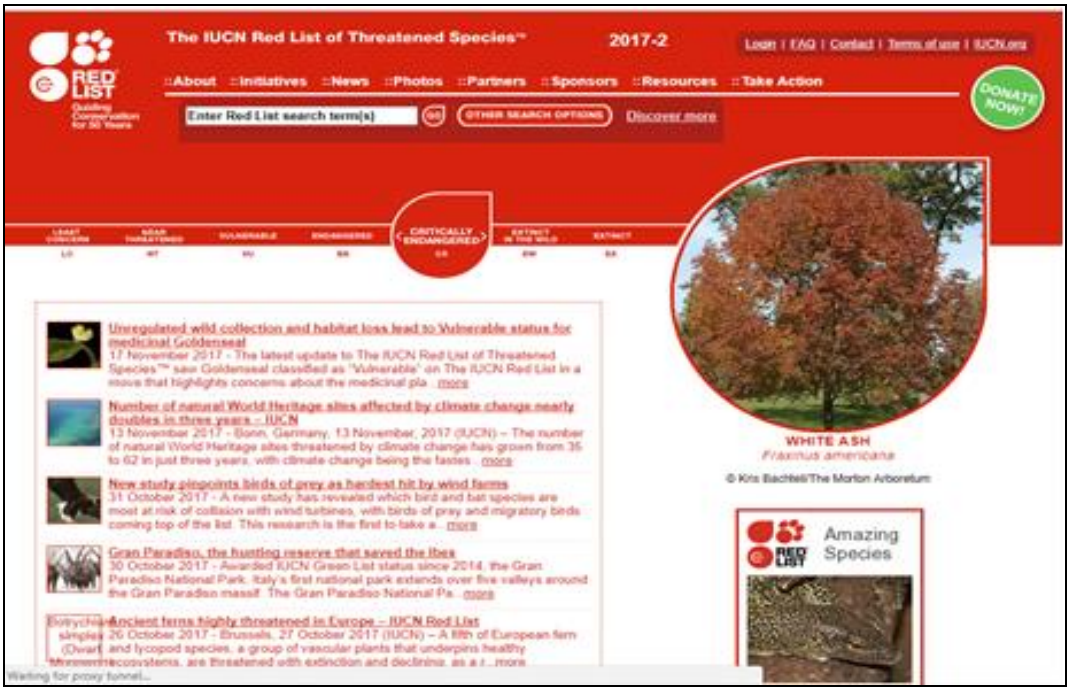
Consultation with the local informants was carried out to understand the biodiversity value present in the vicinity of the project areas and identifying existing conservation concerns. Critical habitat was identified using spatial unit of analysis (Critical habitat Area of Analysis (CHAA) and Discrete Management Unit). This was achieved through screening biodiversity features (i.e. at the species, ecosystem and landscape scales), and evaluating the distributions of CH (Stefan et al., 2013).

Determination of Conservation Status of Species

Only species that were sighted within the project spatial scope were scrutinized against the IUCN Red list of threatened species. The search engine for the IUCN Red list of threatened species 2017 (Figure 4-6) was used to determine conservation status of the species. There are different categories of conservation status of species and are described in the IUCN red list data. These categories include Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Lower Risk, Data Deficient and Not Evaluated. Names of species were entered in the IUCN Red list search engine for verification. Conservation statuses are indicated for each species in biodiversity section below.

[9] Stefan, C.I., C. Robichaud, K. Knopff, D. Nielsen, C. Carveth, D. Melton and R. Novy. 2013. Critical Habitat Assessment Using IFC PS6 Criteria. Presented at IAIA13, the 33rd Annual IAIA Conference, 13-16 May 2013 in Calgary, Alberta, Canada

Figure 4-6: Query on IUCN Red List of Threatened Species 2017



4.6.1.2 Major land use along the ROW

There are two major types of land uses observed along the ROW between Mbeya and Sumbawanga namely, **Miombo woodland** and **cropland**. The Miombo woodland landscape is predominated by plants consisting of *Brachystegia* species that are widespread over the proposed project line. There are areas with a well formed Miombo woodland while some area appear to have been invaded which leaves the landscape with scattered trees and short tree forms.

Cropland along the proposed powerline has two distinct formations namely the **open cropland** and **agroforestry** system. Open cropland is characterized by widely open cultivated areas with very few remnants of Miombo woodland tree species. Crop varieties mainly consist of maize and other annual crop varieties. The agroforestry system takes the form of pure fruit tree orchard and a mixture of this and annual crop varieties interspaced in between.

Wetlands and drainage systems constitute the swamps and river/stream passage areas. The swampy areas are predominated by *Cyperus exaltatus* with the edge of wetlands invaded for agriculture and grazing activities. The riverine area consist of large trees especially *Ficus* species and *Phragmites*; while others has *sSporobolus* species.

Woodlots are basically tree plantations established for commercial gains. These mainly consist of Eucalyptus species (*E. saligna, E. maculata*). Figure 4-7 to Figure 4-12 are images of the types of land uses currently found along the proposed transmission line route between Mbeya and Sumbawanga.

Figure 4-7: Miombo woodland predominated by *Brachestygia* species

Figure 4-8: Typical agroforestry system with mango and orange fruit trees

Figure 4-9: Cultivated Wetland near the transmission line

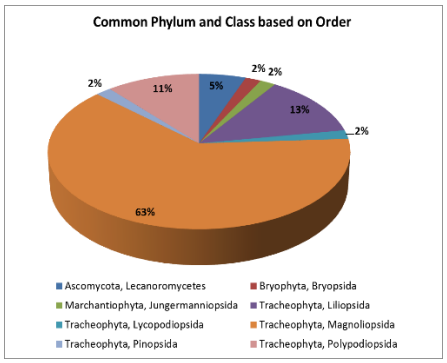
Figure 4-10: Dam reservoir near the transmission line

Figure 4-11: Woodlot with Eucalyptus species

Figure 4-12: Open cropland prepared for new season planting

4.6.1.3 Floral diversity

The plant taxa 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 phyla 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 higher 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.



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 speciformis* observed along the electrical power transmission line. This species was observed in over 95% of the sites visited along the proposed transmission line. Images of the species are shown in Figure 4-13 to Figure 4-16.

Figure 4-13: *Uapaca sp.*.

Figure 4-14: *Brachystegia speciformis*

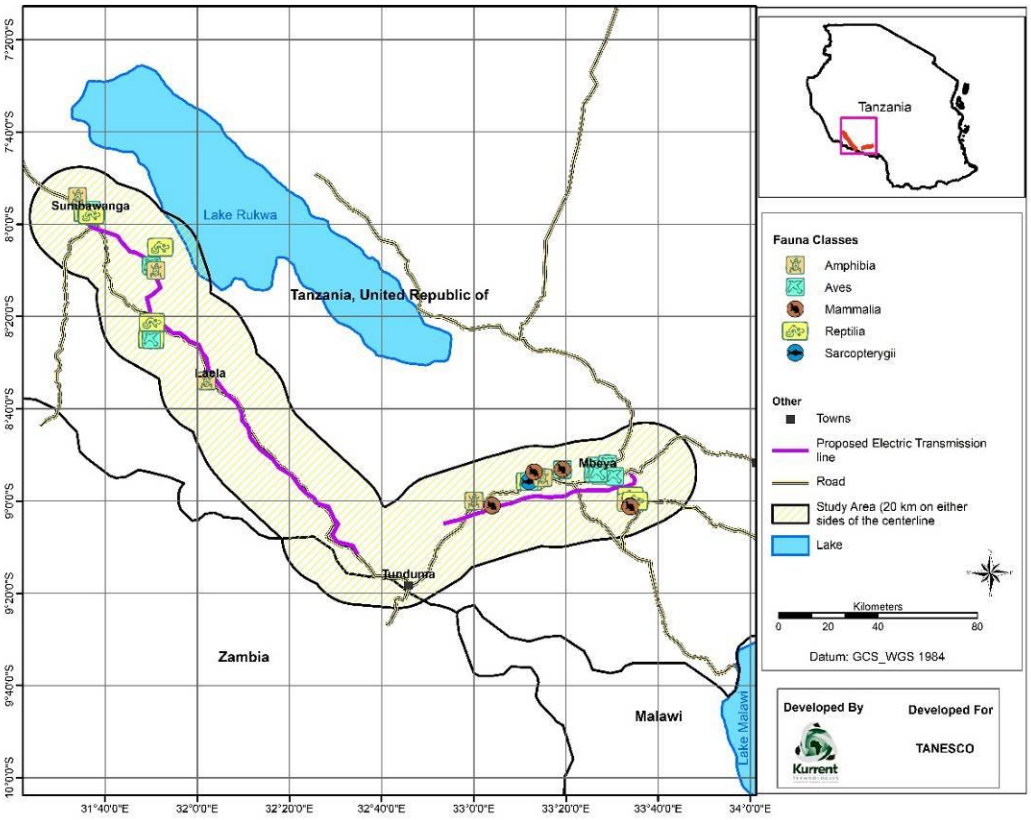
Figure 4-15: *Bridelia micrantha*

Figure 4-16: *Brachystegia boehmii*

4.6.1.4 Fauna diversity

The most common fauna class along the proposed electric power transmission line is birds (Aves) which constitute 52% of observations frequency. The insect group constitute 26%; while mammals and amphibians constitute 8% and 7%, respectively. Reptiles only form 3% of the taxa class observation. The group of mammals, reptiles and amphibians, are further described under taxa categories. Figure 4-17 shows the fauna distribution along the proposed transmission line project.

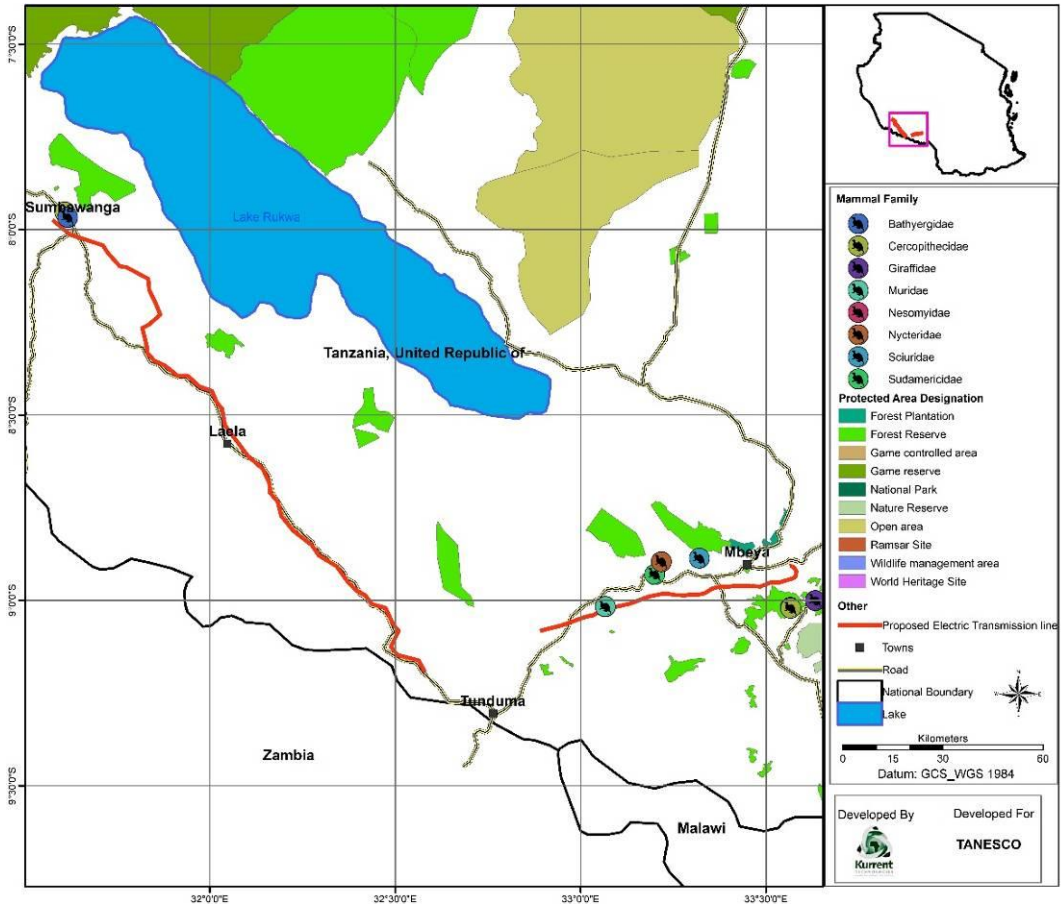
Figure 4-17: Fauna diversity along the transmission line project



4.6.1.5 Mammals

There are about seven taxon orders of mammal occurring along the proposed transmission from Iringa to Mbeya, Tunduma and to Sumbawanga line. The orders *Rodentia* and *Chiroptera* had more taxa Families frequently recorded along the proposed project line. Rodentia and Chiroptera each form 29% frequency of occurrence along the proposed transmission line. The frequency of occurrence for Carnivora and Primates is estimated at 12% each; while Artidactyla, Macroscelidea and Proboscidea, each constitute 6% frequency of occurrence. Rodentia group apparently has the highest taxa family, genus and species along the proposed transmission line. A total of 30 species of mammals have been recorded along the proposed transmission line within 10 km buffer; half of this species are represented by Rodent group. The distribution of mammals along the proposed transmission line corridor is shown in Figure 4-18.

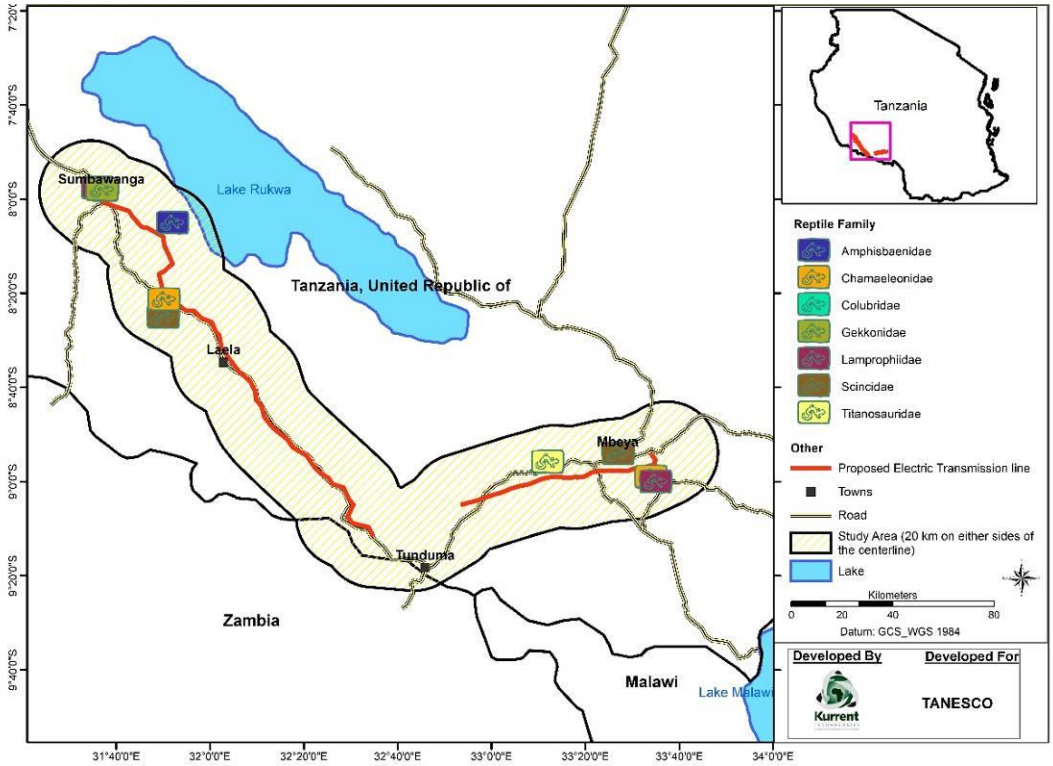
Figure 4-18: Mammal distribution along the proposed transmission line



4.6.1.6 Reptiles

The most common reptile family along the proposed electric power transmission is Lamrophiidae (snakes), which constitute 30% frequency of record along the transmission line. This family has five genera, each having one species record from the transmission line. This group is followed by the reptile family Chamaeleonidae (Chameleons) forming 22% of the observation. Chamaeleonidae only has three genera record along the proposed transmission line with an average record of one species in each genus. Colubridae (snakes) forms about 19% of record observation along the proposed transmission line. Other reptile families only form less than 2% of record observation along the proposed transmission line. The distribution of reptiles along the proposed transmission line is shown in Figure 4-19.

Figure 4-19: Reptile distribution along the proposed transmission line



4.6.1.7 Protected areas

There are about 145 Protected Areas (PA) in Tanzania. The PA are categorized as National Park, Game Reserve, Game Control Area, Wildlife Management Area, Forest Reserve, Nature Reserve, Ramsar Site and World Heritage Site. A number of the PA occur near the proposed transmission line and within a 10 km buffer there are Forest Reserves (15) and Forest Plantations (3).

Forest Reserves are considered by IUCN to be PA category IV which aim at protecting a particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats. The position of these PA with the proposed Mbeya-Sumbawanga transmission line varies with a range distance of 0.8 – 267 km.

In 2012, a new species of squeaker frog (*Arthroleptis*) was described from the Poroto Mountains. However, this species is currently considered of Least Concern according to the IUCN red list of threatened species. Poroto Ridge Reserve and other PA are potential areas for new species discovery.

Table 4-1: Protected areas found in the vicinity of the proposed transmission line

IUCN category	Designation	Name of Protected Area
Ib	Forest Reserve	Mufindi Scarp
II	National Park	Katavi National Park, Ruaha National Park, Kitulo Plateau National Park

IUCN category	Designation	Name of Protected Area
IV	Forest Reserve	Dabaga New, Image, Kigogo, Kisinga Lugaro,
	Game reserve	Kizigo G.R. (C), Rungwa River G.C.A., Selous G.R, Lake Rukwa G.R, Mlele G.C.A.(S), Muhesi G.R (W), Piti O.A.(E), Rungwa Mwamagembe G.R.
Not Applicable	World Heritage Site	Selous Game Reserve
Not Reported	Forest Plantation	Kawetire, Kawetire Ipinda range, Kawetire Karuwe range, Kawetire Mbeya peak range, Kiwira, Sao Hill extension, Wino
	Nature Reserve	Kilombero, Rungwe
	Forest Reserve	Bulongwa Madehani, Chimala Scarp, Chumwa Range, Chuvwi, Dodoma Reservoir, Fonera, Gulosilo, Gumbiro, Hupanga, Idamba, Idewa, Iditima, Idunda, Igoma Logala, Ihoho, Ikonde, Ilamba, Ilonganjaula, renga, Iringa, Irunda, Irunga, Irungu, Isalala, Isililo, Itulu Hill, Ivuna North, Ivuna South, Iyonda, Kalambo River, Kalangai, Kibao, Kihanga, Kilombero, Kipembawe, Kipengere Range, Kiranzi Kitunguu, Kitapilimwa, Kitweli, Kyejo, Kyosa, Litoni, Livingstone, Long'isont, Lukwati, Lupa North, Lyambo Hill, Madenge, Mafifi, Mamboto, Maposeni, Masagati, Masukulu, Matembwe, Matogoro East, Matogoro West, Mayefiya, Mbeya fuel, Mbeya Range, Mdando, Mfulikilo, Mgololo, Mkewe, Mninga, Mpala, Mpanda North East, Mpara, Mpembampazi, Mswima, Muipa, Mulele Hills, Musiora, Ndugumia, Ndukunduku, Ndumbi Valley, Ngalijembe, Nguluka, Ngwasi, Njilikwa, Ntazu, Nyahua Mbuga, Nyonga, Poroto Ridge, Rukwa, Sakaranyumo, Sao Hill, Sasajila, Sawago, Silupati, Songea Fuel, Ugalla River, Ugunda, Umalila
	Open area	Chunya Lukawati, Chunya, Ituru Forest, Litumbandyosi, Mwantisi, Mwantisi, Piti, Ruhidji/Ifinga, Rungwa (N)
	Ramsar Site	Kilombero Valley Floodplain, Malagarasi-Muyovozi Wetlands
	Wildlife management area	Ipole, Mbarang'andu , Pawaga-Idodi
VI	Game controlled area	Mlele, Msima, Inyonga, Kilombero, Lunda Nkwambi, Rungwa River, Wembere,

Protected Areas management categories are classified by IUCN according to their management objectives. The categories are recognized by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas. The IUCN categories listed in the Table 4-1 above are described below.

IUCN category	Designation	Definition
Ia	Strict Nature Reserve	Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.
Ib	Wilderness Area	Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
II	National Park	Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.
III	Natural Monument or Feature	Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
IV	Habitat/Species Management Area	Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.
V	Protected Landscape/ Seascape	A protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI	Protected area with sustainable use of natural	Category VI protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural

IUCN category	Designation	Definition
	resources	resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area

For the segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border none of the protected areas mentioned in table 4-1 above such as National parks, game reserves or any forest reserves found in Momba DC or Songwe Region are near the project area as shown in figure 4-21 below.

A map showing the protected areas in the vicinity of the proposed transmission line is presented in Figure 4-20.

Figure 4-20: Map showing protected area in the vicinity of the proposed transmission line

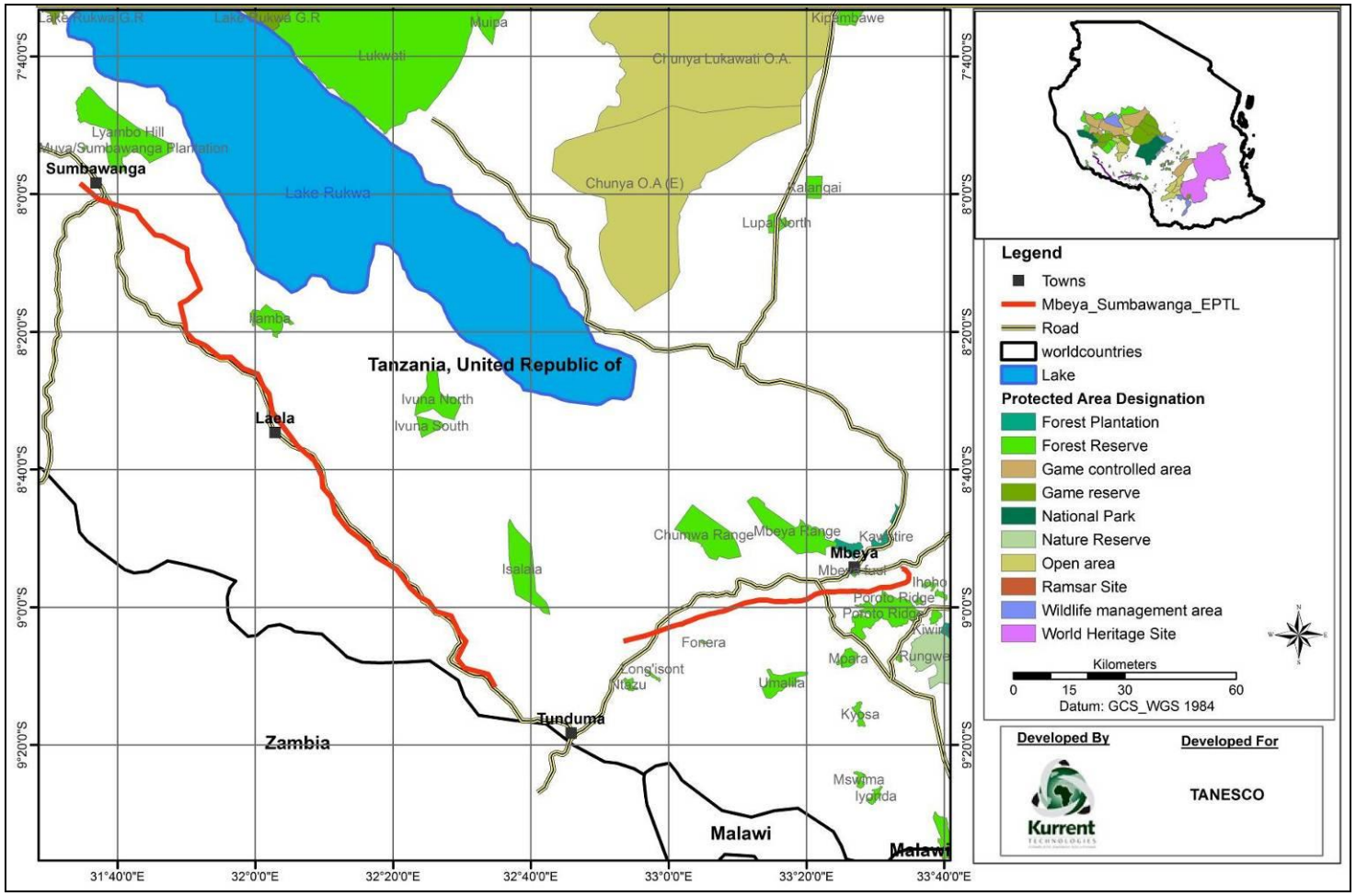
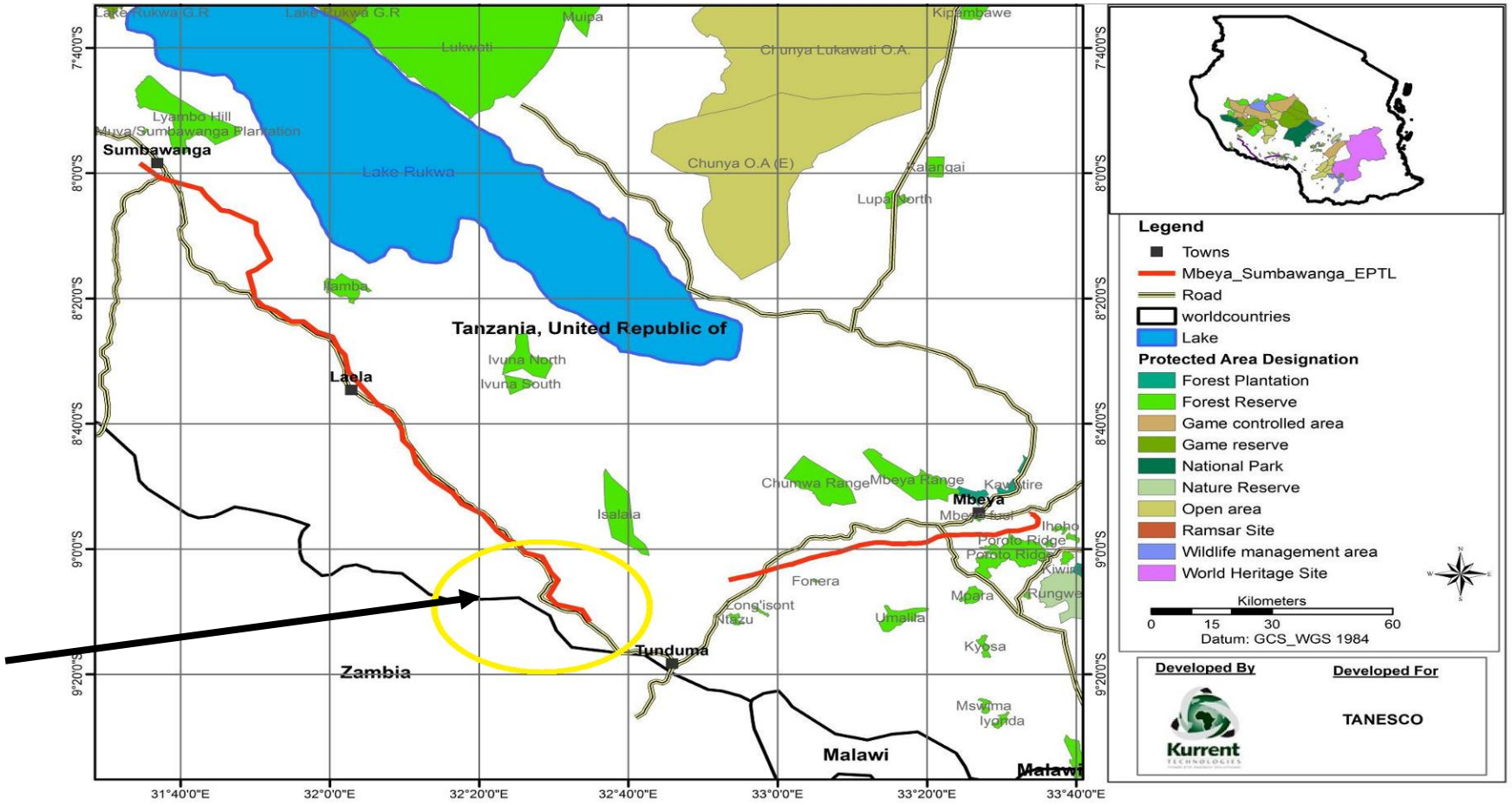


Figure 4-211: Map showing protected area in the vicinity of the proposed Tunduma S/S to TanZam border project area



4.6.1.8 Conservation status of species

These species include species enlisted under the IUCN red list of threatened species and in the Convention on International Trade in Endangered Species of wild Flora and Fauna.

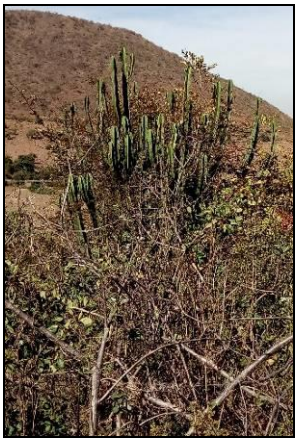
Pterocarpus angolensis (Figure 4-22) and *Osyris lanceolata* (East Africa sandalwood) (Figure 4-23) were encountered along the proposed TL within Miombo woodland. *Pterocarpus angolensis* is enlisted under IUCN red list of threatened species as Lower Risk/near threatened. Thus, according to IUCN, this species is close to qualify for vulnerable category but do not require conservation dependence.

Osyris lanceolata and *Euphorbia candelabrum* (Figure 4-24) are enlisted in CITES Appendix II on 12/06/2013 and 02/01/2017, respectively, for the following countries Burundi, Ethiopia, Kenya, Rwanda, Uganda and the United Republic of Tanzania. The species is illegally extracted and most of the plant parts are shipped to Asian countries. Trade on the species is restricted on all its parts and derivative except: seeds and pollen and finished products packaged and ready for retail

Figure 4-22: *Pterocarpus angolensis (Lower Risk/near threatened)*

Figure 4-23: *Osyris lanceolate (CITES Appendix II)*

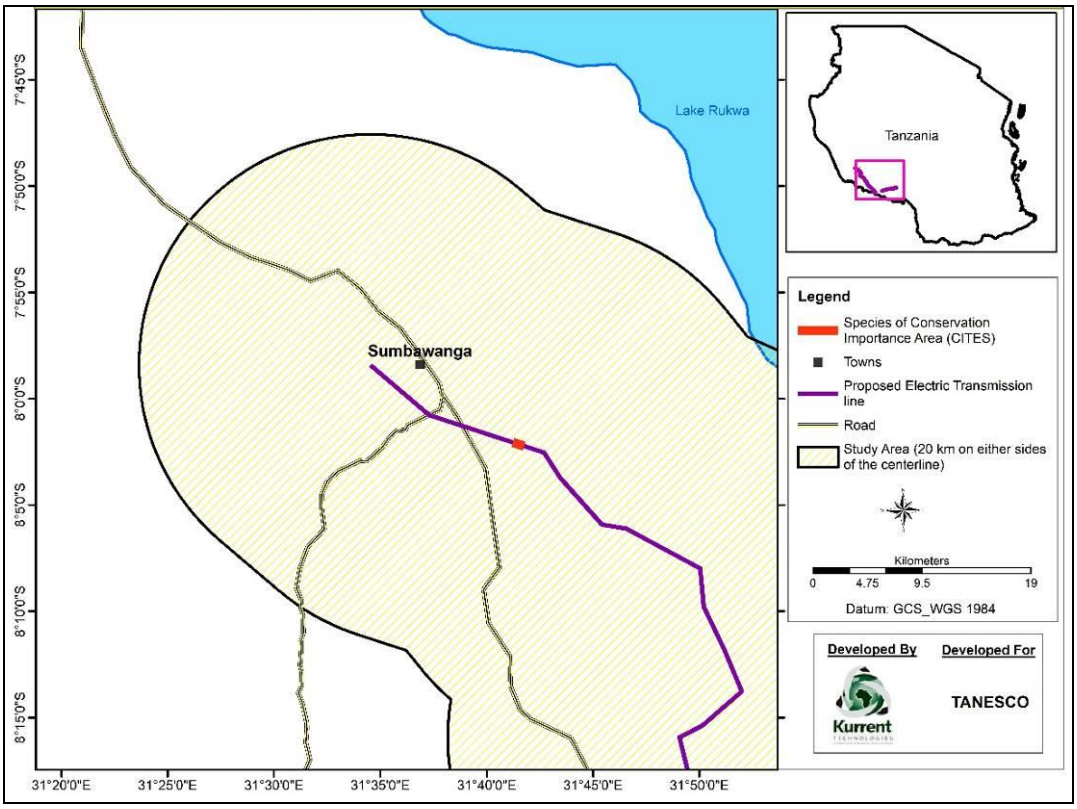
Figure 4-24: *Euphorbia candelabrum*



A map showing where the *Osyris lanceolata* and *Euphorbia candelabrum* are found along the proposed transmission line project is shown in Figure 4-25.

None of species identified in Mbeya-Sumbawanga TL are found in the segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border. The dominant species along the segment are Miombo woodland species in the genera *Brachystegia, Julbernadia* and *Isoberlinia.*

Figure 4-25: Areas where Species of Conservation Importance are found



4.6.1.9 Critical Habitat Assessment

According to the World Bank OP 4.04 (2001), Critical habitats are considered to be existing protected areas and areas known for high suitability for biodiversity conservation according to IUCN, governments and traditional local communities or sites identified. IFC which is a World Bank Group (2012) under the Performance Standard 6 and Guidance Note 6 considers high conservation values in identifying critical habitats and goes further to elaborate criteria for identifying critical habitats including acceptance of an expert opinion. The two documents jointly point out that Critical habitats (CH) require to be identified in order to establish elements of project development that will affect them and the mechanism through which these elements will cause harm on the habitats. In addition, it reduces various biodiversity elements that would be prioritized for impact assessments and proposal for mitigation measures. An understanding of critical habitat is imperative in the process of identification and rationalization of characteristics of critical habitats in a more acceptable manner. The International Finance Corporation provides a through scrutiny of various types of development projects in relationship with biodiversity and human environment.

Adoption of IFC requirements in biodiversity frameworks is important in streamlining biodiversity conservation at local levels. Relevant to this task review is the Performance Standard 6 (PS6; IFC 2012a) and the associated Guidance Note 6 (GN6; IFC 2012b) which are explored to come up with opportunities for protecting and conserving important terrestrial and aquatic biodiversity along the proposed Electric Power Transmission Project Line.

Specifically, sections in the IFC documents that cover critical habitat is given more attention in order to acquire guidance on how to handle conservation issues surrounding the habitats.

Since the requirement for review and assessment of CH is prompted by the proposed Power Transmission Line Project, one would be biased and develop a tendency to focus on the immediate environment of the project site. This does not provide for a proper ranking of habitats on a wider landscape based on their values. It is important to note that the process can be conducted without reference to the power project.

The main objective of conducting CH is to filter information from secondary and primary field data where important biodiversity exist on a wider landscape. The identification of CH along Mbeya-Sumbawanga transmission line project and segment of Tunduma S/S to TanZam border area was conducted through the IFC Guidance Note (2012) based on criteria for identifying critical habitat. This process is however not necessarily limited to the above criteria; a combination of expert guided experience and other recognized high biodiversity values as stipulated in IFC Guidance Note 2012 was used in order to support a critical habitat designation. Appropriateness of this decision would be evaluated on a case-by-case basis according to the concepts of irreplaceability and vulnerability.

Critical habitats were classified into three classes of habitat conditions. These included very critical habitat, moderately critical habitat and less critical habitats. Very critical habitats constitute National Parks, Ramsar site and World Heritage site (Figure 4-26, Table 4-2). Very critical habitat which is close to the proposed power transmission line is 13km which is a Kitulo Plateau National Park (near to Mbeya S/S). Ruaha National Park is approximately 21km away from the proposed power transmission line. Ramsar Site, which is a Wetland of International Importance, is located at least 69 km away from this power line. While, the Selous Game Reserve, which is a World Heritage Site is very far from the proposed power transmission line by 118km.

Moderately critical habitats constituted forest reserves, game reserves, nature reserves and wildlife management area. Protected area in this category has a proximity distance ranging from 0 km to the maximum distance of 204 km from proposed power transmission (Figure 4-26, Table 4-2). This covers also the segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border which is within Momba District, Songwe region. Critical habitats assessed for the proposed Mbeya-Sumbawanga transmission line are far from Tunduma S/S. The detailed information will be provided after final design is complete.

Figure 4-26: Map showing critical habitats assessed for the proposed transmission line

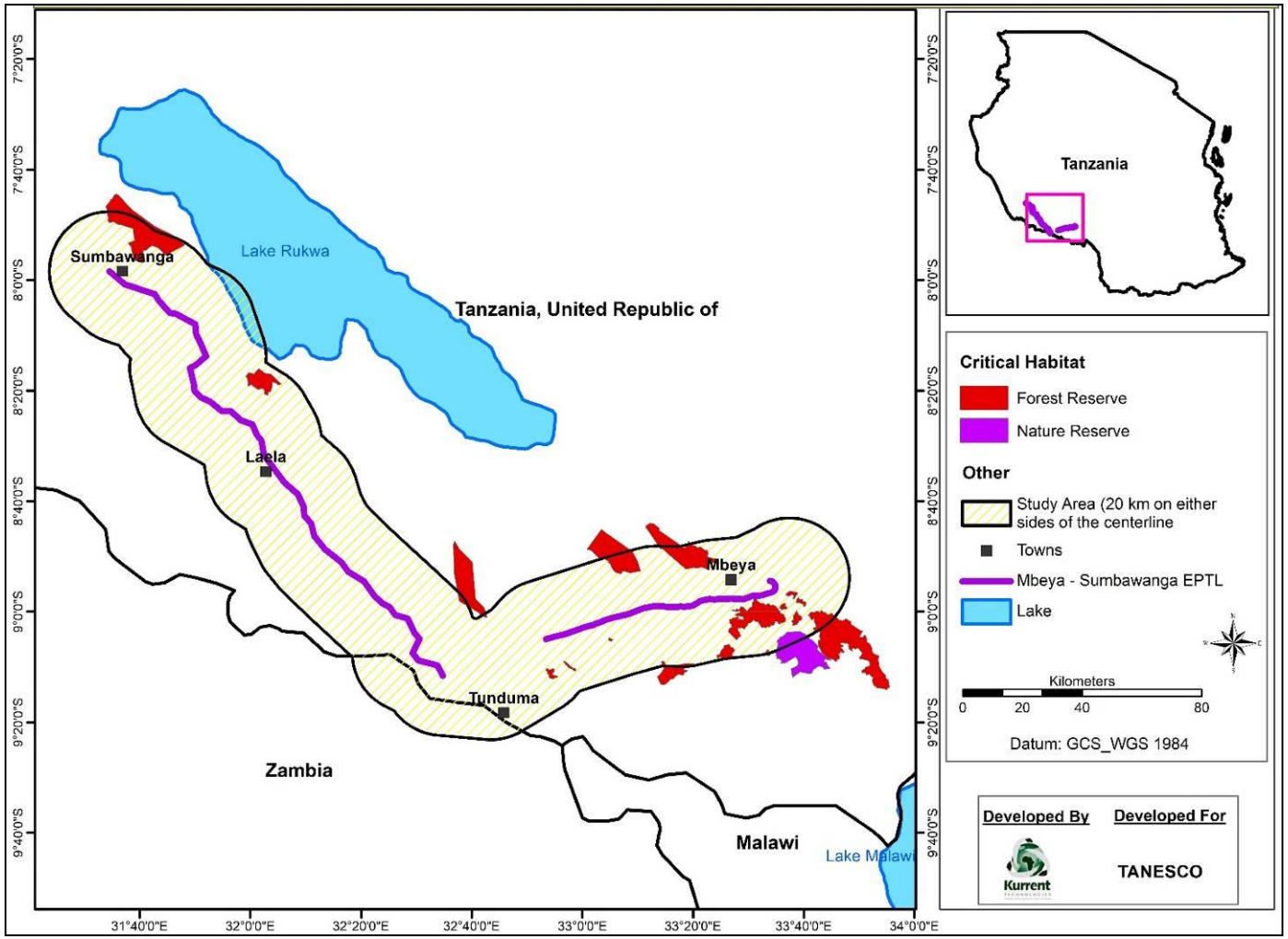


Table 4-2: Minimum and maximum distance of critical habitat relative to transmission line

Very Critical Moderate Less Critical

Critical Habitats		IUCN Category	Min Dist (km)	Max Dist (km)	Example of areas
Designations	Forest Reserve	Ib	33	33	Mufindi Scarp, Dabaga New, Image, Kigogo, Kisinga Lugaro, Bulongwa Madehani, Chumwa Range, Chuvwi, Dodoma Reservoir, Fonera, Gulosilo, Gumbiro, Hupanga, Idamba, Idewa, Iditima, Idunda, Igoma Logala, Ihoho, Ikonde, Ilamba, Ilonganjaula, Irenga, Iringa, Irunda, Irunga, Irungu, Isalala, Isililo, Itulu Hill, Ivuna North, Ivuna South, Iyonda, Kalambo River, Kalangai,
		IV	18	54	
		Not Reported	0	267	
	Game reserve	IV	82	133	Kizigo G.R. (C), Rungwa River G.C.A., Selous G.R, Lake Rukwa G.R, Mlele G.C.A.(S), Muhesi G.R (W), Piti O.A.(E), Rungwa Mwamagembe G.R.
		Not Reported	43	157	
	Nature Reserve	Not Reported	14	46	Kilombero, Rungwe
	Game controlled area	Not Reported	76	247	Inyonga GCA, Kilombero GCA, Lunda Nkwambi GCA, Rungwa River GCA, Wembere GCA
		VI	90	161	
	Wildlife management area	Not Reported	36	204	Ipole, Mbarang'andu, Pawaga-Idodi
	National Park	II	21	70	Katavi National Park, Ruaha National Park, Kitulo Plateau National Park
		Not Reported	13	13	
	Ramsar Site, Wetland of International Importance	Not Reported	69	203	Malagarasi-Muyovozi Wetlands
	World Heritage Site	Not Applicable	118	118	Selous Game Reserve

4.6.1.10 Ecosystem Services

Natural resources distributed around the proposed Mbeya-Sumbawanga transmission line and ~4km segment of TL from Tunduma S/S to TanZam border benefit the people, including businesses derived from ecosystem (International Finance Corporation Guidance Note, 2012). Benefits that the local communities derive from their environment were assessed based on the four types of ecosystem services. These services include: (i) provisioning services; (ii) regulating services; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystem, and; (iv) supporting services, which are the natural processes that maintain other services. Benefits derived by the local communities from the ecosystem are experienced directly and indirectly. The above services are valued by the local communities for sustenance of their livelihood.

The use of some types of ecosystem services were observed along the proposed Mbeya-Sumbawanga transmission line project and ~4km segment of TL from Tunduma S/S to TanZam border vicinity as shown in Figure 4-27 to Figure 4-30. These services consisted of cultural services whereby Miombo woodland is used by the local community for burying the dead. Wet valleys are used for cultivating vegetables and maize which serves throughout the year. Part of the Miombo woodland that consists of grassland which is utilized as pasture and also includes wetlands which provide sources of livelihood during the dry periods. The local community makes charcoal out of the trees from Miombo woodland. This can be seen from sacks of charcoal displayed on the road side for sale.

Figure 4-27: Crop cultivation supported by wetland

Figure 4-28: Cultural service: Grave yard in Miombo woodland

Figure 4-29: Livestock grazing on grassland near the proposed electric transmission line

Figure 4-30: Charcoal business along the road between Mbeya and Sumbawanga

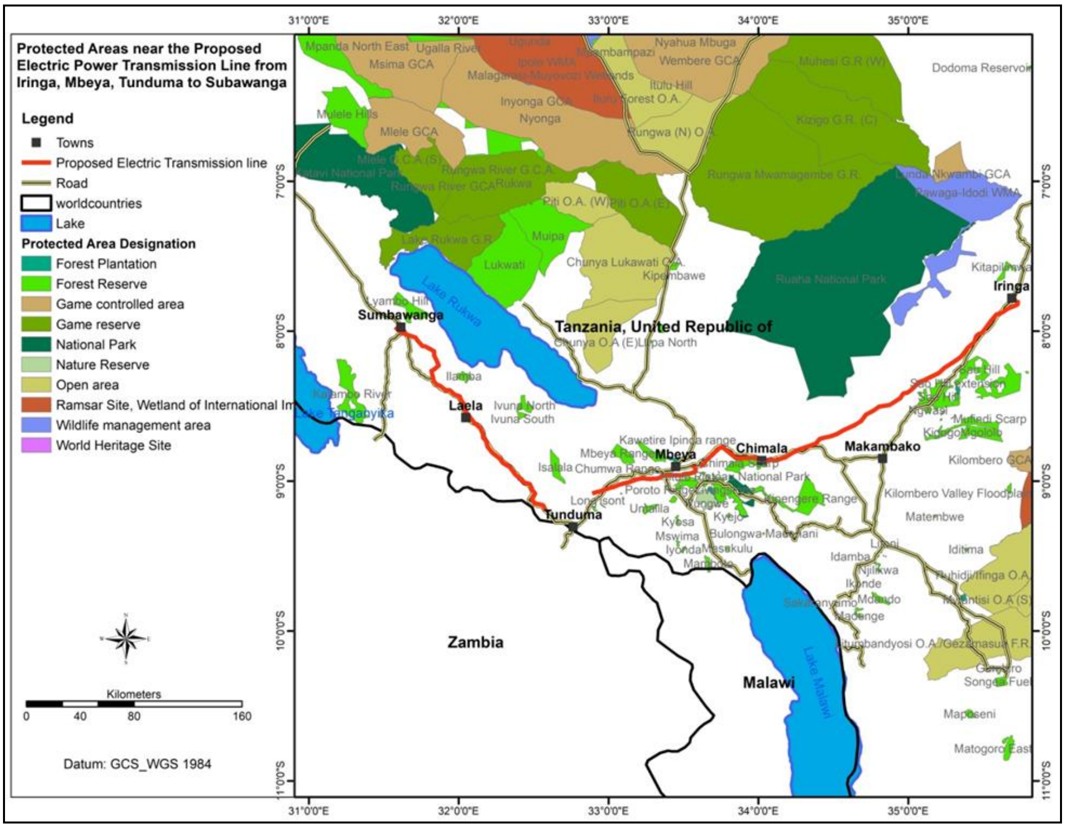
4.6.2 Avifauna baseline

The proposed transmission line passes through landscape and terrain characterized by varied habitats that support avifauna. These include forests, wetlands and woodlands. Wetlands of international importance e.g. Lake Rukwa and other man-made water pans, National Parks and Game Reserves occur in relative proximity to the proposed transmission line as shown in Figure 4-31; for example, the Tunduma – Sumbawanga section of the line passes about 30km west of Lake Rukwa and about 70km east of Lake Tanganyika. The Mbeya – Tunduma section of the transmission line passes about 40km south of the Uwanda Game reserve and about 35km north-west of the Kitulo Plateau National Park. These areas provide a suitable habitat for migratory water birds and foraging habitats for other birds. The transmission line routing also traverses several land uses that support avifauna e.g. farmlands. Lake Rukwa falls within the Southern Rift Valley and is an important flyway for bird migration (Figure 4-32). The Southern Rift valley as part of the Greater East African Rift Valley is of global significance as a migratory corridor for approximately 500 million birds made up of 350 species and which pass through the proposed project area enroute to their summer breeding grounds in Eurasia and over-wintering sites in southern Africa. This flyaway and migration route has one of the most diverse populations of birds in the world, and is the home of globally threatened species as well as being an important stop-over for birds on passage.

The segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border does not pass through important habitats for avifauna, such as forests, wetlands and woodlands. Wetlands of international importance, e.g. Lake Rukwa or The Kitulo plateau, form parts of Important Bird Areas (IBA) thatk are far from project areas.

Given below is a description of the types of landscape and terrain where avifauna habitats are to be found.

Figure 4-31: Protected areas relative to the transmission line route



Lake Rukwa

Eight species of avifauna with global conservation concern have been recorded but, as all data refer to the 1950s, their current status is unknown. *Falco naumanni* was described as a frequent passage migrant, *Circus macrourus* as an abundant winter visitor, *Crex crex* as an occasional passage migrant, *Gallinago media* as a frequent winter visitor and Glareola *nordmanni* a rare visitor. *Grus carunculatus* was a frequent resident, but increased water-levels probably now mean that it is a rare bird. There are a few records of *Balaenicepsrex Phoenicopterus* minor is only likely to be a visitor to the site, especially given higher water-levels and lower alkalinity. Historically, attempts at breeding have been described. The Rukwa valley is the southernmost point of the Somali–and represents the southern limit for several species' ranges in East Africa, including *Struthio camelus*. The records of *Botaurus stellaris* represent the most northerly distribution of the southern African population while a flock of six *Ciconia nigra* may be among the most southerly records of this Palearctic.

Figure 4-32: Image showing the area covered by the East African Rift Valley

Kitulo Game Reserve

The Kitulo plateau forms part of an Important Bird Area (IBA) that is found approximately 25km east south-east of the proposed transmission line and is area of montane grassland. Important habitats within the IBA include Kitulo plateau, the Livingstone Forest Reserve and the Chimala Scarp Forest Reserve (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. *Falco naumanni* has also been recorded and the area is likely to hold a wintering population of Circus Macrourus. The Kitulo plateau holds the only remaining viable population of Ardeotis denhami in the Southern Highlands of Tanzania. Important populations of the near-endemic *Coturnix coturnix* and *Francolinus shelleyi* breed and so might *Pseudhirundo griseopyga* and *Hirundo angolensis Falco biarmicus* and *Buteo augur* nest in the exotic pine Pinus . Four species of the Afrotropical Highlands biome have been recorded from this site.

4.6.2.1 Bird Richness along the Proposed Transmission Line

The mix of habitats across the proposed Mbeya-Tunduma-Sumbawanga transmission line that is dominated by the *miombo* woodlands supports unique avifauna. The proposed transmission line route is also characterized by wetland habitats that include lakes in the nearby area, papyrus dominated wetlands and small pools in the flood plains in addition to undulating landscapes and rocky outcrops (Figure 4-33 and Figure 4-34) that support raptors which are key targets for bird collision assessment studies. The montane landscapes and wetlands are particularly important for bird life, especially for palaearctic and intra-African migrants of globally or nationally threatened importance (Fishpool 2001). The total number of bird species documented for the Mbeya and Rukwa Regions is more than 600 species which utilize the general area of the proposed transmission line at any given time.

For the purposes of this ESIA study, only species considered to be at risk of collision, electrocution or habitat destruction are considered. A list of species observed from previous field surveys done by others and data gathered from studies including description of their migratory status and IUCN Conservation assessment is provided at the end of this section; during the November 13 – 18, 2017 field survey, few species were observed.

Figure 4-33: Suitable habitats for raptor movements in Chimara Game Reserve

Figure 4-34: Existing transmission line adjacent to hills

4.6.2.2 Potential bird movement between habitat features

Based on the critical habitat analysis criteria described under the methodology section, this assessment has established various points that are considered critical bird hotspots based on diversity of bird species and the potential for bird movements especially raptors and water bird groups. Based on the analysis, critical areas were identified for mitigation where bird diverters should be installed. The bird diverters make transmission lines visible for approaching birds in twilight or even darkness and are placed several tens of meters from each other. Movements of wetland birds occur at a low height within the stretches of the wetland. Local movements of residential birds are determined by various existing habitats. Their flight can be moderately high or low compared to the wetland birds and those of raptors.

The models provided in Figure 4-35 and Figure 4-36 indicate raptors descending when looking for food but maintain high flight level when returning to nesting grounds.

Potential collision is possible mainly with raptors that fly low when descending for prey. Flights of water birds are mainly restricted across wetlands. In a situation where the transmission line is aligned between two wetlands, it is possible that birds would cross along the proposed line as they forage or move between habitats.

Habitats within valleys provide suitable feeding sites for the migratory raptors and stop over roost sites for other raptors on migration. The model shows potential flight behavior of raptors along the slope and across the slope. Movement along the slope: down slope flight occurs when raptors descend by gliding to hunt for prey, and; upslope flight occurs when they return by uplift and soaring to nesting areas. Thus, a power transmission line on top of the hills is less likely to affect birds in-flight as compared to powerlines aligned between valleys.

As per figure 4-34, the segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border passes through on habitats that are less critical for birds but may cross a migratory route for birds from Lake Rukwa into Zambia.

Figure 4-35: Potential Bird Movements along the Sumbawanga-Mbeya-Iringa Transmission Line

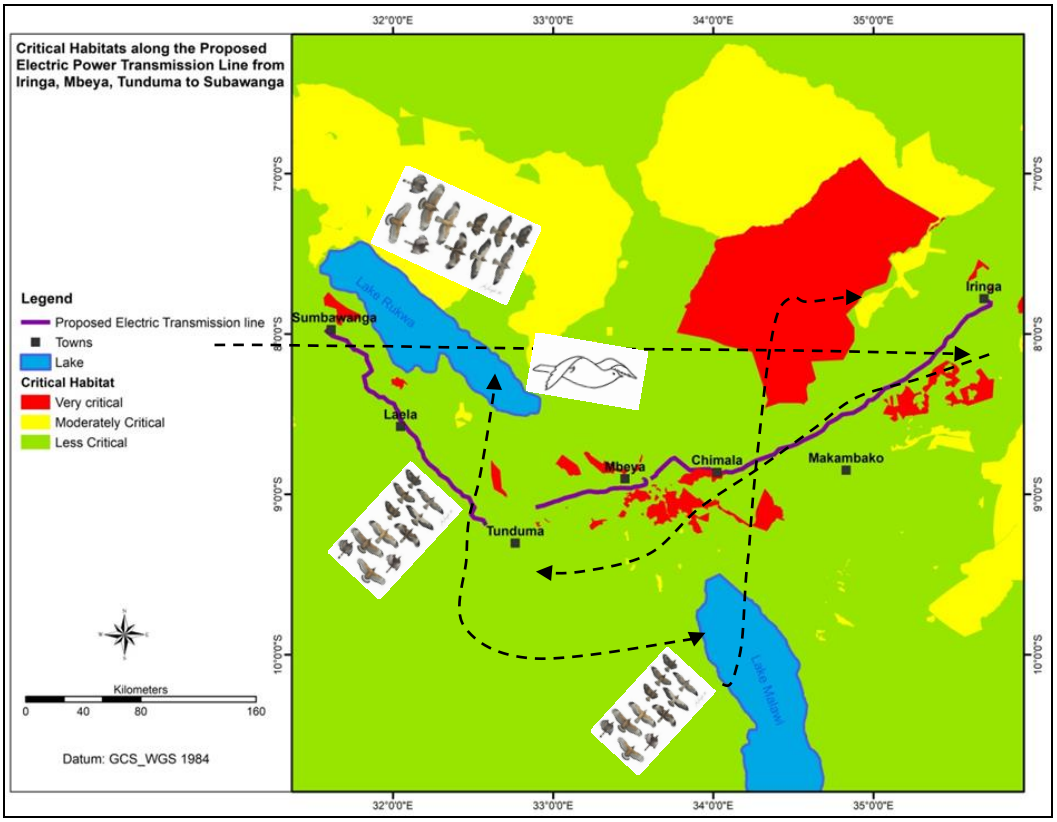
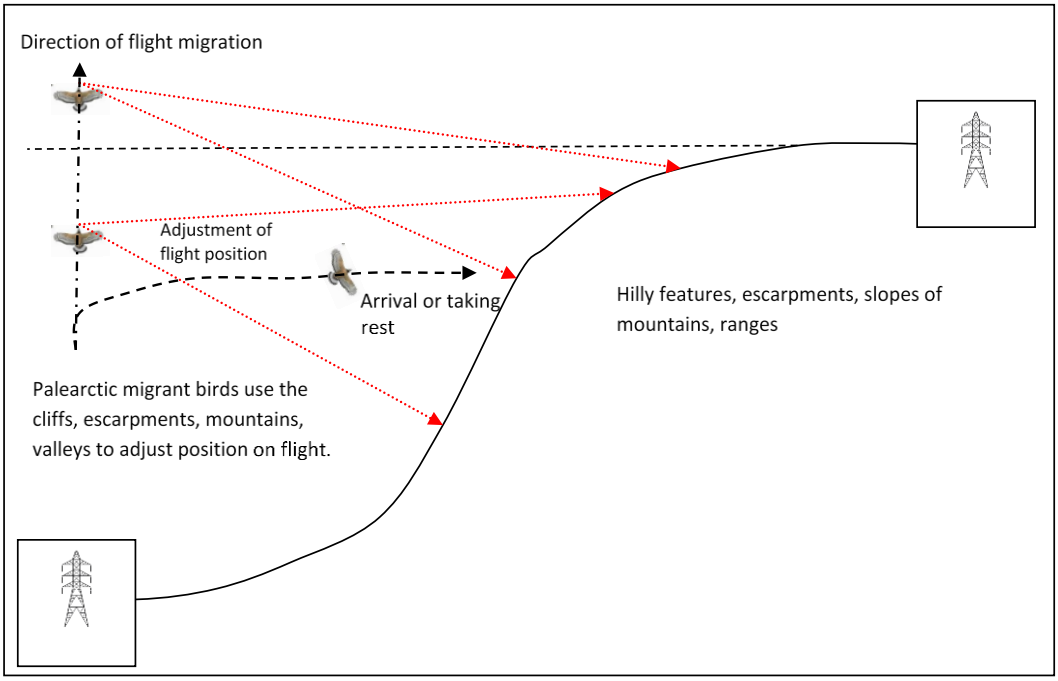


Figure 4-36: Model Showing Potential Bird Movement Behavior across Hilly Landscapes



4.6.3 Bat survey

A baseline study of bats was undertaken for purposes of this ESIA Study. The methodology for conducting the baseline survey involved (i) secondary literature review and (ii) a rapid field survey along the proposed transmission line route and its vicinity on November 12 – 18, 2017.

4.6.3.1 Literature review

The objective of the literature review was to obtain information on bats occurring in or around the area proposed for this development. Particular attention was paid to species which could trigger both World Bank OP4.04 (Operational Manual revised 2013 and Annex A, definition 2001), International Finance Corporation (IFC) Performance Standards 6 (IFC 2012) on natural and critical habitats. To attain this, WB's OP4.04 and IFC PS6 was reviewed for definition, description and criteria for assigning such habitats as natural, modified and critical in the context of the proposed development (constructing transmission line) and existing habitat along the project Right of way(ROW). To understand the bat species associated with this region the following databases were queried:

a) Tanzania Biodiversity Information Facility (TanBIF) database to understand bat species in the vicinity of the proposed transmission line;

b) iNaturalist-Afribat project database to understand bat species associated with the proposed project;

c) Convention on Migratory Species (CMS) database to understand migratory bats;

d) IUCN Red Lists database to understand Red List (threat) category of the species identified in (a) above;

e) Convention on International Trade on Endangered Species (CITES) database to identify level of protection under this convention which Tanzania ratified, adopted as a national law

f) Centre for Biodiversity database at the National Museums of Kenya (houses bat specimens from Tanzania, Kenya and Uganda) to identify bats collected from these countries.

Literature on bats of Tanzania that could be obtained (print or online) were also reviewed to filter information on bats especially on their occurrence, migratory patterns, feeding behavior close to or near the transmission line. Some of the literature reviewed and which was useful included:

a) East African Bat Atlas (Kityo et al., 2009);

b) Taxonomic Key of bats of East Africa (Bruce and Webala 2013);

c) Bats of Southern and Central Africa (Monadjem et al., 2010); and;

d) Online Small mammals of Tanzania by Field Museum of natural History, Chicago.

From the literature review and database queries, a lot of information on bats was generated, key among them is a bat species list and their conservation status. However there were some knowledge gaps that required ground truthing.

4.6.3.2 Field survey

A rapid field survey was conducted to ground truth some of the information gathered during literature review and also to collect pertinent evidence of occurrence of bats in or around the proposed Right-of-Way (ROW) for the transmission line. The field work was conducted on November 13 – 17, 2017 and involved visiting the areas where the proposed Transmission line route and substations.

Along the Transmission Line between Mbeya and Sumbawanga through Tunduma, sampling points were identified based on features observed on Google Earth maps, bat occurrence points generated during literature review and accessibility. Figure 4-5 shows the locations of sampling points that the ecological team utilized for the bat survey.

Survey methods were confined to daytime, followed by best practice of using non-intrusive sampling and limited intrusive sampling where necessary. The methods used particularly followed those outlined by Agwanda (2013), Monadjem 2010, IEEM and Bat Conservation Trust Guidance (2007), Mitchell-Jones & McLeish (2004).

Survey methods used involved walking along 200m-500m within each sampling point and checking for bats in the roosts, feeding signs under tree, guano evidence of night or day roosts, owl pellets for eaten bats.

Techniques used to sample bats in each 200m-500m walk was based on a combination of heterodyne bat detector and naked eye searches in potential habitats. Points where bats were observed were recorded as GPS coordinates after noting down the species observed.

A Bat detector is an electronic gadget that detects bat sonar where sighting is not possible nor helpful. With professional experience and skills, one can detect and identify up to genus level at least a bat in a roost or flying around. The heterodyne detector was

most suited for this rapid day time survey because it is easy to manually scan for a range of frequency at which many bats call, it works in real time, and is the least expensive.

Field data was synthesized into species list and International Union for Conservation of Nature (IUCN) Red List status, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Convention on the Conservation of Migratory Species of Wild Animals (CMS) appendix status screened after confirming taxonomic identity from Taxonomic guide books such as Bruce and Webala (2014), Monadjem (2010). The resulting list was then integrated into the one generated from literature search and screening by using professional knowledge and experience on species natural history and distribution.

4.6.3.3 Bat Species living in the targeted habitats

Tanzania has 94 bat species well documented in the Global Biodiversity Information Facility (GBIF), iNaturalist, IUCN Redlist and Mammal Species of the World (Simmons 2005). Twenty-one (21) of this (about 20%) national number are represented in the landscape designated to host this TL project, as could be constructed from databases and field survey. Fifteen (15) of the twenty (21) species associated with this landscape were observed during the field survey. Some of the locations where bats species were observed are shown in Figure 4-37 and Figure 4-38.

Figure 4-37: Observed *Nicticienips schliefeni* roosting on banana leaves between Mbeya and Tunduma

37 bats were counted on this roost of a cluster from banana farm. Notably, banana is the commonest crop on farms where the TL passes from Mbeya to Sumbawanga through Tunduma

Figure 4-38: Road side erosion control gabion, where *molossid* bats were observed using heterodyne bat detector, near Sumbawanga

Mops condylurus, identified by the sonar frequency used rock crevices and are some of the bats to be affected when rocks on hills or escarpment are pulled down during construction.

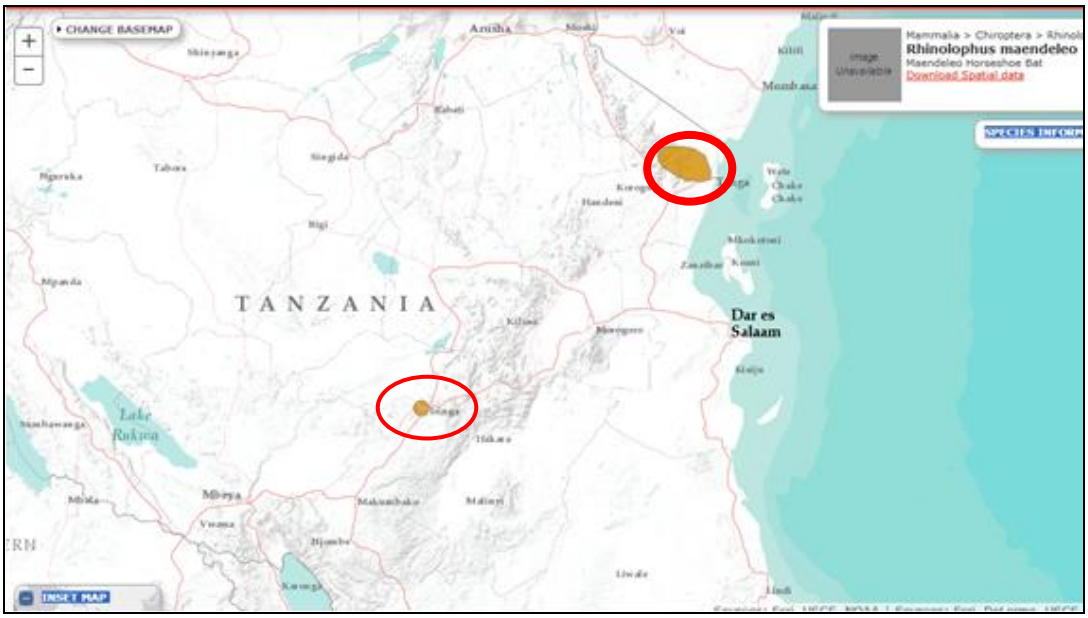
4.6.3.4 Conservation status

Of the 94 bat species in Tanzania, sixteen are listed as threatened in the IUCN Redlist. In this group one is classified as Endangered, two as vulnerable and thirteen as near threatened.

There are five bats species endemic to Tanzania. They include Pemba flying fox, *Pteropus voeltzkowi*, *Maendeleo* Horse shoe bat, *Rhinolophus maendeleo*, Dar es Salaam Pipistrelle, *Pipistrellus permixtus*; Tanzanian wooly bat, *Kerivoula africana* and *Mops bakarii*.

In this endemic group, only *Maendeleo* Horse shoe bat that is found within the vicinity of the project can be affected by the development. A map showing the endemic distribution of this bat species is shown in Figure 4-39.

Figure 4-39: Distribution of endemic bat, *R. maendeleo* in Iringa and Tanga in Tanzania



4.6.3.5 Critical Habitat assessment for bats

Critical habitats are defined in the World Bank's OP 4.04 manual as land and water areas where:

i.) Existing protected areas and areas officially proposed by governments as protected areas (e.g., reserves that meet the criteria of the World Conservation Union [IUCN] classifications2), areas initially recognized as protected by traditional local communities (e.g., sacred groves), and sites that maintain conditions vital for the viability of these protected areas (as determined by the environ-mental assessment process3); or

ii.) Sites identified on supplementary lists prepared by the Bank or an authoritative source determined by the Regional environment sector unit (RESU). Such sites may include areas recognized by traditional local communities (e.g., sacred groves); areas with known high suitability for biodiversity conservation; and sites that are critical for rare, vulnerable, migratory or endangered species. Listings are based on systematic evaluations of suchfactors as species richness; the degree of endemism, rarity, and vulnerability of component species; representativeness; and integrity of ecosystem processes.

Taken together in view of this these definitions and in light of the conservation status of bat species found within the project ROW, the proposed transmission line ROW intersects the migratory route of African Straw colored fruit bat (*Eidolon helvum*).

It potentially meets the World Bank definition (ii) i.e. sites critical for rare, vulnerable and migratory and also meets IFC criteria (iii) i.e. habitats supporting globally significant concentration of migratory species.

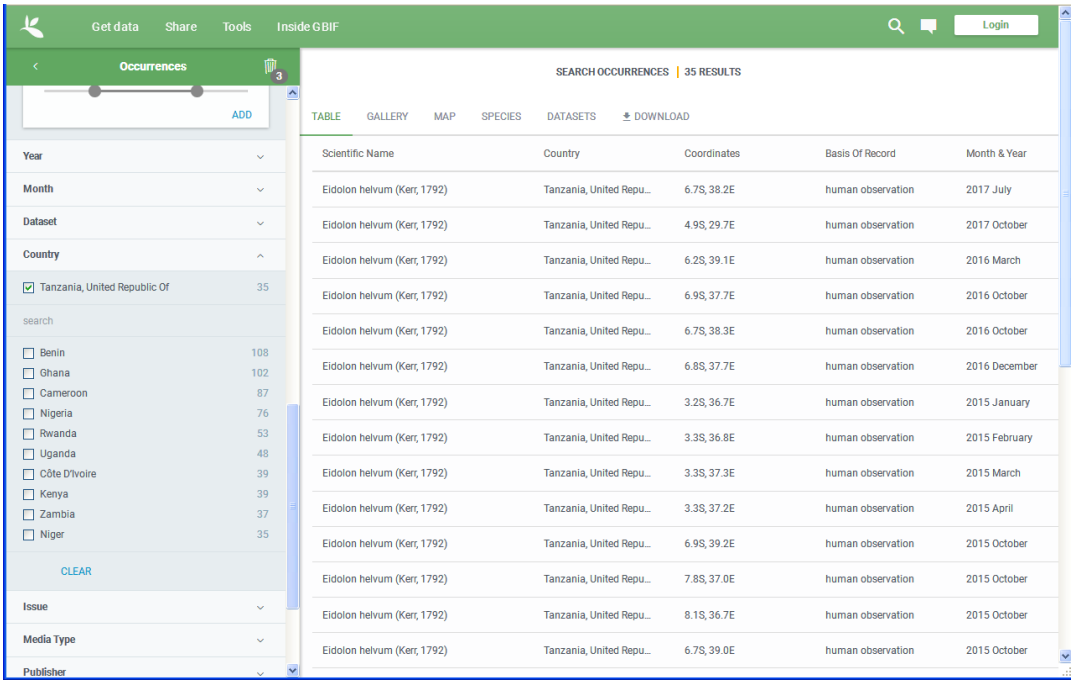
Whereas the entire migratory route does not constitute critical habitat, it is prudent to determine if the actual habitat where the bat migratory route intersects the ROW is significant to the survival of the migratory population of these two species. The significance may be stop-over sight for breeding, feeding, watering or just safe resting points. If this is proved through a study, then the sight would qualify as a critical habitat and assessment of impact by the project must be done to ascertain extent, magnitude and duration.

4.6.3.6 Migratory corridor

From desktop study, it was established that one species of bat known as the Straw colored fruit bat, *Eidolon helvum*, uses Tunduma area as a migratory corridor to Kasanka in Zambia where they congregate in November-December every year. According to recent records in iNaturalist and Global Biodiversity Information Facility (GBIF) database, there are many colonies of this bat in Tanzania, Kenya, Uganda, Rwanda, Burundi and DR Congo (DRC). All these colonies migrate to Kasanka every year through various routes. Two of these routes cross the Tunduma area where the proposed TL is located.

From the Global Biodiversity Information Facility (GBIF) database posted by Tanzania Biodiversity Information Facility (TanBIF) (Figure 4-40), 35 records of the migratory *Eidolon helvum* were obtained. When these records were mapped, none of them appeared to be close to the proposed transmission line. However the migratory route suggested in literature appears to cross areas proposed for the transmission line project.

Figure 4-40: Results of the TanBIF database query on migratory bats

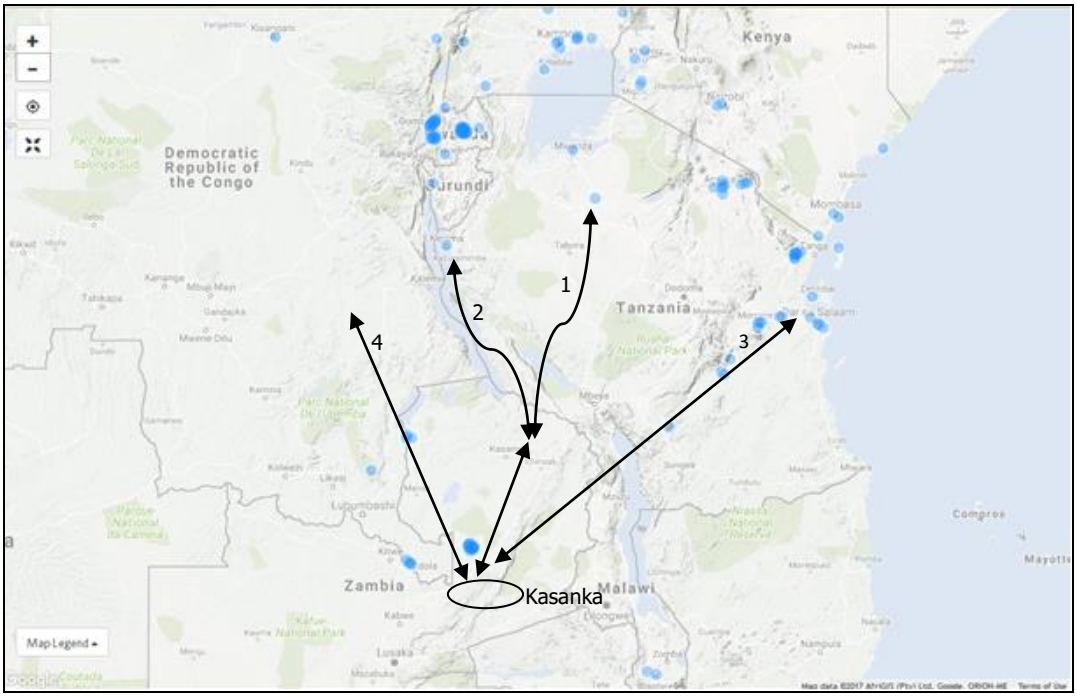


According to Convention on Migratory Species (CMS) and recentstudies, (Bruce and webala 2013, Kityo et al 2009), *Eidolon helvum* is a migrant bat and in East and Central

Africa and the different populations from Uganda, Kenya, Rwanda, Burundi, Tanzania and DRC congregate in Kasanka National Park in Zambia from November to December numbering to about 1.5 million bats (Monadjem et al 2010). During this time they form one of the largest aggregation of terrestrial vertebrate animals in the World (Sorensen and Halberg 2001). According to the past studies, migratory routes used by various populations vary according to the population origin, a point confirmed by iNaturalist/GBIF occurrence data to Kasanka in Zambia and back. Two of these routes do cross the proposed transmission line. (Figure 4-41).

According to IFC PS6 on Critical habitat, the migratory route of this bat where it insects Transmission line ROW, likely qualifies as a critical habitat under criteria iii of IFC PS6 (IFC 2012). An effort to determine the use of this particular intersect area by the bat constitutes critical habitat. Since the many populations from Uganda,Tanzania, Kenya, Rwanda and Burundi seems to use this area as a migratory corridor, there is high chance the Tunduma area is critical for the migration of all these populations (Figure 4-41).

Figure 4-41: Migratory routes of *Eidolon helvum*



Migratory routes: Migratory route marked 1 is most likely used by *Eidolon* populations from Northern Tanzania (shore of Lake Victoria) and Southern Kenya (Kisii and Migori populations) as they migrate to Kasanka, Zambia. The proposed transmission line crosses this migratory route around Tunduma.

Migratory route marked 2 is used by the *Eidolon* bat populations from Uganda, Rwanda, Burundi and Western Tanzania using the landscape between Lake Tanganyika and Lake Rukwa, Sumbawanga general area. In the Tunduma area, land between the Lake Tanganyika and Lake Malawi seems to be a critical migratory space which different populations (routes 1, 2, 3) squeeze through to and from Kasanaka.

Route 4 has been confirmed through telemetry studies involving tagging and tracking bats departing Zambia. Migratory routes 1, 2 & 3 and actual path though plausible, are yet to be confirmed.

Another species with potential to evoke critical habitat is the Tanzanian endemic, *Rhinolophus maendeleo* (IUCN 2017). According to IUCN Redlist and Monadjem 2010, this species has been recorded in Tanga and Iringa. Iringa being within the proposed Area of Interest (AOI), the fate of this species should be considered in light of IFC PS6 and project activities. The bat population in Iringa is thus an important environmental receptor from which potential impact has to be assessed and appropriate mitigation measures must be developed.

There were other bat species endemic to Tanzania which meets IFC PS6 on Critical habitat, (criterion (ii)), but their occurrence along the proposed transmission line could not be confirmed during the rapid field survey or literature search. Further surveys to ascertain their occurrence on the proposed line is strongly recommended.

4.6.3.7 Identification of Vulnerable Species along the Transmission line

Vulnerability of the bats to impacts of the project is a function of the risk aspect and significance of the bats habitat. For instance limited habitat loss to a few individual bats is less impacting than loss of breeding and roosting. Similarly fatality of endangered species is more significant than abundant species in least concern status in IUCN Redlist.

Using this logic, species of conservation in this area including endemics and migrants are more vulnerable than abundant and common species in the same area. Common species with breeding site such as *Rhinolophus hildebrandtii* found with young in a cave roost not far from the proposed line are also more vulnerable than species which use the habitat for feeding and general roosting.

Another aspect of vulnerability is flight behavior and wing size of a bat. High flying bats such as *Tadarida ventralis* and *Eidolon helvum* are more vulnerable to collision than low flying bats. Long wing span bats such as *E. helvum* are more likely to be electrocuted than smaller ones which cannot touch the two wires simultaneously.

As per figure 4-40, Migratory route marked 1 is most likely used by *Eidolon* populations from Northern Tanzania (shore of Lake Victoria) and Southern Kenya (Kisii and Migori populations) as they migrate to Kasanka, Zambia via Tunduma. Also Migratory route marked 2 is used by the *Eidolon* bat populations from Uganda, Rwanda, Burundi and Western Tanzania using the landscape between Lake Tanganyika and Lake Rukwa, Sumbawanga general area. In the Tunduma area, land between the Lake Tanganyika and Lake Malawi seems to be a critical migratory space which different populations (routes 1, 2, 3) squeeze through to and from Kasanaka. Those routes are near the segment of ~4km 330kV Transmission Line (TL) from Tunduma Substation to TanZam Border. More detailed information will be provided after final route selection for the segment and completion of bat surveys for the entire transmission line.

4.7 Social baseline

A baseline that describes the Social, Cultural and Economic characteristics of the key districts covered by the proposed Mbeya Tunduma Sumbawanga 400 KV transmission Line is provided below. The information is derived from various sources including the Tanzania National Bureau of Statistics. 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 Mbeya to Sumbawanga 400KV power transmission line traverses three regions namely; Mbeya, the newly formed Songwe region and, Rukwa region; the Songwe region was carved out of the larger Mbeya region in 2016. Also, because the location of ~4km segment TL from Tunduma S/S to TanZam is within Songwe region, Momba District and probably within Nkangamo village, socio-economic baseline information will be the same as mentioned in this ESIA study for Mbeya-Tunduma-Sumbawanga.

4.7.1 Methodology

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

- Review of a previous environmental and social assessment undertaken in 2013 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;
- Review of a public meeting convened by TANESCO on September 12, 2017 with several lead agencies and regulators to discuss the Terms of Reference (TOR) for this ESIA Study; and
- Information gotten from the public/stakeholder consultation meetings held on November 13 – 17, 2017 along the Mbeya – Tunduma – Sumbawanga transmission line route.

The census carried out in Tanzania in 2012 was a key source document that was used in developing an understanding of the social profile in the project area of influence.

4.7.2 Area of influence

The socio-economic baseline description is focused at a local level about 20km on either side of 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 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. A 1km boundary for those directly affected by the project was selected based on the field survey carried out on November 13 – 17, 2017 along the proposed transmission line ROW and the professional judgement of the ESIA team. Community members living outside of this area up to a distance of about 20km on either side of the transmission line are considered within the Indirect Area of Influence.

4.7.3 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 Mbeya – Tunduma – Sumbawanga including segment from Tunduma S/S to TanZam border 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.

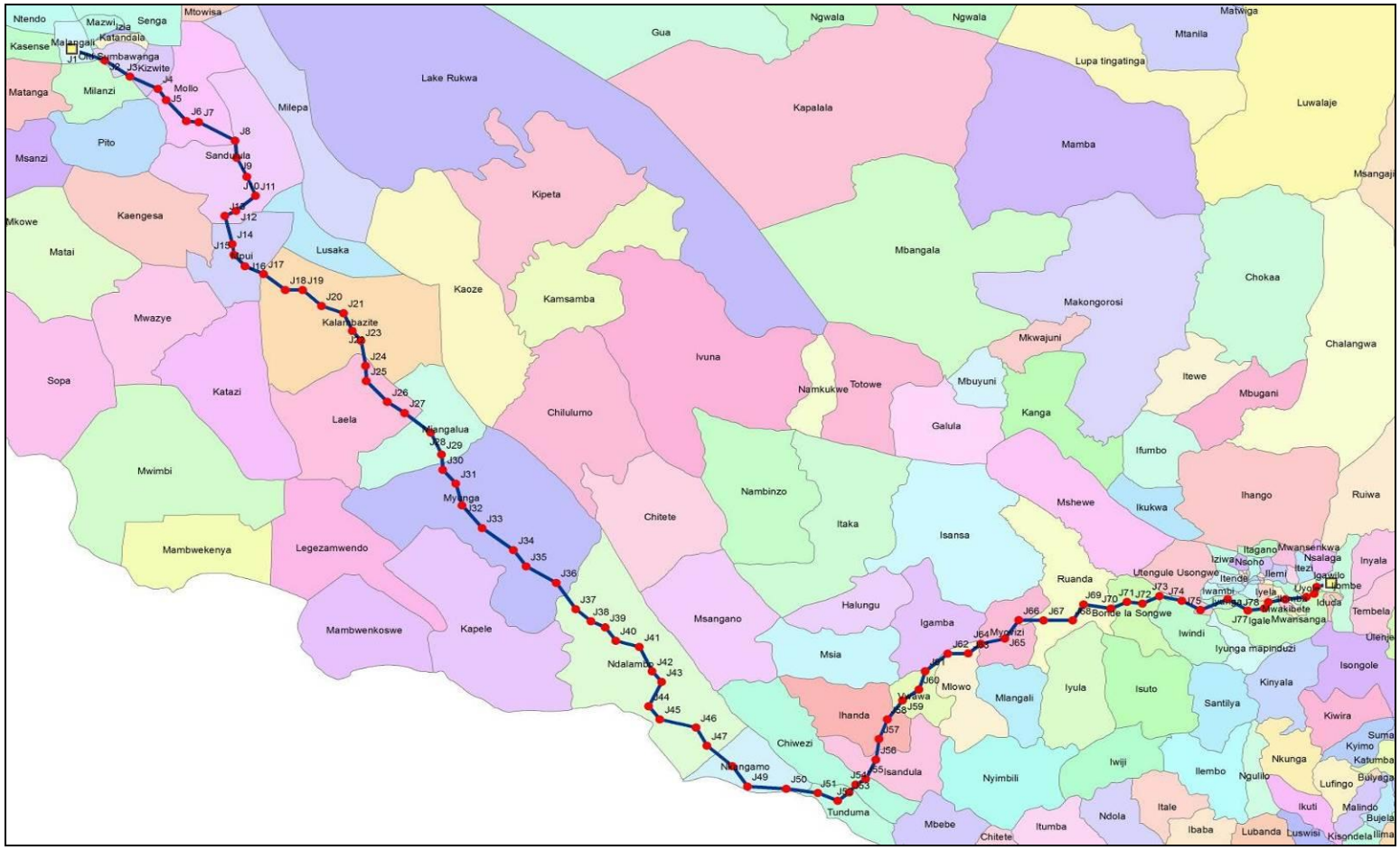
The proposed transmission line project traverses the regions, districts and wards shown in Table 4-3. Subsequently, TANESCO and the Project Contractor will be engaging the administrative leadership in the regions, districts and wards listed in the table for the proposed transmission line project.

Table 4-3: Regions, Districts and Wards where the proposed transmission line passes

No.	Region	District	Ward
1.	Mbeya	• Mbeya City Council • Mbeya District Council	Igawilo, Tembela, Igale, Lwindi, Lyunga, Bonde la Songwe, Swaya, Uyole, Mwakibete, Ilomba
2.	Songwe	• Mbozi District Council • Tunduma Town Council • Momba District Council	Mlowo, Ihanda, Ruanda, Myovizi, Isandula, Chiwezi, Vwawa, Ndalambo, Myunga, Tunduma
3.	Rukwa	• Sumbawanga District Council • Sumbawanga Municipal Council	Miangalua, Laela, Sandulula, Mpui, Kalambanzite, Mollo, Kizwite, Malangali, Old Sumbawanga

A map showing the above regions and districts that the proposed line traverses through is given in Figure 4-42.

Figure 4-42: Image showing the wards crossed by the proposed transmission line (Mbeya – Tunduma – Sumbawanga)



4.7.4 Land use and tenure

The predominant land use (about 90%) along most of the length of the transmission line routing between Mbeya and Tunduma and Sumbawanga and the portion from Tunduma S/S to TanZam border is agricultural. The remaining sections of the transmission line routing (about 10%) would be considered part of built up environment such as cities and towns (e.g. Mbeya, Tunduma and Sumbawanga) 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.

4.7.4.1 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 4-4.

[10]Table 4-4: 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	214	0.6	0	0	214	0.6

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

City						
Total	**35,493**	**100**	**461**	**100**	**35,954**	**100**

4.7.4.2 Rukwa region – Land Area, Land Use Pattern and Administrative Units

Rukwa region has a total surface area of 27,765km^2 out of which 21,160km^2 (76.21%) is land area, the remaining 6,605 km^2 (23.79%) is covered with water bodies. Rukwa region is among biggest region in Tanzania Mainland and occupies about 3.14% of Tanzania Mainland's total land area of 883,343km^2.

Table 4-5 shows that the distribution of the region's area among the districts is largely in favor of Nkasi District which covers 47.27% of the total area of the Region followed by Sumbawanga District 36.74%. Kalambo District has the smallest area and accounts for only 15.99% of the Region's total area.

The proposed transmission line project passes through Sumbawanga district and Sumbawanga Municipal Council.

[11]Table 4-5: Distribution of Land Area and Water Area by Councils in Rukwa 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)**
Sumbawanga Municipal Council	1,329	100	0	0	1,329	4.79
Sumbawanga District Council	8,203	92.5	668	7.5	8,871	31.95
Kalambo District Council	3,937	88.7	504	11.3	4,441	15.99
Nkasi District Council	9,375	71.4	3,749	28.6	13,124	47.27
Total	**22,844**	**82.3**	**4,921**	**17.7**	**27,765**	**100**

4.7.5 Population

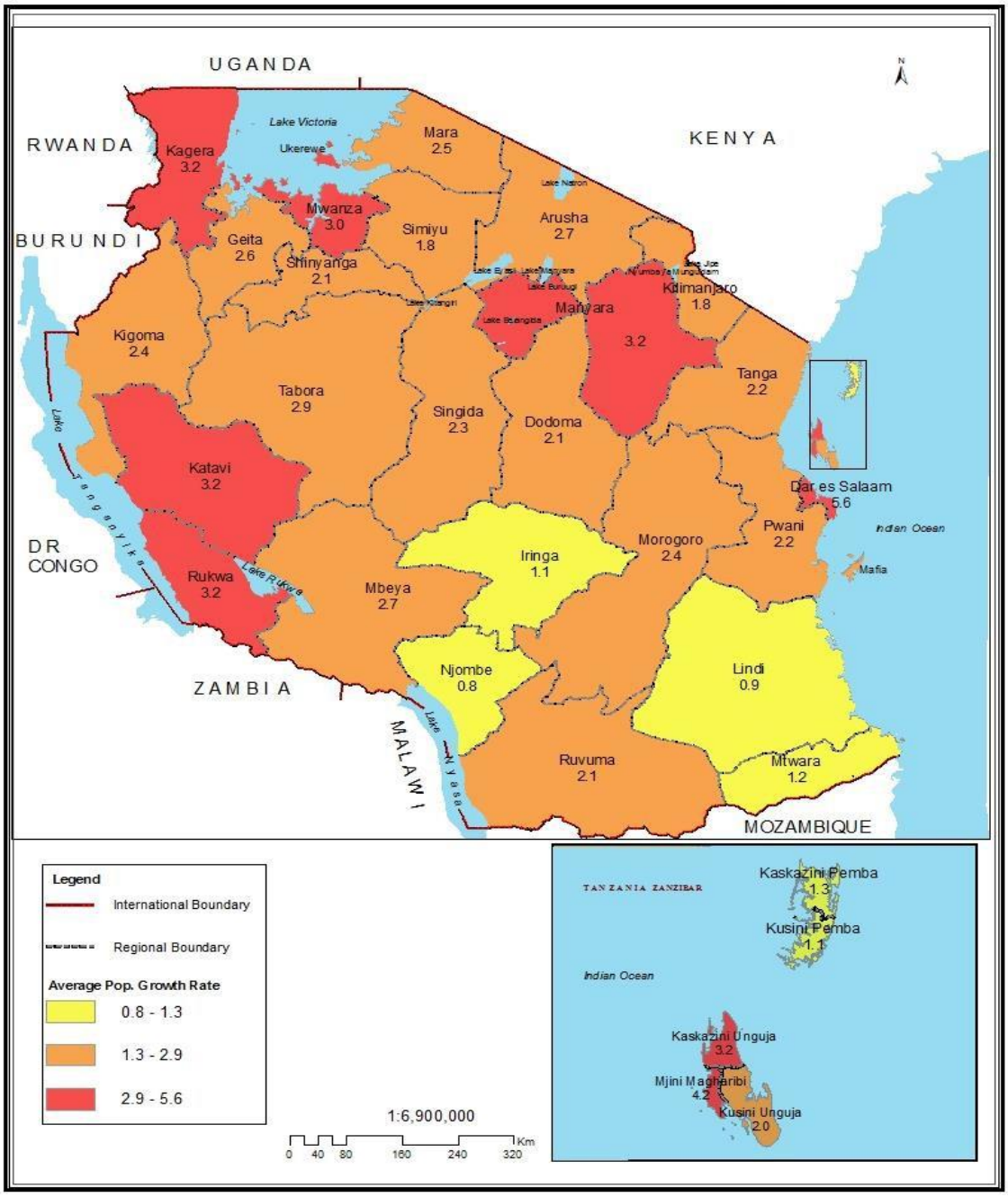
4.7.5.1 Existing population

According to the 2012 census in Tanzania, the total population in the mainland was 43,625,364. The proposed transmission line project traverses two regions namely Mbeya

[11] Source: Regional Commissioner's Office, Rukwa Region, 2016

and Rukwa. The two regions had a population growth rate of 2.7% and 3.2% respectively over the period 2002 – 2012 as shown in Figure 4-43. According to the 2012 census, the population of Mbeya region was 2,707,410 while that of Rukwa region was 1,004,539.

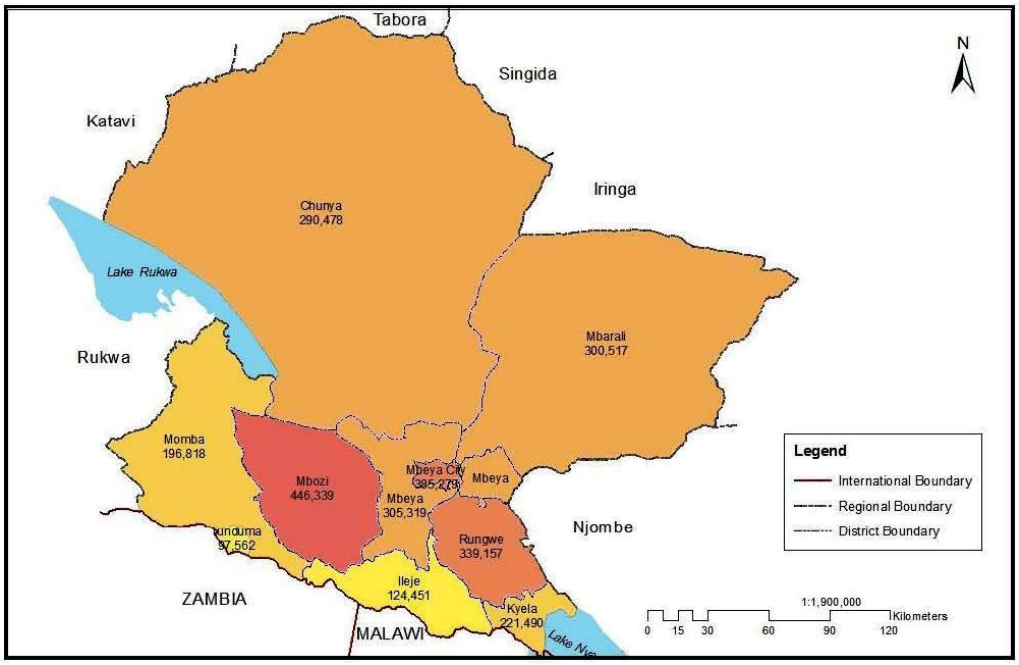
[12]Figure 4-43: Average Annual Population Growth Rate by Region, 2002 – 2012 Censuses



[12] Source: 2012 Population And Housing Census – Tanzania

In Mbeya region, the proposed transmission line will pass through the districts of Mbeya City, Mbeya Rural, Mbozi, Tunduma and Momba. The districts and their respective population in 2012 is shown in Figure 4-44.

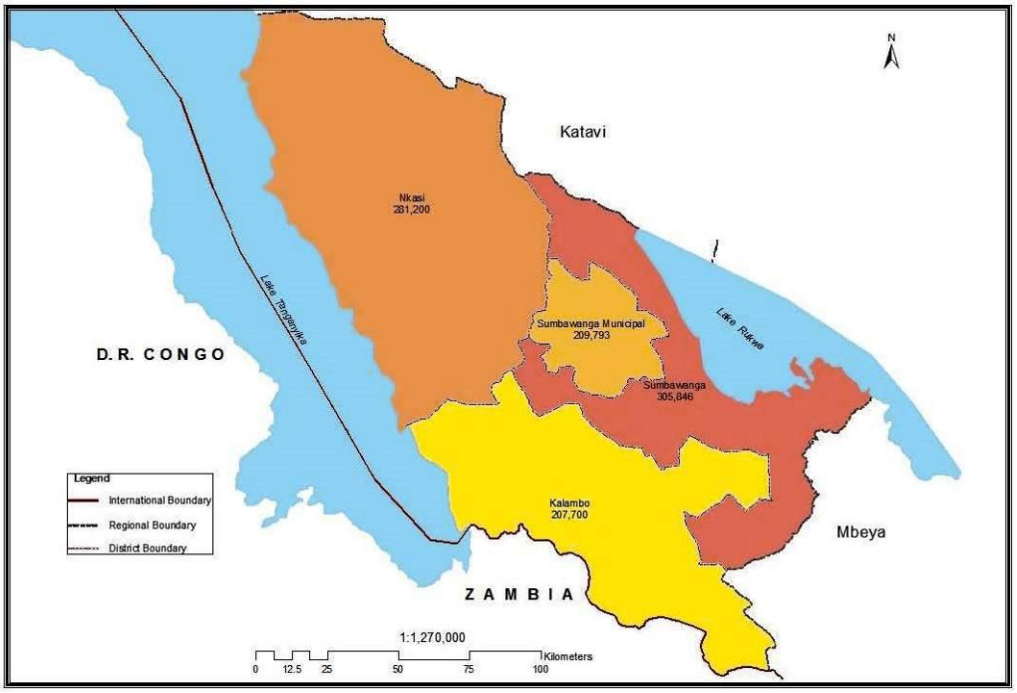
[13]Figure 4-44: Location of districts in Mbeya Region with their 2012 population



In Rukwa region, the proposed transmission line will traverse through two districts known as Sumbawanga and Sumbawanga Municipal. A map showing the location of the two districts relative to the entire region is given in Figure 4-45.

[13] Source: 2012 Population And Housing Census – Tanzania

[14]Figure 4-45: Location of districts in Rukwa Region with their 2012 population



Based on the above maps and data extracted from the 2012 census, given in Table 4-7 is the population within the various districts through which the proposed transmission line project traverses.

Table 4-6: Population of persons living in districts crossed by the transmission line

District	Ward	Population in 2012		
		Male	Female	Total
Mbeya city	Igawilo	7,931	9,369	17,300
Mbeya rural	Tembela	4,982	5,728	10,710
Mbeya rural	Igale	5,183	5,681	10,864
Mbeya rural	Lwindi	8,740	9,657	18,397
Mbeya city	Lyunga	7,188	7,838	15,026
Mbeya rural	Bonde la Songwe	8,733	9,754	18,487
Mbeya rural	Swaya	4,434	5,043	9,477
Mbeya city	Uyole	5,344	6,199	11,543
Mbeya city	Mwakibete	11,094	12,225	23,319
Mbeya city	Ilomba	16,001	18,020	34,021

[14] Source: 2012 Population And Housing Census – Tanzania

District	Ward	Population in 2012		
		Male	Female	Total
Mbozi	Mlowo	17,978	20,038	38,016
Mbozi	Ihanda	10,088	11,267	21,355
Mbozi	Ruanda	4,136	4,468	8,604
Mbozi	Myovizi	7,591	8,547	16,138
Mbozi	Isandula	6,592	7,957	14,549
Mbozi	Chiwezi	12,006	13,054	25,060
Mbozi	Vwawa	26,372	29,884	56,256
Momba	Ndalambo	5,532	6,161	11,693
Momba	Myunga	5,631	5,960	11,591
Tunduma	Tunduma	46,854	50,708	97,562
Sumbawanga	Miangalua	6,923	7,496	14,419
Sumbawanga	Laela	11,244	12,485	23,729
Sumbawanga	Sandulula	9,133	9,622	18,755
Sumbawanga	Mpui	7,216	7,615	14,831
Sumbawanga	Kalambanzite	9,949	10,837	20,786
Sumbawanga	Mollo	7,640	8,067	15,707
Sumbawanga	Kizwite	7,662	8,525	16,187
Sumbawanga	Malangali	3,270	3,473	6,743
Sumbawanga	Old Sumbawanga	11,128	12,170	23,298

4.7.5.2 Population density and trend

Based on the 2012 census, the average population growth rate over the period 2002 – 2012 in Mbeya and Rukwa regions was 2.7% and 3.2% respectively. Using these population growth rates, the projected population in 2017 that could potentially be affected by the proposed transmission line is given in Table 4-7.

Table 4-7: Projected population in 2017 of the wards affected by the project

District	Ward	2012 Population	Avg. HH size	Pop. growth rate (%)	2017 projected population		
					Male	Female	Total
Mbeya city	Igawilo	17,300	3.9	2.7%	9,061	10,704	19,765
Mbeya rural	Tembela	10,710	4.0	2.7%	5,692	6,544	12,236
Mbeya rural	Igale	10,864	4.0	2.7%	5,922	6,490	12,412

District	Ward	2012 Population	Avg. HH size	Pop. growth rate (%)	2017 projected population		
					Male	Female	Total
Mbeya rural	Lwindi	18,397	4.1	2.7%	9,985	11,033	21,018
Mbeya city	Lyunga	15,026	4.3	2.7%	8,212	8,955	17,167
Mbeya rural	Bonde la Songwe	18,487	4.0	2.7%	9,977	11,144	21,121
Mbeya rural	Swaya	9,477	3.9	2.7%	5,066	5,762	10,827
Mbeya city	Uyole	11,543	4.1	2.7%	6,105	7,082	13,188
Mbeya city	Mwakibete	23,319	4.2	2.7%	12,675	13,967	26,642
Mbeya city	Ilomba	34,021	4.4	2.7%	18,281	20,588	38,869
Sub-total					**90,976**	**102,269**	**193,245**
Mbozi	Mlowo	38,016	4.0	2.7%	20,540	22,893	43,433
Mbozi	Ihanda	21,355	4.1	2.7%	11,525	12,872	24,398
Mbozi	Ruanda	8,604	4.1	2.7%	4,725	5,105	9,830
Mbozi	Myovizi	16,138	4.3	2.7%	8,673	9,765	18,437
Mbozi	Isandula	14,549	4.2	2.7%	7,531	9,091	16,622
Mbozi	Chiwezi	25,060	4.2	2.7%	13,717	14,914	28,631
Mbozi	Vwawa	56,256	4.2	2.7%	30,130	34,142	64,272
Sub-total					**96,841**	**108,782**	**205,623**
Momba	Ndalambo	11,693	4.2	2.7%	6,320	7,039	13,359
Momba	Myunga	11,591	4.3	2.7%	6,433	6,809	13,243
Tunduma	Tunduma	97,562	4.0	2.7%	53,530	57,933	111,464
Sub-total					**66,284**	**71,781**	**138,065**
Sumbawanga	Miangalua	14,419	4.7	3.2%	8,104	8,775	16,878
Sumbawanga	Laela	23,729	4.6	3.2%	13,162	14,615	27,777
Sumbawanga	Sandulula	18,755	5.2	3.2%	10,691	11,263	21,954
Sumbawanga	Mpui	14,831	4.6	3.2%	8,447	8,914	17,361
Sumbawanga	Kalambanzite	20,786	4.8	3.2%	11,646	12,685	24,332
Sumbawanga	Mollo	15,707	5.2	3.2%	8,943	9,443	18,386
Sumbawanga	Kizwite	16,187	4.7	3.2%	8,969	9,979	18,948
Sumbawanga	Malangali	6,743	4.6	3.2%	3,828	4,065	7,893
Sumbawanga	Old Sumbawanga	23,298	4.7	3.2%	13,026	14,246	27,272
Sub-total					**86,816**	**93,985**	**180,801**
Total population affected by the project					**340,917**	**376,818**	**717,734**

Shown graphically, the projected population of the four districts through which the proposed transmission line traverses is shown in Figure 4-46 to Figure 4-49.

Figure 4-46: Projected population of wards in Mbeya district in 2017

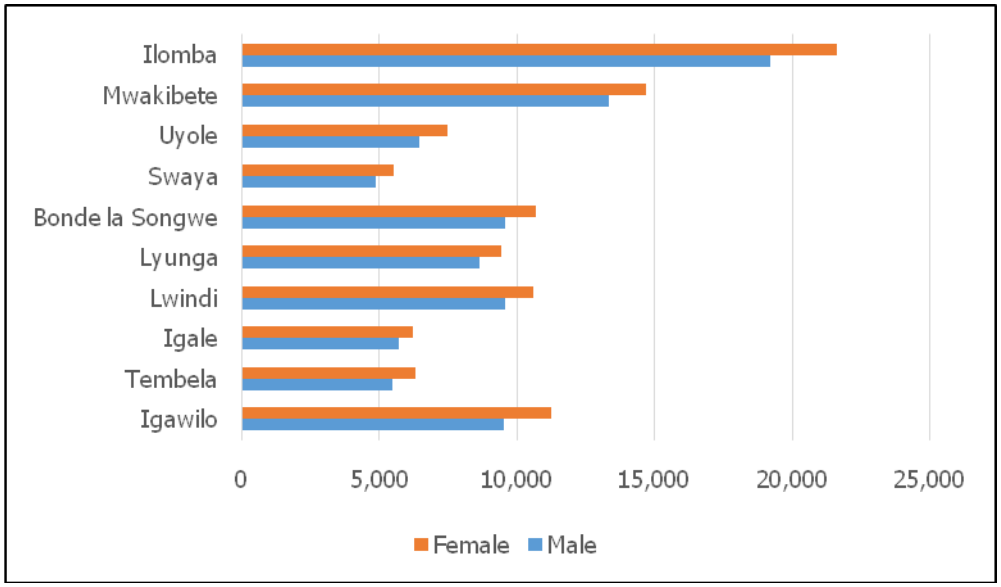


Figure 4-47: Projected population of wards in Mbozi district in 2017

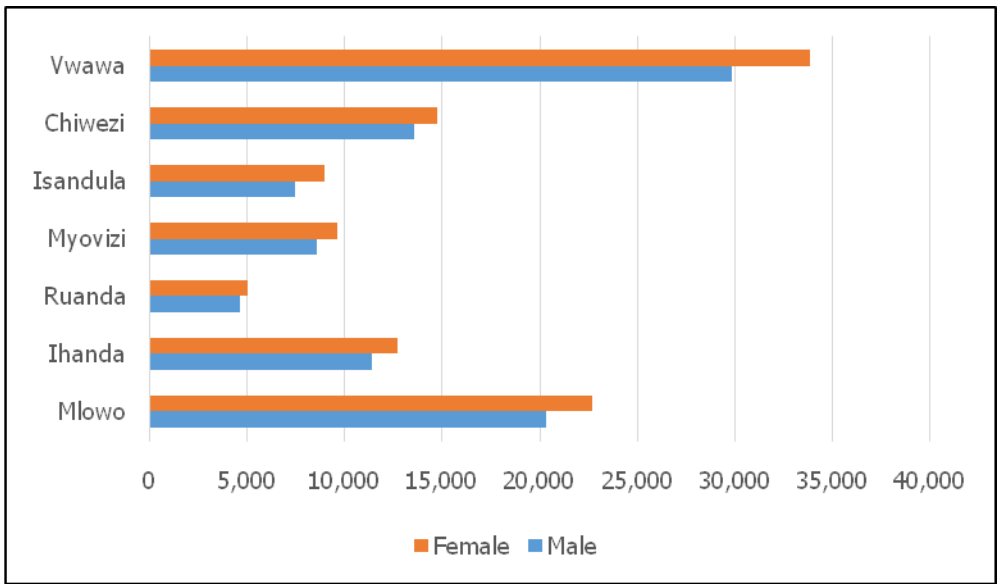


Figure 4-48: Projected population of wards in Momba district in 2017

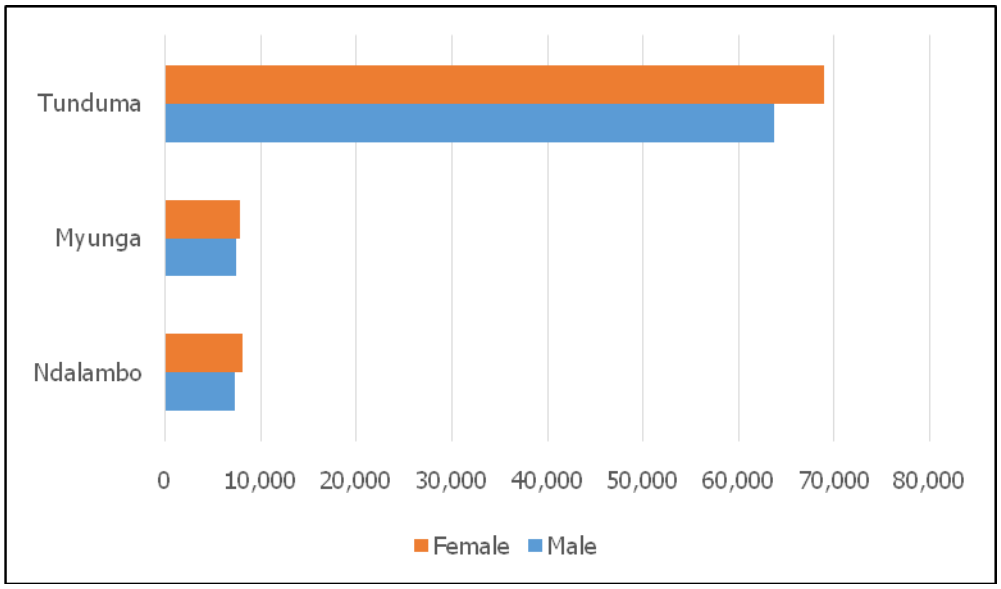
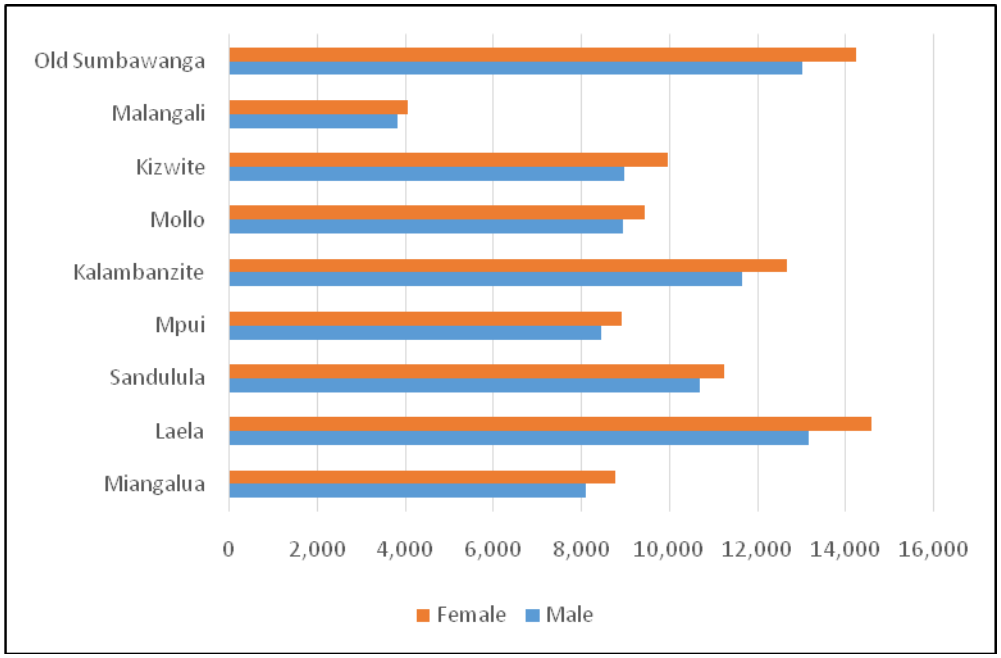


Figure 4-49: Projected population of wards in Sumbawanga district in 2017



The proposed transmission line project will affect the population of the various districts as indicated in Table 4-7. Given in Figure 4-50 is a breakdown of the percentage of population by district affected by the proposed project while Figure 4-51 shows the percentage of households that could be affected by the proposed project. The data for average household size was gotten from the 2012 Census for each district which has remained consistent over the period 2002 – 2012.

Figure 4-50: Percentage of population by district affected by the transmission line project

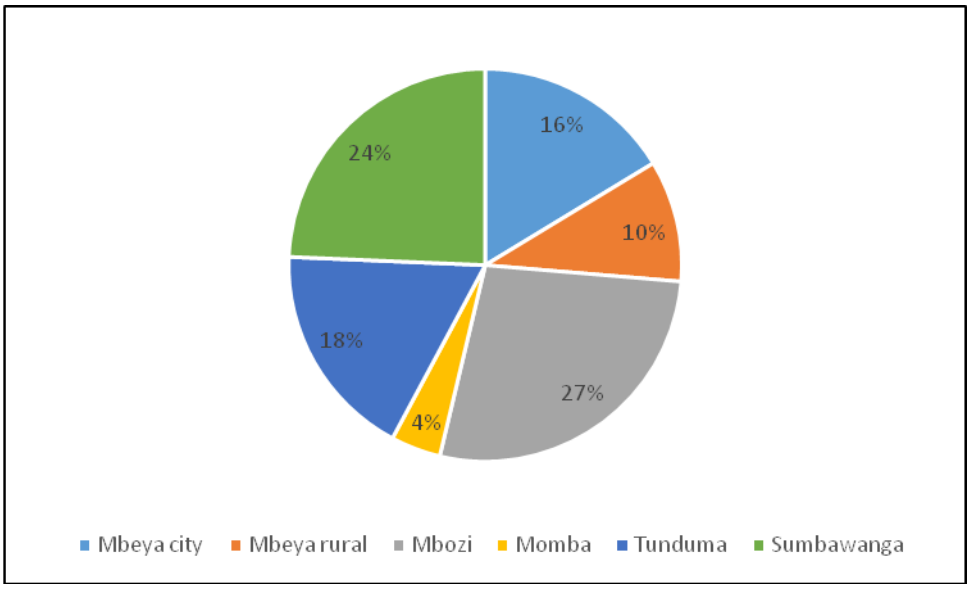
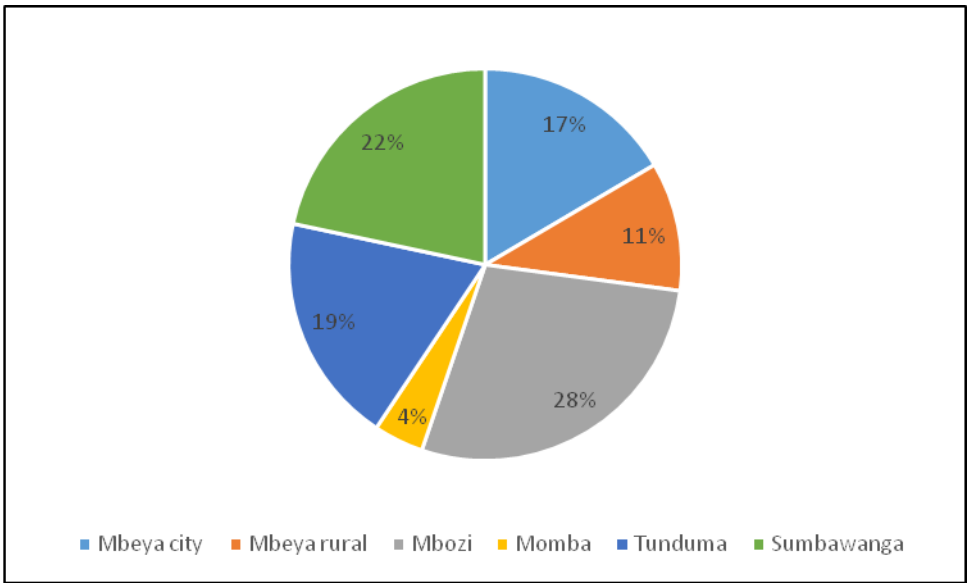


Figure 4-51: Percentage of households by district affected by the transmission line project



Based on the field survey undertaken on November 13 – 17, 2017 along the proposed transmission line, it was observed that a higher population density is located close to the roads and trading centers of the urban parts of the project areas, while the rural segments are characterized by much density at the central locations of the villages.

4.7.5.3 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.

Mbeya Region is one of the 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 Mbeya Region has fertile agricultural land, it attracts seasonal workers from neighbouring Regions and districts such as Sumbawanga. Another reason for migration is the electrification rates; the electrification rate in Mbeya Region is high at about 86%, Songwe and Rukwa Regions are low at 45.2% and 43.8% respectively.

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 4-8. 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.

Table 4-8: Approximate staff strength for the construction and commissioning phases

Project phase	Migrant workers	Local community workers
Mobilization	76	100
Construction	220	660
Commissioning	180	260

4.7.6 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%) live 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.

4.7.6.1 Agriculture

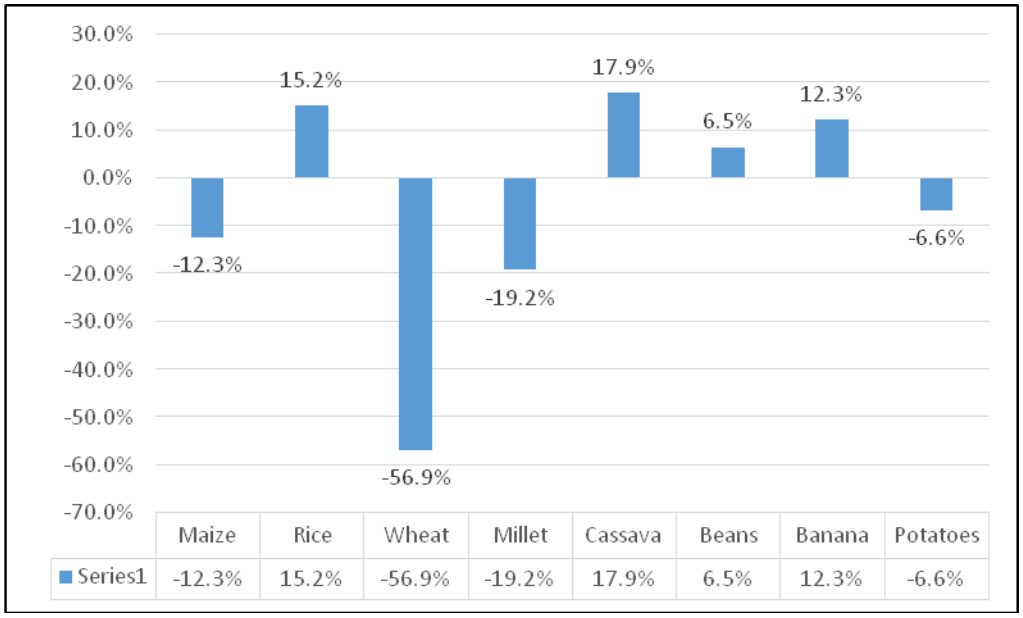
According to the 2015 data from the Ministry of Agriculture, Livestock and Fisheries, Tanzania, the production of food crops on the mainland produced a mixed bag of results as shown in Table 4-9 and Figure 4-52.

Table 4-9: Production of Food Crops in Tanzania Mainland, 2009–2015 ('000 Tons)

Crop	2009	2010	2011	2012	2013	2014	2015	% change in yield 2014/15

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 4-52: Percentage change in yield of food crops production – 2014/15



In Mbeya Rural district, 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.

Agriculture in Rukwa region is dominated by small-scale subsistence farming, with approximately 68% of the cultivated land used by smallholder farmers who operate between 0.5 and 2.0 ha. The crops produced include maize, sunflower and paddy as shown in Figure 4-53.

Figure 4-53: Typical food crops grown in Rukwa region

Maize Sunflower Paddy

During the field visit conducted on November 13 – 17, 2017, it was observed that most of the communities where the transmission line traverses from Mbeya to Tunduma to Sumbawanga practice peasant and/or small scale farming as shown in Figure 4-54 to Figure 4-56. They tend to grow crops such as maize, bananas, ground nuts, rice, etc.

Figure 4-54: Typical type of peasant farming undertaken in the project area

Figure 4-55: Typical small scale subsistence farming near the proposed Tunduma SS

Figure 4-56: Mango and banana trees planted near Ichesa village where the transmission line passes

4.7.6.2 Livestock keeping

Livestock keeping is the second most predominant economic activity in the Mbeya and Rukwa Regions. The sector plays a significant role in the rural economies of the two regions. In Mbeya region, 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 is shown in Table 4-10.

Table 4-10: Livestock population in 2014 in Mbeya and Rukwa Regions

District	Cattle	Goats	Sheep	Pigs	Chicken
Mbeya	88,455	39,983	6,368	33,146	471,222
Mbozi and Momba	117,558	84,503	14,466	26,623	290,030
Sumbawanga	229,052	90,574	14,088	35,997	277,015

4.7.7 Socio-economic factors

4.7.7.1 Occupation

During the field survey and public/stakeholder consultation meetings held on November 13 – 17, 2017 from Sumbawanga to Tunduma 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, beans, bananas, mangoes and groundnuts. For cash crops, a few of the farmers were observed to be growing coffee, sunflower and finger millet; they also sell maize and beans as a cash crop. As an occupation, the men in rural areas also partake in animal husbandry of cows, goats, sheep, chicken, pigs, donkeys, ducks and guinea fowl.

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 Mbeya, Tunduma, Sumbawanga 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.

4.7.7.2 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).

According to the 2015 Tanzania Statistical Abstract the total number of schools (public and private) in Mbeya and Rukwa regions are shown in Table [4-11] and [15]Table 4-12.

Table 4-11: Number of public and private schools in Mbeya and Rukwa Regions

Region	2008	2009	2010	2011	2012	2013	2014
Mbeya	1126	1059	1060	1065	1082	1076	1084
Rukwa	512	513	507	514	518	157	364

Table 4-12: Total enrolment in public and private primary schools in Mbeya and Rukwa Regions ('000s)

Region	2008	2009	2010	2011	2012	2013	2014
Mbeya	566	578	558	557	541	529	537
Rukwa	300	290	307	290	280	202	201

The proposed transmission line will go through the districts of Sumbwanga, Tunduma, Mbozi, Momba, Mbeya Rural and Mbeya City respectively. According to the [16]Rukwa Investment Profile, in 2014, there were a total of 150 public and private pre-primary schools in Sumbawanga District having a total student population of 10,019. In the same year, the district had 161 primary schools with a total enrolment of 102,160 students. In 2014, the number of secondary schools in Sumbawanga Municipal Council were 27, while those in Sumbawanga Rural were 20.

[15] 2015 Statistical Abstract, Tanzania

[16] Rukwa Investment Profile, 2014

4.7.7.3 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.

Table 4-13 shows the types of health facilities in Mbeya region which have been increasing over the years from fiscal year 2012/2013 to 2015/2016.

[17]Table 4-13: Number of health facilities and services has been increasing per years

No.	Health facility type	2012/2013	2013/2014	2014/2015	2015/2016
1	Hospitals	20	20	20	20
2	Health centers	36	36	38	37
3	Dispensaries	374	374	365	412

In Rukwa region, the proposed transmission line passes through the districts called Sumbawanga Municipal and Sumbawanga Rural. The health facilities available in these two districts is shown in the table below.

[17] Source: Regional Medical Doctor's Office, 2016

Table 4-14: Number and ownership of health facilities in Rukwa region

District	Hospital			Health Center			Dispensary			
	Govt.	V.A.	Total	Govt.	V.A.	Total	Govt.	V.A.	Pr.	Total
Sumbawanga Municipal	1	1	2	1	2	3	19	4	6	29
Sumbawanga District	0	0	0	6	1	7	54	2	1	57
Total	**1**	**1**	**2**	**7**	**3**	**10**	**73**	**6**	**7**	**86**

4.8 **Govt.=Government** V.A.=Voluntary Agency Pr.=Private dispensary

5 Stakeholder consultation

5.1 Introduction

This section discusses the stakeholder engagement activities undertaken by the ESIA team for the proposed Mbeya – Sumbawanga 400kV transmission line project and ~. This Section outlines the objectives of undertaking stakeholder consultation and identification of the stakeholders. The section further discusses the national and international framework for undertaking stakeholder consultation. Subsequently, this section outlines the process followed for undertaking the public meetings and identifies the key issues, concerns and expectations that the stakeholders raised. Finally the section concludes by suggesting the next steps following the stakeholder engagement associated with this ESIA Study.

5.2 Objectives of stakeholder consultation

Stakeholder engagement refers to a process of sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration and partnership. It is a long-term process that requires the building of trust through open dialogue and the delivery of commitments.

The most important objective of stakeholder consultation is to provide sufficient and accessible information to potential Interested and Affected Parties (I&APs) in an objective manner and to provide a platform for constructive participation in the application process thereby assisting I&APs to:

- Gain an understanding of the project, the various components and the potential impacts (positive and negative);
- Raise issues of concern and suggestions for enhanced benefits and commenting on reasonable alternatives;
- Verify that their issues have been recorded (Stakeholder Engagement Logs) and considered in investigations; and
- Contribute relevant local information and traditional knowledge to the process.

TANESCO recognizes that open and transparent communication is essential due to the importance of the activities in which it is engaged and the impact on the local, regional and national economies and individuals.

For the proposed transmission line project, TANESCO seconded a Sociologist and Principal Environmental Engineer to the ESIA team for carrying out public meetings.

5.3 Project stakeholders

For the proposed project, project stakeholders include the following categories of persons or institutions:

Those directly impacted by the project such as people living within the proposed 52m wide ROW which will be acquired by TANESCO. These would be people that would be subjected to involuntary resettlement resulting from the ROW acquisition;

The owners and occupiers of land adjacent to the proposed ROW – this includes all adjacent land owners and occupiers along the length of the transmission line;

Tanzania local government at the region, district, ward or village level. Specifically, the two regions affected by this project are Mbeya and Rukwa while the districts include Mbeya City, Mbeya Rural, Mbozi, Momba, Songwe, Tunduma, Sumbawanga among others;

Government parastatals other than regulatory agencies such as Rural Energy Agency (REA), Tanzania National Parks Authority (TANAPA), National Museums of Tanzania (NMT) among others;

Civil society organizations operating in the project area and its environs;

Private sector (businesses, industries) in the vicinity of the proposed project;

The project Proponent – TANESCO.

5.4 Requirements for stakeholder consultation

Stakeholder consultation is required by Tanzanian environmental legislation as well as the World Bank Group's Operational Policy (O.P.) 4.01. Each of these requirements is discussed below.

5.4.1 National requirements

At a national level, stakeholder consultation on ESIA Studies is embedded within the Environmental Management Act, 2004 and specifically under clauses 85, 88, 89 and 90. In each of these clauses, the principal statute makes it clear that public/stakeholder consultation is mandatory and must be undertaken by the Proponent of a project.

Section 85 requires that in determining the scope of the Environmental Impact Statement (EIS), the Proponent should identify the persons and institutions that need to be consulted during the preparation of the EIS.

Clause 88 states that that one of the EIS review criteria will include comments received by the National Environment Management Council (NEMC) during public hearings and other consultative processes.

Clause 89 requires the public to review an EIS submitted to the NEMC for consideration. This clause states that (i) the NEMC will make available the EIS statement to institutions and government agencies for review and comments, (ii) publish through appropriate

means (e.g. newspaper advert or Gazette notice) the place and time for reviewing the EIS and (iii) solicit written or oral comments from various stakeholders.

Clause 90 states that the NEMC can utilize public hearings for the review of an EIS prepared by a Project Proponent.

In order to operationalize the Environment Management Act, 2004, the Tanzanian Government promulgated the Environmental Impact and Audit Regulations in October 2005. These regulations included among other things, the process of carrying out public participation for projects requiring an EIS.

Regulation 17 (1) – (4) of the Environmental Impact Assessment and Audit Regulations requires a Project Proponent to undertake public/stakeholder consultation. Methods of publicizing and seeking views of the public include:

a) Publicizing the benefits and effects of the proposed project through (i) posters placed strategically in the vicinity of the project site, (ii) publishing a notice in the newspaper of national circulation once a week for two consecutive weeks, and (iii) making an announcement on radio in English and Swahili once a week for two consecutive weeks;

b) Conducting public meetings with Interested and Affected Persons (I&APs) near the project site and to receive their oral or written submissions;

c) Send out prior notices about a week prior to conducting a public meeting.

5.4.2 International requirements

The World Bank's Operational Policy 4.01 on Environmental Assessment, requires that during the ESIA process, the project-affected groups and local NGOs are consulted about the project's environmental aspects and their views taken into account. The requirements of the public/stakeholder consultation follow similar processes to those provided for under Tanzanian regulations.

For meaningful consultations, O.P. 4.01 emphasizes on the disclosure of relevant material in a timely manner and in a form and language that are understandable and accessible to the groups being consulted.

For the initial consultation, it stipulates that a summary of the project's objectives, description, and potential impacts should be disclosed. For consultation on the draft ESIA report, stakeholders need to be provided with a summary of the ESIA's conclusions. In addition, the proponent is expected to make the draft ESIA report available at a public place accessible to project-affected groups and local NGOs.

5.5 Approach to stakeholder engagement

Stakeholder engagement is a continuous process that occurs throughout the lifetime of a project. For a project Proponent, consistent and transparent stakeholder engagement is a cornerstone in getting a social license to operate.

5.5.1 Prior stakeholder engagement

There have been prior engagements with the community through a number of forums including previous environmental assessments for the proposed transmission line project.

A comprehensive stakeholder consultation meeting was held in Dar es Salaam on September 12, 2017 to discuss the proposed transmission line project from Mbeya – Tunduma – Sumbawanga. The meeting further discussed the Terms of Reference (TOR) for the ESIA Study of the transmission line.

The workshop was organized by TANESCO with support from the World Bank and invitations were sent out to the following stakeholders:

- District Officers from the districts where the transmission line passes such as Iringa, Njombe, Mbeya, Songwe and Sumbawanga;
- Ministries and other government agencies or authorities which are relevant to this proposed project such as NEMC, Ministry of Natural Resources and Tourism, Ministry of Water and Irrigation, Ministry of Energy, Mpanga-Kipengere Game Reserves, Kitulo National park, Tanzania Forest Services and Tanzania Wildlife Management Authority (TAWA).

The agenda for the stakeholder workshop was as follows:

1. Presentation by TANESCO on the proposed transmission line project;
2. Presentation and discussion of Draft TOR for ESIA Study;
3. Question and answer session on the proposed project and ESIA Study;
4. Any Other Business.

The participants at the workshop included representatives from the Local Government Authorities and institutions given below. The names of the representatives are appended at the end of this section (see section 5.8).

- Tunduma Town Council;
- Iringa District Council and Iringa Municipal Council;
- Songwe District Council;
- Momba District Council;
- Mbozi District Council;
- Mbeya City Council and Mbeya District Council;
- Sumbawanga District Council;
- Makete District Council;
- Mufindi District Council;
- TANAPA – Kitulo National Park;
- Ministry of Tourism;
- Ministry of Water;
- MEM;
- MNRT – Dodoma; and

- TANESCO.

The key issues and concerns raised at this stakeholder engagement workshop are given below.

ESIA Study

- The workshop proceedings should be incorporated into the TORs for the ESIA Study;
- The ESIA Study should be undertaken in accordance with the Tanzanian Environment Management Act and its subsidiary legislation, and the World Bank Operational Policies on environment and social sustainability;
- Stakeholder engagement should be carried out by TANESCO and the successful ESIA Consultant;
- ESIA Study should cover flora and fauna affected by the proposed project e.g. forests, wetlands, wildlife; and
- Project Contractor should develop and implement a Construction Environment and Social Management Plan.

Involuntary resettlement

- Confirmation of the width of the Right-of-Way;
- All Project Affected Persons (PAPs) should be identified by TANESCO;
- Once valuations are complete, TANESCO should identify resources and immediately pay in full, the PAPs prior to commencement of the construction phase of the project; and
- TANESCO should consider restoring livelihoods of PAPs.

Based on the two key issues above, TANESCO provided the following responses:

ESIA Study

- The suggestions made at the workshop were incorporated in the TORs for the ESIA Study;
- The ESIA Study will be undertaken to satisfy the requirements of Tanzanian national environmental laws and regulations and the World Bank policies on environmental and social sustainability;
- Public/stakeholder meetings will be conducted along the route of the proposed transmission line route;
- The ESIA Study will elaborate on the potential ecological impacts arising from the project including mitigation measures; and
- The Project Contractor will be required to comply with the requirements of the ESIA Study as a contractual obligation.

Involuntary resettlement

- The width of the ROW was confirmed as 52m (26m on either side of the centerline). This ROW will be acquired through an outright purchase of the land by TANESCO;
- TANESCO will develop a Resettlement Policy Framework (RPF) based upon which an Request For proposal (RFP) will be sent out for undertaking a Resettlement Action

Plan (RAP) for the project in accordance with Tanzanian laws and World Bank's Operational Policy 4.12;

- TANESCO will endeavor to pay compensation to all PAPs prior to the commencement of the construction phase of the project.

The proceedings of the stakeholder workshop are appended at the end of this section.

5.5.2 Current stakeholder engagement

The purpose of stakeholder consultation for this ESIA Study was to seek the comments, views and concerns of the communities that would be impacted by the proposed transmission line project. In order to agree on an approach for this, the ESIA team met with the TANESCO in Mbeya on November 12, 2017 to characterize the process of stakeholder consultation meetings.

It was agreed that meetings should be conducted along the transmission line route based on the following criteria:

- Identification of villages that cross or pass near the proposed transmission line; and
- Identification of access roads leading to the villages that either cross the transmission line or pass near it.

Based on the above criteria, public/stakeholder consultation meetings were undertaken along the proposed transmission line between Iringa, Mbeya, Tunduma and Sumbawanga on November 13 – 17, 2017. The work schedule adopted for the stakeholder consultation meetings is given in Table 5-1.

Table 5-1: Work schedule for conducting public/stakeholder consultation meetings

Date	Activity
November 13, 2017	Drive from Mbeya to Sumbawanga (~340km) and identify locations where stakeholder consultation meetings can be conducted
November 14, 2017	Starting from Sumbawanga, conduct stakeholder meetings with communities living near the proposed transmission line project between Sumbawanga and Tunduma
November 15, 2017	Starting from Tunduma, conduct stakeholder meetings with communities living near the proposed transmission line project between Tunduma and Mbeya
November 16, 2017	Drive from Mbeya to Iringa (~320km) and identify locations where stakeholder consultation meetings can be conducted
November 17, 2017	Starting from Iringa, conduct stakeholder meetings with communities living near the proposed transmission line project between Iringa and Mbeya

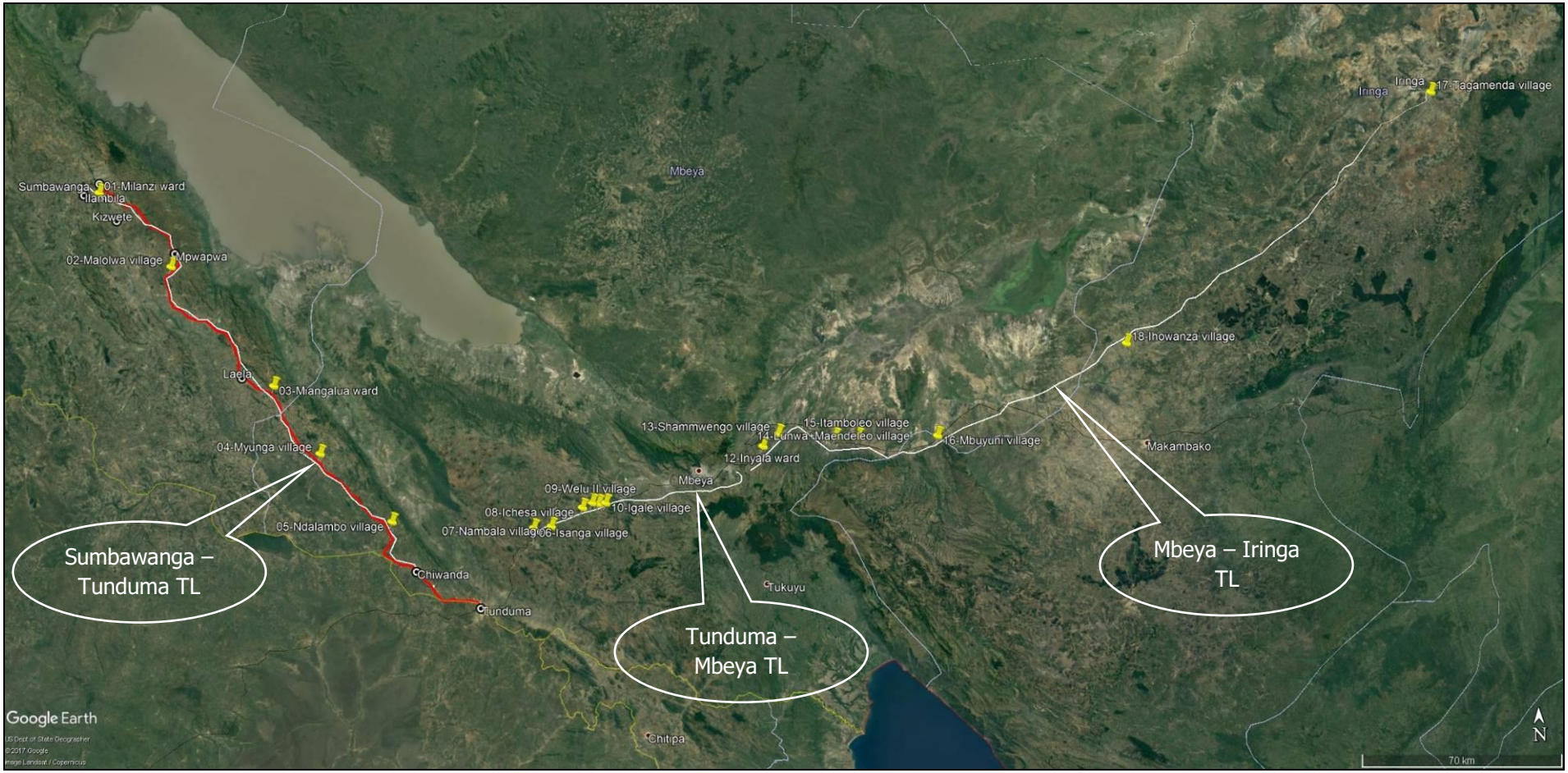
5.5.3 Locations of stakeholder meetings

During the week of November 13 – 17, 2017, a total of eighteen stakeholder consultation meetings were held at various locations between Sumbawanga, Tunduma, Mbeya and Iringa.

While the focus of this ESIA Study is on the proposed transmission line between Mbeya and Sumbawanga, the stakeholder meetings held between Iringa and Mbeya provided additional views about the larger Iringa – Mbeya – Tunduma – Sumbawanga transmission line project.

A map showing the meeting locations is shown in Figure 5-1.

Figure 5-1: Locations of public meetings (Sumbawanga-Tunduma-Mbeya-Iringa)



5.5.4 Details of the public/stakeholder meetings

The public/stakeholder consultation meetings were conducted by a team of four persons – two from TANESCO and two from the ESIA Consultant's office. Each meeting lasted between 1.5 to 3 hours and were physically held in the office of the Village Executive Officer or at a location convenient and comfortable for the community members. The meetings were conducted in Kiswahili. The stakeholder consultation logs of each meetings are provided at the end of this section.

The objective of each stakeholder consultation meeting was:

a) Present key characteristics of the proposed transmission line project;

b) Scope issues of concern to the Ward Executive Officer and Councilor;

c) Solicit information about the ward's areas of interest within the project area; and

d) Recording of interviews

For each stakeholder consultation meeting, the ESIA Consultant used the following agenda:

1. Introduction to the ESIA and TANESCO team;
2. Overview of project activities in the design, construction and operational phase;
3. Solicitation of oral comments, questions and queries;
4. Question and answer (Q&A) session;
5. Any Other Business (AOB).

A breakdown of the meetings conducted is given in Table 5-2.

Table 5-2: Location of meetings and composition of stakeholders

Meeting	Date	Location	No. of Participants	Type of meeting	Composition of stakeholders
1.	November 14, 2017	Milanzi ward	6	Key Informant Interview (KII)	Village Executive Officer (VEO), Councilor
2.	November 14, 2017	Malolwa village	12	Public meeting	Community members
3.	November 14, 2017	Miangalua ward	8	Public meeting	Community members
4.	November 14, 2017	Myunga village	19	Public meeting	Community members
5.	November 14, 2017	Ndalambo village	1	KII	VEO
6.	November 15, 2017	Isangu village	4	KII	VEO, Ward Executive Officer (WEO), Agricultural Officer, Chairman of the *"Mtaa"*
7.	November 15, 2017	Nambala village	26	Public meeting	VEO, Village Chairpersons, Village Chairman, Agricultural Officer, Community Members
8.	November 15, 2017	Ichesa village	10	KII	VEO, Village Chairman, Village Executive Committee Member, Community Members
9.	November 15, 2017	Welu II village	52	Public meeting	Village Chairman, Extension Officer, Community Members
10.	November 15, 2017	Igale village	35	Public meeting	VEO, Sub-village Chairman, Political Leader, Community Members
11.	November 15, 2017	Nswiga sub-village	14	Public meeting	Community members
12.	November 16, 2017	Mwakwenje village	8	KII	VEO, Village Chairman, Agricultural Officer, Community Members
13.	November 16, 2017	Shammwengo village	12	Public meeting	Village Chairman, Sub-village Chairperson, Community Members
14.	November 16, 2017	Lunwa and Maendeleo villages	7	KII	VEO, Ward Commercial Development Officer, Sub-village Chairperson, Village Chair persons

Stakeholder consultation

Meeting	Date	Location	No. of Participants	Type of meeting	Composition of stakeholders
15.	November 16, 2017	Itamboleo village	25	Public meeting	VEO, Village Chairman, Community Members
16.	November 16, 2017	Mbuyuni village	36	Public meeting	Village Community Member, Community Members
17.	November 17, 2017	Tagamenda village	16	Public meeting	VEO, Village Chairperson, Community Members
18.	November 17, 2017	Ihowanzo village	42	Public meeting	VEO, Village Chairperson, Community Members

5.6 Key issues, concerns and expectations from stakeholders

Following the public meetings, the stakeholders raised a number of issues and concerns which are grouped below for ease of discussion.

5.6.1 Employment and economic development

The meetings conducted at all locations shows that the communities firmly support the implementation of the proposed transmission line from Mbeya – Tunduma – Sumbawanga. At nearly all meetings, the communities interviewed said that if the project is being promoted by the Tanzanian government, then they fully support it as they have faith in what their government is doing for them.

At each key informant interview (KII) or public meeting, the community expressed a desire to be given job opportunities during the construction and operational phases of the project. The communities expressed their view that the youth unemployment rate is high and that the Project Contractor should give the first opportunity for employment to the communities where the transmission line construction occurs. The best mode of employing workers for unskilled, semi-skilled and skilled workers is through the Village Executive Officer (VEO) who has administrative jurisdiction over a village.

Additionally, the communities felt that there will be short-term direct and indirect benefits to the local economy through supply of construction materials and services such as accommodation, transport and catering for the construction workers.

5.6.2 Land acquisition

Concerns related to the compensation and resettlement process have been raised by all stakeholders who generally expect that the Project will ensure proper negotiation and consensus reaching with affected landowners. Most people interviewed said that replacement lands may be difficult to find in the study area and people may not easily accept to be moved somewhere else. Early involvement and transparent communication with local governments, as well as involvement of district valuers in the valuation process, are seen as critical in order to build trust into the compensation and resettlement process. Different stakeholders have recommended that additional resettlement assistance be provided for "economically displaced" households.

Most communities consulted said that TANESCO should pay PAPs for land acquired for transmission line projects immediately after valuation is complete. They also said that they should be paid promptly and well before construction commences to allow them to look for alternative parcels of land where they can restart their livelihoods.

The representatives from TANESCO continually reminded all communities where public meetings were held that the company has an involuntary resettlement process that has successfully been used for several past transmission line projects. TANESCO intends to follow their internal processes for acquiring the 52m wide ROW in accordance with Tanzanian land laws and the World Bank Policy 4.12 on Involuntary Resettlement.

With respect to crops that have been planted after the land acquisition "cut-off date", TANESCO will allow the land owners to harvest their crop as no compensation will be paid for crops planted.

5.6.3 Infrastructure

Strain by the construction workforce especially the migrant ones is seen as a concern by the communities. Currently, the communities have limited resources with respect to health facilities, educational establishments, electricity supply, access roads and water and the construction of the proposed project is seen as exacerbating the present situation.

A number of stakeholders along the proposed transmission line route requested for electricity provision as a result of the proposed project. However, they were advised that the Rural Energy Agency (REA) has a program of electrification and densification of villages in various rounds. Currently, REA is in round 3 of the electrification program and each round has a number of villages that have been targeted for either electrification or densification or both.

5.6.4 Gender requirements

The construction of the proposed transmission line is perceived as a male dominated activity; in order to mainstream gender requirements into the proposed transmission line project, the following aspects were discussed:

Women should have a say in how money gotten from the land acquisition process is used. This would be a personal decision for a couple to make but none-the-less important as women generally tend to the family's needs. Through provision of financial education to women project affected persons (PAPs), TANESCO should ensure that women are engaged during the RAP process and have a say in how the money the family receives as compensation will be spent; and

Women expressed their desire to be provided with opportunities by the Project Contractor to supply food to the construction workers. They said that they had done this in the past for other linear projects and would like the opportunity to do so for the proposed project.

5.6.5 Communities and social cohesion

In a number of stakeholder meetings, the host communities felt that the influx of migrant workers may lead to adverse impacts on social cohesion between them. This is due to a strain on the already existing meagre infrastructure and, interactions with the women members of the community leading to increased STIs.

5.6.6 Community health and safety

At some meetings, communities identified issues such as dust emission from construction plant and equipment and noise as an adverse impact that will need to be managed by the

Project Contractor. A few communities feared that there would be an increase in the motor vehicle accident rate resulting from the construction phase of the project.

5.6.7 Worker health and safety

At a few stakeholder consultation meetings, community members identified accidents and incidents affecting construction workers as an adverse impact. Risks such as working at heights and excavations were identified as potential worker health and safety hazards which need to be managed during the construction phase of the project.

5.6.8 Labor and working conditions

At one of the meetings, stakeholders raised issues regarding fair payment of wages to workers undertaking construction of the proposed transmission line project. They said that there had been cases in the past where workers were not paid in accordance with Tanzanian labor laws and that TANESCO should ensure that the Project Contractor fully complies with Tanzanian laws and regulations on remuneration of workers.

In this regard, while it was not mentioned, the Project Contractor should have a written employment contract with each permanent or temporary worker clearly stipulating the terms and conditions of employment including social benefits.

Additionally, while it did not come out clearly at the meetings, it was felt that the living conditions for those workers to be housed in construction camps should comply with international standards.

5.7 Next Steps

5.7.1 Stakeholder Engagement Plan

Based on the stakeholder consultation meetings held on November 13 – 17, 2017, the communities 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 Plan for the project. The SEP will include a Grievance Redress Mechanism (GRM) for addressing grievances.

5.7.2 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 will enable all stakeholders, local, regional and national, to provide feedback to TANESCO with any complaints or comments throughout the project through TANESCO's grievance mechanism.

5.8 Stakeholder engagement logs

Given on the following pages are the following:

Stakeholder workshop held on September 12, 2017 by TANESCO in Dar es Salaam;

Stakeholder engagement logs for the eighteen meetings conducted on November 13 – 17, 2017. A number of images are also included showing the nature and types of attendees at the meetings.

6 Assessment of impacts and identification of alternatives

This section of the ESIA Study presents the potential impacts associated with the proposed 400kV overhead transmission line project between Mbeya and Sumbawanga including segment of ~4km TL from Tunduma S/S to TanZam border. The purpose of this impact assessment is to assign relative significance to predicted impacts associated with the project, and to determine the manner in which impacts are to be avoided, mitigated or managed. The potentially significant environmental impacts were identified based on the nature of the receiving environment, a review of the proposed activities, and the issues raised in the public participation process.

6.1 Proposed project activities

The following activities are associated with the construction, operation and decommissioning of the Project:

Construction phase

- Awarding of the contract;
- Surveying of the Right-of-Way (ROW) between Mbeya and Sumbawanga including the proposed sub-station sites at Mbeya, Kisada, Tunduma and Sumbawanga;
- Surveying of the Right-of-Way (ROW) between Tunduma S/S to TanZam border
- Upgrading of existing access roads crossing the proposed ROW to receive heavy equipment components;
- Site clearing along the ROW and substation sites in Mbeya, Kisada, Tunduma and Sumbawanga;
- Soil excavation for the tower foundations and substation sites;
- Disposal of vegetation and excavation spoils;
- Casting reinforced concrete foundations for the steel towers and substations;
- Delivery of transformers and other substation components;
- Construction of the proposed substations;
- Assembling the steel tower and their erection; and
- Stringing the conductors.

Operational phase

- Operation of the substations and transmission line;
- Routine maintenance of equipment and plant and ROW, and
- Security of facilities.

Decommissioning

- Tender process and awarding of contract for decommissioning and demolition;
- Removal and disposal of hazardous materials;
- Disassembling equipment and plant from the substations;
- Removal of conductors, insulators, steel towers, and reusable components;
- Demolition of buildings and breaking up for removal; and
- Site leveling and filling.

6.2 Methodology for assessing the impacts

In the impact assessment stage of an ESIA, identified issues are analyzed and expected impacts are defined. This analysis identifies:

- The types of impact;
- Predicts the magnitude;
- Probability of occurrence;
- Extent of the impact; and
- Determines the overall significance of the impact.

6.3 Identification of environmental and social aspects and impacts

The outstanding environmental issues identified as having significance will be assessed using the methodology described below.

First, the issues raised will be described giving consideration to the associated activity and the aspect of that activity that is likely to result in an impact. The nature of the impact will also be described. Once this has been undertaken the significance of the impact can be determined. The following definitions will apply:

- An **activity** is a distinct process or task undertaken by an organization for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organization.
- An **environmental aspect** is an element of an organizations activities, products and services which can interact with the natural or human environment. The interaction of an aspect with the environment may result in an impact.
- **Environmental and social impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and paleontology. Impacts on the

environment can lead to changes in existing conditions; the impacts can be direct, indirect or cumulative. Direct impacts refer to changes in environmental components that result from direct cause-effect consequences of interactions between the environment and project activities. Indirect impacts result from cause-effect consequences of interactions between the environment and direct impacts. Cumulative impacts refer to the accumulation of changes to the environment caused by the project and other ongoing or planned human activities.

Aspects and impacts associated with the proposed development have been differentiated into construction and operation phases of the project.

6.4 Description of aspects and impacts

The accumulated knowledge and the findings of the environmental investigations form the basis for the prediction of impacts. Once a potential impact has been determined during the scoping process, it is necessary to identify which project activity will cause the impact, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). This information is important for evaluating the significance of the impact, and for defining mitigation and monitoring strategies. The aspects and impacts identified will therefore be described according to the definitions below.

6.4.1 Extent

The extent for each aspect, receptor and impact will be defined. The geographical coverage (spatial scope) description will take account of the following factors:

- The physical extent/distribution of the aspect, receptor and proposed impact; and
- The nature of the baseline environment within the area of impact.

For example, the impacts of noise are likely to be confined to a smaller geographical area than the impacts of atmospheric emissions, which may be experienced at some distance. The significance of impacts also varies spatially. Many will be significant only within the immediate vicinity of the site or within the surrounding community, whilst others may be significant at a local (project) or regional (district) level.

The **extent** of the impact will be rated on the following scale:

Localized (At localized scale i.e. within the substation footprint area or 1km on either side of the ROW in extent)	1
Study area (The proposed ROW and 20km on either side of it)	2
Regional (Covers the region where the TL passes)	3
National (At country level)	4
International (Beyond Tanzania)	5

6.4.2 Duration

Duration refers to the length of time that the aspect may cause a change either positively or negatively on the environment.

The environmental assessment will distinguish between different **time periods** by assigning a rating to duration based on the following scale:

Very short (0 – 1 Years)	1
Short term (1 – 5 Years)	2
Medium term (5 – 15 years)	3
Long term (>15 years)	4
Permanent	5

6.4.3 Magnitude

The **magnitude** of an environmental or social aspect is determined by the degree of change to the baseline condition, and includes consideration of the following factors:

- The reversibility of the impact;
- The sensitivity of the receptor to the stressor;
- The impact duration, its permanency and whether it increases or decreases with time; Whether the aspect is controversial or would set a precedent; and
- The threat to environmental and health standards and objectives.

The magnitude of each of the impacts will be rated on the following scale:

Small (will have no effect on the physical, biological or social environment)	0
Minor (will cause a minimal impact on physical, biological or social environment)	2
Low (will cause a slight impact on the physical, biological or social environment)	4
Moderate (will result in a physical, biological or social environment component or process continuing but in a modified way)	6
High (physical, biological or social environment or component or process is altered to the extent that they temporarily cease to exist or operate)	8
Very high (results in complete destruction of physical, biological or social environment components and permanent cessation of the processes)	10

6.4.4 Probability of impact

The **probability** or **frequency** of the impact occurring refers to how often the issue may impact either positively or negatively on the environment. After describing the frequency the findings will be indicated on the following scale:

Highly improbable (<20% chance of occurring)	1
Improbable (20 – 40% chance of occurring)	2
Probable (>40% - 70% chance of occurring)	3
Highly probable (>70% - 90% chance of occurring)	4
Definite (>90% - 100% chance of occurring)	5

6.5 Method of assessing the significance of impacts

The purpose of impact evaluation is to assign relative significance to predicted impacts associated with the project, and to determine the manner in which impacts are to be avoided, mitigated or managed. The information presented above in terms of identifying and describing the aspects and impacts will be summarized in a tabular form and a significance will be assigned with supporting rational. Significance will be determined before and after mitigation, taking into consideration all the factors described above.

A definition of a "significant impact" for the purposes of the study is: "An impact which, either in isolation or in combination with others, could in the opinion of the specialist, have a material influence on the decision-making process, including the specification of mitigating measures."

6.6 Significance determination

The environmental significance rating is an attempt to evaluate the importance of a particular impact, the consequence and likelihood of which has already been assessed by the relevant specialist. The description and assessment of the aspects and impacts undertaken is presented in a consolidated table (Table 6-1) with the significance of the impact assigned using the process and matrix detailed below.

The sum of the first three criteria (extent, duration and magnitude) provides a collective score for the CONSEQUENCE of each impact. The last criteria determines the PROBABILITY of the impact occurring. The product of CONSEQUENCE and PROBABILITY leads to the assessment of the SIGNIFICANCE of the impact, shown in the significance matrix below.

Table 6-1 : Significance Assessment Matrix

		CONSEQUENCE (Extent + Duration + Magnitude)																			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
PROBABILITY	**1**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
	3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
	4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

In order to evaluate the mitigation threshold, the ratings in Table 7-2 are used.

Table 6-2: Mitigation Ratings Table

Low	<30	Where this impact would not have a direct influence on the decision to develop in the area
Medium	30-60	Where the impact could influence the decision to develop in the area unless it is effectively mitigated
High	>60	Where the impact must have an influence on the decision process to develop in the area

6.7 Mitigation

Measures to avoid, reduce or manage impacts consistent with best practice will be proposed and the effectiveness of such measures assessed in terms of their ability to avoid, remove an impact entirely, render it insignificant or reduce its magnitude.

In assessing the significance of the impact, natural and existing mitigation will be taken into account. Natural and existing mitigation measures are defined as natural conditions, conditions inherent in the project design and existing management measures that alleviate (control, moderate or curb) impacts. In addition, the significance of impacts will be assessed taking into account any mitigation measures that are proposed.

An Environmental and Social Management Plan (ESMP) has been prepared and is provided in Section 8 of this report. This plan specifies the methods and procedures for managing the environmental aspects of the proposed development. Monitoring requirements are also be detailed within the plan, particularly for those environmental aspects that give rise to potentially significant impacts.

6.8 Potential impacts associated with the project

The proposed transmission line project from Mbeya to Sumbawanga including segment of ~4km TL from Tunduma S/S to TanZam border are expected to potentially have both positive and adverse impacts on the physical and social environment. The project will require construction works over a total length of about 344km, a new 400kV transmission line will be erected to link Mbeya via Tunduma to Sumbawanga with new substations being built in Mbeya, Tunduma and Sumbawanga. Also Tunduma Substation will connect with Zambia via 33kV TL.

Prior to the commencement of the construction phase, the project will require the physical relocation of community members that reside within the proposed 52m wide ROW. Additionally, any Project Affected Persons (PAPs) currently residing on land required for the three proposed substations in Mbeya, Tunduma and Sumbawanga will be physically displaced. Construction of 400kV and 330kV TL will involve vegetation clearance, excavation of foundation for towers construction, erection of towers, stringing of conductors as well as substation construction. Also, the maintenance and repair activities of the ROW and transmission line will involve periodic access to the structures.

The sources of impact can be defined as all the activities linked to the project likely to have an impact on the environment. The sources of impact are grouped by project phase: pre-construction, construction, operation and decommissioning phases. Table 6-3 explains these sources of impacts.

Table 6-3 : Sources of Environmental and Social Impacts

Source of impact	**Description of impact**
Pre-construction phase	
Land acquisition	Procedures relating to agreements with landowners
Resettlement	Resettlement process of the people affected by the project.
Displacement of economic activities	Resettlement of economic activities affected by the project
Construction phase	
Site preparation	Site preparation activities, including establishment of equipment storage yards and worker camps, vegetation clearing, removal of topsoil, excavation, earthworks and construction of access roads
Transportation and traffic	Road transportation of materials, equipment and workers to and from the site, including fueling and maintenance of vehicles and machinery
Construction activities	Construction of the power transmission line and substations, including temporary facilities used during the work phase, such as borrow pits.
Waste and hazardous materials management	Management and storage of waste, hazardous substances and other materials to be removed, including hydrocarbons
Purchase of materials, goods and services	Purchases required for the construction of the power transmission line and substations
Presence of workers	Workers present along the RoW and substation sites which could lead to added burden on socio-economic and public services in the communities, potential abuse of local population, including gender based-violence and potential increase in STDs.
Operational phase	
Presence and operation of line, substations and access roads	Presence and operation of facilities.
Transportation and traffic	Road transportation of materials and equipment, including vehicle fueling and maintenance
Maintenance and repairs	Inspection, maintenance and repairs of conductors, towers and structures in substations

Source of impact	Description of impact
	as well as RoW maintenance
Waste and hazardous materials management	Handling operations and storage of hazardous waste used during the operation, including oil used in transformers at substations
Purchase of materials, goods and services	Purchases required for the operation of the substations and the transmission line.
Presence of workers	Employees operating substations and during maintenance along the line.

6.8.1 Environmental and social components

Determining environmental and social components (ESC) consists of identifying, based on available data, elements of the physical, biological and socio-economic environment that are likely to be affected by one or more source of impact. The ESC identified for the project are listed in Table 6-4. The ESIA process will focus only on these components.

Table 6-4: Environment and Social Components

Component		Description
Physical environment	Soils	Physical and chemical characteristics of the surface deposits, including vulnerability to erosion.
	Water	Physical and chemical characteristics of the surface water and groundwater
	Air quality	Physical and chemical characteristics of the air.
	Noise, vibrations and electromagnetic fields	Noise, vibrations and EMF levels.
Biological environment	Terrestrial flora	Terrestrial plant communities, including special-status species
	Terrestrial fauna	All terrestrial and semi-aquatic animal species and their habitats, including special-status species
	Avifauna	All bird species and their habitats, including special-status species
Socio-economic environment	Employment and economic development	Local and regional economic development, employment
	Land use	Land uses: agricultural, livestock rearing, fishing, tourism, mining, forestry, urban, etc.
	Infrastructure	Electricity and telecommunication networks, public services (health, education), regional and local road network, railroads, etc.

Component		Description
	Gender aspects	Women living conditions, including women's economic opportunities and gender equity within the communities.
	Gender Based Violence	An umbrella term for any harmful act that is perpetrated against a person's will, and that is caused by differences in power between people of different genders, i.e., between males and females and people of other gender and sexual identities
	Communities and social cohesion	Traditional knowledge, social cohesion and vulnerable groups (the poor, youth, women and the elderly).
	Cultural and archaeological heritage	Religious, cultural or historical sites and structures
	Safety and public health	Population well-being and health, including Sexually Transmitted Infections (STIs)

6.8.2 Environmental and social issues raised during stakeholder engagement

During the public meetings held in the week of November 13 – 17, 2017, the stakeholders consulted raised some environmental and social issues and concerns associated with the proposed transmission line project. These issues are summarized in Table 6-5 and will be considered for impact assessment as they represent the most sensitive and the most valued components of stakeholders.

Table 6-5: Environmental and social issues raised during public meetings

Biological Environment	
Terrestrial flora	• Importance to protect forested areas which are important for the livelihood of local population
Avifauna	• Importance to protect bird migration corridors, in particular Lake Rukwa, Lake Tanganyika, Lake Malawi and Uwanda Game Reserve
Social Environment	
Employment and economic development	• Job creation is expected from the construction activities • Need for local benefits including rural electrification in order for the project to be seen as acceptable by local population and authorities
Land use	• Expectation for fair compensation and resettlement assistance • Potentially difficult to find replacement land • Local leaders (Village Executive Officers and Village Chairpersons among others) should be involved in

	overseeing the implementation of the Resettlement Action Plan
Communities and social cohesion	• Migrant workers should respect the cultural norms of the host communities • Stakeholder Engagement Plan – TANESCO to rollout a Communication plan to update communities on status of project • Project Contractor to implement a code of conduct for all staff working on the project

6.8.3 Positive impacts

Tanzania is a vast country which has the potential of becoming an economic powerhouse in East Africa. In order to do this, the country needs a significant amount of investment in the electric power sector in order to provide an enabling environment for businesses, factories and industries to operate.

The proposed transmission line project including segment of TL from Tunduma S/S to TanZam border will yield benefits to both the formal and informal economy in the regions of Mbeya and Rukwa as well as the wider temporal area of Tanzania. For example, the Project Affected Persons (PAPs) could be temporarily employed during the construction phase for unskilled and semi-skilled work. The stakeholders consulted said that they expected positive benefits for the women who would be able to provide catering services to the construction workers.

Additionally, it is expected that resulting from the influx of workers, there will be a demand for temporary housing, lodging and catering services which the communities consulted identified as a benefit to them especially during the construction phase.

The availability of high voltage electric power spanning from Mbeya to Tunduma and then on to Sumbawanga will provide an enabling environment for new businesses to set up their facilities, factories and agro-processing industries in these towns and their environs.

Through the Rural Electrification Agency (REA), it is envisaged that the proposed transmission line project will lead to more villages to be connected to power through the REA3 and similar subsequent programs.

6.8.4 Negative impacts

The main impacts on the biophysical environment are the permanent loss of vegetation (trees and shrubs) within the proposed ROW, the proposed substations in Mbeya, Tunduma and Sumbawanga, and, upgrading of the roads leading to these three substations.

Other impacts may occur during construction and maintenance works but will be of temporary nature. These include dust emissions, noise, soil erosion, degradation of water quality, and, soil contamination by poor waste management or accidental spill of hydrocarbons.

For project affected households and communities, negative impacts occurring during the construction phase will be localized and of a short-term duration. Some of the long-term impacts are the permanent loss of arable land due to the presence of access roads and tower bases, and the restriction of planting species in the ROW. In addition to these impacts on agricultural activities, an important impact will be the relocation of houses and some public or private infrastructure such as schools, mosques, churches, shops, etc. In most cases, these will be relocated on another part of the same land, to an adjacent land plot or elsewhere as may be desired by the affected households. The nature and extent of relocation related impacts will be determined through a separate comprehensive Resettlement Action Plan (RAP).

6.8.5 Identification of potential environmental and social impacts

The identification of the potential environmental and social impacts was established by an "environmental matrix", in which one axis identifies the project's sources of impacts while the other axis identifies the biophysical and socio-economic components of the project. Table 6-6 presents these interactions and will be the basis for the impact evaluation.

Table 6-6: Impact identification matrix

		ENVIRONMENTAL COMPONENT													
		Physical environment				Biological environment		Social environment							
		Soils	Surface water	Air quality	Noise and EMF	Terrestrial ecology	Avifauna and bats	Employment and economic development	Land use	Infrastructure	Gender requirements	Gender based violence	Communities and social cohesion	Community health and safety	Worker health and safety
SOURCES OF IMPACT BY PHASE	**PRE-CONSTRUCTION PHASE**														
	Land Acquisition								N		N		N		
	Resettlement										N		N		
	Displacement of economic activities							N					N		
	CONSTRUCTION PHASE														
	Site preparation	N	N	N	N	N	N	P		N		N		N	N
	Transport and traffic	N	N	N	N	N		N/P	N	N		N		N	N
	Construction activities	N	N	N	N	N	N	P		N	N	N		N	N
	Waste and hazardous materials management	N	N											N	N
	Purchase of goods, materials and services							P							
	Presence of workers	N				N	N	N/P			N	N	N	N	N

		ENVIRONMENTAL COMPONENT													
		Physical environment				Biological environment		Social environment							
		Soils	Surface water	Air quality	Noise and EMF	Terrestrial ecology	Avifauna and bats	Employment and economic development	Land use	Infrastructure	Gender requirements	Gender based violence	Communities and social cohesion	Community health and safety	Worker health and safety
	OPERATIONAL PHASE														
	Presence and operation of line, substations and access roads					N	N							N	
	Transportation and traffic		N	N		N								N	
	Maintenance and repairs			N		N	N								N
	Waste and hazardous materials management	N	N												N
	Purchase of materials, goods and services														
	Presence of workers												N	N	N
	N = Negative impact		P= Positive impact		N/P = Negative and positive impacts										

6.9 Assessment of positive impacts – construction phase

6.9.1 Potential impacts on employment

The proposed project including segment of TL from Tunduma S/S to TanZam border is envisioned to generate direct and indirect employment opportunities for both semi-skilled and unskilled workers. Direct employment includes jobs for constructing the transmission line during the construction phase. Indirect employment will be realized through increased business opportunities and spurred economic growth both at the local, regional and national levels through procurement of goods and services required for the project.

Creation of employment opportunities during the construction phase was perceived to be the most important benefit of the project by the communities living along the ROW. This is expected to benefit people living in the vicinity of the transmission line route. The unemployment levels are generally high in the regions through which the project is passing and expectations on job opportunities are high among the people. The Project Contractor will aim for gender balance during employment to help empower women in the community. Women interviewed during the stakeholder consultation meetings expressed their interest in providing catering services to the workers constructing the transmission line.

It is anticipated that the proposed project will result in a marked increase in individual income and for the communities living near the proposed transmission line. This will be attributed to the increased purchases from local, regional and national businesses, employment generated by project activities, and a general spur of economic activities stimulated by the project.

From the foregoing, the potential impacts associated with direct, indirect and induced employment arising from the construction phase of the project are assessed below.

Table 6-7: Impact significance on employment

Enhancement Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without enhancement	Regional	Short term	Low	Probable
	3	2	4	3
	Result: (+27) Low positive			
Enhancement measures	• TANESCO will direct its Project Contractor to prioritize the local community along the construction corridor in the allocation of job opportunities from the residents immediately neighboring and/or displaced by the project. • TANESCO will also ensure opportunities for capacity building are afforded to the local communities to enable them to benefit from the available employment opportunities. This includes training in skills set required during the construction and operational phases of the project • Job advertisements will be made through mediums that are easily accessible to the local communities living near the			

	proposed transmission line project. • Where possible, expertise will be sourced locally then regionally and nationally before resorting to engagement of international experts • The recruitment selection process will seek to promote gender equality and the employment of women where possible. • Management and enhancement measures for local employment will be included in the Project Contractor's labor and human resources plan. • In all cases, the village administration (Village Executive Officer and Village Chairperson) will be consulted when recruiting local workers • The Project Contractor will make a conscious effort to promote local business people in the procurement of goods and services to assist in providing more economic and employment opportunities for the local community			
Enhancement Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With enhancement	Regional	Short term	Moderate	Definite
	3	2	6	5
	Result: (+55) Medium positive			

6.9.2 Potential impacts on economic development

The proposed transmission line project including segment of TL from Tunduma S/S to TanZam border is of such magnitude that it will impact the economy of western and northwestern Tanzania and by extension the country. Implementation of the proposed project is anticipated to stimulate economic growth through:

- Access to affordable and reliable power by industries and micro-enterprises in western and northwestern Tanzania. This will promote the emergence of new enterprises and boost business and economic opportunities both in the formal and informal sectors. This is also expected to increase productivity of all sectors through mechanization of sectors such as agriculture, enhanced industrialization and adoption of ICT.
- Enhanced availability of markets for local products. Both goods and services such as food supplies, catering services and construction materials will be required during construction phase. As rightly perceived by the local communities, this will lead to secondary employment and creation of small supporting businesses.
- Increased tax revenue through direct and indirect taxes on goods and services associated with the project.

An assessment of the positive impacts to be created during the construction phase resulting from implementation of the proposed transmission line project is given below.

Table 6-8: Impact significance on economic development

Enhancement Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without enhancement	Regional	Short term	Low	Probable
	3	2	4	3
	Result: (+27) Low positive			
Enhancement measures	• TANESCO will encourage the Project Contractor to source as many goods required for construction purposes economic opportunities are available or are created for the local community and that proper capacity building is afforded to the local communities to enable them to benefit from the available economic opportunities • Communication and information programs will be used to manage expectations and target local service providers • TANESCO and its Project Contractor will, to the extent possible, make deliberate efforts to source for all required supplies from local providers, prioritizing from the region to the rest of the Country, before resorting to importation • Tender documents will include guidelines for the involvement of local entrepreneurs, businesses and SMEs from the local sector			
Enhancement Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With enhancement	National	Short term	High	High
	4	2	8	4
	Result: (+56) Medium positive			

6.10 Assessment of negative impacts – construction phase

6.10.1 Impacts on the physical environment

6.10.1.1 Soils

The proposed transmission line project including segment of TL from Tunduma S/S to TanZam border will require the removal of vegetation along the Right-of-Way (ROW) and excavation of foundation pits for the steel towers which will affect the soil structure. For the tower sites, all vegetation over the tower footprint area will be cleared and an area around them. Additionally, excavation on slopes for the foundation pits will increase the likelihood of soil instability and consequently erosion.

The movement of construction plant and equipment such as trucks, 4WD vehicles, etc. will lead to a compaction of soils along the access roads used during the construction phase of the project.

The soils along the proposed transmission line route have good agricultural potential as observed by the subsistence farming during the field survey on November 13 – 17, 2017. The excavation of tower foundation pits and access roads for the proposed transmission line project could potentially lead to the loss of the top organic layer which has good agricultural potential.

If not maintained in a good state of repair, the construction plant and equipment used for the project could cause fugitive spills due to leaks thus leading to surface and subsurface soil contamination.

Soils can also be contaminated through accidental spills caused as a result of field refueling or motor vehicle accidents.

Based on the above, the impact assessment on soils resulting from the construction phase activities is given below.

Table 6-9: Impact significance of soils

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Minor	Improbable
	1	2	2	2
	Result: (-10) Low negative			
Mitigation measures	**Comments/Mitigation:** • Avoid grading in areas with high slope angles to avoid future possible erosion • Minimize grading of rugged areas by looking for alternative passage within the 52 m ROW. • Restrict construction activities, materials and manpower movements to existing roads/tracks and RoW limits. • Prepare and implement erosion and sediment control plans, particularly in areas identified as having high erosion potential • Construct a designated, signposted, concrete wash down bay that is fully contained for all excess concrete and concrete wash down (e.g. plastic lined). • Hazardous materials must be stored in a manner that prevents interaction with each other or with the environment or from being tampered accidentally. • Control and reduce at source the production of wastes and hazardous waste			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With	Study area	Short	Small	Improbable

mitigation	1	2	0	2
	Result: (-6) Low negative			

6.10.1.2 Water

Sources of impacts to watercourses and wetlands are removal of vegetation, construction of access roads, vehicle movement along the ROW and construction sites and excavation/piling for tower installations.

Vegetation removal in riparian areas can increase soil erosion, causing sediment to be deposited into waterbodies, especially during rain events. Ultimately, this could lead to the deterioration of water quality as well as modification of the natural hydrology of these watercourses.

Construction of access roads as well as vehicle movements along the construction sites can result into changes in run-off as well as hydrology by modifying the water flow dynamics.

Moreover, the excavation of pits for the towers' foundations could expose groundwater. During the construction phase, this groundwater may be exposed to contamination by spills or leaks of contaminant.

The significance of the impacts on water during the construction phase are given below.

Table 6-10: Impact significance on water

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Minor	Probable
	2	2	2	3
	Result: (-18) Low negative			
Mitigation measures	**Comments/Mitigation:** • 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			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Small	Improbable
	2	2	0	2
	Result: (-8) Low negative			

6.10.1.3 Air and noise quality

Air quality and noise will be a potential impact during the clearing of vegetation for creation of access roads, the ROW and sub-stations. Dust emissions will particularly affect the air quality when construction is carried out during the dry season. Some of the impacts include dust deposition/soiling on flora along access roads as well as in houses located adjacent to access roads.

The baseline noise quality along the proposed transmission line route is of a rural nature. Construction works for the access roads, ROW and substations in some locations may be carried out in close proximity to existing homes, businesses and farms. The construction plant and equipment used for the above purpose will most likely cause temporary noise emissions which may cause nuisance to neighboring communities and local fauna.

Where explosives need to be used for excavation of foundations, there could be significant noise and vibration caused by this activity and in some instances could lead to cracks in walls of houses near the blasting area.

The significance of the impact is expected to be present during the construction phase and subsequently, impacts associated with air and noise quality are given below.

Table 6-11: Impact significance of air and noise quality

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Short	Low	Highly probable
	2	2	4	4
	Result: (-32) Medium negative			
Mitigation measures	**Comments/Mitigation:** • The Project Contractor will protect all soil stockpiles subject to wind erosion using a barrier, windscreen or vegetation; • All trucks that cart away excavated soils will be covered using a tarpaulin sheet • During the dry season, the Project Contractor should enforce speed limits to a maximum of 30km/h to reduce the amount of dust generated by the project. Additionally, the Project Contractor will use dust suppression methods such as periodic watering of access roads and other construction areas to minimize generation of dust. • For noise mitigation, the Project Contractor will ensure that the construction plant and equipment is well maintained at all times • The Project Contractor will limit the construction times preferably to daylight hours and only in exceptional cases will they work beyond daylight hours • For blasting mitigation, the Project Contractor will notify affected communities and village administration of the expected blasting activities so that communities can be informed of such activities • The Project Contractor will develop and implement a compensation framework for those houses which get adversely affected by			

	blasting activities			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Probable
	2	2	2	3
	Result: (-18) Low negative			

6.10.2 Impacts on the biological environment

6.10.2.1 Biological environment-terrestrial vegetation alteration

During the construction phase, local vegetation will be cut under the ROW. Vegetation clearing will lead to a permanent loss of terrestrial habitats along the ROW for a width of 52m.The source of potential impact is from the activities of the ROW construction. A small length of the proposed transmission line is routed across landscape that has Miombo woodland. Construction within ROW will destroy the vegetation mosaic through clearing of areas with this type of woodland vegetation. Miombo woodland formation comprises a large percentage of the land cover in the area and might not be affected adversely as only a small length of the transmission line is routed through this vegetation. The *Brachystegia* species forms a large part of the woody tree species along the Mbeya-Sumbawanga power transmission line. Its distribution will not be affected as the vegetation has a wide spread population over the landscape. Thus, the Miombo woodland vegetation within the ROW will not be significantly affected during the construction phase.

Table 6-12: Impact significance of habitat alteration

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Permanent	Low	Probable
	3	5	4	3
	Result: (-36) Medium negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will reconsider the routing of the proposed transmission line to try and avoid adversely impacting any part of the Miombo woodland • Avoid grading in areas with high slope angles to avoid future possible erosion • Minimize grading of rugged areas by looking for alternative passage within the 52 m ROW. • Avoid cutting trees within the ROW that do not adversely impact construction. i.e., selective clearing. • Where the location of towers or angle points fall on clusters of bushes, offset the foundation backwards or forward within the			

	ROW to avoid destruction of the potential habitats or refugia for reptiles and small mammals. • Conservation offset should be introduced in order to compensate the population of trees cleared from the ROW.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Short	Minor	Probable
	3	3	2	3
	Result: (-24) Low negative			

6.10.2.2 Biological environment – alien invasive plant species

Alien Invasive Plant Species (AIPS) are introduced in the environment through construction plant, equipment, and containers imported into the country that have not undergone decontamination. The propagules of AIPS attach themselves to construction plant and equipment and get introduced in project environments through interactions with native soils.

Once introduced into the landscape, AIPS usually displace indigenous plant species and do not provide good habitat and forage for animal species. Some of the known and notorious types of AIPS include *Parthenium* species, *Datura stramonium*, and *Lantana camara*. In areas where AIPS is introduced, the landscape in terrestrial habitat changes significantly with other plant species displaced or suppressed. Most environmental managers are challenged by the AIPS because they pose unusual characteristics which lack management measures. For instance, some AIPS could be poisonous when eaten by wild herbivores.

The proposed transmission line project will most likely be undertaken by foreign based contractors who will import construction plant and equipment. The lack of enforcement by Tanzanian authorities of equipment inspection and decontamination procedures, will create opportunities for introduction of AIPS in the ROW, construction camps and material lay down areas. If contaminated construction plant and equipment is used, chances of AIPS being introduced into the indigenous environment are high. This could leave the Tanzanian authorities and TANESCO with a new problem to deal with during the operational phase of the project. The impact of introducing AIPS along the ROW is assessed below.

Table 6-13: Impact significance of AIPS

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Permanent	Moderate	Probable
	3	5	6	3
	Result: (-42) Medium negative			
Mitigation measures	**Comments/Mitigation:** • Develop and implement an AIPS prevention strategy which includes monitoring for invasive alien plants, effective rehabilitation of			

	disturbed areas and prevention of unnecessary disturbance of natural areas. Prevention could also include measures such as washing the working parts and wheels of earth-moving equipment prior to it being brought onto site, visual walk-through surveys every three months • If any alien invasive plants are found established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.2.3 Biological environment – Aquatic habitat alteration

The proposed transmission line project might include the construction of tower foundations close to existing permanent or ephemeral rivers and streams. The project's ROW has a few permanent rivers and a number of ephemeral streams. Construction activities by heavy plant and equipment near the banks of rivers and streams can make the soils near there susceptible to runoffs. Fishing activity was observed in Momba River where the proposed transmission line crosses the river. It is likely that the river supports subsistence fishery in the area. Other rivers that could potentially be affected by the project include Myunga, Katonto, Binjirwa, Lwiche, Kamawe, Binjirwa, Kanteza, Kipanda, Momba, Mienje. The aquatic organisms in the permanent rivers could potentially be affected adversely if such activities are left uncontrolled.

Table 6-14: Impact significance of aquatic habitat alteration

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Short	Low	Probable
	3	2	4	3
	Result: (-27) Low negative			
Mitigation measures	**Comments/Mitigation:** • Relocate any towers to about 100m away from any permanent or ephemeral stream to avoid habitat loss to the aquatic ecology at river crossings • Minimize construction impacts on receiving water bodies by implementing an erosion and sediment control plan and following best management practices			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With	Study area	Short	Minor	Improbable

mitigation	2	2	2	2
	Result: (-12) Low negative			

6.10.2.4 Biological environment – Obstruction of wildlife movement

Parts of the proposed project lie within a landscape that provides dispersal areas for wildlife. Normally wild animals disperse over landscape during the wet season when vegetation is abundant. However, during the dry season, they tend to concentrate in order to maximize resources. The forage conditions of wild herbivores are adversely affected during this season, depriving them of feed.

The construction phase of the project could potentially affect activities and behaviors of wildlife. During the field survey carried out along the transmission line route on November 13 – 17, 2017, there were few species observed along the line since most of them had moved to high grounds for forage. Some of the mammals prefer woodlands or bushlands, riverine, grasslands and rocky areas. Activities leading to interference of movements of the animals are viewed as adverse to the species.

Generally, during the construction of the power line, there will be movements of vehicles and noise generated by vehicles and construction equipment. The noise would potentially scare animals away from dispersal areas thus affecting their movements.

Table 6-15: Impact significance for obstruction to wildlife movement

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Low	Highly probable
	2	2	4	4
	Result: (-32) Medium negative			
Mitigation measures	**Comments/Mitigation:** • Speed of vehicles should be controlled at a maximum limit of 40 km/h. Once a driver notices a herd of gazelles is crossing s/he should wait until all have crossed or slow down to avoid hitting individuals • Construction activities should be restricted to day time from 8am to 5pm. This provides time for foraging for nocturnal animals. This group is normally sensitive to presence of human activities and flood lights at night.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.2.5 Biological environment – Poaching of bush meat

Given that some parts of the ROW may be dispersal areas for wildlife, there is a potential for poaching activities to occur during the construction phase. With clearing of the ROW, wildlife would be more visible thus being easy to target for bush meat. Poachers could potentially distract the Project Contractor's personnel in order to access the ROW. The alignment of the proposed transmission line is relatively close to the main highway where poachers can quickly transport meat from the ROW.

Table 6-16: Impact significance for poaching of bush meat

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Long term	Low	Highly probable
	3	4	4	4
	Result: (-44) Medium negative			
Mitigation measures	**Comments/Mitigation:** • Screen all personnel entering and leaving the construction area and ROW • Include prohibition of hunting by workers in the construction contracts and strictly enforce it. • TANESCO should create awareness consistently throughout the construction phase among the citizens living in the vicinity of the proposed project about poaching activities during the construction phase and how to report any suspicious activities to the appropriate authorities			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Short	Minor	Improbable
	3	2	2	2
	Result: (-14) Low negative			

6.10.2.6 Biological environment – Destruction of herpetofauna habitats

Most of the herpetofauna species are found in areas with trees, under stones and rock crevices and hidings such as burrows. Disturbance during construction by excavation and grading by earth movers might destroy hidings of this species.

During the construction phase, the speed at which vehicles move in the area will determine occasions of road kill accidents. Normally the herpetiles crawl and they are prone to road kills by vehicles. Species normally affected are snakes, lizards and geckos. The most common species that would be observed are *Chamaeleo dilepis* (Reptile) and *Hyperolius benguellensis* (Amphibian).

Table 6-17 : Impact significance of herpetofauna habitat destruction

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Short	Minor	Probable
	2	2	2	3
	Result: (-18) Low negative			
Mitigation measures	**Comments/Mitigation:** • The Project Contractor should try and conserve bushes and large trees within the proposed ROW which are usual habitats for herpetofauna • The Project Contractor should enforce the use of speed limits along the ROW and the drivers should be alert while driving so as not to crush any herpetofauna • The Project Contractor should develop and implement a "Snake Bite Management Standard" as part of the Construction Environment and Social Management Plan. This standard should include education of workers on methods to allow snakes to escape instead of killing them, hiring the services of professional snake catchers, using the Tanzania National Parks Authority (TANAPA) to create awareness about snakes			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Small	Improbable
	2	2	0	2
	Result: (-8) Low negative			

6.10.2.7 Biological environment – Temporary interference of ecosystem services

Mbeya, Tunduma and Sumbawanga landscape is utilized by both livestock and wild herbivores, which interact in grazing areas as observed during field study. Unlike the wild herbivores, livestock are led to grazing areas and thus where they go is determined by the pastoralists. Moreover, presence of human and the activities does not prevent them from utilizing pastures.

The operation during construction phase of the project would potentially affect livestock herds especially with by the movement of vehicles. When livestock grazing areas are utilized by project activities during the construction phase of the project pastoralist will be forced to divert to other areas which probably is not favorable or very far.

Fishing activity on rivers where the transmission line crosses would be affected temporarily during the construction phase of the project.

Table 6-18: Impact significance of interference with ecosystem services

Mitigation	Extent	Duration	Magnitude	Probability

Status				
Without mitigation	Study area	Short	Low	Probable
	2	2	4	3
	Result: (-24) Low negative			
Mitigation measures	**Comments/Mitigation:** • The Project will avoid acquiring or restricting access to important pastureland wherever possible • Fisher folks should be noticed when construction across the river takes place in advance			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.2.8 Biological environment – impacts on avifauna and bats

During the construction phase, vegetation clearance along the proposed access roads, ROW and substations will lead to habitat modification or fragmentation. Habitat loss could impair habitats for birds, like breeding or nesting sites. Additionally, the noise generated by construction plant and equipment will cause disturbance to bird species during the construction phase.

The bats found in the project area includes the migratory *E helvum* and endemic *R mandeleo* which, according to the World Bank's OP4.04 require minimizing habitat loss or establishing and maintaining an ecologically similar protected area. Though the exact sites of these two species of bats is yet to be established along the proposed transmission line route, existing data shows *E. helvum* uses Tunduma area to migrate to Kasanka (in Zambia) and back (This is cross to proposed TL from Tunduma S/S to TanZam border). The *E. helvum* bat species typically uses large tall trees for roosting and wild fruits in the Miombo woodlands, forest habitats and farm fruits including mango during their migration or residency.

Table 6-19: Impact significance on avifauna

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Moderate	Probable
	2	2	6	3
	Result: (-30) Medium negative			
Mitigation measures	**Comments/Mitigation:** • The Project Contractor will minimize vegetation clearing of the ROW, access roads and substation areas to only what is required for the construction phase processes			

	• There shall be no destruction of riparian habitats and water pans during construction and operation phases of the project • The activities of the construction and operations staff must be restricted to the ROW and immediate surrounds. • Under no circumstances must birds be exposed to more disturbance than is inevitably brought about by construction and operations activities. • Machinery and vehicle access to these areas should be carefully controlled and maintenance and construction activities must be restricted to the ROW where practical • Engage an experienced bat specialist to identify the exact sites that the migratory *E. helvum* and endemic *R mandeleo* use for migration and feeding while in residency or in transit. • Based on the above, consider repositioning the transmission line so that it is routed away from the bat migratory corridor • If avoidance alternatives have been exhausted, offset by planting fruit trees in adjacent habitats • Identified bat roosts such as those identified in tree holes, banana trees and rock cliffs should be avoided • Clearance should be avoided during breeding season of endemic and threatened bat species. • Tower positions should be adjusted to avoid watering and roosting points.

Mitigation Status	Extent	Duration	Magnitude	Probability
With mitigation	Study area	Short	Low	Improbable
	2	2	4	2
	Result: (-16) Low negative			

6.10.2.9 Biological environment – impacts on bats due to fugitive dusts and waste generated by equipment

Dust generated during the construction of foundations and heavy vehicles movements on access tracks can affect the foraging success of resident bats especially at night when they are active. There is therefore a need to assess the risk of resident bats starving due to dust-induced poor visibility of prey.

Table 6-20: Impact significance of fugitive dusts and waste

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Very short	Minor	Probable
	2	1	2	3

	Result: (-15) Low negative			
Mitigation measures	**Comments/Mitigation:** • This impact is low but can be made less in magnitude and extent when dust suppression methods such as watering of the access roads, ROW and substation areas is done where dust is more likely to be an adverse impact to bats. • Construction could potentially be timed when the ground is not too dry and dusty and bats are not desperate for food.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Localized	Very short	Small	Improbable
	1	1	0	2
	Result: (-4) Low negative			

6.10.2.10 Biological environment – construction plant noise impacts on bats

Resident and migratory bats in the vicinity of the proposed transmission line live in natural habitats and perhaps villages away from loud noise from heavy machines and vehicles. The use of loud-noise producing construction plant and equipment in an otherwise quiet habitat, presents both audible and visual scare which may affect foraging, mating and roosting habits of the resident bats.

Table 6-21: Impact significance of noise from construction plant and equipment

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Low	Highly probable
	2	2	4	4
	Result: (-32) Medium negative			
Mitigation measures	**Comments/Mitigation:** • Noise will depend on types and duration of use of plant and equipment during the construction phase. Silencers fitted to the engines could significantly reduce impact of noise to bats. Switching off engines not in use can also reduce noise duration and intensity.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.3 Impacts on the social environment

6.10.3.1 Land use including involuntary land acquisition

According to the land laws in Tanzania, TANESCO will acquire the ROW for the proposed transmission line project between Mbeya and Sumbawanga and ~4km segment of TL from Tunduma S/S to TanZam border. The proposed transmission line from Mbeya to Tunduma is approximately 100km while that between Tunduma and Sumbawanga including segment of TL from Tunduma S/S to TanZam border is approximately 244km meaning that the total length of the project is approximately 344km. As the ROW width to be acquired is 52m, the total area affected by the project will be about 17.89km^2. Following the acquisition, it is expected that all activities currently undertaken on this land such as farming and livestock grazing will cease. The lack of compensation to the PAPs based on market valuation of the agricultural land together with crops grown, could potentially lead to being disenfranchised.

The power transmission line crosses mostly small-scale agricultural land, as well as some land that might be used for grazing. Therefore, the clearance of the line's ROW will impact local farmers. During the public stakeholder consultation meetings held on November 13 – 17, 2017, it was clear that over 80% of the communities living along the ROW practice subsistence agriculture and also rear livestock. These farmers may be affected adversely as they will have to look for new areas to perform their livelihood activities.

Table 6-22: Impact significance of land use

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Permanent	Moderate	Definite
	2	5	6	5
	Result: (-65) High negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will prepare a Resettlement Policy Framework (RPF) prior to the project appraisal. • Once the scale of the impacts is established, TANESCO will develop and implement a comprehensive resettlement action plan (RAP) for the proposed transmission line project including segment of TL from Tunduma S/S to TanZam border prior to the construction phase in conformance with Tanzanian legislation and World Bank Operational Policy 4.12. • The RAP, including valuation of properties and compensation payment, should be implemented in full prior to beginning of construction works that lead to resettlement • If feasible, TANESCO should assist the PAPs with identification of alternative parcels of land to restart their livelihood activities • TANESCO should allow all PAPs that have grown crops for subsistence or sale to harvest their crops prior to commencement			

	of construction activities • All PAPs should be compensated for agricultural crops and fruit trees at the most current and applicable market rates • TANESCO should provide counseling services for the PAPs to assist them in adaptation to the new surroundings • TANESCO should provide financial literacy training to PAPs for sustainable management of the funds • 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			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Permanent	Low	Improbable
	2	5	4	2
	Result: (-22) Low negative			

6.10.3.2 Impacts of land acquisition on vulnerable groups

Female headed households (FHH) are perceived as vulnerable households, with low economic positions. Special attention would be required when they are affected as PAPs in the project. Some FHH 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.

Table 6-23: Impact significance of Female Headed Households

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Short	Moderate	Highly probable
	3	2	6	4
	Result: (-44) Medium negative			
Mitigation measures	**Comments/Mitigation:** • 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 develop and 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 develop and implement a Communication Plan for vulnerable groups and be prompt in handling and resolving issues associated with vulnerable groups			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Short	Low	Improbable
	3	2	4	2
	Result: (-18) Low negative			

6.10.3.3 Impacts on existing infrastructure

During the construction phase, construction plant, equipment and materials are expected to be transported to various locations along the ROW. This will have an adverse impact on the existing highway between Mbeya and Tunduma and between Tunduma and Sumbawanga if the Project Contractor does not comply with the axle load limits.

Further, the Project Contractor's use of existing secondary roads is expected to damage them through regular movement of construction vehicles some of which could be heavy goods vehicles (HGVs). This will be a detrimental impact to other road users who need to access villages located in the interior and close to the proposed ROW.

The proposed transmission line including segment of TL from Tunduma S/S to TanZam border was routed to avoid populated areas, road and rail crossings. While they were not all counted, there is at least 1 – 2 Tanzania-Zambia Railway (TAZARA) railway crossings and a number of road crossings between Mbeya and Sumbawanga. Improper coordination of road traffic safety measures, could potentially lead to accidents on primary and secondary roads as well as, at or near railway crossings or near the railway line.

The proposed ROW may cross or pass very close to existing telecommunications infrastructure that may be adversely impacted through demolition during the construction phase.

Table 6-24: Impact significance on existing infrastructure

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Short	Moderate	Probable
	3	2	6	3
	Result: (-33) Medium negative			

Mitigation measures	**Comments/Mitigation:** • Immediately after contract award, the Project Contractor will accurately map out the existing conditions of all infrastructure that will be used by them for construction of the transmission line. This includes all primary and secondary roads, rail crossings and telecommunications infrastructure. This will create a baseline of the infrastructure conditions prior to the commencement of construction. • The Project Contractor will rehabilitate to the near original condition, all damaged infrastructure immediately after construction is complete. This specific rehabilitation will be contained within the Project Contractor's Rehabilitation and Restoration Plan for the project • The Project Contractor will develop and implement a written Traffic Management Plan and this will include proper signaling methods with workers trained formally on signaling methods. • The Project Contractor will procure and erect road traffic furniture for communicating with motorists about the construction works. Such road furniture will be erected after acquiring the necessary permits from the appropriate authorities • In order to avoid interfering with road or rail operations, the Project Contractor will consult with the relevant authorities to ensure a smooth flow

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Short	Low	Improbable
	3	2	3	2
	Result: (-16) Low negative			

6.10.3.4 Impacts on gender requirements

Within the project area, traditional cultural norms 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 held on November 13 – 17, 2017, 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.

Table 6-25: Impact significance on gender requirements

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Short	Low	Probable
	2	2	4	3
	Result: (-24) Low negative			
Mitigation measures	**Comments/Mitigation:** • 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 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 (HRMS) 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			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.3.5 Impacts on Gender Based Violence

The proposed transmission line project from Mbeya – Tunduma – Sumbawanga including segment of TL from Tunduma S/S to TanZam border 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.

Table 6-26: Impact significance on Gender Based Violence

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Low	Highly probable
	2	2	4	4
	Result: (-32) Medium negative			
Mitigation measures	**Comments/Mitigation:** • 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 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.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.3.6 Communities and social cohesion

The proposed transmission line project including segment of TL from Tunduma S/S to TanZam border is expected to provide employment to workers living along or near the ROW. There will be a variety of jobs for unskilled, semi-skilled or skilled workers. Based on experiences with similar types of projects elsewhere in Tanzania, it is common to find that the available jobs for local communities are the unskilled type. This implies that the semi-skilled and skilled workers may come from other parts of Tanzania or abroad. The influx of such workers who would be paid more than those indigenous to the area could lead to poor social cohesion with the host communities. Further, the migrant workers would put a strain on the existing services and utilities such as the scarce water supplies, food, etc.

Secondly, the lack of proper management of compensation amounts paid to project affected persons (PAPs) can lead to a lack of social cohesion between family members, landlords and tenants.

The local population will be exposed to different systems of values that may be conflicting with their own, due to the presence of different stakeholders (project managers, contractors, subcontractors, employees and/or consultants). The aforementioned factors could potentially lead to tensions, conflicts with local and traditional authorities, as well as draw cleavages between different groups.

The presence of more affluent migrant workers could potentially lead to family conflicts between the female and male spouse where the female spouse is attracted to the migrant worker. This could potentially lead to gender based violence leading to family break ups with adverse consequences to social cohesion.

Due to the perceived affluence demonstrated by migrant workers to female host community members resulting from better disposable incomes, there is a potential that this could lead to the increased spread of STIs.

Table 6-27: Impact significance on communities and social cohesion

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without	Study area	Medium term	Moderate	Probable

mitigation	2	3	6	3
	Result: (-33) Medium negative			
Mitigation measures	**Comments/Mitigation:** • The Project Contractor will develop and implement a Labor Influx Management Plan Management Plan as part of the overall Construction Environment and Social Management Plan • The Project Contractor will provide the first opportunity for any skilled and semi-skilled jobs to workers living in the vicinity of the ROW where construction works are required. This will be managed through the village administration office • The Project Contractor and TANESCO will facilitate small and medium enterprise (SME) development in the local communities and surrounding region			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.10.3.7 In-migration of workers

During the mobilization, construction and commissioning phase of the project, a significant number of workers will be required for execution of the project. Over the full duration of the three phases, it is estimated that there will be about 180 workers for the mobilization phase, 880 workers during the construction phase and 440 workers during the commissioning phase. The source of this information is a previous TANESCO environmental assessment done in 2013 for the proposed transmission line project. While the exact percentages of unskilled, semi-skilled and skilled manpower requirements will be known once the Project Contractor is employed, nearly all unskilled labor will be gotten from the communities living in the vicinity of the ROW; a small percentage of semi-skilled labor may be sourced from the communities living along the ROW if such skills sets exist, however the majority will come from other parts of Tanzania ;and the skilled labor is expected to come from other parts of Tanzania or overseas such as Zambia.

This implies that there will be an influx of migrant workers along the ROW during the construction phase. In order to accommodate these workers, a number of temporary camps may be constructed between Mbeya, Tunduma and Sumbawanga.

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 siting criteria of the construction camps (i.e. away from communities, schools, socially significant buildings and other places where underage children may congregate) 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 camp management controls may be weak thus allowing migrant workers to have convenient and easy access to the community.

The influx of migrant workers could potentially lead to increased demand and competition for local social and health services, as well as for goods and services, which can lead to price hikes and crowding out of local consumers, increased volume of traffic and higher risk of accidents, increased demands on the ecosystem and natural resources, social conflicts within and between communities, increased risk of spread of communicable diseases, and increased rates of illicit behavior and crime. The in-migration of workers in the project area could potentially 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 felt.

Table 6-28: Impact significance on in-migration of workers

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Regional	Short	Low	Probable
	3	2	4	3
	Result: (-27) Low negative			
Mitigation measures	• 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. This will be done through the media where the Project Contractor will advertise for available jobs through the local print media, radio and any other channel which can reach the project communities well in advance of the construction commencement period • The Project Contractor will give priority for employment and other economic opportunities to the local community living in the vicinity of the proposed transmission line project in order to minimize in-migration • The Project Contractor will develop and implement camp and workforce management protocols for all permanent and temporary camps which will be clearly communicated to the workforce and enforcement measures implemented • The Project Contractor will develop and implement a Labor			

	Influx Management Plan as part of the Construction Environment and Social Management Plan. The Labor influx Management Plan shall be approved by TANESCO and will form part of the contractual documents for the project • The Project Contractor will develop and implement a written grievance redress mechanism (GRM) for the construction phase of the project. This GRM will form part of the Project Contractor's Human Resource Management System (HRMS) • The Project Contractor and TANESCO will facilitate small and medium enterprise (SME) development in the local communities and surrounding region.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Short	Low	Improbable
	3	2	4	2
	Result: (-18) Low negative			

6.10.3.8 Community health and safety

The proposed transmission line project goes through rural areas where the communities lack sufficient clean water for drinking, cooking and washing; the communities' currently abstract water from shallow water wells. Any contamination of the water sources through leakages or spills of hazardous chemicals (fuels, used oil, etc.) by construction plant and equipment would adversely impact community health.

The proposed transmission line project will require significant amounts of water for reinforced concrete foundations. The Project Contractor will most likely use existing boreholes or shallow wells for their construction water needs thus putting a strain on the already meager water resources available to the community.

During the construction phase, communities living along or near the ROW may be exposed to construction related impacts such as accidents with construction plant and equipment and, respiratory distress from dust, fumes and noxious odors.

The use of heavy, medium and light construction vehicles along existing and proposed access roads and the ROW could lead to accidents with members of the communities living near the construction areas together with their livestock. The lack of enforcement of speed limits, use of drivers competent in defensive driver training techniques, overloading of construction vehicles ferrying workers to various construction locations along the ROW, will no doubt exacerbate the situation.

The construction of the proposed transmission line project has the potential to result in Sexually Transmitted Infections (STIs) such as HIV/AIDS. These could arise from sources such as migrant workers interacting with female community members.

Table 6-29: Impact significance of community health and safety

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**

Without mitigation	Study area	Long-term	Moderate	Highly probable
	2	4	6	4
	Result: (-48) Medium negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO must specify in the Contract that the Project Contractor shall not use any construction plant and equipment which could potentially contaminate any water source used by the community(ies) for drinking, cooking and washing • The Project Contractor will ensure that their construction vehicles are maintained and kept in a good state of repair through a preventive maintenance program to prevent leaks and spills contaminating community water sources • All construction plant and equipment will be inspected daily by the Project E&S Officers prior to their use in order to identify any leaks. Any construction plant and equipment found leaking shall not be used until it is fully repaired and no leaks are visible from the equipment • The Project Contractor shall apply and pay for all required construction phase permits from relevant authorities, the use of water for construction purposes. The Project Contractor shall not abstract water from any other source except those permitted by relevant authorities • In order to prevent accidents to the communities, the Project Contractor will develop and implement a Traffic Management Plan as a sub plan of the Construction Environment and Social Management Plan. The contents of the Traffic Management Plan will include: ✓ Construction plant, equipment, vehicle and driver licensing procedures ✓ Use of existing road infrastructure ✓ Maintenance of vehicle and access roads ✓ routing of traffic, speed limits and signage ✓ Pedestrian and passenger safety ✓ Transport of equipment and materials ✓ Emergency response and reporting of hazards ✓ Review of the plan • The Project Contractor shall develop and implement a site specific written emergency response plan (ERP) for the construction phase. The ERP will be written in English and will include an emergency response risk assessment carried out between TANESCO and the Project Contractor. The ERP will contain the following headings based on an emergency response risk assessment:			

	✓ Administration (policy, purpose, distribution, definitions, etc.) ✓ Organization of emergency areas (command centers, medical stations, etc.) ✓ Roles and responsibilities ✓ Communication systems ✓ Emergency response procedures ✓ Emergency resources ✓ Training and updating ✓ Checklists (role and action list and equipment checklist) ✓ Business Continuity and Contingency • In order to prevent the spread of STIs, the construction camp(s) will be cited away from populated areas, fenced and secured. Additionally, the camp sites will enforce strict security control measures for management of workers staying in the camp(s). • The Project Contractor will use Peer Educators for implementing regular campaigns on STIs such as HIV. These campaigns will be targeted towards all construction workers and the 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

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Long-term	Low	Improbable
	2	4	4	2
	Result: (-20) Low negative			

6.10.3.9 Worker health and safety

The proposed transmission line project including segment of TL from Tunduma S/S to TanZam border will employ about 180 workers during the mobilization phase, over 800 workers during the construction phase and over 400 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 (SWP),

adequate supervision, trained workforce could potentially lead to safety and health incidents.

Table 6-30: Impact significance of worker health and safety

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Short	Moderate	Probable
	3	2	6	3
	Result: (-33) Medium negative			
Mitigation measures	• 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: ✓ Provision of occupational safety and health orientation training to all employees; ✓ Periodic safety inspections; ✓ Employment of health and safety personnel; ✓ Development of a worker safety programme; ✓ 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 firefighting 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 have 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

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	3	2	2	2
	Result: (-12) Low negative			

6.10.3.10 Potential impacts on traffic and related incidents

The influx of construction workers will entail an increase in the traffic to and from the ROW. 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 above impacts will be felt for transporting construction materials between Dar es Salaam and various locations between Mbeya, Tunduma and Sumbawanga where construction activities occur.

Table 6-31: Impact significance of increase in traffic and related incidents

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Regional	Short term	Low	Highly probable
	3	2	4	4
	Result: (-36) Medium negative			
Mitigation measures	• TANESCO and its Project Contractors will undertake a risk management appraisal of their road transport carriers. This appraisal will be used to select those road transport carriers that can demonstrate compliance with set road safety standards • The Project Contractor will develop a Traffic management plan for the construction phase of the project • 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 to identify areas of particular risk 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			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short term	Low	Improbable
	2	2	4	2
	Result: (-16) Low negative			

6.10.3.11 Cultural heritage

A review of literature associated with the proposed transmission line indicates that there may be graves and shrines located within the ROW for the project. This was further observed during the field survey carried out where a few graves were seen as being within the ROW. For segment of TL from Tunduma S/S to TanZam border, a detailed survey will be carried out to identify cultural heritage sites such as graves, shrines etc.

Tanzania has legislation associated with relocation of graves. The lack of compliance with national legislation and customary requirements in relation to grave relocation and shrine destruction could potentially have adverse consequences to the Project Contractor and their employees during the construction phase. This would especially be true if the Project Contractor does not carry out their own risk assessment during the vegetation clearance process within the ROW.

The proposed transmission line ROW traverses greenfield areas where no prior human activities have been carried out. Subsequently, there is a potential for adversely impacting surface and subsurface archaeological resources. This would be an adverse impact on cultural resources associated with the transmission line project.

Table 6-32: Impact significance of graves and shrines

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Moderate	Probable
	2	2	6	3
	Result: Medium negative (-30)			
Mitigation measures	**Comments/Mitigation:** • As part of the Resettlement Action Plan (RAP) process, the RAP Consultant will map all graves located within the proposed 52m wide ROW. The RAP will further elucidate how grave relocation is to be done in accordance with relevant laws in Tanzania • Additionally, if any graves or shrines are identified within the ROW during the construction phase, the Project Contractor will immediately notify TANESCO so that the process of relocation can be commenced			

	• The project Contractor will comply with the requirements for grave relocation based on the mapped graves and shrines • The Project Contractor shall develop and implement a management plan for relocation of the graves and shrines which fall within the ROW • Prior to the commencement of any construction works, the Project Contractor will develop and implement a "Chance Finds Procedure" for archaeological and cultural heritage finds. This procedure will form and integral part of the overall Construction Environmental and Social Management Plan (CESMP) which the Project Contractor will develop and implement for the project • Where bones appear in the course of any construction works on site, work will stop and a qualified scientist from the National Museum of Tanzania will be engaged to identify and advise the contractor on the way forward • In the event of such an occurrence, the Project Contractor must engage the Village Executive Officer and Village Chairperson to undertake the necessary rituals to relocate the human bones and accord a proper burial at a new location.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Low	Improbable
	2	2	4	2
	Result: Low negative (-16)			

6.11 Assessment of negative impacts – operational phase

6.11.1 Impacts on the physical environment

6.11.1.1 Soils

During the operation phase, oil spills could result from equipment breakdown at the substation sites and lead to soil contamination in proportion with the magnitude of these accidental events. The lack of spill control and countermeasures plan and a hazardous materials management plan for the ROW and substations could further exacerbate the situation.

Table 6-33: Impact significance on soils

Mitigation Status	Extent	Duration	Magnitude	Probability
Without	Localized	Short	Low	Improbable

mitigation	1	2	4	2
	Result: (-14) Medium negative			
Mitigation measures	**Comments/Mitigation:** • All areas within the substation footprint where operational spills can occur, will be made up of impermeable surfaces • TANESCO will develop and implement the following plans in order to prevent surface and sub-surface soil contamination resulting from its activities at the substations and along the ROW: ✓ Spill control and countermeasures plan ✓ Waste management plan			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Localized	Very short	Small	Highly improbable
	1	1	0	1
	Result: (-2) Low negative			

6.11.1.2 Surface water

During the operational phase, there will be maintenance activities carried out at the substations where hazardous chemicals may leak or spillages may occur. If such leaks or spillages come into contact with either wash water or rain, then the oily wastewater will be discharged through the stormwater drains without adequate treatment. This could potentially contaminate surface water and will not comply with discharge limits set by Tanzanian environmental legislation or WB guidelines.

Table 6-34: Impact significance on surface waters

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Short	Low	Probable
	2	2	4	3
	Result: (-24) Low negative			
Mitigation measures	**Comments/Mitigation:** • All surfaces where potential spills and leaks of hazardous substances can occur will be made out an impermeable surface such as reinforced concrete • The design of the substations will include an oil water separator to provide primary treatment of any oily wastewater generated during the operations and maintenance • TANESCO will develop a formal effluent management program to test the effluent generated from the activities at the substations. The discharge limits stated in this program will be those applicable under Tanzanian legislation or the World Bank Group guidelines for			

	effluent quality discharge.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Very short	Minor	Improbable
	2	1	2	2
	Result: (-10) Low negative			

6.11.1.3 Air quality

During the operation phase, occasional maintenance activities will be conducted on the transmission line along the ROW and maintenance of the access roads. These activities will generate dust and exhaust emissions which will lead to temporary air quality deterioration and disturbances to neighboring communities. Additionally, handling of waste and hazardous material at the substations will need to be properly done to avoid unpleasant odors and deterioration of the air quality.

Table 6-35: Impact significance of air quality

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Very short	Minor	Probable
	2	1	2	3
	Result: (-15) Low negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will develop and implement a traffic management plan which will include among other things a risk assessment of the activities that can lead to deteriorating air quality, and control measures to prevent or minimize such risks. • As part of the traffic management plan, TANESCO should enforce the requirement for their vehicles not exceed speed limits of 30 – 40km/h; this will reduce the amount of dust generated while traveling along the ROW			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Very short	Small	Improbable
	2	1	0	2
	Result: (-6) Low negative			

6.11.1.4 Impacts arising from EMF

There is public and scientific concern over the potential health effects from exposure to electric and magnetic fields (EMF), but there are currently inconclusive findings of adverse health effects from exposure to EMF levels typically associated with power

transmissions lines and equipment. Research into the biological effects of EMF indicates that electric fields are less likely than magnetic fields to have health effects because magnetic fields penetrate most materials, whereas electric fields are attenuated when passing through materials that conduct electricity, even poor conductors. Some studies have shown a weak association between exposure to magnetic fields and an increased risk of childhood leukemia, but others have not replicated that finding (NIEHS/NIH, 2002).

The proposed 400kV power transmission line will and 330kV segment of TL from Tunduma S/S to TanZam border be erected within a 52m wide corridor in which no structures for human habitation will be permitted by TANESCO. While 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.

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Localized	Long term	Minor	Improbable
	1	4	2	2
	Result: (-14) Low negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will carry out an EMF study to 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. • TANESCO will enforce the requirement that no person shall encroach into the transmission line ROW during the operations phase of the project.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Localized	Long term	Small	Highly improbable
	1	4	0	1
	Result: (-5) Low negative			

6.11.2 Impacts on the biological environment

6.11.2.1 Flora

During the operation phase, the ROW maintenance will require regular vegetation clearing to reduce short-circuit risks caused by electric arcing. This means no vegetation will be allowed to grow above 5m within the ROW which will result in continuous alteration of natural habitats. The most affected forms of flora will be woody species as

they can grow over these limits. This periodic disturbance will maintain ROW habitats in earlier vegetation development stages, leading to the presence of more common species and rarity of specialized species.

The presence of access roads in previously inaccessible areas could lead to an increase in natural resources exploitation and a reduction of species communities with a higher use value particularly inside forested areas. This could generate additional fragmentation and degradation of forest species.

Moreover, periodic ROW maintenance activities can also lead to Alien Invasive Plant Species (AIPS) proliferation, especially if these activities include moving and clearing of vegetation. Once introduced, AIS will likely spread and impact adjacent areas with habitats that correspond to their ecological requirements.

Table 6-36: Impact significance of flora

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Moderate	Probable
	2	4	6	3
	Result: (-36) Medium negative			
Mitigation measures	**Comments/Mitigation:** • 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.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Long term	Minor	Improbable
	2	4	2	2
	Result: (-16) Low negative			

6.11.2.2 Bird collisions with the transmission line

Bird collisions can potentially occur during the operational phase of the project. Resident breeding birds are expected to have lower collision rates than non-residents, partly because they become familiar with the transmission line and would avoid it (Kingsley and Whittam, 2007). For proposed section of the transmission line from Mbeya-Tunduma-Sumbawanga passes near habitats considered avifauna sensitive areas

such as wetlands and migratory corridors; these habitats would attract species such as storks which could be at risk of collisions.

This impact was assessed as Medium negative prior to mitigation due to the abundance of medium size species and raptors that are present in the area which are vulnerable to collisions. The majority of potential fatal mortalities are expected to arise from migrating birds e.g. Vultures, Raptors and storks.

Table 6-37: Impact significance of bird collisions with the transmission line

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Low	Probable
	2	4	4	3
	Result: (-30) Medium negative			
Mitigation measures	**Comments/Mitigation:** • Appoint an ornithologist and bat specialist from a recognized institution to undertake a survey of birds and bats within the Area of Influence of the transmission line project including segment of TL from Tunduma S/S to TanZam border. • Based on the results of the bird and bat survey, consider rerouting the proposed transmission line including segment of TL from Tunduma S/S to TanZam border 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.; • Align the transmission line corridor to avoid critical habitats (e.g. nesting grounds, heronries, rookeries, bat foraging corridors and migration corridors); • Consider having the conductors in a horizontal plane rather than a vertical plane • Maintain a 1.5m spacing between energized components and grounded hardware or, where spacing is not feasible, covering energized parts and hardware; • Install bird diverters in areas where birds frequently pass through to increase the visibility of the line. There are three general types of line marking devices: aerial marker spheres, spirals, and suspended devices. An example of aerial markers is shown below.			

	  • All sections of line crossing rivers and the adjacent Riparian habitat should be fitted with Bird Flappers on the earth wire.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Long term	Minor	Probable
	2	4	2	3
	Result: (-24) Low negative			

6.11.2.3 Bird electrocution on towers or transmission lines

The bird species at the greatest risk of electrocution would be raptors and this would be in the operational phase of the proposed project including segment of TL from Tunduma S/S to TanZam border. An example of a bird electrocution with a transmission line is shown in Figure 6-1.

Figure 6-1 : Bird electrocution with transmission line

Table 6-38 : Impact significance of bird electrocution with transmission lines or towers

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without	Study area	Long term	Low	Improbable

mitigation	2	4	4	2
	Result: (-20) Low negative			
Mitigation measures	**Comments/Mitigation:** • Provide artificial bird safe perches and nesting platforms placed at a safe distance from the energized parts above the tower at a minimum of 70 cm above energized components, or higher • Cross-arms, insulators and other parts of the power lines can be constructed so that there is no space for birds to perch where they can be proximate to energized wires. The distance between a likely perch (mainly the cross arm) and the energized parts (conductors) is at least 70 cm • All terminal structures (transformers) should be constructed with sufficient insulation on jumper wires and surge arrestors			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

6.11.2.4 Avifauna displacement along the transmission line

In the operational phase, long distance transmission lines could potentially act as a barrier for avifauna movements. This may necessitate additional flights for species such as raptors that may gain additional altitude and fly well above the transmission line. Such birds may expend excess energy in finding alternative routes consequently affecting their survival (EchoTrack Inc., 2005). In this way, avoidance response ultimately contributes to reduced population size and changes in population abundance. The extent to which displacement is considered an impact depends on the species, size of the project, type of bird movements and the incurred energetic cost (Masdenet al., 2009). The real effect of any such avoidance has not been measureable. From this analysis, such impacts are considered low with mitigation. More research is required to further understand the relationship of the transmission line, bird behavior and population dynamics. Some of this information would be gained through the implementation of the Environmental Monitoring Plan for the proposed transmission line.

Table 6-39: Impact significance of avifauna displacement along the transmission line

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Long term	Low	Probable
	3	4	4	3
	Result: (-33) Medium negative			
Mitigation	**Comments/Mitigation:**			

measures	• TANESCO should restore and manage habitats in areas where vegetation is cleared • Regularly maintain the ROW in order to assure safe clearance between conductors and vegetation and to allow passage for inspections of avifauna on foot or by vehicles. • Avoid erecting transmission lines in areas that are attractive for birds e.g. areas adjacent to hills by allowing a 5km buffer, areas adjacent to wetlands where birds could be crossing			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Long term	Minor	Improbable
	3	4	2	2
	Result: (-18) Low negative			

6.11.2.5 Bats – habitat loss and disturbance

Habitat alteration and disturbance as an impact on bats may happen during construction phase as shown above. Bat habitats may also be altered (to the detriment of resident and migratory bats) when vegetation maintenance activities on the Transmission way leave involves clearance of growing vegetation under the power lines. The size of trees, bushes cleared and frequency of clearance may determine ultimately magnitude of alteration and impact thereof.

Table 6-40: Impact significance of habitat loss

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Regional	Long term	Moderate	Highly probable
	3	4	6	4
	Result: (-52) Medium negative			
Mitigation measures	**Comments/Mitigation:** • Engage an experienced bat specialist to identify the exact sites that the migratory *E. helvum* and endemic *R mandeleo* use for migration and feeding while in residency or in transit. • Based on the above, consider repositioning the transmission line so that it is routed away from the bat migratory corridor • If avoidance alternatives have been exhausted, offset by planting fruit trees in adjacent habitats			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Long term	Low	Improbable
	2	4	4	2

	Result: (-20) Low negative

6.11.2.6 Bat collisions with the transmission line

Overhead power transmission conductors, towers at substations and transmission line towers rise high enough in space to pose risks of collision with flying animals. There is therefore concern that cumulatively there could be risk of bats crashing into the towers or transmission line especially when they are erected in migratory paths and congregatory habitats such as roosts.[8]There could be positive impacts of towers acting as roosts to some bats. However, locations of towers should be aligned to habitats that are not critical to bats' breeding and mass migration.

Table 6-41: Impact significance of bat collisions with transmission lines and towers

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Long term	Low	Probable
	2	4	4	3
	Result: (-30) Medium negative			
Mitigation measures	**Comments/Mitigation:** • The mitigation measures given in Table 6-37 apply to potential bat collisions with the transmission line. Additionally, the mitigation measures given below will be incorporated by TANESCO • Remove fruit trees along the TL in areas identified as migratory routes of the *E. helvum.* • Monitor migratory foraging behavior along the sections where the TL intersects migratory corridor to ensure adaptive management.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Long term	Minor	Improbable
	2	4	2	2
	Result: (-16) Low negative			

6.11.3 Impacts on the social environment

6.11.3.1 Land use

TANESCO will fully acquire the ROW from Mbeya to Tunduma to Sumbawanga and Tunduma S/S to TanZam border for the proposed transmission line project. Subsequently, project affected persons (PAPs) will be restricted from planting any crops within the ROW during the operational phase of the project and this could have an adverse impact on land use especially if it is fertile. This impact is expected to be of low significance after implementation of mitigation measures.

Table 6-42: Impact significance of land use

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Localized	Short	Minor	Probable
	1	2	2	3
	Result: (-15) Low negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO should consider allowing farmers to farm within the ROW so long as the crops or trees do not exceed 4m in height • Only short rooted crops should be allowed to be grown within the ROW to allow for easy removal when required to do so • TANESCO should plan for maintenance activities to be conducted outside of the growing and grazing seasons.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Very short	Small	Improbable
	2	1	0	2
	Result: (-6) Low negative			

6.11.3.2 Communities and social cohesion

During the operational phase, TANESCO will undertake periodic maintenance activities along the ROW. The communities living along the ROW are very important in assisting TANESCO with security related surveillance of the transmission line and steel towers. In order to avoid theft of transmission line infrastructure, it is important for TANESCO to periodically engage the communities living near the ROW on gather intelligence in order to prevent such vices. The lack of engagement by TANESCO with the communities on security surveillance could potentially lead to poor relationships resulting in theft of TANESCO transmission line infrastructure.

Table 6-43: Impact significance of communities and social cohesion

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Study area	Long term	Moderate	Probable
	2	4	6	3
	Result: (-36) Medium negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will develop and implement a Communication Plan in order to engage the communities on security surveillance			

Mitigation Status	Extent	Duration	Magnitude	Probability
With mitigation	Study area	Long term	Minor	Probability
	2	4	2	2
	Result: (-16) Low negative			

6.11.3.3 Community health and safety

During the operational phase, there is a potential for people to get electrocuted if they come into contact with the proposed transmission line. This impact could be caused equipment breakdowns, illegal connections, steel thefts and all other forms of unsafe contacts.

The corona of overhead transmission line conductors and high-frequency currents of overhead transmission lines may result in the creation of radio noise. There could be periods especially during the rainy season when the corona effects on conductors sharply increase and may affect radio reception in residential areas near transmission line. There are no mitigation measures that can be applied for preventing such corona effects.

Large power transmission lines such as the proposed 400kV one are usually routed away from residential areas as they can be visually intrusive and undesirable to local residents.

The siting of power transmission towers is important and should avoid flight paths of aircraft; they should not be located near airports as this creates a direct safety impact through collision or indirectly through radar interference.

Periodic maintenance activities by TANESCO personnel within the ROW or while driving along the access roads could potentially lead to accidents and physical injuries with community members.

Table 6-44: Impact significance of community health and safety

Mitigation Status	Extent	Duration	Magnitude	Probability
Without mitigation	Regional	Long term	Moderate	Probable
	3	4	6	3
	Result: (-39) Medium negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will ground conducting objects (e.g. fences or other metallic structures) installed near power lines to prevent shock • As part of their communication plan, TANESCO will use 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; • TANESCO should engage a consultant to carry out a landscape and visual impact assessment of the proposed transmission line and implement the recommendations arising from that study			

	• TANESCO will consult with the civil aviation authority in Tanzania to determine if there are any safety related issues with the current routing of the proposed transmission line. The recommendations by the civil aviation authority will be implemented by TANESCO during the design and operation phases respectively • TANESCO will develop and implement an occupational safety and health (OSH) management system in alignment with the requirements of OHSAS 18001.			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Regional	Long term	Minor	Improbable
	3	4	2	2
	Result: (-18) Low negative			

6.11.3.4 Worker health and safety

During the operational phase, TANESCO personnel will operate and maintain the proposed transmission line including segment of TL from Tunduma S/S to TanZam border and substations in Mbeya, Tunduma and Sumbawanga. The lack of competent operations and maintenance staff trained in occupational safety and health (OSH) could potentially lead to accidents and injuries during the operational phase of the project. OSH hazards associated with the operational phase include (i) live power lines, (ii) working at heights and (iii) electric and magnetic fields.

Table 6-45: Impact significance of worker health and safety

Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
Without mitigation	Study area	Long term	Moderate	Probable
	2	4	6	3
	Result: (-36) Medium negative			
Mitigation measures	**Comments/Mitigation:** • TANESCO will carry out a formal Occupational Safety and Health (OSH) risk assessment of the operations and maintenance activities associated with the transmission line and substations • Subsequently, TANESCO will develop and implement an OSH Management System (MS) in alignment with the requirements of OHSAS 18001 for the operational phase of the project. This MS will include relevant OSH management programs such as driver safety, working at heights, traffic safety, Lock-out/Tag-out (LOTO), electrical safety, Personal Protective Equipment (PPE), exposure monitoring for electric and magnetic fields (EMF), among others. • In order to implement the OSH MS, TANESCO will develop and implement an OSH training program based on the needs analysis			

	carried out for the staff that will work on the operations and maintenance of the substations and transmission line			
Mitigation Status	**Extent**	**Duration**	**Magnitude**	**Probability**
With mitigation	Study area	Short	Minor	Improbable
	2	2	2	2
	Result: (-12) Low negative			

7 Environmental and Social Management Plans

7.1 Introduction

This Section presents the Environmental and Social Management Plan (ESMP) for the proposed 400kV overhead transmission line project between Mbeya and Sumbawanga Project and ~4km segment of proposed 330kV overhead transmission line from Tunduma S/S to TanZam border and consolidates all mitigation and control measures for the identified environmental and social risks and impacts. The ESMP will be updated as necessary when details of the line route from Tunduma to TanZam border and results of bird and bat studies are available. The objectives of the ESMP are to:

- Consolidate the mitigation and control measures into a concise summary that can be used during implementation of the project; and
- Define the associated roles and responsibilities.

7.2 Objectives of the ESMP

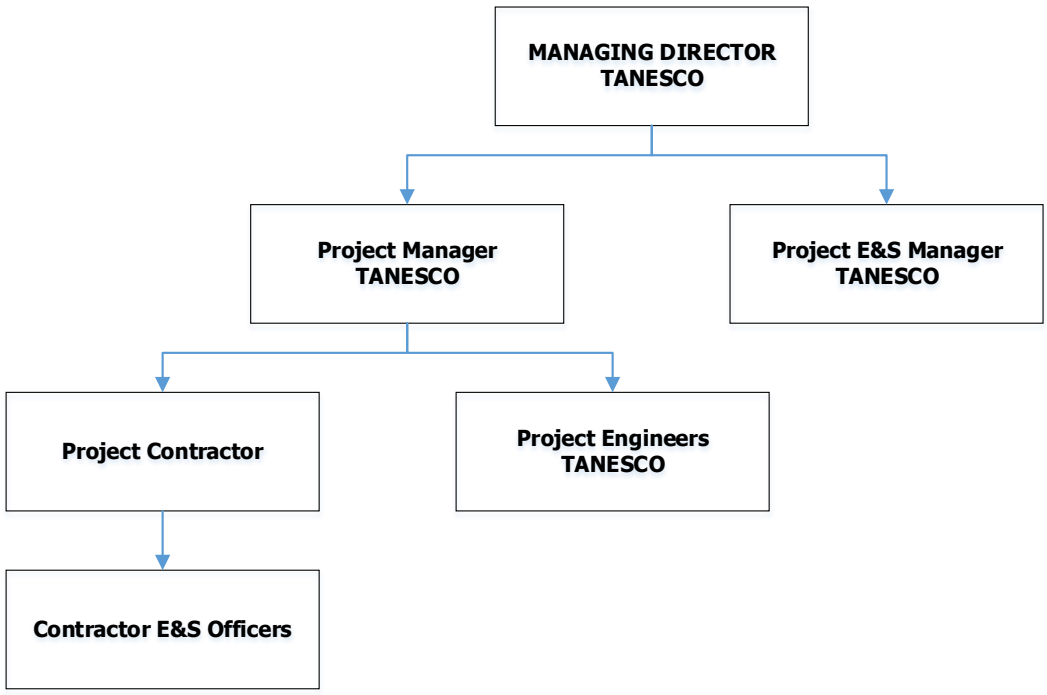
The objectives of the ESMP are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- To identify measures that could optimize beneficial impacts;
- To create management structures that address the concerns and complaints of stakeholders with regards to the development;
- To establish a method of monitoring and auditing environmental and social management practices during all phases of development;
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental and Social Management;
- Detail specific actions deemed necessary to assist in mitigating the adverse environmental and social impacts of the project;
- Ensure that the safety recommendations are complied with;
- Propose mechanisms for monitoring compliance with the ESMP and reporting thereon; and
- Specify time periods within which the measures contemplated in the final environmental and social management plan must be implemented, where appropriate.

7.3 ESMP roles and responsibilities

Several professionals will form part of the construction phase project management team. The most important from an environmental and social perspective are the Project Manager (TANESCO), the Project Environmental and Social (E&S) Manager (TANESCO), the Project Contractor, the Project Engineers (TANESCO) and the Developer (TANESCO). While it may change, the organization chart showing various professionals involved in the implementation of the ESMPs is shown in Figure 7-1.

Figure 7-1 : Organization chart for implementing ESMP



The Project Manager is responsible for the implementation of the ESMP on the site during the **pre-construction** and **construction** phases of the project.

The Project E&S Manager is responsible for monitoring the implementation of the ESMP during the **pre-construction** and **construction** phases of the project and advising the Project Manager on correct management of E&S issues during these phases of the project.

The Project Contractor is responsible for fully complying with the mitigation measures stated within the ESMP which are implemented by the Project Manager during the **construction** phase. The Project Contractor is further obliged to develop and implement a Construction Environment & Social Management Plan (CESMP) and sub-plans for specific E&S issues.

The Project Engineers are responsible for ensuring that the Project contractor complies with the mitigation measures and ESMP requirements during the **design**, **pre-construction** and **construction** phases of the project.

TANESCO is accountable for the implementation of the ESMP during the **design, pre-construction, construction, operational** and **decommissioning** phases of the project. Decommissioning will however entail the appointment of a new professional team and responsibilities will be similar to those during the design, pre-construction and construction phases.

Specific responsibilities of the actors mentioned above are given in the sub-sections below.

7.3.1 Project Manager

The Project Manager is responsible for overall management of project and ESMP implementation. The following tasks will fall within his/her responsibilities:

- Be aware of the findings and conclusions of the Environmental and Social Impact Assessment (ESIA) and the conditions provided by regulatory authorities in licensing the project;
- Be familiar with the recommendations and mitigation measures of this ESMP, including implementation of the mitigation and enhancement measures;
- Monitor site activities on a daily basis for compliance with the ESIA conditions and this ESMP;
- Conduct internal audits of the construction site ROW against the ESMP;
- Confine the construction site to the demarcated area; and
- Rectify infractions through the implementation of corrective action.

7.3.2 Project E&S Manager

The Project E&S Manger is responsible for the implementation of the ESMP during the construction phase as well as liaising and reporting to the TANESCO, Project Contractor, Landowners and Authorities on compliance with it. The following tasks will fall within his/her responsibilities:

- Be aware of the findings and conclusions of the ESIA and the conditions stated within the permit issued by the environmental regulator in Tanzania;
- Be familiar and have good working knowledge of the enhancement and mitigation measures of this ESMP;
- Conduct regular (e.g. weekly/monthly) audits of the construction site ROW according to the ESMP and EIA permit conditions;
- Organize relevant and applicable E&S training for the Project Contractor's team about the management measures of the ESMP and EIA permit conditions;
- Regularly liaise with the construction team and the project leader about implementation of the ESMP;

- Recommend corrective action for any E&S non-compliance incidents on the construction site; and
- Compile a regular report highlighting any non-compliance issues as well as good compliance with the ESMP.

7.3.3 Project Contractor

The Project contractor is responsible for the implementation of and compliance with recommendations and conditions of the ESMP. The Project Contractor's responsibilities will include:

- Ensuring compliance with the ESMP at all times during construction
- Undertake a formal/written E&S risk assessment of the activities and sub-activities in the construction phase of the project and submit a report to TANESCO for review and approval. The activities during the construction phase will include (i) site preparation, (ii) transport of goods and people along the transmission line route and substation locations, (iii), clearance of the ROW and substation area, excavation of foundations for steel towers and substation infrastructure, concreting of steel tower foundations, erection of steel towers, stringing of conductors, etc. (iv) waste and hazardous materials management, (v) purchase of materials, goods and services, and (vi) management of workers at the construction sites and camps. The E&S risk assessment shall be undertaken in accordance with the requirements of ISO31000 and its companion ISO31010;
- Development and implementation of a written Construction Environmental and Social Management Plan (CESMP) and associated sub-plans.
- The CESMP shall be compliant with the applicable requirements of international standards such as ISO 9001, ISO14001, OHSAS 18001 and ISO 45001 when it is released. The Project Contractor shall use this ESMP as a basis for the development of a CESMP;
- As part of the CESMP, develop and implement a formal system of Job Safety and Environmental Analysis (JSEA) for all construction phase activities;
- Maintain a record of all E&S statistics relevant to the project and provide updates at monthly progress meetings. Both leading and lagging indicators must be included in the reporting;
- Maintain an E&S register which keeps a record of all incidents which occur along the ROW and at the sub-stations during the construction phase. These incidents include:
    - Public involvement / complaints;
    - Health and safety incidents;
    - Incidents involving Hazardous materials stored on site; and
    - Noncompliance incidents.

Most Landowners will see the construction period as interference with their daily activities. There may be a negative attitude towards the whole construction process.

Landowners are always apprehensive toward changes they do not control and strangers on their properties. If and where the transmission line project is close to any inhabited

area, the necessary precautions shall be taken by the Contractor to safeguard the lives and property of the inhabitants. The Contractor shall under no circumstances interfere with the property of Landowners or nearby Communities.

7.3.4 Contractor E&S Officer

The Project Contractor will recruit one or more E&S Officer(s) to monitor activities on site along the ROW on a daily basis. Each E&S Officer will be the Project Contractor's representative on the site and will report back on all audit trips to the Project E&S Manager. The E&S Officer must report any major incidents immediately to the Project E&S Manager and subsequently carry out a thorough incident investigation and root cause analysis.

7.3.5 Independent E&S Auditor

An independent E&S auditor may be appointed by TANESCO to conduct independent E&S audits during the construction and operational phase of the project on a six-monthly basis according to the provisions of the ESMP. The independent E&S auditor will:

- Conduct independent E&S audits of the construction and operational phase of the project;
- Submit audit reports to the Project E&S Manager and if required, relevant authority;
- Engage specialist sub-consultants when required to assist with specific E&S aspects and impacts.

7.3.6 E&S management responsibilities

The following are the E&S management responsibilities of the various parties during construction and operational phases. Unless otherwise stated the ESMP will be adhered to as follows:

- The Project Contractor shall be the responsible party for compliance with all requirements of this ESMP during the construction phase;
- The monitoring party will be the Project E&S Manager;
- Method of record keeping will be weekly to two weekly audits depending on the stage of the project;
- Audit technique will be the review of records that will be kept on site by the Project Contractor's E&S Officers and/or site inspections;
- TANESCO will bear ultimate responsibility for full compliance with the ESMP.

7.4 E&S monitoring

A monitoring program will be implemented by the Project Contractor for the duration of the construction phase of the project. This program will include:

- Monthly E&S inspections to confirm compliance with the ESMP and EIA permit conditions. These inspections can be conducted randomly and do not require prior arrangement with the Project Manager;
- Compilation of an inspection report complete with corrective actions for implementation;
- Monthly E&S committee meetings to be held for the various construction spreads to ensure compliance with the Tanzanian E&S laws and their subsidiary legislation, as well as, the World Bank Group E&S standards for such projects.

The Contractor E&S Officer shall keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable.

All claims for compensation emanating from construction related damage should be directed to the Project E&S Manager for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints/claims shall be handled immediately to ensure timeous rectification/payment by the responsible party.

It should be noted that it is difficult to outline a formal monitoring protocol for specific E&S parameters and key impacts until detailed transmission line and substation designs have been completed. A formal monitoring protocol will be included within the revised ESMP once the detailed project design has been completed, and recommendations and conditions from the reviewing authority have been received. It should further be noted that for the same reasons mentioned above, it is difficult to delineate the cost of the ESMP for specific mitigation measures and therefore this has been excluded from the ESMP tables.

The Project Contractor shall be responsible for acquiring all necessary permits during the construction phase of the project. Such licenses include any abstraction of water permits, local authority approvals for camp site locations and operations, extraction of aggregates from borrow pits and their rehabilitation, etc.

7.4.1 Compliance with the ESMP and associated documentation

A copy of the ESMP must be kept on site (within each construction spread location) during the construction phase at all times. The ESMP will be made binding on all contractors operating at the site and must be included within the Contractual Clauses. It should be noted that in terms of the principles of E&S management espoused through environmental legislation in Tanzania, those responsible for environmental damage must pay the repair costs both to the environment and human health measures to reduce or prevent further pollution and/or environmental damage (The polluter pays principle).

The Project Contractor is deemed not to have complied with the ESMP if:

- Within the boundaries of the site, site extensions and haul/access roads there is evidence of contravention of clauses; or
- If environmental damage arises due to negligence; or
- The contractor fails to comply with corrective or other instructions issued by the Project E&S Manager or Authorities within a specified time; or
- The Contractor fails to respond adequately to complaints from the public.

TANESCO is deemed to be out of compliance with the ESMP if:

- Within the boundaries of the site, there is evidence of contravention of clauses;
- If environmental damage arises due to negligence;
- TANESCO fails to respond adequately to complaints from the public.

7.4.2 Training and Awareness

7.4.2.1 Training of Construction Workers

The construction workers must receive basic training in workplace health and safety and in environmental awareness, including the storage and handling of hazardous substances, minimization of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must also be appraised of the ESMP's requirements.

Additional site specific training must be provided by the Project Contractor and Project E&S Manager in order to ensure that workers comply with the requirements of the ESMP.

7.4.2.2 Contractor Performance

The Project Contractor must ensure that the conditions of the ESMP are adhered to. Should the Contractor require clarity on any aspect of the ESMP, the Contractor must contact the Project E&S Manager for advice.

7.5 ESMP requirements for pre-construction

The requirements that need to be fulfilled during the pre-construction phase of the project are as follows:

- There should be continuous liaison between TANESCO, the Project Contractor and Landowners along the ROW and at the substations to ensure all parties are appropriately informed of construction phase activities at all times;
- The Landowners should be informed of the start date of construction as well as the phases in which the construction will take place;
- The Project Contractor must adhere to all conditions of contract including the ESMP;

- The Project Contractor should plan the construction program taking cognizance of climatic conditions along the ROW especially wet seasons and disruptions that can be caused by heavy rains;
- Where existing private roads are in a bad state of repair, such roads' condition shall be documented before they are used for construction purposes. This will allow for easy assessment of any damage to the roads which may result from the construction process. If necessary some repairs should be done to prevent damage to equipment;
- The construction site office must keep a proper record of all complaints received and actions taken to resolve the complaints;
- A Project E&S Manager should be appointed by TANESCO and a Contractor E&S Officer(s) should be appointed by the Project Contractor to implement this ESMP as well as deal with Landowner related matters;
- Internal and external E&S inspections and audits should be undertaken during and upon completion of construction. The frequency of these audits should be quarterly;
- The Project E&S Manager should conduct regular inspections along the ROW in order to maintain good control over the construction process during the construction phase;
- A formal communications protocol should be set up during this phase. The aim of the protocol should be to ensure that effective communication on key issues that may arise during construction be maintained between key parties such as the Project E&S Manager, Project Manager and Project Contractor. The protocol should also ensure that concerns/issues raised by stakeholders are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular basis may need to be set up. This could be done through the Project Contractor's site office that would meet on a regular basis. The communications protocol should be maintained throughout the construction phase.

Table 7-1 : Environmental Management Plan - Preconstruction phase

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
Pre-construction phase impacts	1) Appoint a Project E&S Manager supported by a team of Environmental Officers and Sociologists for the construction phase of the project. The TANESCO E&S staff members should have the necessary skills and experience for ensuring that the Project Contractor fully complies with the mitigation measures recommended in this ESIA Study and this Environment and Social Management Plan (ESMP). 2) A minimum of three properly trained E&S Officers at TANESCO head office level would be required for enforcing the requirements of this ESMP namely (i) an Environmental Officer, (ii) a Social Officer, and (iii) a Grievance Redress Mechanism (GRM) specialist. 3) Alternatively TANESCO could consider outsourcing the E&S management of the construction phase of the project to a Consulting company that can provide adequate E&S Officers to supervise the Project Contractor's E&S contractual obligations. 4) Subsequent to adopting one of the two options above, TANESCO will document specific roles and responsibilities for each of the four key E&S team members namely, (i) E&S Manager, (ii) Environmental Officer, (iii) Sociologist, and (iv) GRM Specialist	TANESCO	Prior to commencement of construction
	5) Recruit and appoint a number of qualified E&S Officers for the construction phase; 6) Carry out a formal E&S risk assessment of the specific project activities to be undertaken for the project and submit to TANESCO for review and consideration. The E&S risk assessment should be undertaken in accordance with ISO31000 and ISO31010 standards respectively 7) Based on an approved E&S risk assessment, develop a written Construction Environment and Social Management Plan (CESMP) and sub-plans for the project. The CESMP should be developed in accordance with the requirements of ISO9001, ISO14001 and OHSAS 18001 at a minimum. 8) The sub-plans must include as a minimum (i) air quality management plan (ii) noise	Project Contractor	Prior to commencement of construction

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	management plan (iii) biodiversity management plan (iv) emergency response plan (v) water management plan (vi) waste management plan, and (vii) community health, safety and security plan. 9) Develop and implement a formal Human Resource Management System (HRMS) specific and not generic for the transmission line project. The HRMS must include compliance with local labor laws and regulations, have terms and conditions of employment for all types of workers and include an employee grievance mechanism among other elements. 10) Acquire all necessary permits from regulatory authorities or lead agencies for executing construction works e.g. water abstraction, borrow pits, waste disposal, construction site office, etc.		
	11) Clearly demarcate (e.g. using fencing and marking of pegs) all areas to be developed before construction commences; 12) The Project Contractor to comply with the conditions of the EIA Certificate issued by the Minister for Environment. These should form part of the Contract conditions in the Agreement between TANESCO and the successful Project Contractor; 13) Identify and confirm suitable sites for the construction camps and storage areas for materials. The selection criteria for the location of the camp must include among other things, siting it away from (i) any communities and settlements, (ii) schools, (iii) socially significant buildings, (iv) community centers where underage children may assemble; 14) Identify and map out all existing access roads that can be used during the construction phase; 15) Store construction equipment in construction camps. Ensure oil changes take place on an impermeable surface such as reinforced concrete slab; 16) Maintain records of E&S incidents and avail a copy of these records to TANESCO and relevant lead agencies on request throughout the construction phase;	Project Contractor	Bi-monthly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	17) Use workforce as much as possible from the local areas along the ROW; 18) Train site staff on the following areas of E&S management; a) E&S awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artifacts; b) Project Manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks; c) Operators of construction equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks; d) No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Project Contractor and certified competent by the Project Manager; e) Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. f) All employees should be trained in workplace health and safety including use of PPE.		

7.6 ESMP requirements for construction phase

7.6.1 Site preparation

Site clearing along the ROW will be limited to the width of the proposed width which is 52m. Site clearing must take place in a phased manner as and when required. Areas which are not to be constructed on within two months of time must not be cleared to reduce erosion risks. The area to be cleared must be clearly demarcated and this footprint strictly maintained. Topsoil from the ROW must be neatly stockpiled adjacent to the trench ready for backfill when required.

7.6.2 Establishment of Construction Camps and Materials yards

The proposed transmission line project will be undertaken in lots; it is envisaged that one lot may include the transmission line from Mbeya to Tunduma including the ~4km segment of TL from Tunduma S/S to TanZam border (about 104km long) and the second lot may include the line from Tunduma to Sumbawanga (about 240km). It is anticipated that for each LOT, there will be one main camp created for the construction phase of the project and a number of "fly camps" (smaller and mobile camps). The main camp and fly camps shall be strictly controlled through a labor influx management plan.

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.

Table 7-2: Environmental Management Plan - Construction phase

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
Poor traffic and access management during construction	**Construction traffic** **1.** Clearly identify and map construction routes and required access roads; **2.** Use the minimum number of trips for delivering construction plant and equipment along the ROW; **3.** Strictly control the access of all construction and material delivery vehicles especially during wet weather to avoid compaction and damage to the topsoil structure; **4.** Schedule the delivery hours to avoid peak hour traffic, weekends and evenings; **5.** Implement wheel washing and damping down of unsurfaced roads to reduce dust and nuisance; **6.** Service vehicles and equipment regularly to avoid the contamination of soil from oil and hydraulic fluid leaks, etc. Servicing of vehicles and equipment must be done off-site and on an impermeable surface such as concrete;	Project Contractor, Project E&S Manager	Every two weeks
	Access roads **7.** Position entry and exit points strategically to ensure minimal effects on traffic; **8.** Clearly signpost primary routes to the site and issue to all suppliers and Sub-Contractors. **9.** Project Contractor to plan access routes to the site for construction purposes in conjunction with the Landowners. All agreements reached should be documented and no verbal agreements should be made. The Project Contractor shall clearly mark all access roads. **10.** If new access roads are necessary, they shall be constructed according to the design and contract specifications of relevant Tanzanian authorities. Drainage channels shall be suitably designed to ensure erosion does not occur, especially at the outflow points. The	Project Contractor, Project E&S Manager	Every two weeks

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	new access road shall be designed to allow for the natural flow of water where required. Crossing of eroded areas on access routes to new sites shall be thoroughly planned and installed according to design and contract specifications. All areas susceptible to erosion shall be protected with suitable erosion control measures from the onset of the project. Prevention is the ultimate aim, as restoration is normally difficult and costly; **11.** Rehabilitate all temporary access roads used during the construction phase to as near original condition prior to the demobilizing from the site.		
	Road maintenance 12. All damaged roads shall be rehabilitated using suitable measures. In the event of rehabilitation work being required on private roads, such work will be done to the original specifications of the private road; 13. Access roads should be maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop.	Project Contractor, Project E&S Manager	Every two weeks
	General 14. Safety requirements shall be complied with at all times during the construction phase. All equipment transported shall be clearly labeled as to their potential hazards according to specifications. All the required safety labeling on the containers and trucks used shall be in place; 15. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken.	Project Contractor, Project E&S Manager	Every two weeks
Improper setup and operation of Construction camps	**Site of construction camp** **1.** The Project Contractor shall seek approval from the communities and relevant local authority for setting up of the construction camp(s) for the project. Factors to consider during siting of construction camps include, location of local residents and/or ecologically sensitive areas including flood zones and slip/unstable zones and should be located in	Project Contractor, Project E&S Manager	Prior to construction

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	sparsely populated area. Additional siting criteria must include siting the camp away from (i) schools, (ii) socially significant buildings and (iii) any community centers where underage children may assemble. If the Project Contractor chooses to locate the camp site on private land, he must get prior permission from both TANESCO and the landowner; **2.** Minimize the size of the construction camp (especially where natural vegetation or grassland has had to be cleared for its construction); **3.** Provide adequate parking for site staff and visitors. This should not inconvenience or serve as a nuisance for neighbors; **4.** Provide adequate drainage around the camp site to avoid standing water and/or sheet erosion.		
	Storage of materials (including hazardous materials) **5.** Choose storage area location by considering prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary; **6.** Designate, demarcate, fence off and secure all storage areas to minimize the risk of crime; storage areas should be safe from access by unauthorized persons; **7.** Carry out an appropriate fire risk assessment and provide fire prevention facilities at all storage facilities; **8.** Store all hazardous materials such as oils, paints, thinners, fuels, chemicals, etc. in properly constructed and impermeable bunded areas. Hazardous materials must not be allowed to contaminate the subsurface or enter into drainage systems. Siting of hazardous material storage areas must be approved by the E&S Manager. **9.** The Project Contractor will acquire Safety Data Sheets (SDSs) for all chemicals and hazardous substances used on site. Training on environmental health impacts of	Project Contractor, Project E&S Manager	Every two weeks

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	chemicals and hazardous substances and PPE required to worn must be provided to the users. **10.** Hazardous material storage areas must be signposted clearly **11.** Use a NEMC licensed waste handler for disposal of all used oils from the camp sites. A waste tracking sheet must be completed whenever used oils are disposed. **12.** Dispose any excess concrete mixes in consultation with the Project Manager. **13.** Immediately contain, recover and cleanup any spillages that may occur during the construction phase. All spillages must be reported to the Project E&S Manager and Project Manager.		
	Drainage of construction camp **14.** Ensure that all potentially contaminated run-offs from the construction camp meets the discharge limits set under Tanzanian Water Quality Regulations or in their absence the World Bank Group's wastewater discharge guideline limits; **15.** Effluent water quality samples must be collected by an independent laboratory and analyzed for various parameters; **16.** Run-off from the camp site must NOT discharge into neighbors' properties or into adjacent wetlands, rivers or streams.	Project Contractor, Project E&S Manager	Every two weeks
	End of construction **17.** Rehabilitate all storage areas after construction has been completed on site and all excess material has been removed. Such areas shall be rehabilitated to as near as their original state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, leveled and re-vegetated; **18.** Store construction materials, soil stockpiles, machinery and other equipment in	Project Contractor, Project E&S Manager	Every two weeks

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	designated areas; **19.** The construction camp must be kept clear of litter at all times. Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal. No open fires are allowed within the construction camp and no wood from surrounding vegetation may be used to create a fire.		
Lack of HSE and social training for construction staff	**Health, Safety, Environmental and Social (HSES) training** **1.** Ensure that all site personnel have a basic level of HSES awareness training. The Project Contractor must submit a proposal for this training to the Environmental and Social (E&S) Manager for approval. Topics covered should include; • What is meant by "E&S"; • Why the E&S needs to be protected and conserved; • How construction activities can impact negatively on the biophysical and human environment ; • What can be done to mitigate against adverse impacts; • Gender based violence; • Sexually Transmitted Infections such as HIV; • Awareness of emergency and spill response provisions; and • Social responsibility during construction e.g. being considerate to local residents. **2.** It is the Project Contractor's responsibility to provide the site foreman with no less than 1 hour's HSES training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff;	Project Contractor, Project E&S Manager	Monthly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	3. Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary; **4.** Use should be made of safety and environmental awareness posters on site; **5.** The need for a "clean site" policy also needs to be explained to the workers; **6.** Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks.		
	Monitoring of environmental training **7.** The Contractor must monitor the performance of construction workers to ensure that the points relayed during their induction have been properly understood and are being followed. If necessary, the E&S Officer and/or a translator should be called to the site to further explain aspects of environmental or social behavior that are unclear. Toolbox talks are recommended.	Project Contractor, Project E&S Manager	Monthly
Improper use and management of borrow pits	**Location of borrow pits** **1.** Borrow pit localities must be identified by the Project Contractor and approval for their use gotten from the relevant local authority to ensure consensus of their location;	Project Contractor, Project E&S Manager, Contractor E&S Officer	Monthly
	Management of borrow pits **2.** The Project Contractor must also compile an information document which states the methods which will be utilized when creating borrow pits. This document must include, but not be limited to the following: • Plans which detail the expected quantity of excavation that will be required; • Temporary and permanent stormwater control;	Project Contractor, Project E&S Manager, Contractor E&S Officer	Monthly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	• The final contouring of the borrow pit and the proposed method of rehabilitation; • The current status and land use of the borrow pit; • Topsoil management strategy (preservation of topsoil for reinstatement); • Proposed management of dangerous conditions (e.g. steep slopes, loose and unstable material, holes).		
Impacts relating to erection of steel towers and stringing of conductors	**General construction** **1.** Limit construction time to daylight hours in sensitive areas such as residential areas. Where construction is required after hours in order to avoid traffic interruptions, notification is to be sent out to all potentially affected land owners. **2.** Send out prior notifications to relevant lead agencies, parastatals, etc. when essential services such as water or electricity may be affected by the construction process.	Project Contractor, Project E&S Manager	Bi-weekly during the activity
	Clearing and grading **3.** Refer to sub-section 8.6.1 of this report.	Project Contractor, Project E&S Manager	Bi-weekly during the activity
	Excavation and backfilling for steel tower foundations **4.** Excavate top soil and keep on one side to be reused as backfill **5.** Cart away excavated soil for each foundation using trucks that are covered with a tarpaulin to reduce dust emissions and soil fallout during transport **6.** Replace soil in reverse order, that is, trench soil first and top soil later.	Project Contractor, Project E&S Manager	Bi-weekly during the activity
	Reinstatement **7.** Rip the compacted areas to loosen the soil and then rehabilitate the ROW.	Project Contractor, Project E&S Manager	Bi-weekly during the activity

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
Impacts related to soils and geology	**Soil erosion** **1.** Provide wind screening and stormwater control to prevent soil loss from the excavated foundations; **2.** Use silt fences and/or sand bags as barriers in areas that are susceptible to erosion; **3.** Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. **4.** Regularly maintain all erosion control mechanisms; **5.** Retain vegetation where possible to avoid soil erosion. Vegetation clearance should be phased to ensure that the least area of soil is exposed to potential erosion at any one time; **6.** Re-vegetate disturbed surfaces immediately after construction activities are completed;	Project Contractor, Project E&S Manager	Monthly
	Soil inversion **7.** The Project Contractor to determine the average depth of topsoil and agree on this with the Project E&S Manager. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas. **8.** Care must be taken not to mix topsoil and subsoil during stripping. **9.** Separately stockpile all subsoil and overburden in construction and lay down areas to be returned for backfilling in the correct soil horizon order.	Project Contractor, Project E&S Manager	Monthly
	Soil compaction **10.** Construction vehicles must only be allowed to utilize existing tracks or pre-planned access routes.	Project Contractor, Project E&S Manager	Monthly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	11. Soils compacted during construction should be deeply ripped to loose compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas.		
	Soil contamination **12.** The Project Contractor will arrange to remove all construction related contaminated topsoil to the full depth of pollution and replace it at his own expense with approved topsoil; **13.** The Project Contractor will be responsible for remediating any polluted topsoil.	Project Contractor, Project E&S Manager	Monthly
Impacts related to surface water and groundwater	**Sanitation** **1.** Provide adequate sanitary facilities for male and female construction workers in accordance with the Public Health legislative requirements; **2.** Ensure that sanitary facilities are regularly serviced and emptied to reduce the risk of surface or groundwater pollution.	Project Contractor, Project E&S Manager	Monthly
	Hazardous materials **3.** Place all hazardous materials in bunded containment areas with sealed surfaces; **4.** All hazardous substances must be stored at least 100m from any water body on site; **5.** Contaminated wastewater must be managed by the Project Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal.	Project Contractor, Project E&S Manager	Every two weeks
	Public areas **6.** Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis;	Project Contractor, Project E&S Manager	Every two weeks

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	7. The Project Contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the construction areas, camp site(s) and immediate surroundings, including litter accumulating at fence lines; **8.** No washing or servicing of vehicles on site.		
	Water resources **9.** Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing or washing of clothing; **10.** Treated water (or another source approved by the Project E&S Manager) should instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, compacting, etc.	Project Contractor, Project E&S Manager	Every two weeks
Impacts related to air quality	**Dust control** **1.** The Project Contractor will dampen un-surfaced and un-vegetated areas with a water bowser or sprinklers when necessary to reduce dust; **2.** Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of dust into neighboring areas; **3.** The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to a Landowner or neighboring communities; **4.** A speed limit of 40km/h must not be exceeded. All vehicles should be fitted with On Board Computers (OBCs) whose data can be downloaded and reviewed for compliance; **5.** Any complaints emanating from the lack of dust control shall be attended to immediately by the Project Contractor.	Project Contractor, E&S Officer	Daily when construction plant and equipment uses the ROW or access roads

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	Rehabilitation **6.** The Project Contractor will commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks.	Project Contractor, E&S Officer	Weekly during the rehabilitation
	Fire prevention **7.** No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires; **8.** The Contractor shall have operational fire-fighting equipment available on site at all times. The level of firefighting equipment must be assessed and evaluated thorough a fire risk assessment process.	Project Contractor, E&S Officer	Weekly
Impacts associated with noise on surrounding areas	**1.** The Project Contractor will comply with applicable sections of Tanzanian legislation on occupational and environmental noise; in the absence of this, the Project Contractor shall comply with the noise limits stipulated in the World Bank Group EHS Guidelines. If occupational noise levels exceed the stipulated or guideline values, ear protection gear will be provided free of charge to the workers by the Project Contractor and be worn by the workers; **2.** Construction site yards, workshops and other noisy fixed facilities should be located well away from noise sensitive areas. Truck traffic should be routed away from noise sensitive areas, where possible; **3.** Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activities near noise sensitive areas should not be allowed; **4.** With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the Project Contractor and E&S Manger should liaise with local residents on how best to minimize impact, and the local population should be kept informed of the nature and duration of intended activities;	Project Contractor, E&S Officer	Weekly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	5. Noise from laborers must be controlled; **6.** Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the contractor may be instructed to remove the offending vehicle or machinery from site; **7.** The contractor must take measures to discourage laborers from loitering and causing noise disturbance. Where possible labor shall be transported to and from the site by the Project Contractor or his Sub-Contractors.		
Impacts on ecology along the ROW	**Existing vegetation** **1.** Existing indigenous vegetation must be retained where possible. A follow up vegetation survey should be conducted before site clearing to demarcate vegetation that should remain or be removed and relocate any plants of botanical or ecological significance. Vegetation to be removed as it becomes necessary; **2.** There shall be no destruction of riparian habitats and water pans; **3.** Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected; **4.** Engage an experienced bat specialist to identify the exact sites that the migratory *E. helvum* and endemic *R mandeleo* uses for migration and feeding while in residency or in transit **5.** Trees cut down within the ROW should be kept aside and provided to the local communities for their use. Under no circumstances will burning of vegetation such as grass be allowed within the ROW	Project E&S Manager, E&S Officer	Weekly along the ROW during the construction phase
	Rehabilitation	Project E&S Manager, E&S	Weekly along the ROW during

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	6. All damaged areas shall be rehabilitated upon completion of the contract to as near pre-construction conditions; **7.** All natural areas impacted during construction must be rehabilitated with locally indigenous grasses typical of the representative botanical unit; **8.** Rehabilitation must take place as soon as construction is complete to avoid the edge effect, the infiltration of alien species and soil erosion within the ROW;	Officer	rehabilitation
	Permits **9.** Permits for removal of any protected species must be obtained from Tanzania National Parks Authority (TANAPA) or Tanzania Forestry Services Agency (TFS) or other relevant lead agency should such species be affected. The Project Contractor shall engage the services of a full qualified botanist from Tanzania to identify any protected species that may lie within the ROW and map them using a GIS platform or equivalent. The Project Contractor will instruct their clearing crews not to cut protected species identified prior to clearing the ROW; **10.** All plants not interfering with the operation of the transmission line construction shall be left undisturbed, clearly marked and indicated on the site plan; **11.** The construction workspace must be well demarcated and no construction activities must be allowed outside of this demarcated footprint; **12.** Only vegetation within the steel lattice towers footprint area to be excavated must be completely removed. Selective clearing is recommended elsewhere. Vegetation removal must be phased in order to reduce impact of construction; **13.** Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. **14.** Construction areas must be well demarcated and these areas strictly adhered to.	Project E&S Manager, E&S Officer	Weekly during clearing and grading

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	15. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.		
	Utilization of resources **16.** Gathering of firewood or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the Project E&S Manager.	Project E&S Manager, E&S Officer	Every two weeks initially and then monthly
	Steel tower excavation pitfalls **17.** Physical barriers should be erected to prevent any animals from falling in the excavated footprint of each steel tower foundation **18.** Small mammals, reptiles and amphibians prefer using open areas for basking and move on the edge of open areas looking for food. Grading of roads within ROW should be restricted. Only leveling should be done where vehicle clearance is poor to allow it pass an area	Project E&S Manager, E&S Officer	Monthly
	Attacks by wild animals within protected areas **19.** TANAPA and TFS should provide security to the Project Contractor on a full-time basis during the construction phase within game reserves, forest or other protected areas along the proposed ROW; **20.** TANAPA should restrict movement of construction personnel to the ROW construction working areas; **21.** Construction camp sites should be located outside the protected areas;	Project E&S Manager, E&S Officer	Weekly
	Potential poaching **22.** Contractor should work within the construction space of the ROW in full compliance of KWS rules and regulations;	Project E&S Manager, E&S Officer	Weekly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	23. KWS should screen Project Contractor's construction plant, equipment, containers, etc.; **24.** KWS to enhance security surveillance at the cost of the Project Contractor.		
Inconsistent waste management	**Construction rubble** **1.** A project specific waste management plan will be developed and implemented for this project consisting of waste identification and a waste reduction work plan. Waste identification includes an indication of anticipated types and quantities of demolition, site-clearing, and construction waste generated by the project. Waste identification will include estimated quantities and assumptions for estimates. The waste reduction work plan will list each type of waste and whether it will be salvaged, reused, recycled, or disposed of in landfill or other waste area. The waste reduction plan will include the points of waste generation, total quantity of each type of waste quantity for each means of recovery, and handling and transportation procedures. **2.** Rubble must not be dumped on site but must be placed within a receptacle for regular removal; **3.** Construction rubble shall be disposed of in pre–agreed, demarcated spoil dumps that have been approved by the relevant local authority.	Project Contractor, Project E&S Manager, Contractor E&S Officer	Every two weeks
	Litter management **4.** Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site; **5.** A housekeeping team will be appointed to regularly maintain the litter and rubble situation on the construction site; **6.** Waste disposal will need to take place in accordance with Tanzanian waste management regulations or in their absence the World Bank Group EHS Guidelines; **7.** Littering by employees of the Project Contractor shall not be allowed under any	Project Contractor, Project E&S Manager, Contractor E&S Officer	Every two weeks

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	circumstances. The Project E&S Manager shall monitor the neatness of the work sites as well as the Project Contractor campsite; **8.** Receptacle containers should be maintained on site. These should be kept covered and arrangements made for them to be disposed regularly form the site; **9.** Waste Tracking Sheets providing disposal shall be provided for the Project E&S Manager's inspection.		
	Hazardous waste **10.** All hazardous materials must be carefully stored as advised by the Project E&S Manager, and then disposed of offsite using NEMC approved waste handlers; **11.** Contaminants will be stored safely to avoid spillage; **12.** Machinery must be properly maintained to keep oil leaks in check.	Project Contractor, Project E&S Manager, Contractor E&S Officer	Monthly
	Sanitation **13.** The Contractor shall install mobile chemical toilets on the site along the ROW and organize for their regular removal and replenishment; **14.** Staff shall be sensitized to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed along the ROW or the camp site(s); **15.** There should be enough toilets available to accommodate the workforce in accordance with the Public Health requirements. Male and female ablution facilities at all construction locations must be accommodated separately; **16.** Toilets shall be serviced regularly and the Contractor's E&S Officer shall inspect these for hygiene; **17.** Under no circumstances may open areas, neighbors fences or the surrounding bush be	Project Contractor, Project E&S Manager, Contractor E&S Officer	Weekly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	used as a toilet facility; **18.** Potable water must be provided for all construction staff.		
	Remedial actions **19.** Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site; **20.** Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until disposed of using NEMC approved waste handlers; **21.** If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials; **22.** If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. **23.** Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. **24.** Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriately disposed.	Project Contractor, Project E&S Manager, Contractor E&S Officer	Monthly

Table 7-3: Social Management Plan – Construction phase

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
Impacts on labor and working conditions	**Preamble** **1.** Prior to the construction phase, the successful Project Contractor will seek approval from TANESCO on the management systems which will be used to execute the project. These are described below. **2.** The Project Contractor will develop and implement a Human Resource Management Plan (HRMS) for the transmission line project. The HRMS will be site specific to the Mbeya – Tunduma – Sumbawanga transmission line project and will not be a generic one borrowed from elsewhere. The HRMS will be written in English and Swahili and will contain elements such as: (i) Retaining workers, (ii) Hiring workers, (iii) Administration, (iv) Managing Payroll, (v) HR planning, (vi) Recruiting/Learning management, (vii) Performance record, (viii) Scheduling, (ix) Absence management, (x) Analytics, (xi) Employee Reassignment module, (xii) Labor Influx Management, (xiii) camp management and (xiv) Employee grievance handling procedures. **3.** The Project Contractor will develop and implement project specific policies and associated procedures such as (i) HIV Policy, (ii) Honor Code, (iii) Recruitment Policy (should be based on equal opportunity, (iv) Sexual Harassment Policy, and (v) migrant influx policy **4.** The Project Contractor will develop and implement an in-migrant management plan and a camp management plan to manage the influx of workers in the project areas **5.** The Project Contractor will develop a training plan based on a Training Needs Analysis (TNA) of all workers that are employed for the construction phase of the project.	Project Contractor	Monthly
	Influx of workers **1.** To the extent practical and without compromising on the specifications and quality of	Project Contractor, Project E&S	Monthly

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
	work expected, the Project Contractor will use workers from the local communities where the proposed transmission line project traverses, thus reducing the need to have migrant workers **2.** The Project Contractor will advertise the available jobs using communications media that has the widest reach in the local communities in order to give workers from these areas the first opportunity to apply for available jobs **3.** For workers not indigenous to the ROW areas, awareness should be created among construction workers about local traditions and practices; **4.** Communities living in close proximity to the ROW should be given an opportunity through the local Village Executive Officer's and Village Chairperson's office to communicate their expectations of construction workers' behavior; **5.** Implement methods (Peer Educators, posters, talks, etc.) to create HIV and STI awareness amongst construction workers; **6.** Payment to construction workers shall comply with applicable Tanzanian Labor Law legislation in terms of minimum wages;	Manager	
	Job seekers **1.** As stated above, the Project Contractor will develop and implement a project specific HR management system for the proposed Mbeya – Tunduma – Sumbawanga TL project including segment of TL from Tunduma S/S to TanZam border. In recruiting workers for the execution of the work, the Project Contractor will use the Village Executive Officer and Village Chairperson's offices for the project along the ROW; **2.** No person under the age of 18 years shall be engaged for any work on the project; **3.** No loitering will be allowed in the vicinity of the camp sites. The Project Contractor to work with relevant security agencies to evict any loiterers.	Project Contractor, Project E&S Manager	Every two weeks

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
	4. Construction workers should be clearly identifiable by wearing proper uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags.		
	Employee Grievance Mechanism **1.** The Project Contractor shall develop and rollout an Employee Grievance Redress Mechanism (GRM) for the construction phase of the project; **2.** The employee GRM will form part of the formal HR Management System that the Project Contractor must develop for the project	Project Contractor, Project E&S Manager	Monthly
Impacts on community health and safety	**Priority ecosystem services** **1.** Water is an important resource along the ROW and subsequently construction workers should be made aware of the limited availability of it and the conservation measures to employ in its use especially during the dry seasons; **2.** The Project Contractor will notify relevant water boards along the ROW and negotiate the amount of water required for construction purposes; **3.** Construction camps should be located away from sensitive receptors to avoid pollution of water bodies.	Project Contractor, Project E&S Manager	Monthly
	Community exposure to disease **1.** Construction workers should receive medical advice regarding correct sanitation and correct medical attention where required; **2.** Adequate water facilities should be provided for ablution and washing in the permanent camp, temporary camps, along the ROW where construction works occur or at the proposed substations; **3.** Sufficient portable chemical toilets on site and at the construction camps should be	Project Contractor, Project E&S Manager	Monthly

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
	provided; **4.** Adequate sanitation services (e.g. showers) at the construction camp should be provided with effective drainage facilities to ensure that grey water and sewage are properly treated before being discharged to the environment.		
	Gender based violence 1. The Project Contractor will conduct mandatory and periodic training for workers on required lawful conduct in host community and legal consequences for failure to comply with laws on gender based violence (GBV) 2. TANESCO will roll out its grievance redress mechanism (GRM) of the proposed transmission line project for communities living in the project's Area of Influence and collect information about GBV and associated social ills on a monthly basis with a view to resolving it with the Project Contractor 3. The Project Contractor will identify and create a partnership with a local NGO to report workers' misconduct and complaints/reports on GBV or harassment through the GRM 4. The Project Contractor will commit through its HR Management System and contract with TANESCO to cooperate with law enforcement agencies investigating perpetrators of GBV 5. The Project Contractor should consider providing opportunities for migrant workers to return to their families periodically 6. The Project Contractor should consider providing entertainment facilities within the camp and away from the host communities	Project Contractor, Project E&S Manager	Quarterly
	Emergency response plan **1.** An emergency response risk assessment should be undertaken for the construction phase of the project in which credible scenarios should be identified; **2.** Based on 1 above, the Project Contractor will develop and implement an emergency	Project Contractor, Project E&S Manager	Six monthly

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
	response plan (ERP) for the construction phase of the project in alignment with international best practices; **3.** Given the remote locations where construction of the transmission line will be carried out, the Project Contractor will identify mutual aid and response capabilities that can assist the Project Contractor and TANESCO during the handling of a crisis; **4.** The Project Contractor will conduct out mock drills on various credible scenarios to enhance the emergency preparedness levels		
	Integration with host communities **1.** The Project Contractor will launch an aggressive STI and HIV/AIDS awareness campaign which is not only directed at construction workers but also at the community as a whole; **2.** Condoms should be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of condoms. The distribution of condoms should be approached with the necessary cultural sensitivity; **3.** Access to the construction site (ROW, substations and construction camps) should be controlled to prevent sex workers from either visiting and/or loitering within the project footprint areas; **4.** Local women should be empowered. This could be achieved by employing them to work on the project, which in turn would decrease their (financial) vulnerability.	Project Contractor, Project E&S Manager	Quarterly

7.7 ESMP requirements during the operational phase

The requirements that need to be fulfilled during the operational phase of the project are as follows:

- There should be continuous liaison between TANESCO and Landowners along the ROW to ensure all parties are appropriately informed of operations and maintenance phase activities;
- Internal and external E&S inspections and audits should be undertaken by TANESCO during the operational phase of the project; the frequency of these audits should be six-monthly;
- A formal communications protocol should be set up during the operational phase of the project between TANESCO and communities living adjacent to the ROW. The aim of the protocol should be to ensure that effective communication on key issues that may arise during operations and maintenance between key parties i.e. TANESCO and communities. The protocol should also ensure that concerns/issues raised by stakeholders are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular basis may need to be set up. This could be done through TANESCO's regional offices office that would meet on a regular basis. The communications protocol should be maintained throughout the operational phase of the project.

Table 7-4: Environmental Management Plan - Operational phase

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
Impacts associated with demobilization of construction plant, equipment and associated infrastructure	**Removal of equipment** **1.** Remove all structures comprising the construction camp. Check for any previous construction related chemical soil contamination and cleanup. Return the ground conditions within the camp sites to their near original state by undertaking the necessary landscaping.	Project Contractor, TANESCO, Project E&S Manager, Contractor E&S Officer	Weekly
	Associated infrastructure **2.** All rubble is to be removed from the site to an approved disposal site as approved by the Owner's Engineer. Burying of rubble on site is prohibited. **3.** The site is to be cleared of all litter. **4.** The Contractor is to check that all watercourses that they may have crossed during the construction phase are free from building rubble, spoil materials and waste materials. **5.** Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Owner's Engineer. **6.** All residual stockpiles must be removed or spread on site as directed by the Owner's Engineer.	Project Contractor, TANESCO, Project E&S Manager, Contractor E&S Officer	Weekly
Impacts associated with subsurface soil and surface water contamination	**Sub-station operations** **1.** All areas of the substation footprint where operational spills could occur will be made out of an impermeable surface; **2.** The design of each proposed substation in Sumbawanga, Tunduma 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,	TANESCO	Monthly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	COD, BOD, etc. **3.** TANESCO will develop and implement a spill prevention control and countermeasures plan and a waste management plan for the proposed substation sites in Sumbawanga, Tunduma and Mbeya **4.** 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 air quality	**Maintenance activities in the ROW** **1.** A traffic management plan will be developed and implemented in which the speed limits should be set to a maximum of 40km/h and monitored. This management plan will be applicable to the TANESCO vehicles that will be performing maintenance activities along the ROW.	TANESCO	Quarterly along the ROW, annually at each substation
Impacts on noise quality	**Humming from the substations** 1. An independent environmental noise level survey will be undertaken on an annual basis at each of the three substations constructed in Mbeya, Tunduma and Sumbawanga. 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 berms high enough to shield the noise from traveling outside the property line.	TANESCO	Annually
Impacts associated with transmission line operations and	**Maintenance** **1.** All applicable standards, legislation, policies and procedures must be adhered to during operation; **2.** Regular ground inspection must take place to monitor the status of the transmission line;	TANESCO	Monthly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
maintenance			
	Public awareness **3.** TANESCO should continue their awareness campaign about the hazards of the 400kV and 330kV line to landowners/residents affected by the transmission line throughout the operational phase. this can be done through community meetings held at various locations along the transmission line route; **4.** TANESCO will develop and implement an emergency response plan (ERP) for the proposed transmission line and substations. At a minimum, the ERP will contain	TANESCO	Six monthly
Impacts on biological environment	**Flora** **1.** An Alien Invasive Species (AIS) Management Plan will be developed and implemented during the operational phase of the project **2.** Indigenous vegetation must be maintained and all exotics removed as they appear and disposed appropriately **3.** Vegetative re-establishment shall, as far as possible, make use of indigenous or locally occurring plant varieties **Fauna** **4.** No faunal species must be harmed by maintenance staff during any routine maintenance of the transmission line **Avifauna** **5.** Carry out an avifauna monitoring survey for two years after the project becomes operational to determine the areas where raptors such as vultures and eagles could collide with the transmission line thus causing high rates of mortality. The surveys should be seasonal to incorporate migration paths and, roosting and breeding locations.	TANESCO	Quarterly

Impact	Environmental Mitigation Measure/Monitoring Plan	Responsibility	Frequency/ Monitoring requirement
	6. Based on 5 above, install bird diverters on the conductors at approximately 5m intervals along the locations where avifauna collisions **Bats** **7.** Engage an experienced bat specialist from a recognized Tanzanian institution to identify the exact sites that the migratory *E. helvum* and endemic *R maendeleo* bat species use for migration and feeding while in residency or in transit. This activity should be undertaken over a period of 5 – 7 days based on secondary information about migration seasons; at least three seasonal surveys should be undertaken over a period of 2 years to get an understanding of the migratory patterns of these bat species and adjusted thereafter if no new information is being collected. **8.** During vegetation maintenance, conduct post-operational phase bat monitoring within the ROW to determine if there is habitat loss resulting from cutting down fruit trees or bushes used by bats as habitats and to monitor migratory foraging behavior. This activity should be undertaken quarterly over a period of 5 – 7 days along the length of the transmission line; this monitoring will be carried out over a period of two years and adjusted thereafter if no new information is being collected		

Table 7-5: Social Management Plan – Operational phase

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
Impacts on health and safety at the proposed	**Emergency response plan** 1. Upon completion of the construction phase, TANESCO will develop and implement an operational phase emergency response plan (ERP) for the transmission line to ensure	TANESCO	Six monthly

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
substations	the safety of the staff and surrounding land owners in case of an emergency. 2. A site specific emergency response plan should be developed and implemented for each of the new substations in Mbeya, Kisada, Tunduma and Sumbawanga; 3. The contents of the ERP will include the following: 7. Administration (policy, purpose, distribution, definitions, etc.) 8. Organization of emergency areas (command centers, medical stations, etc.) 9. Roles and responsibilities 10. Communication systems 11. Emergency response procedures 12. Emergency resources 13. Training and updating 14. Checklists (role and action list and equipment checklist) 15. Business Continuity and Contingency 4. All permanent staff at each substation must undergo appropriate safety training;		
	Maintenance and housekeeping **5.** TANESCO will ensure that housekeeping standards at each of the substations and along the transmission line corridor 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.	TANESCO	Six monthly
	Fire safety 6. A fire risk assessment should be carried out at each of the proposed substations in	TANESCO	Six monthly

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
	Mbeya, Tunduma and Sumbawanga 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.		
	Storage and handling of hazardous waste 7. A spill kit needs to be kept at each proposed substation to address any unforeseen spillages; 8. Transport of all hazardous substances must be in accordance with the relevant environmental legislation.	TANESCO	Six monthly
Impacts on health and safety along the ROW	**Live power lines** 1. Only trained workers should be allowed to install, repair and maintain electrical equipment 2. Prior to commencing any work on or near live lines, ensure that the power has been fully isolated 3. All live-wire work shall be conducted in accordance with specific safety and insulation standards 4. Workers must be insulated with gloves or other approve insulation when approaching an exposed energized or conductive part of the transmission line. Additionally, the conductive part should be insulated from the worker	TANESCO	Quarterly
	Working at heights on structures 5. Implement a fall protection program (includes training in climbing techniques and use of fall protection measures) for workers that intend to work at heights on transmission line towers and other associated structures	TANESCO	Six monthly

Impact	Social mitigation measure/monitoring plan	Responsibility	Frequency/ Monitoring requirement
	6. Workers must use a fall protection system when working over 1.8m above grade level. The fall protection system should be appropriate for the tower structure and necessary movements for ascending, descending and moving from point-to-point. 7. Towers should come with fixtures for latching fall protection system 8. Approved tool bags should be used for raising or lowering tools or materials on structures		
	Electric and magnetic fields 9. Develop and implement an electric and magnetic field safety program for workers that may be exposed	TANESCO	Six monthly
	Exposure to chemicals 10. Develop an occupational health exposure monitoring program for exposure to chemicals such as pesticides and polychlorinated biphenyl (PCB).	TANESCO	Six monthly
Impacts on community health and safety	**Electrocution** 11. TANESCO should use signs, barriers (e.g. fences to substations and steel posts surrounding tower structures) and education/public outreach to prevent public contact with potentially dangerous equipment 12. All conducting objects near power lines (such as fences or metallic structures) should be properly grounded to prevent shock	TANESCO	Quarterly
	Visual impact assessment 13. A visual impact assessment should be carried out for the proposed project to ensure that the power lines and sub-stations are not visually intrusive to residential communities. Further the proposed routing of the transmission line should endeavor to be located in less populated areas.	TANESCO	Annual

8 Analysis of alternatives

8.1 Introduction

Project alternatives refers to the considerations made in the course of developing the project that would achieve the same project objectives. Consideration of project alternatives is crucial in ensuring that the developer and decision–makers have a wider base from which they can choose the most appropriate option. In this EIS report, the following alternatives are considered and will be examined in detail during the EIA process.

8.2 Alternative Transmission Line Routes for Mbeya-Tunduma-Sumbawanga TL

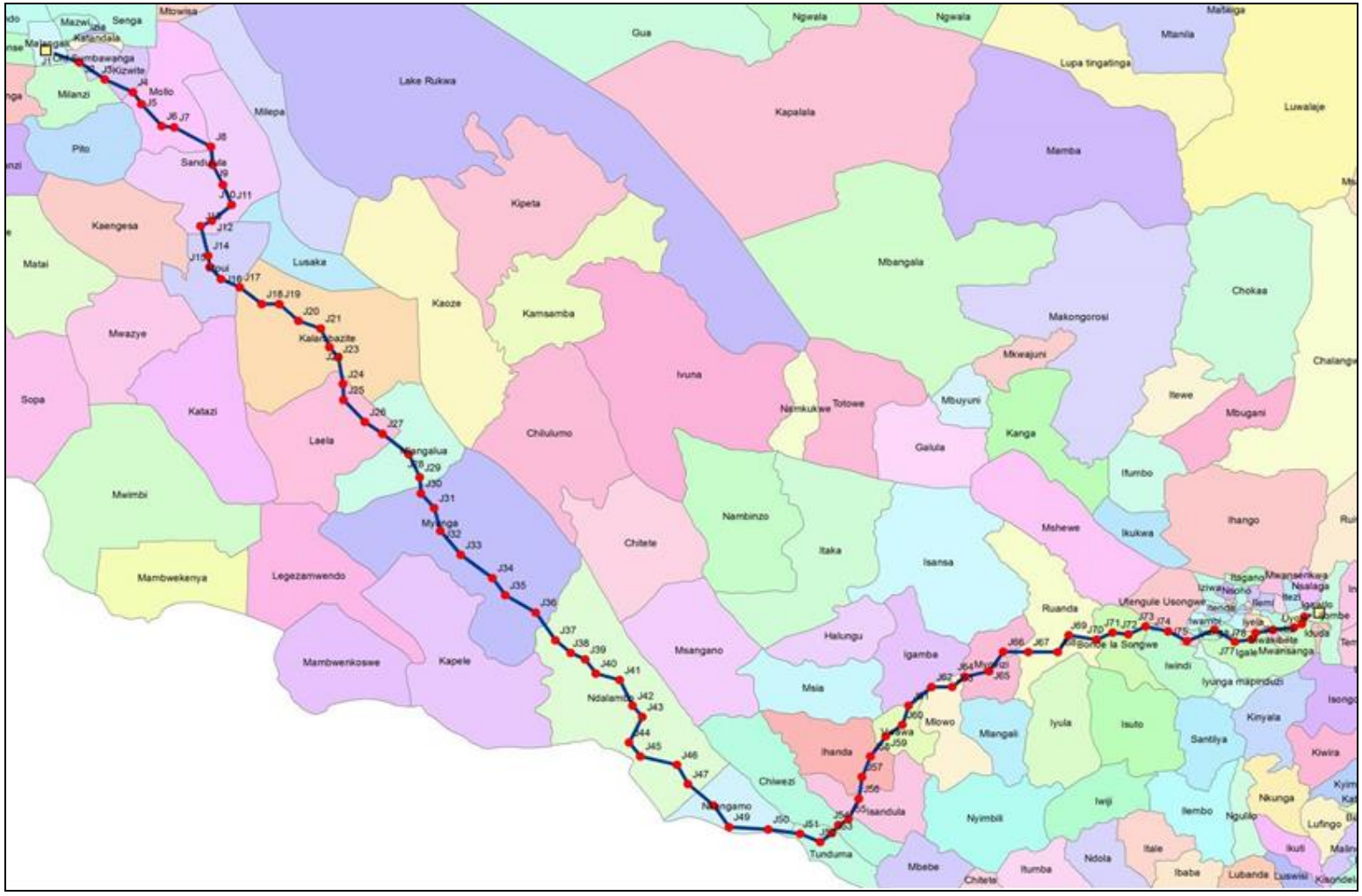
TANESCO has undertaken a route options appraisal process in order to identify suitable route for the transmission line. This process involved identification of a number of high level constraints such as the avoidance of built up areas, technical constraints such as hilly slopes, minimizing road crossings, avoiding rivers, valleys, forests and other sensitive areas where possible.

In general, the following principles were used for the selection of route of least impact:

- Take construction, operation and traffic into integrated consideration and make comparison among alternative plans. The route should be close to existing roads for convenience of construction, transport and operational maintenance.
- Avoidance of forest for convenience of construction and operation and reduce tree cutting
- Avoidance of city, village and ground building and reduce house demolition
- Avoidance of low lying land, accumulated water area, marsh, forest and poor geological area
- Tension section length can be larger at better geological area while smaller at limited geological area

Alternative routes were considered in selecting the best route and the best technical option for the transmission line based on construction costs and reduced anticipated environmental and socio-economic impacts. The proposed transmission line route showing the angle towers is shown in Figure 8-1.

Figure 8-1 : Location of propsoed 400kV transmission line route with angle towers labeled



Two line alignment options were considered from Sumbawanga Substation to angle tower J4 at Malangali and Kasiswe wards respectively towards Tunduma. These two alternative routes are:

1. Alignment of transmission line from proposed Sumbawanga Substation to angle tower J4 passing through angle towers J1 and J2 on the left side of the Kapata hill.
2. Shifting of angle towers J1, J2 and J3 to pass through right side of the Kapata hill.and use another location for substation about 200 m away from the proposed Sumbawanga substation.

Route option two is recommended by the ESIA team to avoid interference with Sumbawanga Municipal plan to build regional bus stand and reduce compensation cost that could result by crossing industries at angle tower J2.

Moreover, two line alignment options were considered from angle tower J70 to angle tower J77 at Bonde la Songwe ward. These two alternative routes are:

1. Alignment of transmission line from J70 at Idiga passing through J74 at Mwashiwawala to the left side of the railway towards Mbeya City to angle tower J77 crossing Mbalizi military base at angle tower J75.
2. Shifting of Substation at the angle tower points J70 at Idiga, J74 at Mwashiwawala to the right side of the railway closer to the TAZAMA pipeline way leave towards Mbeya City and angle towers J75 at Iwindi crossing near or behind Baluti Hill to angle tower J77.

Route option two is preferable to avoid interference with the municipal plan to build a satellite city between angle towers J70 to J71. This route will also avoid safety and security risks of crossing near secured areas of Mbalizi military base at angle tower J75 and will be cost effective than route one in terms of reducing 4 angle towers (J71, J72, J74 and J76)

Furthermore, three line alignment options were considered from angle tower J80 and to angle tower J83 at Uyole and Igawilo wards respectively. These three alternative routes are:

1. Alignment of the transmission line route from proposed angle tower J82 and to angle tower J83. In this route option there are hundreds of houses that will need to be compensated before construction of the line.
2. Shifting of existing 33 kV line to the right side of the existing 220 kV tower T534 and T535 towards Mbeya substation at Mwakibete. This route option will avoid proposed angle towers J82 and J83 and use other points parallel to existing 220 kV line from Iringa to Mbeya substation at tower number T534 and T535. About 12 poles of 33 kV distribution line will be shifted to give room for 400 kV TL line. Therefore this option will use existing way leave from Tower T535 to T528 near to the proposed Mbeya substation at Itanji Street in Igawilo ward.
3. Shifting of the angle tower points J80 at Ivumwe and J81 at Songwi Mantanji and use new angle tower points J80 at Iduda and J81 at Igawilo to another proposed location of substation. This option will avoid constructing two angle towers J82 and J83.

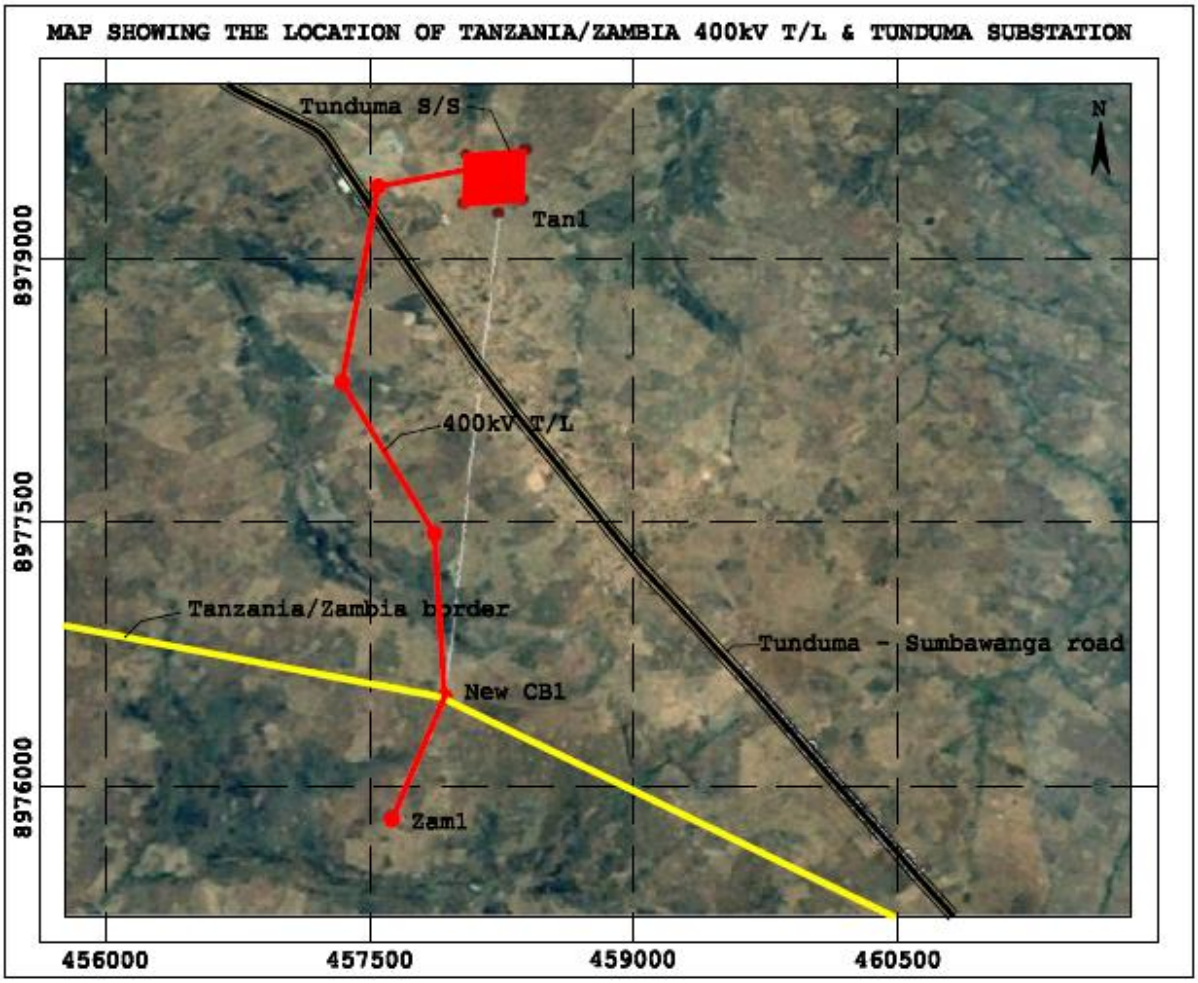
Route option three is recommended for construction as it will have low compensation costs and low social impacts than option one and two since only few houses will need to be compensated. It will also be cost effective than route one and two in terms of reducing 2 angle towers (J82 and J83).

8.3 Alternative Transmission Line Routes for Tunduma S/S to TanZam border

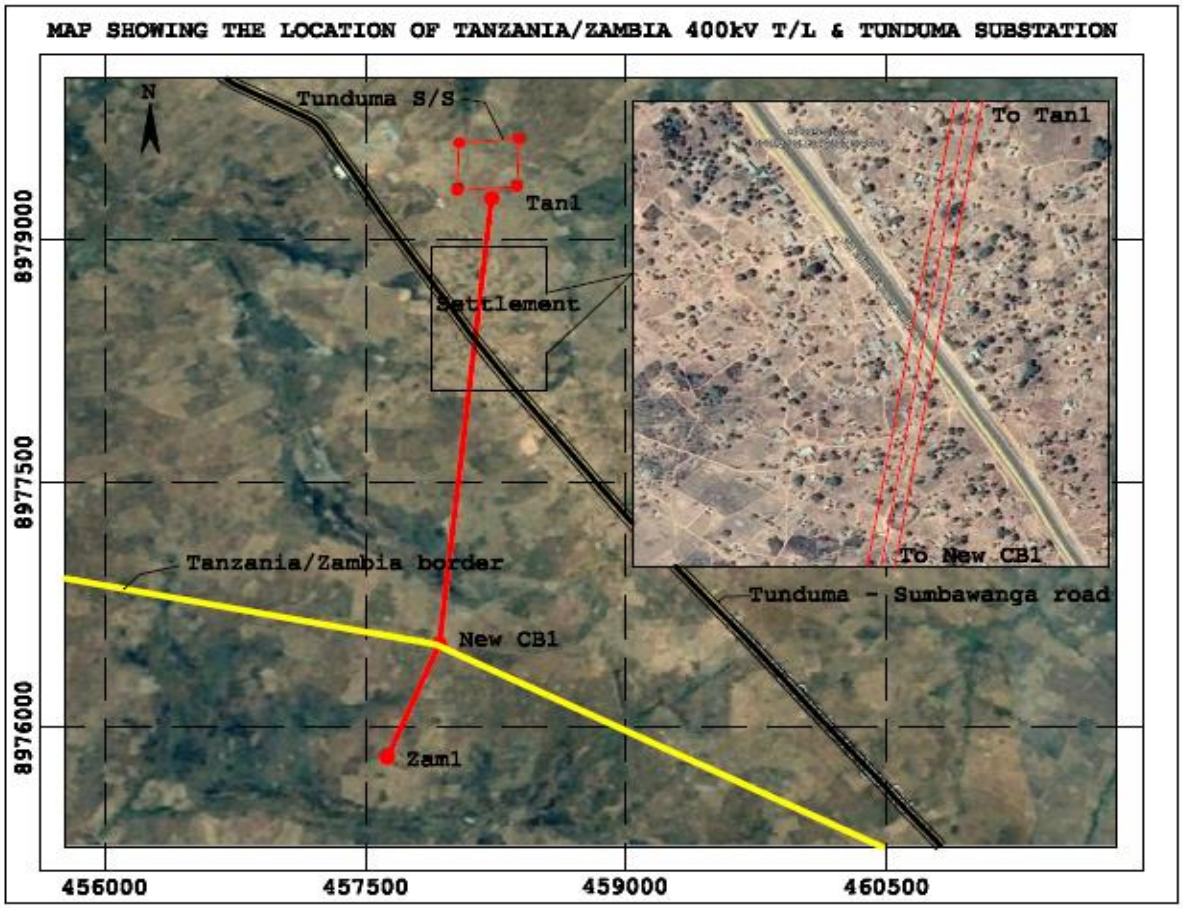
For this segment of TL same principles used for selection of Mbeya-Tunduma-Sumbawanga TL were used for the selection of route of least impact as follows:

Alternative routes were considered in selecting the best route and the best technical option for the transmission line based on construction costs and reduced anticipated environmental and socio-economic impacts.

Option 1: From the proposed substation, the TL crosses the Tunduma–Sumbawanga highway and shifts to the left hand side of the road near to Nkangamo weighbridge at the edge of Nkangamo village, thence about 3km to reach the TanZam border. This option will have about 3 angle corner with about 4km distance hence is not the best technical option for the transmission line based on construction costs, but on E&S aspects will have less impacts on human settlements after diverge the centre of Nkangamo village.



Option 2: From Tunduma S/S, the TL crosses Tunduma – Sumbawanga highway and passes straight, near the road near to Nkangamo weighbridge at centre of Nkangamo village about 2.5km to reach the TanZam border. This option will have no angle corner, less distance and just straight TL hence is the best technical option for the transmission line based on construction costs, but on E&S aspects will have more impacts on human settlements at Nkangamo village which will lead more compensation cost.



By comparing the above two options, **Option 1** is the best option with less E&S impacts compare to option 2. Hence **Option 1** is recommended by the ESIA team for construction of the proposed segment of TL from Tunduma S/S to TanZam border since it will have low E&S impact.

8.4 Alternative Locations for Substations

Two alternative locations were considered for construction of Sumbawanga substation. The first option is to construct the substation near to 66 kV tower number 530 and the second option is to construct the substation about 200 m away from the proposed area between 66 kV tower numbers 527 and 529. Location option two is recommended by the ESIA team for construction of the substation as it will reduce safety risks to the pupils by locating the substation away from Makazi Mapya Primary School.

Additionally, three alternative locations were considered for construction of Mbeya substation. The first option was to extend the existing 220 kV Substation at Mwakibete near to the reserved area planned by the Mbeya City Council for the expected expansion of existing substation. The second option was to build a new substation near to 220 kV tower number T528 at Itanji in Igawilo ward. Currently the area is mainly used for agriculture activities and few houses exist in the area. The third option was to build the substation at about 1.5 km away from the proposed substation area at Itanji Street in Igawilo ward. The area is also currently used for agriculture activities.

Location option three is recommended by the ESIA team for construction of the substation since it will have low impact to vegetation and low cost for land acquisition and compensation as compared to the option one and two. This option will also enable future expansion of the substation to accommodate other transmission line projects such as 400 kV Iringa to Mbeya TL and 400 kV Zambia, Tanzania and Kenya interconnector TL projects.

8.5 No Project Alternative

The no project alternative entails retaining the current status quo without developing the project and therefore foregoing such investment. That is to say North West regions of the country will not be connected to the grid power and thus left these areas especially rural areas with no reliable electricity. People and government in some of the districts will continue using generators to generate power and thus release pollutants that pollute air, soil and water. Quality of life of residents who restricted on energy use will not improve. All will still spending lot money for fuel, maintenance and spares which could have been spend on other social benefits. Moreover, the interconnection with the Zambia national grid will not occur.

In fact this decision will not disturb the existing environment and will not take any land of the PAPs. However, it will deny the economic gains through employment, government revenues indirectly from availability of electricity and social development in the region that will enable people to initiate fruit canning processing industries, which also increase farm employment. TANESCO will not gain the benefits accrued from expansion of the national grid power line. Rural areas where the project would supply them with the electricity will continue experience hardship related to power shortage.

In other words the "Zero Option" is not in line with the NBI plans for a regional power system or with Government policies of improving the investment development in order to achieve the requirements of National Strategy for Growth and Reduction of Poverty (NSGRP/MKUKUTA) as envisaged in the Tanzania's Development Vision (Vision 2025) which stresses on development and commitment to regional and other international initiatives for social and economic development.

9 Summary and conclusion

9.1 Summary

The overall objective of the proposed Mbeya – Tunduma – Sumbawanga 400kV overhead transmission line project including ~4km segment of TL from Tunduma S/S to TanZam border is to achieve sustainable development of the rural areas of the country as well as support rural electrification for productive activities in an environmentally sustainable way that will generate more income and thus reduce poverty. The proposed project is intended to provide supply reliability and security to the towns located along its course. Moreover, the interconnection with the Zambia national grid will lead to business opportunities to TANESCO and will ensure Tanzania to have reliable and stable power.

A number of studies have been undertaken by TANESCO over a period of over 4 years on upgrading and improving the high voltage transmission line infrastructure in order to be able to connect additional customers to the national grid.

According to the requirements of Environmental Management Act (EMA) Cap 191 of 2004, Environmental Impact Assessment is mandatory for projects of this nature since they are likely to have potential impacts (positive and adverse) on the physical, biological and human environment. This Environmental and Social Impact Assessment (ESIA) Study has been completed in accordance with the Tanzanian environmental legislation and relevant World Bank environmental and social safeguard Operational Policies.

From a review of literature about the project, review of the transmission line routing, field surveys of the biological and human environment where the proposed transmission line traverses, and, an analysis of the potential environmental and social impacts, there are no fatal flaws associated with the proposed project. There are a number of potential environmental and social impacts identified, mitigation measures proposed and a management plan recommended.

Based on the technical information available at the time of this ESIA Study, a description of the project was presented in Section 2. A description of the transmission line routing between (i) Mbeya and Tunduma and (ii) Tunduma and Sumbawanga (iii) Tunduma S/S and TanZam border was discussed. Additionally, this section provided an overview of the construction procedures and technology which will be adopted in the construction of the transmission lines.

A legal and regulatory framework assessment was carried out as part of the ESIA Study and documented in Section 3 of this ESIA Study. Firstly, this project will comply with the national legal requirements in Tanzania. Subsequently, an overview has been given of various national policies, laws and regulations which the proposed project will need to comply with. Additionally, the proposed project will comply with the requirements of the World Bank's environmental and social safeguards policies. The project is defined as a Category A project under the World Bank's Operational Policy 4.01 which means that the proposed project is one that can have significant impacts on the environment without mitigation measures. An analysis of the World Bank's Operational Policies which will be complied with is discussed in Section 3 of this ESIA Study.

An important aspect of the ESIA Study is to document the baseline environmental and social conditions that exist prior to the commencement of the project. In order to do this, the proposed transmission line route was superimposed onto satellite imagery from Google Earth to scope the issues of concern and define the study area. Subsequently, relevant baseline studies were undertaken between Mbeya, Tunduma and Sumbawanga to gather and analyze biological and social information. The baseline data was captured in Section 4 of the ESIA Study.

Public/stakeholder consultations have been an important aspect of undertaking this ESIA Study. On September 12, 2017, TANESCO organized a workshop for Government ministries and various affected Local Government Authorities to discuss the proposed transmission line project and finalize the Terms of Reference for this ESIA Study. The proceedings and outcomes of this important workshop are captured in Section 5 of this ESIA Study.

Between November 13 and 17, 2017, eighteen stakeholder consultation meetings were held at various locations between the towns of Iringa, Mbeya, Tunduma and Sumbawanga. While the focus of this ESIA Study is Mbeya – Tunduma – Sumbawanga, stakeholder meetings were held with communities living between Iringa and Mbeya too as the transmission line project emanates from Iringa. The proceedings of the consultations with the representatives of local communities are captured in Section 5 of the ESIA Study.

Section 6 of the ESIA Study assesses the significance of environmental and social (E&S) impacts associated with the proposed project. The section begins with the identification of potential E&S impacts followed by an assessment of the unmitigated impact using a severity and likelihood matrix in order to come up with a significance rating. Mitigation measures are proposed and another risk assessment is done this time assuming that the proposed mitigation measures are implemented. The result provides a residual significance which in all cases was found to be "low" according to the significance criteria used.

Once the mitigation measures were established, an Environment and Social Management Plan (ESMP) was developed in Section 7 of this ESIA Study. The ESMP incorporates the use of various types of management plans such as a waste management plan, effluent management plan, traffic management plan, Construction Environment and Social Management Plan among others, to manage the construction and operational phases of the project in an environmentally sustainably manner.

An ESIA Study would be incomplete without an analysis of the alternatives considered for the proposed transmission line project. In this case, the important criteria would be the routing of the transmission line taking into consideration the technical, financial and E&S aspects of various corridors. The "do-nothing" alternative is also considered in this section. An analysis of the alternatives for the proposed transmission line between Mbeya, Tunduma and Sumbawanga including section of Tunduma S/S to TanZam border is presented in Section 8 of this ESIA Study.

9.2 Impact assessment conclusion

The principal objective of the proposed project is to extend TANESCO's electricity network in order to be able to provide electricity to commercial business activities, fresh water pumping, secondary schools, medical services, streetlights, residential houses, agro-

processing activities etc. in Sumbawanga, Mbozi, Songwe and Mbeya districts respectively.

The ESIA process is a systematic approach to identifying the potential environmental and social impacts of a development proposal, and to describing the mitigation, management and monitoring measures that will be implemented to address those impacts. Ultimately, it allows relevant parties to make informed decisions about a development proposal, and allows potentially affected stakeholders to participate in the process. The impact assessment has been based on the methodology presented in **Chapter 6 Impact Assessment Methodology.** Credible impacts to the key receptors were in general assessed using an impact significance matrix approach that considers the sensitivity of the receptors and the magnitude of the impacts.

Impact significance was assessed with and without mitigation measures in place. The assessment of impact significance without mitigation measures in place took into consideration Project design controls. It is pertinent to note that impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are described in this ESIA Report to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and thus represents the final level of predicted impact associated with the development of the Project.

Most impacts associated with the proposed transmission line project will occur during the construction phase. Once commissioning is completed and the project becomes operational, the project will have limited E&S impacts.

Given in the subsection below are the conclusions from the impact assessment of the project.

9.2.1 Soils and hydrology

Impacts to soil may result through the use and storage of materials, land clearance and earthworks along the ROW and substations. With mitigation measures in place, including standard soil and erosion control measures and the provision of adequate spill prevention, the residual impact to soils is concluded to be of **Low** significance. This applies to the Construction and Pre-Commissioning Phase, and to the Operational Phase of the Project.

9.2.2 Air quality

Project emissions will result from a number of point and mobile sources. These include emissions of combustion gases from construction vehicles and plant and diesel generators. There will also be dust generated from earth works and vehicles movements. Consequently, the impacts during operation are anticipated to be of small magnitude, resulting in an impact that is **Low**.

Despite the Project's minor impact on air quality, a number of good practice mitigation measures will be implemented to minimize air emissions such as dust suppression with water. Monitoring will also be undertaken during the Construction Phase to confirm that ambient air quality remains within applicable limits for the protection of human health.

9.2.3 Noise and vibration

An assessment of the noise and vibration impacts associated with construction has been undertaken. The source of the noise and vibration impacts will be the construction plant and equipment that moves along the ROW and access roads with the receptors being the communities living in the study area.

It is predicted that noise and vibration impacts will be **Low** at existing sensitive receptors neighboring the Project if the recommended mitigation measures are implemented by the Project Contractor e.g. maintaining all construction plant in a good state of repair and working during daylight hours and using low noise emitting equipment.

9.2.4 Terrestrial ecology

The Project has the potential to affect natural habitats along the proposed transmission line route. Impacts which have been identified as likely to occur at the Construction and Pre-commissioning Phase include habitat loss and degradation, Alien Invasive Species (AIS), aquatic habitat alteration, obstruction of wildlife movement, poaching of bush meat, and interference of ecosystem services. Impacts are however anticipated to be either avoided, through consideration of ecological receptors in the Project's design and/or, where appropriate, through implementation of mitigation measures which will reduce the magnitude of all impacts to **Low**.

The assessment also considered the potential for the Project to affect terrestrial ecology receptors during the Commissioning and Operational Phase of the Project. Although impacts during this phase are anticipated to be relatively limited, there is the potential for the Project to have impacts of up to medium significance, in the absence of mitigation. This is due to the potential for routine maintenance activities to cause habitat loss resulting from cutting trees that are >5m in height and mortality or injury to herpetiles. Mitigation measures have been proposed which will reduce the magnitude of all impacts at the Operational Phase on all receptors to **Low** significance.

9.2.5 Avifauna

During the construction phase, there will be impacts to birds and bats resulting from habitat loss, construction related noise, and fugitive dusts. The impacts without mitigation on avifauna are expected to be of **Medium** to **Low** significance. With mitigation measures in place, all impacts on avifauna during the construction phase are expected to be **Low**.

The main impacts to avifauna are expected to be felt during the operational phase due to collisions with the transmission lines or electrocution. The key potential impacts on avifauna include bird collisions with transmission line infrastructure and, electrocution on towers or transmission lines. The impacts to avifauna without mitigation measures is of **Medium** significance, however with the implementation of the mitigation measures, the significance reduces to **Low**.

9.2.6 Land use

In accordance with the Land Act of 2009, TANESCO will purchase the ROW width of 52m from Mbeya – Tunduma – Sumbawanga and Tunduma Substation-TanZam Border for the proposed transmission line project. This will result in the involuntary resettlement of hundreds of Project Affected Persons (PAPs). The PAPs currently residing within the proposed 52m width ROW are predominantly peasant farmers that eke out a living by growing subsistence crops such as maize, beans, bananas and mangoes. The lack of adequate and timely compensation paid to the PAPs could potentially be a **High** significance impact; this impact will be felt after the "cut-off date" is announced and each PAP is not paid compensation in a timely manner or in full prior to commencement of the construction phase.

However, with the development and implementation of a Resettlement Policy Framework (RPF) within TANESCO and subsequently a Resettlement Action Plan (RAP) for the project, the potential impacts on the PAPs is considered to be **Low**.

9.2.7 Infrastructure

The proposed transmission line project will use existing infrastructure such as primary and secondary roads to transport goods and workers. Some of the loads that may be transported to the construction locations could be heavy and would have detrimental impacts on existing roads. An assessment of this impact was carried out and established that it would have a **Medium** significance without mitigation measures; however, with the recommended mitigation measures, the significance of this impact was rated as **Low**.

9.2.8 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. The ESIA Study assessed the potential impacts on gender requirements for the proposed project and found that the impact is considered **Low** without any mitigation measures.

Despite this, the ESIA Study makes recommendations to allow women equal opportunities to 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.

9.2.9 Communities and social cohesion

The proposed transmission line will require skilled, semi-skilled and unskilled workers for implementation of the project. Most skilled workers are expected to be expatriates who specialize in the construction of transmission lines. The semiskilled workers may come from within the project area or other parts of Tanzania while the unskilled workers will likely come from villages and wards within or near the ROW. The influx of workers from other parts of Tanzania or overseas may lead to social tensions resulting from differences in social classes. The influx of workers may also strain the already meager resources such as water, food crops, and health centers within the wards and districts of Rukwa Region

where the transmission line passes; the strain on resources may not be felt in Mbeya Region which has better resources than Rukwa. Without mitigation measures, the potential impacts of migrant workers on communities and social cohesion was determined to be **Medium** significance and after mitigation, was assessed to be of **Low** significance.

9.2.10 Community health and safety

The infrastructure and logistics requirements of the Project mean that there are inevitably some adverse effects for certain population groups. Large construction sites and busy transport corridors can be disruptive for Local Communities and can contribute to negative health outcomes such as accidents and incidents leading to injuries.

It was observed that communities living along the ROW abstract water from nearby rivers and shallow wells for their washing, drinking, cooking and agricultural needs and the accidental contamination of water sources could have an adverse impact on the communities livelihoods. Additionally, large quantities of water will be required for the construction thus putting a strain on the limited existing water sources.

Noise impacts on residential dwellings in parts of the study area due to traffic on the main highway or access roads and from the use of the pneumatic equipment for rock breaking for foundations could cause disturbances to the local community (ies).

The influx of migrant workers into the construction area could lead to interactions with female community members which in turn could lead to an increase in the STI related infections including HIV. Additional potential risks resulting from an influx of migrant workers may include an increased risked of gender-based violence particularly of underage girls and underage unwanted pregnancies.

The above impacts on the community were considered of **Medium** significance without mitigation measures, however with the implementation of the mitigation measures, the residual significance was determined to be **Low**.

9.2.11 Labor and working conditions

The proposed project will employ about 180 workers during the mobilization phase, over 800 during the construction phase and over 400 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**.

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This section provides the references associated with the ESIA Study of the proposed high voltage 400kV transmission line project from Mbeya – Tunduma – Sumbawanga

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