Environmental & Social Impact Assessment Studies for the proposed Iringa – Mbeya – Tunduma – Sumbawanga 400kV Transmission Line

EXECUTIVE SUMMARY

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1 Executive Summary

1.1 Introduction

This Executive Summary is associated with the Environmental and Social Impact Assessments (ESIA) carried out for the proposed high voltage 400kV:

- Iringa – Mbeya overhead transmission line which is about 292km long; and
- Mbeya – Tunduma – Sumbawanga overhead transmission line which is about 320km long.

These two projects are being sponsored by Tanzania Electric Supply Company Limited (TANESCO) with funding to be sourced from multi-lateral finance institutions such as the World Bank. The objectives of developing and implementing the two transmission line projects can be summarized as follows:

1. Implement the 400kV grid power project in the regions of Rukwa, Mbeya and Songwe in western Tanzania and extend it to the regions of Kagera, Kigoma and Katavi in northern Tanzania;
2. Achieve an interconnected ring in order to increase the redundancy and stability of the 400kV grid;
3. Complete the 400kV Zambia – Tanzania – Kenya interconnection in order to facilitate the smooth power transfer to the North and to the South, linking the Eastern Africa Power Pool (EAPP) countries to Southern Africa Power Pool (SAPP).

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

In order to implement the project, an ESIA Study is mandatory under Tanzania's environmental legislation and the WB Operational Policies on E&S sustainability. Subsequently, an ESIA Study was undertaken for each of the two projects; one ESIA Study was undertaken for the high voltage 400kV Iringa – Mbeya project, while another ESIA Study was undertaken for the high voltage 400kV Mbeya – Tunduma – Sumbawanga transmission line. This section summarizes the salient features of the ESIA Studies undertaken for the two projects.

The two ESIA Study reports define and characterize the affected environment, identify potential environmental and social (E&S) impacts, and provide recommendations for impact mitigation. The two ESIA Studies also includes a detailed synopsis of the proposed Environmental and Social Management Plan (ESMP) that will govern the construction and operation of the transmission line throughout its life cycle. ESIA report for Iringa-Mbeya, an ESMP has been included to depict the range of environmental impacts/issues and associated mitigation measures envisaged for this Project. Later TANESCO will update the proposed ESMP for Iringa-Mbeya portion with site specific mitigation measures once the detailed design is completed. The updated ESMP will be submitted to the financier (WB) for approval and clearance. The ESIA and the ESMP will apply to the terrestrial

environment within the project's Area of Influence (AOI) where the preponderance of impacts are anticipated to take place.

For purposes of the E&S assessment of the proposed transmission line project, the AOI is defined as a spatial area covering 20km on either side of the transmission line from Iringa – Mbeya – Tunduma – Sumbawanga; additionally, the AOI includes the four proposed substations to be constructed in Kisada, Mbeya, Tunduma and Sumbawanga respectively. These areas encompass the proposed site and the immediate surrounding which contains the communities affected by the project.

The proposed transmission line project meets the threshold for classification as Category "A" Project under the World Bank (WB) criteria. The proposed high voltage 400kV transmission line projects i.e. (i) Iringa – Mbeya and (ii) Mbeya – Tunduma – Sumbawanga will have adverse impacts on natural habitats (through clearance of the ROW and substation footprint areas), involuntary resettlement and potentially physical cultural resources. Category "A" projects under the World Bank's Operational Policy 4.01 are triggered if a project is likely to cause significant adverse environmental impacts that are "**sensitive**", diverse, or unprecedented. Sensitivity is attributed to an impact being irreversible or raises issues covered by natural habitats, indigenous peoples, physical cultural resources or involuntary resettlement. Accordingly, the ESIA has been prepared to meet the relevant requirements associated with this project category.

The Executive Summary follows the WB's prescribed format, including (i) an overview of the project justification and description; (ii) policy, legal, and administrative framework; (iii) description of project environment; (iv) project alternatives; (v) potential impacts and mitigation/enhancement measures; (vi) environmental and social management; (vii) public consultations; and (viii) complementary initiatives.

1.2 Project description and justification

Overall, the proposed project includes the construction of a 400kV overhead transmission line from Iringa – Mbeya –Tunduma – Sumbawanga and four new substations at Kisada, Mbeya, Tunduma and Sumbawanga. The total length of the transmission line will be about 620km and will be tendered in a number of lots with each lot being about 150km – 200km line. A map showing the proposed project is shown in Figure 1-1.

The main components of the transmission line project will include (i) transmission line towers, (ii) wayleave corridor or ROW, (iii) conductors, (iv) optical ground wires (OPGW), (v) four new substations, and (vi) access roads.

Activities envisaged by the project include right-of-way acquisition, land clearing, arrangement of access roads to the towers/poles where required, construction of foundations and towers, stringing – installation of conductors, insulators, other equipment. The final design will be based on the outcomes of geotechnical and cadastral surveys, towers spotting and the present ESIA Studies.

The routing of the transmission line generally follows the alignment of the existing highway between the towns of Iringa, Mbeya, Tunduma and Sumbawanga. The main considerations during the selection of route corridor were: the ease with which the route can be accessed for construction and maintenance; the constructability of the line taking into account the topography; environmental constraints; minimization of social impacts, including resettlement, and ground conditions, including areas prone to landslides.

The project will require the outright acquisition of a 52m wide corridor for the proposed transmission line (total length = ~620km) but for portion of Iringa-Mbeya TL, proposed transmission line will utilize part of the existing 60m wayleave of the 220kV transmission line from Iringa to Mbeya whereby addition of 30m new permanent RoW will acquired by TANESCO to portion of Iringa to Tanangozi (15.2km) and also portion of Igawa town to Iganjo Substation at Mbeya City (87.6km) where proposed 400kV will run parallel to existing 220kV TL of Iringa – Mbeya. Also project will involve land acquisition for construction of the four new substations. In accordance with the Land Act in Tanzania, TANESCO will acquire the entire area covered by this project and will not allow any future use of it and consequently, houses and land plots falling within the ROW will have to be resettled. The transmission line route was selected in a way to minimize interference with homes that are occupied by citizens or sources of livelihood derived by them such as farmed areas. However, fully excluding such incidences is not practically possible and the exact number of affected houses, number of people and households, structures and crops grown will be known once the detailed design of the transmission line is produced. In siting the four proposed substations, TANESCO located them in sparsely populated areas taking into consideration future growth.

Relocation and compensation will be carried out in accordance with Tanzanian laws and the World Bank Safeguard Policy on Involuntary Resettlement (OP 4.12). The guiding principles and compensation methodology will be detailed in a Resettlement Policy Framework (RPF) and according to the site-specific Resettlement Action Plans (RAPs) for the project. It should be noted that there will be two RAPs conducted one for the Iringa – Mbeya transmission line project and the other for the Mbeya – Tunduma – Sumbawanga project respectively.

During construction of the line the access roads will be used to bring workers and materials to the tower sites to conduct tree-cutting operations (where needed), construct foundations, assemble and raise the towers and install/string the conductors. Some local roads used by the local population and quite well-established will be partially used as access roads for the proposed line.

Once constructed, the transmission line will require minimal maintenance. Yearly visual inspection of the transmission line towers and conductors is expected to remove trees or branches where these start to grow too close to the line. The operation and maintenance of the transmission line will be based on accepted international practices. The substations will be maintained in accordance with TANESCO standards.

Figure 1-1: Image showing location of proposed 400kV transmission line route in Tanzania

1.3 Policy, legal and administrative framework

The ESIA process has been undertaken in compliance with the relevant Tanzania national statutes and international requirements issued by the World Bank Group. Specifically, the ESIA Study of the proposed project has been undertaken in accordance with the Environment Management Act 2004 (EMA) and its subsidiary legislation Environment Impact Assessment and Audit (EIAA) Regulations, 2005. The Third Schedule of the EMA requires all "electrical infrastructure" to undergo a full ESIA Study. The EIA Regulations operationalize the EMA and guide project Proponents on the process of carrying out an ESIA Study.

The proposed transmission line project is also required to meet the World Bank safeguard policies, including OP 4.01 *Environmental Assessment*, OP 4.04 *Natural Habitats*, OP 4.11 *Physical Cultural Resources* and OP 4.12 *Involuntary Resettlement*.

The ESIA studies were also aligned with the World Bank Group's *EHS General Guidelines* and *EHS Guidelines for Electric Power Transmission and Distribution*, as technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards.

In terms of technical standards and regulations, the OHL is designed according to EN 50341-1-2012 titled *Overhead electrical lines exceeding AC 1 kV; General requirements; Common specifications* (Euro-Norms). This European Standard applies to new overhead electric lines with nominal system voltages exceeding AC 1 kV and with rated frequencies below 100 Hz.

The equipment, components and installation shall comply with applicable laws, by-laws, rules, recommendations, and to the relevant specifications of the latest editions from standards.

1.4 Environmental screening and ESIA process

The proposed transmission line projects were screened based upon the requirements of Tanzania's Environmental Management Act, 2004 (EMA) and the World Bank's Operational Policy 4.01. The Third Schedule of the EMA specifies that "electrical infrastructure" projects such as the proposed transmission line project must undergo a full ESIA Study for consideration by the National Environmental Management Council (NEMC).

According to the World Bank's OP 4.01, an environmental screening of the project was undertaken to classify it into a relevant environmental category, and to determine the appropriate extent and type of Environmental Assessment (EA) needed. Based on this screening exercise, it was concluded that the transmission line project from Iringa – Mbeya – Tunduma – Sumbawanga involves new construction with the entire length of the transmission line traversing Greenfield areas and passing close to some protected areas.

Additionally, there are communities living within the proposed 52m wide corridor who will be affected and consequently, the project has the potential to cause adverse impacts on the them and the environment. It is clear that project implementation is associated with the need for land acquisition with the possibility of affecting households and assets within the 52m wide corridor and with the need for physical relocation.

Therefore, in accordance with the World Bank O.P. 4.01, the proposed transmission line project is classified as environmental **Category A.** Its preparation requires the carrying out of a full ESIA, a stakeholder engagement process that involves consultations throughout the lifetime of the project, and development of a Resettlement Policy Framework and Resettlement Action Plan (RAP).

1.5 Stakeholder engagement

Stakeholder engagement is an important process which is carried out throughout the lifetime of the project. Consistent stakeholder engagement leads to good neighborliness and provides project proponents with a social license to operate.

For a linear project such as the two high voltage 400kV proposed transmission line projects which cover a total length of about 620km, a standalone Stakeholder Engagement Plan (SEP) will be developed by TANESCO; the SEP will be complemented with a Grievance Redress Mechanism (GRM). TANESCO has an existing GRM which will be updated to include the requirements of multilateral finance institutions such as the World Bank Group. Consistent implementation of the project SEP will enable TANESCO to communicate with affected communities living adjacent to or in the vicinity of the proposed 52m wide corridor as well as to listen to their grievances and address them adequately in a timely manner.

For the Iringa – Mbeya – Tunduma – Sumbawanga ESIA Study, the public/stakeholder consultation process commenced on September 12, 2017 and carried on during the week of November 13 – 17, 2017; eighteen meetings were held at various locations adjacent to the transmission line during the above period between Iringa, Mbeya, Tunduma and Sumbawanga as shown in Figure 1-2.

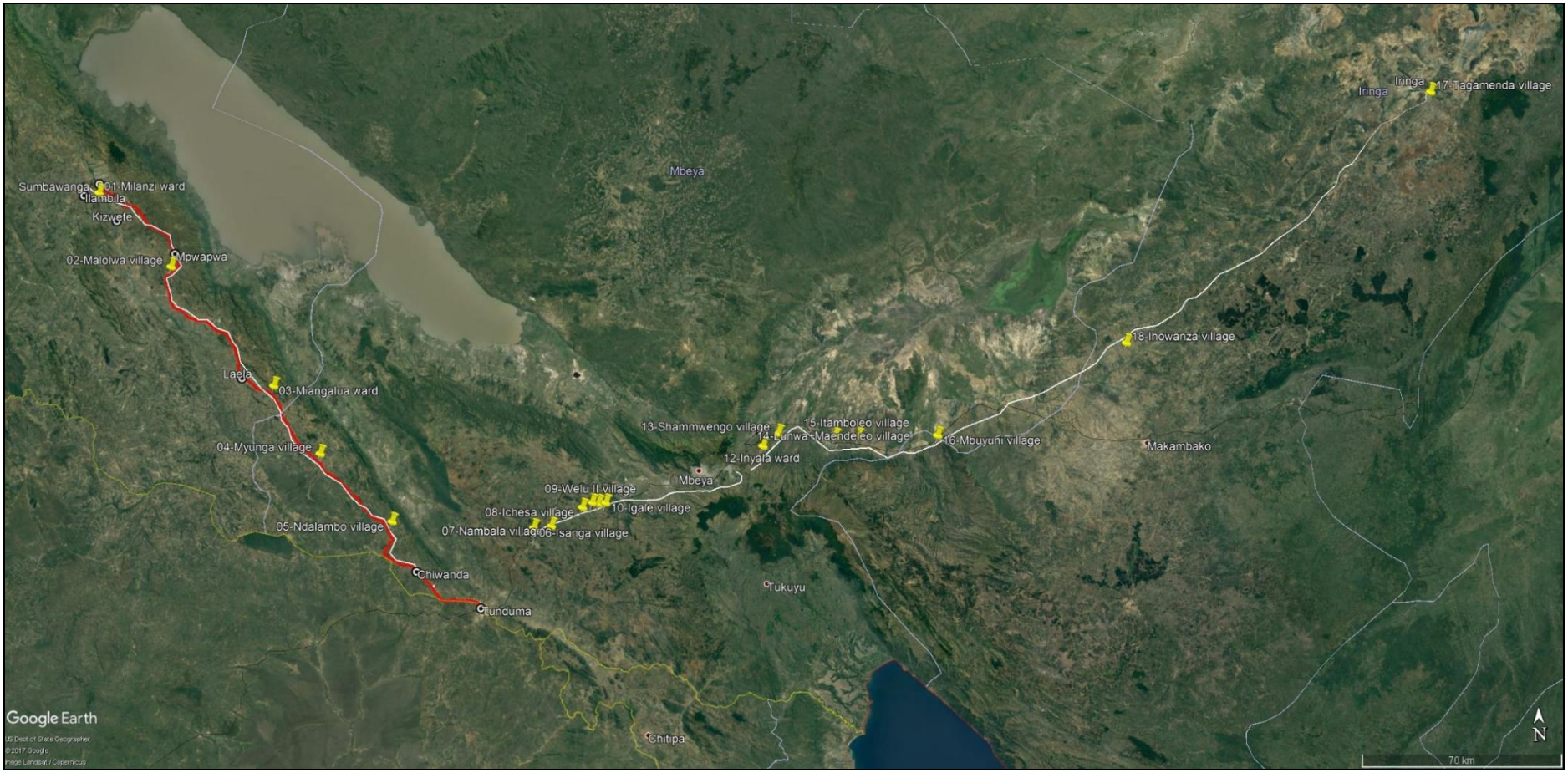
In addition to this, there was another round of stakeholder consultation meetings conducted by TANESCO and held on January 13 – 21, 2018.

The project stakeholder consultation meetings held on the above dates are reflected in Stakeholder Consultation Logs and the outcomes considered (feedback) in each ESIA Studies. The key issues raised during the meetings fall into the categories listed in the table below.

Biological Environment	
Terrestrial flora	• Importance to protect forested areas such as Chimala FR which are important for the livelihood of local population
Avifauna	• Importance to protect bird migration corridors, in particular Usangu plats IBA, 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 Stakeholder Engagement Plan and a Communication strategy to update communities on status of project. • Project Contractor to implement a code of conduct for all staff working on the project

The conclusions of each ESIA Studies are the result of specialist assessments and outcomes of the public/stakeholder consultation meetings. The public consultation process has made an effort to include representatives of various stakeholders within the process.

Figure 1-2: Locations of public meetings (Sumbawanga-Tunduma-Mbeya-Iringa)



1.5.1 Stakeholder Engagement Plan

As stated above, a Stakeholder Engagement Plan (SEP) will be developed by TANESCO for the transmission line projects from Iringa-Mbeya-Tunduma-Sumbawanga. The steps in developing the SEP are as follows:

a) Define the Area of Interest (AoI) of the project: For the two transmission line projects, the AoI has been spatially defined as a corridor of 20km on either side of the transmission line corridor;

b) Determine regulatory compliance requirements which will define the framework under which consultations will be conducted;

c) Identify and list all stakeholders to the project. Stakeholders could be grouped into (i) Government Authorities, (ii) Affected Parties, (iii) Civil Society and Development Agencies, and (iv) Commercial Organizations;

d) Undertake an analysis of stakeholders to determine their influence/power capacity, network capacity and interest level in the outcomes of the project;

e) Develop a communication strategy/plan. This is where TANESCO will plan public consultations, identify communications methods, the audience for each engagement, frequency, and the tools that will be used to efficiently implement the strategy;

f) Create a stakeholder engagement plan matrix that shows each stakeholder, their areas of influence/interest, the project phase(s) in which the stakeholder should be engaged, the approach to the engagement (e.g. one-on-one, consultation, focus group discussion, etc.), engagement tools (such as website, face-to-face, etc.) and, frequency of engagement (e.g. monthly, quarterly, six-monthly, etc.);

g) Define the roles and responsibilities of those persons within TANESCO that will be responsible for implementing the SEP. It may be useful to add an organizational chart within the SEP followed by the job description of each individual;

h) Develop and implement the TANESCO Grievance Redress Mechanism (GRM) (see 1.5.2. below); and

i) Conduct monitoring of the SEP and GRM using tools such as spreadsheets and e-mails.

The two ESIA Studies for Iringa- Mbeya and Mbeya-Sumbawanga TL have been disclosed and available on the TANESCO website (http://www.tanesco.co.tz/) for public feedback. Additionally, both ESIA Studies will be disclosed on the World Bank website for public feedback.

1.5.2 Grievance Redress Mechanism

The proposed project will include the development and implementation of a Grievance Redress Mechanism (GRM). TANESCO has an existing GRM which they have been using for other transmission line projects and will apply it to the two proposed transmission line projects. The purpose of the GRM is to respond to community concerns about the project

during the planning, pre-construction, construction, operations and decommissioning phases of the project in a timely manner. The existing GRM will be strengthened to improve its efficiency, and to respond more effectively to feedback from the communities.

1.6 Description of the project environment

Iringa – Kisada– Mbeya

The proposed 400kV transmission line begins at the existing Iringa substation and follows the existing 220 kV transmission line for some distance. Before the village of Tanangozi, the line separates from the existing line, crosses route A104 to Kisada substation and remains north of this road in order to traverse a flatter terrain and also to avoid population. Between Igawa and Kimani, the line crosses again route A104 to join the existing transmission line. The Iringa-Mbeya segment of the line is in Tanzania's Southern Highlands. Vegetation cover is miombo woodland (a grassland-savanna-scrubland biome), grassland, bush, cropland and plantations. The proposed alignment runs along or near the boundaries of the Mpanga/Kipengere Game Reserve (MKGR), the Chimala Scarp Forest Reserve, and two Important Bird Areas (IBA). It traverses the Igambo-Igawa Wildlife Corridor that links the MKGR and Ruaha National Park.

From this point, the proposed 400 kV line follows the 220 kV line until it reaches the future Mbeya substation. This portion of the proposed line passes through a more rough and rugged terrain.

Mbeya – Tunduma

Between the proposed substations in Mbeya and Tunduma, the proposed line passes through several types of land cover/use, the dominant one being agricultural lands. There are some areas with bushes, coffee estates, scattered trees, planted tree forests, natural woody vegetation especially on hilly terrain and scattered human settlement.

There is no known area with wildlife of significant importance, the only form of animals and birds found in the area is limited to wood and domestic animals (cows, goats, etc.).

The important vegetation community along the ROW for which access may be somewhat restrictive is these private or village planted woodlots, Village miombo forest reserves at Nanyala and Senjele. But these trees can be compensated like any other crops such as coffee or upon permission from Mbozi district authority.

Tunduma – Sumbawanga

Between the proposed substations of Tunduma and Sumbawanga, there are no areas with restricted access along this part of the ROW; the terrain is largely flat with few rolling hills and plateaus. The transmission line route generally runs parallel to the B8 highway crossing it at a number of locations. Soils along this section seem to be fertile due to the fact that the whole area along the road is cultivated. The farms are cropped with annuals such as maize and beans. The concentration of cropping on cereals suggests that the area is moderately to relatively dry, this was observed by the few number of streams crossed during the field survey. Apart from cultivation natural vegetation comprises miombo with patches of tall and short grass.

This section is open with scattered trees and cultivated land. The environment is not attractive for wildlife hence it is unlikely to be found in the area. There were few herds of domestic animals observed like cows and goats seen freely grazing in the area.

Activities envisaged by the project include right-of-way acquisition, land clearing, arrangement of access roads to the towers/poles where required, construction of foundations and towers, stringing – installation of conductors, insulators, other equipment.

1.6.1 Physical environment

1.6.1.1 Climate

Tanzania has a tropical climate with two seasons (wet and dry) and temperature varying from hot during wet season and cool during dry season, particularly in the central plateau regions of the country, while coastal areas experience more humidity. The project area between Iringa and Mbeya enjoys a tropical climate with marked changes in temperatures and rainfall due to elevation and season. The temperature around Iringa Town ranges between 15^{o}C and 25^{o}C. In Mbeya region, the average temperatures range is between 12^{o}C in Mbeya Mountains to about 25^{o}C in the lowlands areas. Additionally, this section of the transmission line project will traverse highlands that are characterized by moderate and cool climate and moderate rainfall.

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 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^{0}C in the highlands to about 30^{0}C in the lowland areas.

1.6.1.2 Soils and geology

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

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.

1.6.1.3 Hydrology

Iringa and Mbeya regions have varying watershed drainage systems featuring wetlands and well-drained uplands. The regions provide the watershed and catchment for Little and Great Ruaha Rivers, which supply water to Mtera hydropower dam. The proposed

transmission line project from Iringa to Mbeya passes through catchment areas for rivers that are used for power generation and irrigated farming.

The proposed transmission line project from Mbeya to Tunduma to Sumbawanga lies within the Lake Rukwa drainage basin. The basin lies within the Rift Valley with Lake Tanganyika on the northwest and Lake Malawi (Nyasa) to the southwest.

1.6.2 Biological environment

An ecological baseline survey was conducted for the proposed transmission line project from Iringa – Mbeya – Tunduma – Sumbawanga. The process of conducting this baseline included (i) a literature review of available information on terrestrial ecology, avifauna and bats, and (ii) site survey on November 13 – 17, 2017 and January 13 – 21, 2018 along the entire length of the transmission line corridor.

1.6.2.1 Terrestrial ecology

The proposed transmission line from Iringa – Mbeya covers a total length of about 292km. Habitat/vegetation types found along this section of the proposed transmission line include human settlements, cultivated fields, riverine vegetation and woodlands. Important habitats that are traversed by the proposed transmission line and/or found close to the project area include riverine vegetation along rivers, the Igando-Igawa wildlife corridor, Mpanga/Kipengere Game Reserve and Chimala Scarp forest reserve.

The transmission line project area from Mbeya – Tunduma – Sumbawanga has minimal wildlife based on the field survey in November 2017. Additionally, consultations with local villagers indicated that the surrounding area of this section of the project does not have much wildlife. The only wildlife seen in the project area is monkeys and squirrels while amphibians such as frogs and, reptiles (mainly snakes) are common in some parts.

1.6.2.2 Avifauna

The proposed transmission line from Iringa – Mbeya – Tunduma – Sumbawanga passes through landscape and terrain characterized by varied habitats that support avifauna such as forests, wetlands and woodlands.

The routing of the proposed transmission line partly falls within the Southern Rift Valley, an important flyway for bird migration. The Southern Rift Valley which is part of the Great East African Rift Valley is of global significance as a migratory corridor for 500 million birds consisting of about 350 species which pass through the area enroute to their summer breeding grounds in Eurasia and over-wintering sites in southern Africa. It 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.

According to data from BirdLife International, the Udzungwa Mountains is an Important Bird Area (IBA) within the Iringa region. This IBA spreads across the A104 highway (Iringa – Mbeya) between Mafinga and Nyororo. The proposed high voltage 400kV Iringa – Mbeya transmission line passes north of this IBA and is not in close proximity to it.

In Mbeya region, the Kitulo plateau is an IBA south of the proposed transmission line between Iringa and Mbeya and in close proximity to it. Additionally, there is another IBA called Usangu flats within Mbeya region which lies to the north of the proposed Iringa – Mbeya transmission line.

Between Mbeya and Tunduma, there is one IBA known as Umalila Mountains and this is located far south of the proposed transmission line.

Between Tunduma and Sumbawanga, there are two IBAs namely Lake Rukwa which is located north-east of the proposed high voltage 400kV transmission line and Loazi-Kalambo Forest reserves and surrounding areas located south-west of the proposed transmission line.

The project area is characterized by wetland habitats such as Lake Rukwa which is about 30km north-east of the transmission line corridor, papyrus dominated wetlands and small pools in the flood plains in addition to undulating landscapes and rocky outcrops that support raptors which are key targets for bird collision assessment studies.

1.6.2.3 Bats

As part of the ESIA Studies of the proposed transmission line from Iringa – Mbeya – Tunduma – Sumbawanga, a bat survey was carried out on November 13 – 17, 2017. Tanzania has ninety-four bat species which are documented in databases such as the Global Biodiversity Information Facility (GBIF), iNaturalist and, IUCN Redlist and Mammal Species of the World (Simmons 2005). Twenty-one of these (about 20%) are represented in the landscape of the proposed transmission line project as constructed from databases and the field survey. Fifteen (15) of the twenty (21) species associated with this landscape were observed during the field survey. Of the ninety four bat species in Tanzania, sixteen are listed as threatened in the IUCN Redlist. In the sixteen bat species, one is classified as Endangered, two as vulnerable and thirteen as near threatened.

1.6.2.4 Ecosystem services

Natural resources distributed around the proposed Iringa-Mbeya-Sumbawanga transmission line benefit the people, including businesses derived from ecosystem. During the field survey along the proposed transmission line corridor carried out on November 13 – 17, 2017 and and January 13 – 21, 2018, it was observed that the communities utilize a number of ecosystem services. For example, the Miombo woodland was being used as a cultural service in which the local communities bury their dead. Wet valleys were being used for cultivating vegetables and maize which serves the communities throughout the year. Part of the Miombo woodland that consists of grassland 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 the Miombo woodland. This can be seen from sacks of charcoal displayed on the road side for sale.

1.6.3 Human environment

A social baseline survey was undertaken for the proposed transmission line project from Iringa – Mbeya – Tunduma – Sumbawanga. This included a review of the available socio-economic literature associated with the project area of influence followed by

public/stakeholder meetings along the transmission line corridor. The public/stakeholder consultation meetings were undertaken on November 13 – 17, 2017 and January 13 – 21, 2018. Prior to these consultations, there was a large public/stakeholder consultation meeting conducted in Dar es Salaam on September 12, 2017 to discuss the ESIA Studies of the proposed high voltage 400kV transmission line projects between (i) Iringa and Mbeya, and (ii) Mbeya, Tunduma and Sumbawanga.

There were several stakeholders from Government ministries, lead agencies and regulators that were present at this meeting including an observer mission from the World Bank. One of the outcomes of this meeting was the development of the Terms of Reference (TOR) for the ESIA Study of the proposed transmission line project from Mbeya – Tunduma – Sumbawanga and the proposed substations in these towns and cities.

1.6.3.1 Area of influence

For purposes of this ESIA Study, the Area of Influence (AoI) for the proposed transmission line project includes (i) a direct AoI, and (ii) an indirect AoI. The direct AoI was defined as the 52m wide corridor from Iringa – Mbeya – Tunduma – Sumbawanga to be acquired fully by TANESCO; additionally and based on the site survey, the direct AoI was extended to mean 1km on either side of the centerline of the transmission line. The indirect AoI was defined as a corridor that extends 20km on either side of the centerline of the transmission line.

1.6.3.2 Administrative structure

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 proposed transmission line from Iringa – Mbeya – Tunduma – Sumbawanga traverses a number of districts which include:

- Iringa Region – Mafinga, Mufindi, Iringa Rural districts;
- Njombe Region – Makete district;
- Mbeya Region – Mbeya City and Mbeya Rural districts;
- Songwe Region – Mbozi, Tunduma and Momba districts; and
- Rukwa Region – Sumbawanga Municipal and Sumbawanga districts.

The three regions above are administered by Regional Commissioners beneath whom are several hierarchies of other administrative officers at the district, ward and village levels. At the grassroots level, the administration consists of a Village Executive Officer (VEO), Village Chairperson and a Ward Executive Officer (WEO). This level of administration is crucial for recruitment of individuals who will be employed by the proposed project. Additionally, this level of administration will support TANESCO if required, for the implementation of the Resettlement Action Plans (RAP) for the project. This level of

administration will also be the first point of contact during the stakeholder engagement process as well as providing inputs in the implementation of TANESCO's Grievance Redress Mechanism (GRM).

1.6.3.3 Land use and tenure

The predominant land use (about 90%) along the length of the proposed transmission line routing from Iringa – Mbeya – Tunduma – Sumbawanga is agricultural. The remaining sections of the transmission line routing (about 10%) are considered part of built up environment such as cities and towns (e.g. Iringa, Mbeya, Tunduma and Sumbawanga) and their environments where the land use is residential, commercial or industrial.

Land tenure in Tanzania is defined under three categories namely (i) reserved land, (ii) village land (under the jurisdiction of the Land Commissioner), and (iii) general land. The proposed transmission line traverses or is in close proximity to all three types of land tenure established in Tanzania. Under the Tanzanian Land Act 1999, authority over all land in the country is vested in the President as a Trustee. This principle of land law will be utilized to acquire land (i.e. 52m wide corridor) for the transmission line project from Iringa – Mbeya – Tunduma – Sumbawanga, a distance of about 620km – 640km or an area equivalent to 3,328 hectares.

1.6.3.4 Population

According to the census carried out by the National Bureau of Statistics in 2012, the population of the mainland in Tanzania was 43,625,364. The proposed transmission line project passes through the regions of Iringa, Mbeya and Rukwa in which the population growth rate from 2002 – 2012 was an average of 1.1%, 2.7% and 3.2% respectively. In 2012, the population of Iringa region was 941,238, Mbeya region was 2,707,410 and Rukwa region was 1,004,539. Using these figures and based on the growth rates above, it is estimated that the 2017 population of Iringa region is 994,158, Mbeya region is 3,093,188 and Rukwa region is 1,175,886. The sex ratio (i.e. the number of males per 100 females) is 92 in Iringa and Mbeya, and 94 in Rukwa indicating that there are almost an equal number of males and females in all three regions which is common for most African countries.

The proposed project is large which requires a skilled, semi-skilled and unskilled workers for its implementation. It is likely that the project will be awarded to an international Project Contractor who will use expatriate and Tanzanian workers for its execution. Additionally, there may be skills sets that will not be available among the communities living along or near the proposed transmission line project and would therefore have to come from other parts of Tanzania. There will be an influx of workers into the project area and the adverse impacts associated with it will be managed in accordance with the mitigation measures recommended in each ESIA Studies.

1.6.3.5 Regional economy

Agriculture is the largest sector of the economy in Tanzania. According to the 2012 Population and Housing Census, the majority of the population (about 70%) 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.

The regional economy in Iringa, Mbeya and Rukwa regions where the proposed transmission line project is to be implemented, is agriculture based. During the public/stakeholder consultation meetings carried out on November 13 – 17, 2017 and January 13 – 21, 2018, it was established that most community members living within the proposed 52m wide wayleave and its environs practice peasant farming and grow crops such as maize, rice, wheat, millet, cassava, beans, banana and potatoes. With the acquisition of the 52m wayleave by TANESCO, all peasant farmers who will have grown crops after the cut-off date, will be allowed to harvest them.

1.6.3.6 Socio-economic factors

Based on the stakeholder consultation meetings conducted on November 13 – 17, 2017, and January 13 – 21, 2018 it was established that the predominant male occupation along the transmission line wayleave is farming of crops and animal husbandry.

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

In the towns of Iringa, Mbeya, Tunduma, Sumbawanga and their environments, 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.

The Tanzania Statistical Abstract 2015 shows that the total number of public and private schools in 2014 within Iringa region was 355, in Mbeya region, 1084, and in Rukwa region, 364. In 2014, the 355 schools in Iringa region enrolled 205,000 pupils while the 1084 schools in Mbeya region enrolled 537,000 pupils and Rukwa region enrolled 201,000 pupils. Compared to the figures of 2013 given in the Statistical Abstract, it is noted that the enrollment of pupils in Iringa region reduced from 220,000 to 205,000, a drop of about 7%, in Mbeya region, enrollment slightly improved from 529,000 to 537,000, and increase of 1.5% while in Rukwa region, the enrollment dropped minimally from 202,000 to 201,000 a reduction of 0.5%.

1.7 Project alternatives

Project alternatives were considered for the proposed Iringa – Mbeya – Tunduma – Sumbawanga transmission line project. The alternatives considered in the ESIA Studies for the proposed project were:

- Transmission line routes;

- Substation location alternatives; and
- No-go alternative.

In assessing the above project alternatives, a common philosophy was to route the transmission line away from existing populated and built-up areas between Iringa, Mbeya, Tunduma and Sumbawanga. This was initially done using satellite imagery such as Google Earth and ground truthed during a physical survey undertaken by TANESCO.

There were three alternative corridors that were evaluated for the proposed high voltage 400kV transmission line project from Iringa to Mbeya. The ESIA Consultant did an alternatives analysis based on technical, environmental and social aspects. The technical aspects evaluated were the length of the transmission line and number of angle towers with the best option being the one having the least distance and lowest number of angle towers. The E&S analysis was based on the interaction of Valued Environmental and Social Components (VESCs) with siting criteria.

An assessment of the alternatives is included in the ESIA Study and was compared to the no-project alternative.

1.8 Summary of the impact assessment

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 each ESIA Reports 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.

During the construction phase, the potential adverse biophysical impacts will arise from (i) air and noise emissions generated by construction plant and equipment during clearance of the wayleave and substation construction, (ii) subsurface contamination through operational leaks and spills at the substations, and (iii) soil erosion leading to sediment transport into water bodies such as streams and rivers.

On terrestrial ecology, the potential adverse impacts during the construction phase of the project could be (i) habitat loss or alteration as a result of the removal of vegetation, (ii) introduction of Alien Invasive Plant Species (AIPS), (iii) dust and waste emission impacts on birds and bats, (iv) bird collisions with the transmission line, and (v) bird electrocution with the transmission lines.

The construction phase impacts on the human environment will include (i) land acquisition for the wayleave and involuntary resettlement of Project Affected Persons (PAPs), (ii) impacts on existing infrastructure such as access roads, water, health facilities, etc. (iii) lack of gender equity in allocation of jobs or provision of business opportunities, (iv) influx of migrant workers leading to lack of social cohesion with the host communities, (v) poor community health and safety concerns, (vi) lack of compliance with Tanzania labor laws and regulations leading to poor labor and working conditions, and (vii) lack of a chance finds procedure for archaeological finds.

During the operational phase, the significance of the adverse risks on the physical, biological and human environment range between Medium negative and Low negative if the mitigation measures are implemented.

1.8.1 Human environment

1.8.1.1 Land use

In accordance with the Land Act of 2009, TANESCO will purchase the ROW width of 52m from Iringa – Mbeya – Tunduma – Sumbawanga 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 Moderate.

1.8.1.2 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.

1.8.1.3 Construction camps

1.8.1.4 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 Studies 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 Studies 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.

1.8.1.5 Gender based violence

Anecdotal evidence suggests that gender based violence (GBV) is not an uncommon practice in some parts of Tanzania. For construction projects, the in-migrant male construction workers tend to exhibit inconsistent behaviors when they are away from their families which can potentially lead to sexual harassment of women and girls, exploitative sexual relations and illicit sexual relations, including with minors (individual below the age of 18 years) from the local community.

Additionally, given the rural nature of the project, law enforcement is usually minimal in such areas or absent thus exacerbating the risk of sexual harassment and illicit relations with minors. The impact significance without mitigation measures was determined to be medium negative and after mitigation, it was assessed to be low negative.

1.8.1.6 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 socio-economic status and cultural norms. The influx of workers may also strain the existing 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 or Iringa Regions which have 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.

1.8.1.7 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.

1.8.1.8 Labor and working conditions

The proposed project from Mbeya – Tunduma – Sumbawanga 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. It is envisaged that there may be a similar amount of workers for the Iringa – Mbeya section of the transmission line project. The creation of these job opportunities for a project that could potentially be implemented over a three year period is expected to directly benefit individuals living within the Area of Influence (20km on either side of the transmission line). Those that may not benefit from direct employment may be able to supply the Project Contractor with construction materials such as sand, ballast and cement for construction of foundations. Other potential benefits may arise for women to provide catering services for construction workers along the ROW.

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. The recruitment of local communities living along or in the vicinity of the proposed transmission line project will be encouraged. This will be done through the village administrative structures through the Village Executive Office and Village Chairperson. With the implementation of sound Human Resource policies and systems, the significance of the risk was established as Low.

1.8.1.9 Construction camps

The proposed transmission line projects from Iringa – Mbeya – Tunduma – Sumbawanga will be tendered in lots with successful Project Contractors awarded certain lengths of transmission line. Associated with the construction phase, each contractor is expected to establish a permanent camp for the construction phase and one or more temporary "fly" camps. The permanent camp would be used throughout the construction phase to store construction materials, have 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 site selection criteria for each of the camps will be directed by TANESCO but and will primarily include the following criteria:

- 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 the ROW within the minimum time possible;
- The site should not be exposed to potential flooding or landslides;
- 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; and
- 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.

On completion of the construction phase, the Project Contractor may either decommission the permanent camp or hand it over to TANESCO for their future management. The impact assessment of the presence of construction camps was undertaken.

1.8.2 Physical environment

1.8.2.1 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.

1.8.2.2 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.

1.8.2.3 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.

1.8.2.4 Electric and magnetic fields (EMF)

Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Electric fields are produced by voltage and increase in strength as the voltage increases.

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

The proposed transmission line will be constructed within a 52m wide corridor which will be acquired by TANESCO. Once acquired, no person will be permitted to erect any semi-permanent or permanent structure where they could get routine exposure to EMF. Without mitigation, the impact of EMF is considered low negative and after mitigation measures remains low negative.

1.8.3 Biological environment

1.8.3.1 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. Along the Iringa – Mbeya transmission line, there could be potential impacts on the Chimala Scarp Forest reserve, Mpanga/Kipengele Game Reserve and disturbance or displacement of wildlife attempting to use the Igando-Igawa wildlife corridor. 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.

1.8.3.2 Avifauna and Bats

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 are expected to be of Medium to Low significance. With mitigation measures in place, all impacts on avifauna and bats during the construction phase are expected to be Low.

The main impacts to avifauna and bats are expected to be felt during the operational phase due to collisions with the transmission lines or electrocution. The key potential impacts include collisions with transmission line infrastructure and, electrocution on towers or transmission lines. The impacts without mitigation measures are of Medium significance, however with the implementation of the mitigation measures, the significance reduces to Low.

1.9 Mitigation measures

Based on the environmental and social (E&S) impact assessment of potential human, social, physical and biological aspects, mitigation measures were developed for the project. In coming up with the mitigation measures, the principle of avoidance, minimization, mitigation, and, compensation/offsets was applied.

Examples of how the above principles have been applied in the mitigation measures include (i) elimination, (ii) substitution, (iii) engineering controls, (iv) administrative controls, and (v) use of Personal Protective Equipment (PPE). The most effective means of mitigating E&S impacts is through careful routing and planning, that is to say reducing the impact before it occurs.

The findings of the specialists' provides an assessment of the potential positive and adverse impacts anticipated as a result of the proposed project. The findings conclude that there are no environmental fatal flaws that will prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented.

The mitigation measures associated with the proposed transmission line from Iringa – Mbeya – Tunduma – Sumbawanga include the following:

- TANESCO will manage and enhance the wildlife corridor (Igando and Igawa) during both phases of project by developing a Wildlife Corridor Management Plan in collaboration with a wildlife expert from TAWIRI/TAWA during updating of ESMP which will submitted to the WB for consideration;
- TANESCO will set aside funds for enhancement of wildlife corridor based on developed Wildlife Corridor Management plan;
- TANESCO and Tanzania Forest Service (TFS) will conduct an inventory to verify the boundary, assess the size affected areas within Chimala Scarp FR and propose proper mitigation and compensation measures which could involve preparation of forest management plan as part of updated ESMP;
- In the detailed design phase, TANESCO will consider use of taller towers where the TL crosses wildlife corridors so that bushes and shrubs may grow taller without endangering the line;
- TANESCO will hire experts to identify and plant shrubs, bushes and grasses which would attract and enhance the movement of wildlife through the Corridor;
- TANESCO will appoint ornithologists and bat specialists from recognized institutions to undertake a survey of birds and bats study within the transmission line's Area of Influence. The study will be undertaken to inform the final design and routing of the new transmission line and the recommendations will be reflected in the updated ESMP that will be submitted to the WB prior to construction;
- TANESCO will conduct independent environmental noise level measurements annually at Iringa, Kisada, Mbeya, Tunduma and Sumbawanga substations. Where the noise levels exceed the Tanzanian environmental noise legislative limits and the World Bank EHS Guidelines, TANESCO will create berms high enough to shield the noise from travelling outside the property line.
- TANESCO will develop and implement a Grievance Redress Mechanism (GRM) available to the communities. The GRM will be administered and monitored by TANESCO.
- TANESCO should consider conducting a Landscape and Visual Impact Assessment Study and incorporate the findings in the detailed design of the project.

The mitigation measures will be incorporated in the design of the proposed project as fully as possible in order to reduce the human interventions required by implementing the Environmental and Social Management Plan (ESMP).

In order to reduce the significance of the E&S impacts and maintain the social and environmental integrity of the project areas and to ensure project sustainability, proposed mitigation measures will be fully implemented and monitored by TANESCO.

A summary of the impact assessment for the construction and operational phases is given in Table 1-1 and Table 1-2 without and with mitigation measures applied to the project.

Table 1-1: Summary of significance of each identified positive impact – construction phase

Impact	Significance rating			
	Preconstruction / construction		Operational	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Potential impacts on employment	Low positive (+)	Medium positive (+)		
Potential impacts on economic development	Low positive (+)	Medium positive (+)		

Table 1-2: Summary of significance of each identified negative impact – construction phase

Impact	Significance rating			
	Preconstruction / construction		Operational	
	Without mitigation	With mitigation	Without mitigation	With mitigation
PHYSICAL ENVIRONMENT				
Impacts on soils	Low negative (-)	Low negative (-)	Medium negative (-)	Low negative (-)
Impacts on surface and groundwater	Low negative (-)	Low negative (-)	Low negative (-)	Low negative (-)
Impacts on air and noise quality	Medium negative (-)	Low negative (-)	Low negative (-)	Low negative (-)
Impacts of EMF			Low negative (-)	Low negative (-)
BIOLOGICAL ENVIRONMENT				
Alteration of terrestrial vegetation	Medium negative (-)	Low negative (-)	Medium negative (-)	Low negative (-)
Alien invasive plant species (AIPS)	Medium negative (-)	Low negative (-)		
Aquatic habitat alteration	Low negative	Low negative		

Impact	Significance rating			
	Preconstruction / construction		Operational	
	Without mitigation	With mitigation	Without mitigation	With mitigation
	(-)	(-)		
Obstruction of wildlife movement	Medium negative (-)	Low negative (-)		
Poaching of bush meat	Medium negative (-)	Low negative (-)		
Destruction of herpetofauna habitats	Low negative (-)	Low negative (-)		
Temporary interference of ecosystem services	Low negative (-)	Low negative (-)		
Impacts on avifauna and bats	Medium negative (-)	Low negative (-)		
Impacts on bats due to fugitive dusts and waste generated by equipment	Low negative (-)	Low negative (-)		
Construction plant noise impacts on bats	Medium negative (-)	Low negative (-)		
Birds and bats collisions with the transmission line			Medium negative	Low negative

Impact	Significance rating			
	Preconstruction / construction		Operational	
	Without mitigation	With mitigation	Without mitigation	With mitigation
			(-)	(-)
Bird electrocution on towers or transmission lines			Low negative (-)	Low negative (-)
Avifauna displacement along the transmission line			Medium negative (-)	Low negative (-)
Bats – habitat loss and disturbance			Medium negative (-)	Low negative (-)
HUMAN ENVIRONMENT				
Impacts of land use including involuntary land acquisition	High negative (-)	Low negative (-)	Low negative (-)	Low negative (-)
Impacts of land acquisition on vulnerable groups	Medium negative (-)	Low negative (-)		
Impacts on existing infrastructure	Medium negative (-)	Low negative (-)		
Impacts of gender requirements	Low negative (-)	Low negative (-)		

Impact	Significance rating			
	Preconstruction / construction		Operational	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Impacts of gender based violence	Medium negative (-)	Low negative (-)		
Communities and social cohesion	Medium negative (-)	Low negative (-)	Medium negative (-)	Low negative (-)
In-migration of workers	Low negative (-)	Low negative (-)		
Community health and safety	Medium negative (-)	Low negative (-)	Medium negative (-)	Low negative (-)
Worker health and safety	Medium negative (-)	Low negative (-)	Medium negative (-)	Low negative (-)
Potential impacts on traffic and related incidents	Medium negative (-)	Low negative (-)		
Cultural heritage	Medium negative (-)	Low negative (-)		

1.10 Environment and social management plan

The Environmental and Social Management Plan (ESMP) for Mbeya-Sumbawanga portion consists of environmental and social (E&S) measures developed to clearly identify mitigation measures and management practices that should be implemented to eliminate, reduce or minimize the adverse impacts identified in the ESIA, and the Monitoring Program for the monitoring over the implementation of mitigation measures and of the residual impacts at the construction and operation phases of the Project, following best management practices.

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

TANESCO will ultimately be responsible for ensuring that the ESMP is implemented through a Monitoring Program and its own Environmental and Social Management System (ESMS) which considers environmental and social supervision capacities/resources (within TANESCO or contracted out to Supervision Consultant) for the monitoring over the construction and operation of the Project and operation of the Line. TANESCO`s Environmental and Social Management Unit will oversee implementation of the ESMP including all operational related management plans and community relations activities. TANESCO will be responsible for review and approval of specific ESMPs prepared by the successful Contractors. TANESCO will designate appropriately experienced and qualified persons in charge of the environmental and social management to oversee the implementation of the ESMP in each contracted segment. The staff members will be assigned as Environmental Officer and Sociologist and be supported by field assistants. For some elements of the ESMP, TANESCO will collaborate with experts from recognized institutions such as TAWIRI/TAWA/TFS to implement the Environmental and Social aspects of the project during construction and operation phases. The Owner's Engineer team in the field will include staff with environmental and social impact management expertise to provide real-time oversight of the Contractor's implementation of the ESMP and the related sub-plans.

During the construction phase, the successful Project Contractor(s) will be responsible for reviewing the ESMP within this ESIA Study and customizing it into a project specific Construction Environmental and Social Management Plan (CESMP).

The Project Contractor will customize the ESMP in this ESIA Study based on the following:

- TANESCO ESMS requirements;
- Applicable World Bank Group E&S Operational Policies;

- Pre-construction surveys undertaken by the Project Contractor prior to proceeding with the initial stages of construction (i.e. ROW clearance, topsoil stripping for foundations, arrangement of access roads, conductors stringing, etc.); and
- The Project Contractor's ESMS.

The CESMP will contain several sub-plans such as (i) waste management plan, (ii) migrant influx management plan, (iii) traffic management plan, (iv) pollution prevention plan, (v) biodiversity management plan, (vi) restoration and reinstatement plan, (vii) health & safety management plan (including working on heights and prevent electrocution, etc.), etc.

Arising from the above, The Project Contractor will present their project specific Construction Environment and Social Management Plan (CESMP) to TANESCO for approval. In addition to the CESMP, the Project Contractor will develop sub-plans such as Waste Management Plan, Traffic Management Plan, etc.

During the operational phase, TANESCO will develop and implement an ESMP. The TANESCO ESMP should be aligned with the Deming Cycle (i.e. Plan, DO, Check, Adjust) in order for it to be effectively implemented.

The ESMP is a dynamic document which will go through iterations throughout the lifetime of the project based on actual E&S conditions. During the construction phase, the Project Contractor will be responsible for implementing the iterations while TANESCO will be responsible during the operational and decommissioning phases respectively.

1.11 Decommissioning phase

The expected lifetime of the proposed transmission line project is estimated to be about 50 years. An early decommissioning is therefore unlikely, but rather a long-ranging repair or exchange of line components.

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

During the decommissioning activities, metal components from the transmission line will be turned into scrap. Because of high transportation costs and the lack of a scrapping infrastructure in Tanzania, an external buyer or scrapping company will be sought to ensure the materials are disposed in an environmentally sustainable manner. Adequate measures will be implemented to ensure that during the decommissioning activities, there is no contamination of soils and air. The high risk areas where such surface and subsurface contamination may occur is the substation because of likely pollutant substances such as used oils from transformers and heavy metals from electrical materials.

1.12 Conclusion

The potential physical, biological and human related impacts will be experienced during the construction phase of the project with a limited number in the operational phase. There will be positive impacts during the construction phase on employment and economic activities associated with the transmission line project. In the construction phase, there will be potential adverse impacts on the physical, biological and human environment arising from the activities that will be undertaken. It was established that all potential impacts on the physical environment are medium negative without mitigation and low negative with mitigation (residual impacts).