ELECTRICITY SUPPLY CORPORATION OF MALAWI LIMITED

MOZAMBIQUE-MALAWI 400 KV INTERCONNECTION PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

MALAWI SECTION – FROM THE MOZAMBIQUE BORDER TO THE PHOMBEYA SUBSTATION

Project No. 161-07023-00

MAY 2019
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Electricity Supply Corporation of Malawi Limited

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May 2019

Report (final version)

Proponent:

P.O. Box 2047, Blantyre, MALAWI
## Revision History

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<td>02</td>
<td>2017/09/11</td>
<td>Revised ESIA for EAD’s review</td>
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SIGNATURES

PREPARED BY

Ghyslain Pothier, biol., M.Env., EESA
Environmental Scientist

REVIEWED BY

Jean-Marc Evenat, M.Sc.Env.
Project Director / Lead Environmental Planner

The original version of this technical document we are submitting has been authenticated and will be retained by WSP for a minimum period of ten years. Given that the transmitted file is no further under the control of WSP and its integrity cannot be ensured, no guarantee can be given to any subsequent modification.

Reference to mention:
PRODUCTION TEAM

ELECTRICITY SUPPLY CORPORATION OF MALAWI LIMITED

Project Director Lameck Nchembe
Project Director Michael Gondwe
Environmental and Social Specialist Gertrude Malulu

WSP CANADA INC. (WSP)

Project Director / Lead Environmental Planner Jean-Marc Evenat
Environmental Scientist and Deputy Project Manager Ghyslain Pothier
Environmental and Social Impact Assessment Specialist Andréanne Boisvert
Biodiversity Specialist Hélène Chouinard
Lead Social Development Specialist Antoine Moreau
Anthropologist Marie-Andrée Burelle
Communication and Community Development Specialist Francis Barbe
GIS/Survey Expert Mylène Lévesque
Editing Julie Boisvert

SUBCONTRACTOR – WWEC

Malawi Team Coordinator/ Environmental Specialist Kent Kafatia
Socio-Economist Peter Kgoma
Stakeholder Engagement Specialist Selina Mposa
Ecologist Mabvuto Phula
Archaeologist / Cultural Heritage Specialist Oris Chapinga

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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>µg/m³</td>
<td>Micrograms per cubic metre</td>
</tr>
<tr>
<td>ACSR</td>
<td>Aluminium Core Steel Reinforced</td>
</tr>
<tr>
<td>ADB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>ADC</td>
<td>Area Development Committee</td>
</tr>
<tr>
<td>ADI</td>
<td>area of direct influence</td>
</tr>
<tr>
<td>AI</td>
<td>Area of Influence</td>
</tr>
<tr>
<td>AICD</td>
<td>Africa Infrastructure Country Diagnostic</td>
</tr>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>AII</td>
<td>Area of Indirect Influence</td>
</tr>
<tr>
<td>BOD</td>
<td>Biological Oxygen Demand</td>
</tr>
<tr>
<td>BP</td>
<td>Bank Procedure</td>
</tr>
<tr>
<td>C</td>
<td>Common</td>
</tr>
<tr>
<td>CAHMP</td>
<td>Cultural and Archaeological Heritage Management Plan</td>
</tr>
<tr>
<td>CBH</td>
<td>Cahora Bassa Hydroelectric</td>
</tr>
<tr>
<td>CDSS</td>
<td>Community Day Secondary Schools</td>
</tr>
<tr>
<td>CES</td>
<td>Coastal &amp; Environmental Services</td>
</tr>
<tr>
<td>CFC</td>
<td>Chlorofluorocarbons</td>
</tr>
<tr>
<td>CHAM</td>
<td>Christian Hospitals Association of Malawi</td>
</tr>
<tr>
<td>CIA</td>
<td>Central Intelligence Agency</td>
</tr>
<tr>
<td>CIGRE</td>
<td>International Council on Large Electric Systems</td>
</tr>
<tr>
<td>CLN</td>
<td>Corridor Logistico Integrado de Nacala (Vale’s railway manager)</td>
</tr>
<tr>
<td>CNH</td>
<td>Critical Natural Habitat</td>
</tr>
<tr>
<td>CO</td>
<td>Carbon Monoxide</td>
</tr>
<tr>
<td>CR</td>
<td>Critically Endangered</td>
</tr>
<tr>
<td>CSS</td>
<td>Conventional Secondary School</td>
</tr>
<tr>
<td>CT</td>
<td>Current Transformers</td>
</tr>
<tr>
<td>CVT</td>
<td>Curriculum Vitae</td>
</tr>
<tr>
<td>CVT</td>
<td>Capacitor Voltage Transformers</td>
</tr>
<tr>
<td>DAI</td>
<td>Disclosure and Access to Information</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel</td>
</tr>
<tr>
<td>dB(A)</td>
<td>A-Weighted Decibel</td>
</tr>
<tr>
<td>DBH</td>
<td>Diameter Breast Height</td>
</tr>
<tr>
<td>DC</td>
<td>District Commissioner</td>
</tr>
<tr>
<td>DEA</td>
<td>Director of Environmental Affairs</td>
</tr>
<tr>
<td>DEC</td>
<td>District Executive Committee</td>
</tr>
<tr>
<td>DEMG</td>
<td>Decentralized Environmental Management Guidelines</td>
</tr>
<tr>
<td>DESC</td>
<td>District Environment Sub-Committee</td>
</tr>
<tr>
<td>DJFMA</td>
<td>December-January-February-March-April</td>
</tr>
<tr>
<td>DPPS</td>
<td>District Development Planning System</td>
</tr>
<tr>
<td>E&amp;S</td>
<td>Environmental and social</td>
</tr>
<tr>
<td>EAD</td>
<td>Environmental Affairs Department</td>
</tr>
<tr>
<td>EAP</td>
<td>Environmental Action Plan</td>
</tr>
<tr>
<td>EDM</td>
<td>Electricidade de Moçambique, E.P.</td>
</tr>
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</table>
EGENCO  Electricity Generation Company of Malawi
EHP  Essential Health Packages
EHS  Environmental, Health and Safety
EIS  Environmental Impact Statement
EMA  Environmental Management Act
EMF  Electromagnetic Field
EN  Endangered
ESCOM  Electricity Supply Corporation of Malawi Limited
ESIA  Environmental and Social Impact Assessment
ESMP  Environmental and Social Management Plan
ESMS  Environmental and Social Management System
FAO  Food and Agriculture Organization of the United Nations
GBIF  Global Biological Information Facility
GCMs  General Circulation Models
GDP  Gross Domestic Product
GHG  GreenHouse Gas
GIS  Geographic Information System
GPS  Global Positioning System
GVH  Group Village Headman
H&S  Health and Safety
ha  Hectare
HIV  Human Immunodeficiency Virus
I&AP  Interested and Affected Parties
IAS  Invasive Alien Species
ICSC  International Chemical Safety Cards
ICVL  International Coal Ventures Limited
IEC  Information, education and communication
IFC  International Finance Corporation
IHPS  Integrated Household Panel Survey
IPCC  Intergovernmental Panel on Climate Change
ISO  International Organization for Standardization
ISO  International Standards Organization
IUCN  International Union for Conservation of Nature
JCE  Junior Certificate of Secondary Education
JJA  June-July-August
Km  Kilometre
KM/Hr  Kilometres per hour
kV  Kilovolt
Laeq  A-weighted equivalent continuous sound level (in decibels measured over a stated period of time)
Lr  Lower Risk
LRC  Local resettlement committee
m  Metre
m³  Cubic metre
MAM  March-April-May
MAREP  Malawi Rural Electrification Project
MBS  Malawi Bureau of Standards
MDHS  Malawi Demographic and Health Survey
MERA  Malawi Energy Regulatory Authority
<table>
<thead>
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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
</tr>
<tr>
<td>SAIEA</td>
<td>Southern African Institute of Environmental Assessments</td>
</tr>
<tr>
<td>SAPPP</td>
<td>Southern African Power Pool</td>
</tr>
<tr>
<td>SLRK</td>
<td>Strategy Leader Resource Kit</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>Sulfur dioxide</td>
</tr>
<tr>
<td>SON</td>
<td>September-October-November</td>
</tr>
<tr>
<td>SSW</td>
<td>South-South-West</td>
</tr>
<tr>
<td>STA</td>
<td>Senior Traditional Authority</td>
</tr>
<tr>
<td>STD</td>
<td>Sexually Transmitted Disease</td>
</tr>
<tr>
<td>SW</td>
<td>South-West</td>
</tr>
<tr>
<td>TA</td>
<td>Traditional Authority</td>
</tr>
<tr>
<td>TCE</td>
<td>Technical Committee on the Environment</td>
</tr>
<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Suspended Solids</td>
</tr>
<tr>
<td>TSX</td>
<td>Toronto Stock Exchange</td>
</tr>
<tr>
<td>TTL</td>
<td>Task Team Leader</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational Scientific and Cultural Organization</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>US $</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>USGS</td>
<td>US Geological Survey</td>
</tr>
<tr>
<td>VC</td>
<td>Very Common</td>
</tr>
<tr>
<td>VDC</td>
<td>Village Development Committee</td>
</tr>
<tr>
<td>VESC</td>
<td>Valuable Environmental and Social Component</td>
</tr>
<tr>
<td>VNRCs</td>
<td>Village natural resource committees</td>
</tr>
<tr>
<td>VU</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>WBG</td>
<td>World Bank Group</td>
</tr>
<tr>
<td>WEHAB</td>
<td>Water, Energy, Health, Agriculture and Biodiversity</td>
</tr>
<tr>
<td>WESM</td>
<td>Wildlife and Environmental Society of Malawi</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WOLREC</td>
<td>Women’s Legal Resource Centre</td>
</tr>
<tr>
<td>WWEC</td>
<td>Water, Waste and Environment Consultants</td>
</tr>
<tr>
<td>WWF</td>
<td>World Wildlife Fund</td>
</tr>
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NON-TECHNICAL SUMMARY

INTRODUCTION

Ensuring that all member countries are interconnected is a high priority for the Southern African Power Pool (SAPP) and therefore, in the SAPP’s 2013 Annual Report, the Mozambique-Malawi Interconnection was identified as a high priority project.

On April 3rd, 2013, the Governments of Malawi and Mozambique signed a power interconnection agreement that includes two phases: (i) the construction of the Mozambique-Malawi 400 kV Transmission Line from the Matambo substation in Tete, Mozambique, to the Phombeya substation in Balaka, Malawi; and (ii) construction of a second transmission line from Balaka to Nacala, Mozambique.

The current report only considers the first phase of this interconnection agreement and concentrates on the Malawi portion. A separate Environmental and Social Impact Assessment (ESIA) report covers the Mozambique section of the line.

The project proponent is Electricity Supply Corporation of Malawi (ESCOM). In accordance with the Environmental Management Act 1996 and the 1997 Guidelines for Environmental Impact Assessment for Malawi, an Environmental and Social Impact Assessment (ESIA) is to be carried prior to construction of the transmission line.

On 9 May 2016, the Client, Electricidade de Moçambique, E.P., also representing ESCOM, commissioned WSP to conduct the ESIA including the Environmental and Social Management Plan (ESMP) and a separate Resettlement Policy Framework (RPF).

The main objectives of the ESIA are to:

- Identify key environmental and social impacts of the Project;
- Develop an Environmental and Social Management Plan (ESMP) that will be put forward to avoid, minimize or compensate the negative aspects and enhance the positive aspects of the Project, as well as mechanisms for their implementation in the Project process.

The ESIA has been developed based on the analysis of the selected project design, for which detailed surveys were carried out, in addition to the collection of available data at the regional and local levels resulting from field visits and consultations with stakeholders. In doing so, the ESMP will:

- Describe management of the mitigation and other environmental and social (E&S) measures to enhance E&S protection;
- Identify responsibilities and timing for implementation of E&S management measures as well as costs for their implementation.

This ESIA was prepared in accordance with the legislative framework of Malawi, as well as with the World Bank Safeguard Policies. When discrepancies were found between the requirements of the Government of Malawi and those of international financial institutions with regards to the environment and population displacement, the strongest have been taken into account.
PROJECT DESCRIPTION

The project is located in the Southern Region of Malawi (see Figure 1), more specifically in the districts of Mwanza, Neno and Balaka. It extends to the northeastern part of Mozambique, in the province of Tete and, more specifically in the districts of Moatize, Changara and in the City of Tete. The proposed powerline has a total length of 218 km of which 76 km is in Malawi (approximately 40%).

The Mozambique-Malawi 400 kV Interconnection Transmission Line starts from the Matambo substation in Tete, Mozambique, to the Phombeya substation in Balaka, Malawi.

In 2003-2004, initial ESIA studies were completed and a preferred corridor was selected, which is the one being considered in the current ESIA Report. Deviations were considered for three sections of the selected corridor, considering technical, environmental and social criteria. These deviations (one in Mozambique and two in Malawi) were developed to avoid the ICVL (International Coal Ventures Private Limited) and Vale operating mining concessions, to bypass the privately owned forested Nankudwe Estate and to avoid human settlement and agricultural lands. The optimized corridor avoids active mining concessions (in Mozambique), the Mwanza southern expansion area (in Malawi) and a gradually developing area located between the M6 National Road and the Nacala railway corridor (in Malawi).

This line starts in the Matambo region (Matambo Substation) in Mozambique, which is supplied in electricity by the Cahora Bassa Hydroelectric plant (CBH). The Mozambique-Malawi Interconnection project is to be composed of a 400 kV double circuit transmission line, with only once circuit installed, which will link the Matambo Substation with the Phombeya Substation. Main characteristics of the proposed typical 400 kV transmission line are presented in Table 1.

Table 1  Characteristics of the Proposed 400 kV Transmission Line

<table>
<thead>
<tr>
<th>TECHNICAL ASPECT</th>
<th>400 KV LINE</th>
</tr>
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<tbody>
<tr>
<td>Total Estimated Length</td>
<td>218 km</td>
</tr>
<tr>
<td>Length in Malawi</td>
<td>76 km</td>
</tr>
<tr>
<td>Typical ROW</td>
<td>55 m</td>
</tr>
<tr>
<td>Type of Towers</td>
<td>Essentially self-supporting towers</td>
</tr>
<tr>
<td>Tower Spacing</td>
<td>450 m</td>
</tr>
<tr>
<td>Height of the Towers</td>
<td>44 to 53 m*</td>
</tr>
<tr>
<td>Width of Base</td>
<td>18 to 23 m</td>
</tr>
<tr>
<td>Type of Conductors</td>
<td>ACSR Tern conductor</td>
</tr>
<tr>
<td>Capacity of transport required</td>
<td>512 MVA per circuits</td>
</tr>
<tr>
<td>Height of line from ground (Minimum)</td>
<td>10 to 12 m</td>
</tr>
</tbody>
</table>

* Regarding river crossings, it is to be noted that it may be required to be higher depending on the river’s width.

Detailed construction schedules for line and substation construction cannot be presented at this time as they will be prepared by the contractor. However, typically, for a 400 kV transmission line of similar length, total construction time is approximately 30 months.

The global project cost for the Malawi line section and the equipment to be installed at the Phombeya substation amounts to approximately US $35,306,000 that is US $30,201,000 for the transmission line and US $5,105,000 for the work at the substation (Fichtner, 2017).
Various activities are associated with the realization of the project. The following table supplies a list of typical activities per project phase with a short description. Additional information is presented in the section 3.4 for some of the most important activities. More detailed information is provided in Technical reports (Fichtner, 2016).

Table 2  Typical Project Activities for the Construction of a Transmission Line

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-construction</td>
<td>Land acquisition: Procedures relating to agreements with landowners.</td>
</tr>
<tr>
<td></td>
<td>Displacement of populations / economic activities: Resettlement process of assets and economic activities of the populations affected by the project.</td>
</tr>
<tr>
<td></td>
<td>Construction:</td>
</tr>
<tr>
<td>Site preparation</td>
<td>Land and technical surveys. Site preparation activities (deforestation, removal of topsoil, excavation, earthworks) for the construction of temporary and permanent components of the project (access roads, storage areas, tower foundations and substations).</td>
</tr>
<tr>
<td>Installation of work site</td>
<td>Settling of workers’ camp and other temporary facilities and infrastructure used during construction (waste, water, energy, etc.).</td>
</tr>
<tr>
<td>Construction works</td>
<td>Construction of the power transmission line and substations.</td>
</tr>
<tr>
<td>Exploitation of borrow pits</td>
<td>Exploitations of granular material for construction.</td>
</tr>
<tr>
<td>Transportation / circulation</td>
<td>Movement of road vehicles, trucks and construction equipment for labour movement and the supply of materials and equipment during construction, including fueling and maintenance of vehicles and machinery.</td>
</tr>
<tr>
<td>Purchase of materials / goods and services</td>
<td>Purchases required for procurement.</td>
</tr>
<tr>
<td>Operation</td>
<td>Operation of the transmission line and substations: Presence and operation of equipment, and inspection and maintenance of conductors, towers and structures in substations.</td>
</tr>
<tr>
<td>Vegetation management</td>
<td>Vegetation clearance associated with the maintenance of the ROW.</td>
</tr>
<tr>
<td>Waste and hazardous materials management</td>
<td>Handling operations and storage of hazardous waste and used during the operation, including oil used in transformers in substations.</td>
</tr>
<tr>
<td>Transportation / circulation</td>
<td>Employee transportation and movement of vehicles in the ROW, including the fueling and maintenance of vehicles.</td>
</tr>
<tr>
<td>Purchase of materials / goods and services</td>
<td>Purchases required for the operation of the power transmission line and substations.</td>
</tr>
<tr>
<td>Decommissioning</td>
<td>Removal of installations: Work related to the dismantling of facilities and activities associated with the final restoration (decontamination of substation sites, re-naturalization, etc.).</td>
</tr>
<tr>
<td>Purchase of materials / goods and services</td>
<td>Purchases required for completion of the decommissioning work.</td>
</tr>
</tbody>
</table>
Figura 1

Ubicación del Proyecto

Componentes del Proyecto

- Subestación Phombeya (En Construcción)

Temas Ambientales y Sociales

- Reserva Forestal o Propiedad Privada

Elementos del Entorno Humano

- Ciudad

- Aeropuerto

- Limites de la Comunidad Tradicional

- Límites Internacionales

Infraestructuras

- Vía Principal

- Vía Secundaria

- Ferrocarril

- Río

Medio Ambiente

- Cementerio

- Borehole

- Iglesia

Recursos Afectados por la Comunidad

Medio Ambiente Humano

Recursos Afectados por la Comunidad

Borehole

Iglesia

Cementerio
PROJECT’S AREAS OF INFLUENCE

A practical approach for this ESIA and RPF was applied by using the center of a 2 km wide corridor as a proxy alignment to conduct the assessment. The actual alignment and tower locations will be determined as an outcome of the geological and topographical surveys leading to the preparation of a detailed design that will define the positioning of the tower footing.

The baseline description and the impact assessment of the project is based on the delineation of two study areas that cover all physical, biological and social elements that may be directly or indirectly affected by the project or that could affect its implementation, in all of its phases. When considering the project’s direct impacts outside of the footprint area, it is useful to separate the biophysical and socioeconomic impacts. Therefore, the project’s area of direct influence (ADI) is delineated as follows:

- **Biophysical environment**: a 300 m wide and 76 km long corridor, centered on the project’s alignment, as most of the direct biophysical impacts are expected to be felt in the immediate surroundings of the footprint area.
- **Socio-economic environment**: the communities and their property crossed by the proposed ROW. Even if employment and economy stimulation may extend to other communities, direct socioeconomic impacts are expected to be felt mostly by the villages and communities crossed, or near, the alignment. However, a map of community boundaries is not available for the project area and therefore the socioeconomic ADI is illustrated using a 2 km wide corridor centered on the line’s route.

The project’s Area of Indirect Influence (AII) will be defined as follows:

- **Physical environment**: a 2 km wide and 76 km long corridor, centered on the project’s alignment, as most of the indirect physical impacts are expected to be felt in a corridor surrounding the new transmission line.
- **Biological environment**: the area of indirect influence includes areas where the natural environment shows a higher ecological integrity (e.g. hotspot biodiversity area) and anticipated to host species transitioning inside the project area.
- **Socioeconomic environment**: the affected districts (Mwanza, Neno and Balaka) as benefits and impacts from project-induced changes in the ADI are likely to extend to other communities within these territories.

BASELINE CHARACTERIZATION

Physical Environment

In Malawi, the study area has a Tropical Savannah Climate (according to the Köppen-Geiger classification scheme), characterized by two seasons (wet and dry). The wet season starts in November and ends in March, while the dry season occurs from April to October. Winds have average speeds of 5 to 12 km/hr and are largely from the south and south-east.

Climate changes are essentially perceptible through increased extreme weather conditions and temperature increases (Royal Norwegian Embassy in Lilongwe, 2015). These changes affect the project’s area through variations in precipitations, evaporation rates and soil moisture.

The project area crosses two topographical areas: the Rift Valley Escarpment (500 to 1,000 m), near the Mwanza border, and the Plateau Area (less than 500 m), as it stretches towards Balaka (Ministry of Irrigation and Water Development, 2011).

Seismic activity is essentially associated with the presence of the Great Rift Valley and more frequent in the northern part of the country and around Lake Malawi. The Study area is characterized with few epicentres (Geological Survey (USGS) website, consulted in 2016).

Pre-Cambrian to lower Palaeozoic crystalline basement rocks occupy almost the entire line corridor, from the north of the Zambezi River to Phombeya (Malawi Department of Water, 1986). Two major
soil types dominate the project area, namely the Eutric Cambisols, known as lithosols, and the Chromic Luvisols, generally known as latosols.

The project area is in the Shire River Basin. Major rivers including the Mwanza, Mpandadzi, Wamkurumadzi, and Lisungwi rivers originate from the Kirk Range, north-west of Neno (Government of Malawi, 2012a,b). There are also a number of small rivers, which dry up during the dry season.

In Malawi, ambient air quality is regulated by the Malawi Bureau of Standards (MBS) under the MS 740:2005 Ambient Air – Methods of Sampling and Test. In the project’s area of direct influence, there are no significant air pollutant emission sources; the main sources that can be associated with the project’s area include road and rail traffic, emissions generated by agriculture, bush fires and dust dispersion due to wind.

The general existing noise levels associated with the proposed corridor are currently generated by vehicle movements on the M1, the M6 and other local access roads, by rail traffic on the Nacala railway corridor as well as by other local human activities conducted near surrounding settlements.

**Biological Environment**

The study area is located inside the Zambezian and Mopane woodland ecoregion. The ecoregion is characterized primarily by woodlands dominated by mopane trees (*Colophospermum mopane*).

Four vegetation communities were recognized within the Study Area. These vegetation communities as well as species diversity identified during field surveys are the following:

- **Dry Deciduous *Brachystegia*/Savannah Woodland** (132 species of plants belonging to 39 families);
- **Open Semi-deciduous Savannah Woodland of Plateaux** (61 species belonging to 26 families);
- **Open Deciduous Savannah Woodland of hills and scarps** (82 flora species belonging to 39 families);
- **Agricultural crops** (25 flora species belonging to 21 families).

**Table 3  Vulnerable Flora Species in Relation to the IUCN National Red-List**

<table>
<thead>
<tr>
<th>Name of species</th>
<th>National red list category</th>
<th>IUCN (globally) category</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pterocarpus angolensis</em></td>
<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
<tr>
<td><em>Afzelia quanzensis</em></td>
<td>Vulnerable (VU)</td>
<td>Not evaluated</td>
</tr>
<tr>
<td><em>Dalbergia melanoxylon</em></td>
<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
</tbody>
</table>

Three surveyed species are listed in the National Red-List as vulnerable (*Pterocarpus angolensis*, *Afzelia quanzensis* and *Dalbergia melanoxylon*). A total of 147 flora species belonging to 44 families were recorded to be of use-value to communities living in the Study area. Malawi has approximately 635 species of birds (Birdlife, 2017). Of these, 107 are non-breeding migrants or vagrants, leaving more than 450 species which breed in the country. There are 7 species listed as threatened for Malawi and 12 species of conservation concern (BirdLife International, 2004). There are 4 endemic subspecies that have been recorded in country (Kaliba, 2005). A total of 66 bird species were recorded from the study area during the field surveys. One species listed as endangered in the National red-list has been surveyed, *Apalis flavida*.

A total of 29 species of small to large mammals were recorded from the study area during the field surveys. Of these, 8 species were identified during the field survey while 19 were reported to occur in the study area by local communities that were interviewed during the field survey. Twenty-five (25) species of reptiles and 13 species of amphibians were recorded and reported inside the study area. In terms of aquatic fauna, a total of 31 species of fish are present or susceptible to be present inside the study area.
Socio-Economic Environment

The project crosses three (3) districts of the Southern Region, namely those of Mwanza, Neno and Balaka. According to the National Statistical Office of Malawi, the Southern region’s projected population was of 6,890,375 inhabitants in 2014. The Southern region has a much higher population density (184 ppsk) than the national average. However, the population density of the project’s affected districts is lower that the Southern region average. Mwanza has the lowest density (40 ppsk) followed by Neno (73 ppsk) and Balaka (145 ppsk) (NSO, 2009a). Malawi has a relatively larger population in the younger age groups. Almost 48 % of the population is less than 15 years of age and the median age is 17. The members of the households affected by the project are young. About 30.0% are between 16 and 35 years of age and 38.7% are between 5 and 15 years of age.

Malawi is populated by a mosaic of ethnic groups. The dominant ethnic groups within the Southern region are by far the Lomwe (36.6%) and the Yao (24.6%) reaching over a million people each (NSO, 2009a). In the project area, Yao and Ngoni are the most represented. The heads of households affected by the project are mainly Chewa (36.1%) or Ngoni, (34.2%). About 15.8% of heads of households are of Lomwe ethnic descent.

The Southern region has the largest poverty rate (63%) of the country implying that three (3) out of five (5) people live in poverty in the rural areas of the Southern region. Analyses show that poverty rates are higher than average among female and less educated heads of households and that poverty increases with the size of households (NSO, 2012). A clearmajority (88.0%) of heads of households affected by the project are farmers. The land holding characteristics are constant among the PAPs from different traditional authorities, ranging from 1.6 to 2.0 parcels on average. The average land parcel areas vary from 809 m² to 10,522 m² on average, by traditional authority.

It is further noted that 43% of households engaged in agricultural activities are engaged in both livestock rearing and crop cultivation (NSO, 2010). Ownership of livestock, poultry and fisheries, at household levels, is important for food security and assets to be sold if needs arise. Goats (25.2%) and chickens (24.1%) are the main animals possessed by the affected stockbreeders.

Fishing also contributes to the livelihood of the communities in the project districts. Fish is a source of income to fishermen and fish vendors. In the study area, fish is mainly sourced from the Shire River. The preferred route also crosses the Wamkurumadzi River south of Mwanza District, and Lisungwi River to the east of Neno District, which are also sources of fish. Trading and tourism are two other sources of income for the households.

Most of the areas along the line corridor are rural, characterized by basic infrastructure and services. The main community infrastructure includes schools and health facilities. The Southern Region Water Board supplies water in some parts of the project districts. In the rural areas, the people source water from boreholes, rivers and watershed areas. There is a general shortage of water during the dry season in both urban and rural settlements as the rivers dry up and the groundwater table lowers. The study area experiences high temperatures in the summer. As for primary housing residences of the affected PAPs, the main materials for their walls are: burnt bricks (62.0%) and mud bricks (22.9%). The predominant roof materials of these structures are thatch (52.6%) and corrugated iron sheets (46.6%).

About 14 villages among the 32 traversed by the wayleave are connected to the power grid. However, the dominant energy source for cooking among the affected households of the project area is firewood (biomass): 91.7% of affected households use this source. A small portion of affected households also uses charcoal (8.3%) for meal preparations. A great number of households (89.1%) also uses torches for light.

STAKEHOLDER ENGAGEMENT

A public information and consultation process was implemented to support the development of the Project’s ESIA and RPF studies. General objectives of this process were to:

→ Ensure the early and informed consultation of stakeholders at key stages of the ESIA and RPF, in order to improve their results and increase the credibility of the process.
Ensure compliance with national and international requirements for stakeholder engagement and public consultation during ESIA studies for major projects.

Ensure the ESIA helps to consolidate the efforts made by ESCOM in order to establish lasting relationships with affected communities and other stakeholders.

Stakeholder groups that were engaged through the development of the EIA are relevant ministries and agencies at national level, regional government, district governments, customary authorities, affected communities, displaced households, industrial and commercial stakeholders and NGOs.

Three stakeholder information and consultation rounds were conducted through the development of the EIA and RPF studies. Those were planned according to key stages, or decision moments, throughout the study where the informed participation of stakeholders was expected to make the most significant contribution to the on-going analysis, namely the environmental and social scoping stage (1st round), the assessment of the preliminary line route and of PAPs’ needs and preferences (2nd round) and the disclosure of the EIA, ESMP and RPF draft reports (3rd round).

Stakeholders have highlighted the following key concerns and recommendations:

- Affected communities must benefit from the project, either through job opportunities, access to electricity or community development assistance (education, water and sanitation);
- Recent resettlement experiences in the area with other projects have created very high expectations in local communities with regards to compensations;
- Land-for-land compensation strategies are considered difficult to implement in Malawi because people expect money and prefer to look for replacement land themselves;
- Compensations for affected municipal lands through public investment agreements;
- Provide assistance, sensitization and follow-ups with PAPs to make sure the money is actually used to replace what was lost;
- Empower women through information, sensitization and transparency. Compensation should be paid to “families”, rather than to the head of household;
- Need to integrate sensitization and prevention measures for potential social disturbances often associated with construction works and the presence of outside workers, including HIV/AIDS, child labor, sexual abuse of children, prostitution and unplanned pregnancies;
- Involvement of District Services in next phases of Project development;
- Reforestation programme to compensate for vegetation losses.

IDENTIFICATION OF POTENTIAL IMPACTS

The identification of the direct/indirect, positive/negative, trans-regional, social/economic and physical/ecological impacts have been established using an “environmental matrix” opposing, on the one hand, the potential sources of impacts tied to the transmission line’s pre-construction, construction, operation and decommissioning, and, on the other hand, all of the biophysical and socioeconomic components of the project.

The positive impacts that are expected with the project implementation are the followings:

- Positive opportunities for PAPs and communities can be in the form of temporary employment and business opportunities during the construction and operation phases,
- Increased electricity supply to communities and households. Many significant long-term positive indirect impacts could arise with the foreseen rural electrification projects.
- A potential co-benefit of rural electrification is the possibility to provide rural households with the opportunity to use electricity for their energy needs as an alternative to firewood and charcoal. The project could help reduce the deforestation rate in the project area.
- Improved availability and reliability of energy can also improve storage and processing of agricultural products, increasing their market value and/or extending their preservation periods.
Rural electrification is at the center of poverty reduction programs and could support rural economic development through the provision of energy to power water pumps and grain mills, as well as favour the development of tourism, local industries, etc.

Local electrification has the potential to significantly reduce women’s workloads through the usage of water pumps and electricity.

Electrification could support investments in education and strengthen capacity building efforts to overcome critical constraints in the implementation of development programs.

Negative impacts associated with the project implementation are summarized in the following tables for both construction and operation phases.
<table>
<thead>
<tr>
<th>Component</th>
<th>Potential Impacts</th>
<th>Intensity</th>
<th>Extent</th>
<th>Duration</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>• Soil erosion in erosion-prone areas; • Soil compaction in work areas; • Loss of organic layer in areas where excavation and backfilling activities are held; • Changes in soil chemical properties and risk of soil contamination.</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Water resources</td>
<td>• Changes in hydrology; • Modifications of surface water quality with a risk of contamination; • Modifications of groundwater quality with a risk of contamination.</td>
<td>Low</td>
<td>Limited</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Air quality</td>
<td>• Temporary air quality deterioration</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Noise and vibrations</td>
<td>• Increase in noise and vibration levels.</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Terrestrial flora</td>
<td>• Permanent loss of natural habitat area and of its associated flora; • Modification of species composition in flora communities present in the project area; • Potential impacts on vulnerable species communities, such as Pterocarpus angolensis, Dalbergia melanoxylon and Afzelia quanzensis; • Loss of ecosystem services; • Increased pressure on natural resources in some areas. Loss of individuals from species of use-value; • Potential invasive species introduction and risk of spread.</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Terrestrial fauna</td>
<td>• Terrestrial habitat fragmentation and degradation over small areas at the project site; • Modification in habitat composition through introduction of flora invasive alien species; • Modification of species composition in fauna communities present in the project area; • Local reduction of fauna density for species of higher use value.</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Avifauna</td>
<td>• Modification and degradation of bird habitat; • Disturbances and modification of local communities. • Potential habitats losses or degradation for the threatened Apalis flavida (Yellow-breasted Apalis)</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Aquatic habitats and associated fauna</td>
<td>• Local degradation or loss of aquatic and semi-aquatic habitats and associated fauna and flora disturbances; • Impairment of hydrological dynamics leading to disturbances and alteration of aquatic habitats; • Increased pressure on natural resources, especially in areas where new access is created.</td>
<td>Low</td>
<td>Limited</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Employment and economic development</td>
<td>• Disruption of farming activities by construction works • Loss of arable, grazing and pastoral lands</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Component</td>
<td>Potential Impacts</td>
<td>Intensity</td>
<td>Extent</td>
<td>Duration</td>
<td>Importance</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td><strong>Land use</strong></td>
<td>• Inflation risk; • Increase in pressure on resources.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Restriction to land uses within the line’s ROW; • Loss of arable, grazing and pastoral lands; • Disruption of farming activities by construction works.</td>
<td>Medium</td>
<td>Limited</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Built environment</strong></td>
<td>• Houses and other buildings located within the ROW will need to be relocated to clear the ROW.</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
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<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>• Need for relocation of existing infrastructure; • Increased traffic and disturbance of traffic flow; • Damage to existing infrastructure.</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td><strong>Gender aspects and vulnerable groups</strong></td>
<td>• Risk of sexual abuse by workers and especially child abuse; • Women being sidetracked from the compensation and decision-making processes; • Disturbance of women’s subsistence activities; • Marginalization of women during the employment process; • Increased marginalization of vulnerable groups.</td>
<td>Medium</td>
<td>Local</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Communities and social cohesion</strong></td>
<td>• Land use and compensation disputes, reviving old quarrels (land resource and power conflict); • Tensions over the awarding of jobs and contracts; • Tensions with workers from outside; • Increased marginalization of vulnerable groups; • Inadequate communication with communities and stakeholders.</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td><strong>Cultural and archaeological heritage</strong></td>
<td>• Potential disturbance or destruction of archaeological sites and/or artifacts; • Destruction or potential disturbance of burials and/or sacred sites.</td>
<td>Low</td>
<td>Limited</td>
<td>Long</td>
<td>Minor</td>
</tr>
<tr>
<td><strong>Landscape</strong></td>
<td>• Temporary degradation of landscape at worksite.</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td><strong>Safety and public health</strong></td>
<td>• Risk of increased incidences of STDs and HIV/AIDS; • Risk of sexual abuse by workers and especially child abuse; • Risk of abuse by contractors hiring underage workers (child labor); • Increased pressure on community health services; • Accidents and physical injuries involving local residents; • Risk of accidents due to project related traffic; • Increased stress related to nuisances (noise, dust, air pollution).</td>
<td>Medium</td>
<td>Local</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Worker’s health and safety</strong></td>
<td>• Absence of adherence to labor standards and well-being of construction workers; • Work related injury or health effects.</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
</tbody>
</table>

1 The evaluation is undertaken after the application of mitigation measures and therefore represents the project’s residual impact on the environmental or social component.
<table>
<thead>
<tr>
<th>Component</th>
<th>Potential impacts</th>
<th>Intensity</th>
<th>Extent</th>
<th>Duration</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>Changes in soil chemical properties and risk of soil contamination.</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Modifications of surface water quality with a risk of contamination; Modifications of groundwater quality with a risk of contamination.</td>
<td>Low</td>
<td>Limited</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Water resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air quality</td>
<td>Temporary air quality deterioration.</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Noise and vibrations</td>
<td>Increase in noise and vibration levels.</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Minor</td>
</tr>
<tr>
<td>Terrestrial flora</td>
<td>Impairments of natural habitats and associated flora communities; Potential introduction of invasive alien species (IAS).</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Terrestrial fauna</td>
<td>Risks of bat collisions; Modification and alteration of terrestrial fauna habitats, with associated modifications in fauna communities.</td>
<td>Medium</td>
<td>Limited</td>
<td>Long</td>
<td>Minor</td>
</tr>
<tr>
<td>Avifauna</td>
<td>Bird collisions; Modifications and alteration of bird habitats, with associated modifications in fauna communities.</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Aquatic habitats and associated fauna</td>
<td>Disturbances of the water’s physical and chemical characteristics causing modifications in aquatic habitats and its associated fauna; Effects on marshland specialist species and species of conservation interest; Increased pressure on natural resources, especially in areas where new accesses have been created.</td>
<td>Low</td>
<td>Limited</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Employment and economic development</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use</td>
<td>Land use restriction in the ROW and substation; Occasional infringement of machinery on crops for maintenance purposes.</td>
<td>Medium</td>
<td>Limited</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Built environment</td>
<td>Destruction of illegally built primary or secondary structures in the ROW.</td>
<td>Medium</td>
<td>Limited</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Radio and television signal interruption; Interference with train operating systems; Collisions between line and towers with air traffic.</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Gender aspects and vulnerable groups</td>
<td>Effects on women due to crop loss.</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Communities and social cohesion</td>
<td>Tension between local population and outside workers; Land use disputes, reviving old quarrels (land resource and power conflicts).</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Cultural and archaeological heritage</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Component

<table>
<thead>
<tr>
<th>Potential impacts</th>
<th>Intensity</th>
<th>Extent</th>
<th>Duration</th>
<th>Importance 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Permanent alteration to the landscape;</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>• Potential degradation of sensitive scenic areas.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Safety and public health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Risk of electrocution caused by equipment breakdowns, illegal connections, steel thefts and all other forms of unsafe contacts;</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>• Accidents and physical injuries involving local residents;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Increased stress related to nuisances;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Risk of accidents due to project related traffic.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker's health and safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Absence of adherence to labor standards and well-being of construction workers;</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>• Risk of accidents and physical injuries involving local workers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The evaluation is undertaken after the application of mitigation measures and therefore represents the project's residual impact on the environmental or social component.

## CUMULATIVE IMPACTS

The project’s regional area comprises existing infrastructure and activities that may lead to cumulative impacts with the Mozambique-Malawi Interconnection project. The accumulation of linear infrastructures inside a landscape may lead to the territory and natural habitat fragmentation. Construction works and the planned Kammwamba coal fired plant could threat the physico-chemical properties of air, soils and water and generate nuisance.

Also, employment opportunities and improvement of infrastructure may lead to population influx in the area, increasing the negative impacts on land use change, the pressures on land and natural resources. Development activities and the demographic growth contribute to the densification of human presence and to the apparition of new land uses within the regional area and a decrease in natural habitat areas.

## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESMP aims at defining and structuring the measures to be implemented in order to mitigate or optimize the project’s potential impacts. For each measure, responsibilities and costs are presented.

The environmental management plan also comprises specific management plans which are:

- Waste Management Plan;
- Revegetation Plan;
- Erosion and Sediment Control Plan
- Cultural and Archaeological Heritage Management Plan;
- Emergency Response Plan;
- Communication Plan;
- Worker Health & Safety Management Plan;
- Education and Environmental Awareness Plan.

On a larger scale, the ESMP establishes responsibilities for the implementation and oversight of the proposed environmental and social management measures. Responsibilities are to be shared among several stakeholders, including relevant ministerial authorities, competent authorities, ESCOM and its contractors.
The ESMP also provides guidelines for a comprehensive monitoring plan which shall ensure, on an ongoing basis, the adequate implementation of the proposed environmental and social management measures. The ESMP includes both Environmental and Social Surveillance program for the construction phase as well as the Environmental and Social Monitoring program to be implemented during the operation phase. They both propose a set of performance indicators and a clear formulation of expected results to be achieved or maintained. Thus, it will facilitate ongoing adjustments to initial mitigation/optimization measures, within an adaptive management approach.

A section is dedicated to the assessment of the institutional capacity building and training needs and a capacity building and training program is proposed to cover identified needs.

The ESMP also comprises a schedule providing an overview of the key logical steps necessary to ensure the efficiency of the ESMP, avoid redundant efforts and to make sure that information is shared amongst all key project parties. In addition, it presents a summary of the main costs for the implementation of resettlement aspects, plans, programs and some management measures. The estimated costs for the ESMP, including RAP implementation, is US $3,979,781 excluding the costs of measures to be implemented by the contractor and ESCOM and members of the Project Implementation Unit operational budget.
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WSP
Project No. 161-07023-00
May 2019

Electricity Supply Corporation of Malawi Limited
Mozambique-Malawi 400 kV Interconnection Project
Environmental and Social Impact Assessment Study
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1 INTRODUCTION

Malawi is part of the Southern African Power Pool (SAPP) whose purpose is to meet the electricity needs of its member countries, ensuring that their production is based on renewable natural resources without unsustainable effects on the environment.

In 1995, at the time of the creation of the SAPP, only the electrical utilities of nine of the twelve members (countries) were already interconnected that is, Botswana, the Democratic Republic of Congo, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. The remaining member countries that would need to be connected were Angola, Malawi and Tanzania. The SAPP’s 2013 Annual Report the Mozambique-Malawi Interconnection was identified as a high priority project since it ensures that all member countries are interconnected.

On April 3rd, 2013, the Governments of Malawi and Mozambique signed a power interconnection agreement that includes two phases: (i) the construction of the Mozambique-Malawi 400 kV transmission line from the existing Matambo substation in Tete - Mozambique, to the projected Phombeya substation in Balaka - Malawi; and (ii) the construction of a second transmission line from Balaka - Malawi, to Nacala - Mozambique.

The current report only considers the first phase of this interconnection agreement and concentrates on the Malawi portion. A separate Environmental and Social Impact Assessment (ESIA) report covers the Mozambique section of the line.

1.1 IDENTIFICATION OF THE PROMOTER

The project’s proponent is Electricity Supply Corporation of Malawi (ESCOM), whose contact details are provided in the Table 1-1.

ESCOM’s mission is to procure, supply and trade quality, reliable and affordable electricity through sustained growth, continuous innovation and a motivated staff to the satisfaction of our customers and other stakeholders, including the regional market and has the continuous goal of improving customer service and service delivery, electricity access rate, and communication and networking with stakeholders.

Table 1-1 Promoter Contact

<table>
<thead>
<tr>
<th>Promoter of the project</th>
<th>Electricity Supply Corporation of Malawi (ESCOM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>P.O. Box 2047, Blantyre MALAWI</td>
</tr>
<tr>
<td>Person of contact</td>
<td>Michael Gondwe, Project Manager</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:mgondwe@escom.mw">mgondwe@escom.mw</a></td>
</tr>
</tbody>
</table>

1.2 IDENTIFICATION OF THE ENVIRONMENTAL CONSULTANT

WSP Canada Inc. (hereinafter designated as WSP) is a wholly-owned subsidiary of WSP Global Inc., one of the world’s largest professional services, which relies on over 35,000 employees, including engineers, technicians, scientists, architects, planners, surveyors and some 2,000 environmental specialists.

WSP is a publicly listed company on the Toronto Stock Exchange (TSX) under the WSP symbol. In the last decade, building on its environmental and social impact assessment (ESIA) expertise gained in Canada, WSP’s experts have contributed to numerous ESIA & Resettlement Action Plan / Resettlement Policy Framework (RAP/RPF) studies of international power transmission and interconnection projects in Central, Eastern and Western African countries compliant with various national legislations and international best practices. WSP contact information regarding this study is presented in Table 1-2.
Table 1-2  WSP Contact

<table>
<thead>
<tr>
<th>Consultant for the project</th>
<th>WSP Canada Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>1600 Rene-Levesque Blvd. W. 16th Floor, Montréal (Quebec), H3H 1P9, CANADA</td>
</tr>
<tr>
<td>Contact Person</td>
<td>Jean-Marc Evenat, Project Director / Lead Environmental Planner</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:jean.marc.evenat@wsp.com">jean.marc.evenat@wsp.com</a></td>
</tr>
</tbody>
</table>

WSP is supported in Malawi by its sub-consultant Water, Waste and Environment Consultants (WWEC), which is based in Lilongwe, Malawi. WWEC is a private consulting firm, registered in 2005 under the Business Names Registration Act (Cap. 46.02), and with the National Construction Industry Council (NCIC). It is composed of experienced as well as young and dynamic staff offering theoretical knowledge in diversified engineering and environmental fields. The firm has been active in projects all over Malawi and bordering countries, amongst other ESIA, preparation of RPF, environmental and social management frameworks and national capacity assessment for biodiversity.

1.3 OBJECTIVES OF THE STUDY

In accordance with the Environmental Management Act 1996 and the 1997 Guidelines for Environmental Impact Assessment for Malawi, an ESIA is to be carried prior to construction of the transmission line. On 9 May 2016, the Client, Electricidade de Moçambique, E.P., also representing ESCOM, commissioned WSP to conduct the ESIA including the Environmental and Social Management Plan (ESMP) and a Resettlement Policy Framework (RPF).

The RPF are prepared as separate documents for Mozambique and Malawi sections of the transmission line.

The main objectives of the ESIA are to:

- Identify key environmental and social impacts of the Project;
- Develop an Environmental and Social Management Plan (ESMP) that will be put forward to avoid, minimize or compensate the negative aspects and enhance the positive aspects of the Project, as well as mechanisms for their implementation in the Project process.

The ESIA has been developed on the basis of the analysis of the selected project design, for which detailed surveys were carried out, in addition to the collection of available data at the regional and local levels resulting from field visits and consultations with stakeholders. In doing so, the ESMP will:

- Describe management of the mitigation and other environmental and social (E&S) measures to enhance E&S protection;
- Identify responsibilities and timing for implementation of E&S management measures as well as costs for their implementation.

This document presents the final ESIA report. As mentioned previously, the ESIA was prepared in accordance with the legislative framework of Malawi, as well as with the World Bank Safeguard Policies. When discrepancies were found between the requirements of the Government of Malawi and those of international financial institutions with regards to the environment and population displacement, the strongest have been taken into account.

1.4 REPORT STRUCTURE

This report is organized in nine chapters: Chapter 1 is the present introduction; Chapter 2 gives a description of policy, administrative and legal framework within which the project will operate; Chapter 3 deals with the project background and description; Chapter 4 presents the project’s area of influence; Chapter 5 details the baseline or existing conditions of the project site; Chapter 6 presents the results of the stakeholder consultations. Chapter 7 presents an impact assessment for the project, as well as a project alternatives analysis; Chapter 8 presents the Project ESMP. Chapter 9 presents the report conclusion. Finally, Chapter 10 provides the references cited throughout the report.
1.5 PROJECT LOCATION

The project is located in the Southern Region of Malawi (see Figure 1-1), more specifically in the districts of Mwanza, Neno and Balaka. It extends to the northeastern part of Mozambique, in the province of Tete and, more specifically in the districts of Moatize, Changara and in the City of Tete. The proposed powerline has a total length of 218 km of which 76 km is in Malawi (approximately 40%).

1.6 METHODOLOGY OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In order to implement the proposed Mozambique-Malawi Interconnection Project, ESCOM must obtain an approval from the licensing authorities, that is, from the Environmental Affairs Department upon completion of an Environmental Impact Assessment in accordance with the Environmental Management Act of 1996.

The EIA process is a preventive environmental management tool. Its aim is to identify and assess, both quantitatively and qualitatively, the positive and negative environmental effects of a proposed project, and to define the necessary mitigation measures, so as to avoid, reduce or eliminate the negative effects and optimize the positive ones.

This section outlines the methodology used to complete the ESIA and the process that has been followed to date. The approach to this ESIA complies with the applicable Malawian environmental legal requirements as well as the international standards.

Article 24 of the Environmental Management Act of 1996 specifies the types and sizes of activities that require an ESIA before they are implemented. The Director of Environmental Affairs (DEA), after reviewing the Project Brief presented in September of 2016 by ESCOM confirmed that the Mozambique-Malawi Interconnection project was required to initiate an ESIA process. This process is composed of three phases, that is:

- **Pre-feasibility phase**: Preparation of the project brief to present the project to the licensing authorities.
- **Feasibility phase**: Preparation of the scoping and of the proposed terms of reference (ToR) to be approved by the licensing authorities and realization of the ESIA report. The scoping report and associated ToR have been completed. This ESIA report is undertaken following the approval of the ToR by the EAD.
- **Implementation and monitoring evaluation phase**: Once the ESIA is accepted by the licensing authorities, the project can be initiated as well as all associated monitoring activities.

The three phases of the ESIA process are illustrated in the following figure and described in detail in the following sections.

1.6.1 PRE-FEASIBILITY PHASE

The first step of the ESIA process is the production of the project brief and its submittal to the Environmental Affairs Department (EAD) to assist them in determining if the project should be submitted to an ESIA process. The Project Brief contains information regarding the proposed project and on the biophysical and socioeconomic components of the study area.

The Project Brief was submitted to the EAD in September 2016, it was confirmed that the project must undergo the comprehensive ESIA process.
1.6.2 FEASIBILITY PHASE

1.6.2.1 SCOPING STUDY

The scoping study’s main goals were to (i) determine potential fatal flaws associated with the project’s activity and (ii) define the scope of the environmental assessment to will be undertaken in the ESIA.

The scoping report was prepared through literature review and a reconnaissance survey (July and August 2016), inside the project’s areas of influence. Secondary data was gathered from a variety of sources: other ESIA studies undertaken in the Southern region of Malawi, information provided by several governmental and non-governmental institutions and organizations, as well as maps and satellite imagery.

The following information relevant to the realization of the ESIA was provided:

- Description of the legal framework and national and international administrations, relevant to the project, such as the applicable laws and regulations and other environmental requirements within Malawi and the directives of international organizations such as the World Bank (WB). It also presented relevant international conventions for which Malawi is signatory.

- Preliminary definition of the project’s areas of influence.

- Description of the activities to be carried out for the entire project (pre-construction, construction, operation and decommissioning), as well as alternatives considered.

- Brief baseline description of the affected biophysical and socioeconomic environments.

- Preliminary identification of potential impacts, negative or positive, that the proposed development might have on the environment and the communities.

- Identification and assessment of any potential fatal flaws (environmental and social risks) that may threaten the viability of the project.

- Identification of the detailed studies to be undertaken in the ESIA report and development of the respective ToR.
Figure 1-1
Project Location

Sources:
Preparation: G. Pothier
Drawing: V. Venne
Verification: J.-M. Evenat

Environments and Social Issues

Vale Coal Mine’s Active Concession
Benga Mine’s Active Concession

Infrastructures

City
District Boundary
International Boundary

Airport
Existing Substation
Existing Transport Line, 220 kV
Existing Transport Line, 66 kV
Primary Road
Secondary Road
Railroad

Project Components

Phombeya Substation (Under Construction)
Proposed Line Route
Study Area (2 km)

Environmental and Social Issues

Forest Reserve or Private Estate

Human Environment

River

Mozambique
Malawi

M1
M2
M3
M4
M5
M6
M8

Tete
Chingozi
Airport
Chileka
International
Airport
Chichewa
Airport

Antananarivo
Antananarivo

Mwanza
Mwanza

Chikwawa
Chikwawa

Chilabombwe
Zambiri

Zambia
Zambia

South Africa
South Africa

Thyolo
Thyolo

Changara
Changara

Zambiri
Zambiri

Chanika
Chanika

CONDEDEZ RIVER
ZAMBEZI RIVER
NECOMBEZE RIVER
MINJOVA RIVER
METANGUA RIVER
SHIRE RIVER
MWANZA RIVER

1:600 000
The scoping report includes public consultation that aims at presenting the proposed project to all Interested and Affected Parties (I&APs) and identifying issues and concerns about the proposed project. The main objectives of the public consultation process (PCP) are to:

- Identify I&APs and compile an I&AP database, that will be updated during the ESIA.
- Provide I&APs with information regarding the proposed project and its potential impacts.
- Provide I&APs with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed project.
- Elicit comments from I&APs with regards to the ToR.
All the PCP activities undertaken, including the issues and comments raised by I&AP’s, are documented in the PCP Report. The conclusions of the PCP report were integrated into the main scoping report, as to reflect and respond to the issues and concerns collected through public consultation.

The final version of the scoping report, including the proposed ToR for the ESIA study and the PCP report, were submitted for review and approval to the EAD on January 31st, 2017. Comments from EAD were received on February 21st, 2017 (see Appendix 1). Revised Scoping report was transmitted on May 19th, 2017.

1.6.2.2 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

The completion of the ESIA is the final step in the second phase (feasibility). This report is the realization of the ESIA as required by law. The main goals are to undertake the specialist studies, in accordance with the ToR approved by the EAD, assess the environmental impacts associated with the proposed project, define the mitigation measures for adverse impacts and the enhancement measures for positive impacts, and integrate those measures in an ESMP, as clear, practical measures applicable to the local conditions, based on best practice and relevant legislations.

This ESIA report will support the relevant authorities in the decision-making process, resulting in the environmental licensing or rejection of the proposed project.

➔ **Baseline studies**: these studies are undertaken to review and ascertain existing environmental and social conditions relevant to the project’s influence area and to highlight receptors and resources sensitive to potential impacts.

➔ **Assessment of impacts and elaboration of mitigation measures**: the focus is to identify and evaluate the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimize, reduce or compensate for any adverse environmental impacts and to report the significance of residual impacts that occur following mitigation.

➔ **Environmental and Social Management Plan**: the identified mitigation measures are integrated into a suite of customized management plans, addressing a wide range of subjects. The ESMP is developed to guide the environmental and social management during the construction and operational phases of the project. This is the mechanism whereby mitigation and the monitoring of environmental impacts (as identified in this ESIA report) are integrated with the project’s implementation.

The ESIA report includes the following sections:

➔ Non-technical summary, outlining the main issues, findings and recommendations of this report.

➔ Information regarding the proponent of the project, as well as the consulting team responsible for the ESIA process.

➔ Legal framework of the activity and its context within the existing planning instruments.

➔ Description of the activities to be carried out under the proposed project, for all phases (pre-construction, construction, operational and decommissioning), as well as alternatives considered.

➔ Definition of the project’s areas of influence.

➔ Baseline description of the affected biophysical and socioeconomic environments.

➔ Identification and assessment of the project’s environmental impacts.

➔ Definition of mitigation measures.

➔ Environmental and social management plan (ESMP).

Some of the key aspects of the impact assessment phase, such as the specialist studies, the development of the ESMP and the public consultation process, are further described in the following paragraphs.
Several specialist studies have been undertaken during the ESIA, in accordance with the ToR, developed in the scoping report and approved by EAD. These more detailed studies focus on the environmental and social aspects that could be impacted by project activities. The specialist studies completed for the ESIA and their scope are presented in the EAD approved ToR (see Appendix 2 of this report).

Two consultation rounds were undertaken during the development of this ESIA. The first one is through the socioeconomic survey process and occurred in group discussions with community leaders of affected villages, as well as in interviews with heads of potentially-displaced households. Its aims are to involve communities in the identification of sensitive elements within the final transmission line corridor and to discuss options for compensations and resettlement assistance with communities. The other round of consultations identified the final line routing and disclosed the key elements of the draft ESIA and RPF reports. It was completed through meetings with district executive committees and public assemblies in affected districts formally publicized beforehand (15 days) through local media.

This final ESIA report integrates the comments and inputs from the I&APs. Together with the RPF it is submitted to EAD for consideration

1.6.2.3 IMPLEMENTATION AND MONITORING EVALUATION

Once the ESIA is accepted by the licensing authorities, the project will be initiated, as well as all associated monitoring activities. The ESMP will guide the proponent. There are likely to be other licensing conditions that will need to be integrated. These will need to be further developed into a Project Environmental Management System, so as to form part of the proponent’s contractual obligations and ensure that the project is conducted and managed in a sustainable manner.
2 LEGAL AND POLICY FRAMEWORKS

2.1 INSTITUTIONAL AND ORGANISATIONAL FRAMEWORK

A number of agencies, governmental and non-governmental, will play a role in the implementation of the Mozambique-Malawi Interconnection Project including in the planning, resettlement and restoration of livelihoods, construction and operation phases. Sustainable implementation of the Environmental and Social Management Plan prepared under this ESIA will be dependent on effective coordination of the various stakeholder institutions. The institutional set up is summarized as follows:

2.1.1 MINISTRY OF NATURAL RESOURCES, ENERGY AND MINING

The Ministry of Natural Resources, Energy and Mining is mandated to provide policy guidance and direction on all matters concerning Malawi’s natural resources, energy, and environmental management. It is responsible for implementing priority Number Five of the Malawi Growth and Development Strategies (2011 – 2016) which includes Climate Change, Natural Resources and Environmental Management, and Priority Number Nine which tackles Energy and Mining. The mission of the Ministry is to coordinate, facilitate and promote participation of all stakeholders in the sustainable development, utilization and management of natural resources, energy and environment for socio-economic growth and development.

Through the Department of Energy Affairs (which is within the Ministry), the Ministry is responsible for facilitating the implementation of the Mozambique-Interconnection Project. The Ministry has to work with the Ministry responsible for electricity in Mozambique and the other countries in the Southern African Power Pool (SAPP) to ensure that all policy and technical issues for the implementation of the Mozambique – Malawi Interconnection Project are in line with government strategies for nation development. The Ministry also has the responsibility of overseeing the activities of the Electricity Supply Corporation of Malawi in the implementation of the project, providing assistance when needed.

The Ministry holds a department of environmental affairs which is responsible for all matters related to the environment, which is housed at City Centre.

2.1.2 ELECTRICITY SUPPLY CORPORATION OF MALAWI

Electricity Supply Cooperation of Malawi (ESCOM) is a government parastatal mandated to transmit and distribute electricity in Malawi. It has three Division comprising the Transmission, Distribution and Holding, which operates as the head office.

The Transmission Division is responsible for operating the transmission system, which is the backbone of any electricity supply industry. ESCOM’s transmission system comprises of transmission power lines and substations, operated at high voltage level. The transmission power lines transmit electricity over long distances. Their total route length is 2,395 km, which is divided into 1,121 km operated at 66 kV and 1,274 km operated at 132 kV. The lines are constructed on both wood and steel structures. The transmission lines feed power to over 70 transformers which are located at about 39 substations. The transmission system is currently isolated; hence, the Mozambique-Malawi Interconnection Project.

The Distribution Division is responsible for distribution, supply and retail of electricity. The Division has about 325,000 domestic, general, commercial and industrial customers and distributes electricity through the three regional offices (southern, central and northern regions) of Malawi. The Division is also responsible for connecting new customers and expansion of the distribution network and power trading to neighbouring countries.

ESCOM currently has a one Environmental Officer and one Wayleave Officer for Distribution (Centre) and a Wayleaves and Safety Officer for Transmission. ESCOM also has an Environmental and Social Unit. Considering the scale of the Project however, responsibility for implementation of the ESIA recommendations will be assigned to a Project Implementation Unit created especially for Project implementation and described in section 8.2.3 below.
2.1.3 ELECTRICITY GENERATION COMPANY MALAWI

The Electricity Generation Company of Malawi (EGENCO) was established through the unbundling of ESCOM in 2016. The Company is responsible for running all power generation stations in Malawi and its head office is in Blantyre. Most power generation stations are hydro, located along the Shire River in the Southern part of Malawi (i.e. Nkula, Tedzani and Kapichira Power Stations) with another small hydro power station at Wovwe in Karonga. EGENCO also operates thermal power in Mzuzu and Lilongwe as stand-by for the interconnected system.

The total installed power capacity for EGENCO is 351 MW which is low compared to a suppressed demand of about 400 MW. To increase the installed power, EGENCO intends to establish additional power plants and refurbish and expand the existing ones. In the event that more power is being generated than it is required in Malawi, EGENCO is expected to sell excess power to the countries in the Southern Africa Power Pool (SAPP) through ESCOM using the Mozambique-Malawi Interconnection. Hence, EGENCO has a responsibility of working hand in hand with ESCOM to ensure that transmission lines proposed in the Mozambique-Malawi Interconnection Project are of the standards that can enable transmission of power from Malawi to the countries in the SAPP.

EGENCO does not yet have an environmental department but rather one environmental specialist that was transferred from ESCOM. Currently they have draft environmental guidelines and are planning on developing their environmental policy.

2.1.4 MALAWI ENERGY REGULATORY AUTHORITY

The Malawi Energy Regulatory Authority (MERA) is a corporate body established under the Energy Regulatory Act No. 20 of 2004 as the Energy Sector Wide Regulator. Its mandate is to regulate the energy sector in Malawi in a fair, transparent, efficient and cost-effective manner for the benefit of the consumers and operators. Specific functions of MERA, relevant to the sustainable implementation of the Mozambique-Malawi Project include the following:

1. Developing and enforcing performance and safety standards for energy exploitation, production, transportation and distribution;
2. Arbitrating commercial disputes under the Act and Energy Laws and do all such things as are necessary or incidental or conducive to the better carrying out of the functions of the Authority provided for in the Act and Energy Laws;
3. Promote consumer awareness and education;
4. Promoting the integrity and sustainability of energy undertakings and seek to ensure that energy undertakings, whilst providing efficient service, are able to finance the carrying on of the activities which they are licensed or authorized to carry on;
5. In conjunction with other relevant agencies, formulating measures to minimize the environmental impact of the exploitation, production, transportation, storage, supply and use of energy and enforce such measures by the inclusion of appropriate conditions to licences held by energy undertakings.

Thus, MERA will be useful in ensuring that the ESIA recommendations are implemented effectively. During construction, MERA will also be responsible for enforcing standards for transmission structures and safety of the workers and the general population.

MERA does not have any environmental staff. Environmental issues are referred to specific departments which handle them as and when they arise.

2.1.5 ENVIRONMENTAL AFFAIRS DEPARTMENT

The Environment Management Act (EMA) sets out the mandate of the Environmental Affairs Department (EAD), which include administering the Environmental and Social Impact Assessment (ESIA) process. In reviewing an ESIA report, the EAD is mandated to conduct public consultations on findings of the report and how the project operations may affect the people and the environment.
The Technical Committee on Environment (TCE), established in line of the provisions of Section 16 of the EMA, is a multidisciplinary committee of professional experts, which provide technical advice to the EAD on environmental management issues and reviews EIA reports to make recommendations on decisions, to be made by EAD, regarding the relevance and adequacy of the EIA reports.

Upon receiving the recommendations from the TCE, the Director for Environmental Affairs makes decisions and reports to the National Council on Environment (NCE), which is a policy body composed of government Principle Secretaries. The NCE was established in accordance with Section 10 of the EMA: to provide policy guidance and recommend policy decisions on the EIAs to the Minister for approval or otherwise.

The capacity of the Environmental Affairs Department appears to be adequate at present. There are Environmental District Officers, in each of the project districts of Mwanza, Neno and Balaka, who could monitor the extent to which ESCOM and their contractors adhere to the environmental legislation and the ESIA as well as ESMP.

2.1.6 DISTRICT COUNCILS

The three District Councils of Mwanza, Neno and Balaka are the administrative entry points for any project implementer in the districts. Hence, they would have to be fully involved to link the project staff to the local leaders and the communities.

Among the key officers in the project districts, the Environmental District Officer in liaison with the Monitoring and Evaluation Officer would assist to ensure that the contractor adheres to the Environmental Management Plan and mitigation of adverse impacts of the project. The Social Welfare Officer at the district could also be involved in the project to ensure that issues affecting women and children are adequately addressed. The District Information Officer could take the lead to sensitize the communities about the project implementation activities so that they are fully aware at each stage of the project; and the Community Development Officer and HIV/AIDS Coordinator can play important roles in sensitizing the communities about social and health impacts including STDs and HIV/AIDS. The District Councils would be responsible for addressing grievances and complaints on compensations and other project matters received from the communities through their local leaders.

2.1.7 OTHER INSTITUTIONS

2.1.7.1 DEPARTMENT OF FORESTRY

The Department of Forestry has the structures and means to strengthen capacity of the communities in tree nursery establishment and management. They encourage and promote planting of indigenous and fruit tree seedlings on-farms; including agro-forestry trees to offset the number of trees to be cut down. They also have the capacity to monitor adherence to the forestry legislation and activities within forestry reserves. The Department provides valuation rates for timber, including other indigenous and exotic tree species, based on indicative prices recommended in the Forestry Act (Forestry Gazette Amendment Rules, 2010). Fruit trees are valued based on current market production potential for at least five to six years. Institutions that the project could utilize through the Department of Forestry include the Local Forest Management Board, Village Forest Area Committees, Village Natural Resources Committee and Local Leaders.

2.1.7.2 DEPARTMENT OF LANDS

The Department of Lands provides guidance and assistance in the interpretation and enforcement of regulations related to land acquisition, resettlement and compensation. They, in collaboration with the District Commissioners, are responsible for administering paying out of compensations to the affected families. The Department will be useful for interpretation and mediation in matters related to land acquisition and resettlement.
2.1.7.3 MINISTRY OF GENDER, CHILDREN, DISABILITY AND SOCIAL WELFARE

There is a likelihood for the project to result in an influx of men without their spouses, leading to new sexual relationships in the project areas. This could result in spreading of sexually transmitted diseases (STDs); HIV & AIDS; emergence of unwanted pregnancies and eventually children born out of wedlock; loss of livelihoods and disruption of social norms. Ministry of Gender, Children, Disability and Social Welfare could assist in provision of information, education and communication (IEC) on issues of sexuality and family planning methods including use of condoms, etc. They could also provide assistance in monitoring social cash transfer activities to the affected female headed households, to facilitate operation of small scale businesses.

The Ministry has the capacity to establish nutrition and early childhood development centers, which could be considered among the restoration activities for affected communities. The ministry has District Development Assistants who are involved in implementation of training and community liaison activities.

2.1.7.4 MALAWI HUMAN RIGHTS COMMISSION

The Malawi Human Rights Commission (MHRC) has the interest to see that affected communities are fairly treated and compensated. The commission encourages the Human Centred Approach to Development of the UNDP. Among others, this approach encourages community participation during the identification and implementation of projects, consideration of human rights and cultural issues when designing projects and implementing projects. The community adequately consulted during the ESIA and issues and concerns from the community have been incorporated in the mitigations measures for impacts. Considering that Compensation has potential for violence, the MHRC need to be taken on board during the implementation and monitoring process. The MHRC would provide guidance to ensure that full participation of the affected communities, accountability, transparency and women empowerment are built within the project’s Social Corporate Responsibility programs and that there must be linkage to human rights.

2.1.7.5 WOMEN LEGAL RESOURCES CENTRE

Women’s Legal Resources Centre (WOLREC) is a women’s rights Non-governmental organization based in Blantyre. It was started in 2006 and promotes justice from three angles of Social, Legal and Economic Justice. On Social justice, the organization promotes behavioral change towards HIV and AIDS and other cultural aspects such as Gender-based Violence among communities; and advocates the implementation of the Land Act. This is conducted through community sensitization and awareness campaigns. On Legal justice, WORLEC provides women with free legal services, whenever they have a case against a husband and/or any other man, to ensure their rights are not violated. On Economic justice, the organization promotes village savings and loans, livestock production and links women to money lending institutions so that they can easily obtain soft loans for small scale businesses to uplift their lives. The organization works in eight districts including Balaka, Dedza and Neno.

Compensations that would be paid out are likely to result in the disruptions of marriages as a result of misunderstandings on how the family could share the money. In this case, WORLEC could be well positioned to assist by teaching the families how they could best use the money to ensure improvement of livelihoods and income. WOLREC also provides Legal Aid Clinics for free to women. Their Village rights committees, which meet every week, assess and prioritize grievances which might need the attention of their head office for action. WORLEC could also work with the project consultant and contractor in the impact districts to promote the rights and socio-economic empowerment of women and to ensure that they also benefit from the project. The organization could also assist in grievance redress, especially on matters related to compensation, land acquisition and resettlement, affecting women.

2.1.7.6 WILDLIFE AND ENVIRONMENTAL SOCIETY OF MALAWI

Wildlife and Environmental Society of Malawi (WESM) is mainly involved in management of wildlife and natural resources in both protected and non-protected areas. They work with communities to rehabilitate degraded environments, ecosystems and habitats through conservation agriculture; livelihood programs; and mobilizing resources involving schools, wildlife clubs, village natural
resource committees (VNRCs) and communities to plant trees in schools and degraded habitats. WESM would be interested to work with the project to plant trees in communities which would need village forests and could conduct monitoring activities to ensure optimum survival of the planted seedlings. As a rule of thumb, WESM recommends six tree seedlings to be planted for every tree to be cut down. Hunting and killing of wild animals should also be discouraged during implementation of the project to ensure a healthy and balanced ecosystem is maintained.

The ESIA process is being developed in compliance with Malawi's national legislative requirements and applicable international standards. Also, the conventions and protocols ratified by Malawi and directives of international organizations (World Bank –WB and SAPP) will be considered in matters that are not covered by national legislations.

This chapter presents the policy and legal frameworks, relevant bills and international conventions as well as international best practices, as applicable to this project.

Malawi is a signatory to the 1992 Rio Declaration on Environment and Development. Malawi is required, under principle 17, to undertake environmental impact assessments (as a national instrument for environment management) that are reviewed by a competent authority for all proposed activities likely to have significant adverse impacts on the environment. The following section details how this obligation is operationalized in Malawi.

Following the declarations, several policies and legislations on environmental management have been established, of which the overarching legislation is the Environment Management Act (EMA) 1996, currently under review. The Malawi Guidelines for Environmental Impact Assessment were developed in 1997 and are also under review.

The Environmental Affairs Department (EAD) in the Ministry of Natural Resources, Energy and Mining (MNREM) is the responsible authority for the development and enforcement of environmental policy and legislation. The EAD, with the support of the Technical Committee on the Environment (TCE); and in line with the provisions of the EMA (as well as the Environmental Impact Assessment Guidelines 1997) determines whether an ESIA is required or not, for all projects. The TCE reviews environmental impact assessment reports and makes recommendations to the Director of Environmental Affairs, who reports to the National Council for the Environment (NCE). The NCE considers the recommendations and advises the Minister for approval and issuing of the environmental certificate for the project to proceed.

The Electricity Supply Corporation of Malawi (ESCOM) is fully committed to implementing the activities for the construction of the interconnection lines with full compliance to the national policies and legislations, as well as the obligations of Malawi to the international conventions and treaties, giving due consideration to international best practices. The preparation of this ESIA report attests to this commitment.

2.2 POLICY FRAMEWORK

2.2.1 CONSTITUTION OF THE REPUBLIC OF MALAWI, 1995

The Constitution of the Republic of Malawi is supreme over any legal policy or Act in Malawi. Any Act of Government or any law that is inconsistent with the provisions of this Constitution shall, to the extent of such inconsistency, be invalid (Section 5). As such, the reviewed policies and legislations, relevant to the project have to be in line with the Constitution.

Section 12 provides the fundamental principles on which the Constitution was founded upon, and part iii encourages accountability and transparent decision-making, it states:

“The authority to exercise power of State is conditional upon the sustained trust of the people of Malawi and that trust can only be maintained through open, accountable and transparent Government and informed democratic choice”.

Electricity Supply Corporation of Malawi Limited
Mozambique-Malawi 400 kV Interconnection Project
Environmental and Social Impact Assessment Study

2-5
The principle is based on the presumption while society appoint authorities, they retain the right to have an input in decision-making and enforcement processes, and they expect transparency in government decision-making. In line with this principle, ESCOM as a public institution must not assume that it has power over the communities in the line corridor, knowing that it will be accountable to its actions.

The Constitution provides the foundation that guarantees the welfare and development of all the people of Malawi. Section 13 (e) stresses that one of the roles of the state is to enhance the quality of life in rural communities and to recognize rural standards of living as a key indicator of the success of government policies. Therefore, ESCOM must include social welfare programmes, primarily rural electrification activities, in the areas where the electricity line will pass.

Part (d) of Section 13 recognises that activities undertaken must be managed so as to:

- respect the environment and the sustainable development of natural resources to prevent their degradation;
- provide a healthy living and working environment for the people of Malawi;
- accord full recognition to the rights of future generations; and conserve and enhance the biological diversity of Malawi.

ESCOM must therefore comply with this section through the realization of the ESIA and the implementation of the ESMP as provided in chapter 8.

The activities of the proposed project will result in some individuals losing their land and property. The Constitution in Section 28 (2) prohibits arbitrary deprivation of a person’s property. ESCOM must acquire land in accordance with the provisions of Section 44, which states:

“Expropriation of property shall be permissible only when done for public utility and only when there has been adequate notification and appropriate compensation, provided that there shall always be a right to appeal to a court of law for redress”.

Where there are conflicts, Section 13 (1) supports peaceful settlements of disputes, through negotiation, good offices, mediation, conciliation, and arbitration. Section 43 of the Constitution also provides procedures for administration of justice.

The project also has to promote gender equality and human rights. Under Section 13 (e), it is the responsibility of the state to achieve gender equality for women through:

- full participation of women in all spheres of the Malawian society, on the basis of equality with men;
- implementation of principles of non-discrimination and such other measures as may be required;
- implementation of policies to address social issues such as domestic violence, security of the person, maternal benefits, economic exploitation and rights to property.

2.2.2 MALAWI VISION 2020

Malawi Vision 2020 provides the framework for national development goals and the policies and strategies to achieve them. The Vision advocates for the provision of efficient energy supplies as a key pre-requisite for achieving economic development and middle-income status.

To reach this goal, in the face of inadequate, unaffordable, unreliable and inaccessible electricity supplies, Vision 2020 recommends the interconnecting of supply networks from neighbouring countries. This is also the main objective of the Mozambique-Malawi Interconnection project.
2.2.3 MALAWI GROWTH AND DEVELOPMENT STRATEGY II, 2011-2016

The Malawi Growth and Development Strategy (MGDS) II, (2011-2016) is the second medium term national development strategy which draws from Malawi Vision 2020. The MGDS II identifies the following six (6) broad based themes for development:

→ sustainable economic growth;
→ social development;
→ social support and disaster risk management;
→ infrastructure development;
→ governance, and gender;
→ capacity development.

From the thematic areas, nine key priority areas including agriculture and food security; energy, industrial development, mining and tourism; integrated rural development; and climate change, natural resources and environmental management are drawn.

Under energy, the goal is to generate and distribute sufficient quantities of electricity to meet national socio-economic demands, with one of the medium-term expected outcomes being increased availability and access to electricity. To achieve this, a number of focus actions are provided, including construction of transmission lines and rehabilitation and expansion of transmission and distribution systems to rural and peri-urban areas. The proposed Mozambique - Malawi Interconnection will build transmission lines, which will result in a more stable power supply for Malawi. This will also make it possible to expand its distribution to the rural and peri-urban areas.

2.2.4 NATIONAL ENVIRONMENTAL POLICY, 2004

The National Environmental Policy (NEP) developed in 1996 and revised in 2004, advocates for sustainable social and economic development through sound management of the environment and natural resources. Areas of priority include efficient utilization and management of natural resources; through involvement of the private sector, NGOs and communities for sustainable environmental management. The policy empowers communities to protect, conserve, and sustainably utilize the nation’s natural resources; and advocates for enhancement of public awareness and promotion of public participation. In line with the requirements of the NEP, the proposed project has included participation of the local communities in the identification of potential impacts and development of appropriate mitigation measures.

2.2.5 NATIONAL ENVIRONMENTAL ACTION PLAN, 2002

The National Environmental Action Plan (NEAP) of 1994, updated in 2002, provides a framework for integrating the environment into all socio-economic development activities of the country. It documents and analyzes major environmental issues and measures to alleviate them; promotes the sustainable use of natural resources in Malawi; and develops an environmental protection and management plan. The NEAP identifies the following as key environmental issues to be addressed, in relation to the proposed project: soil erosion, water resources degradation, air pollution and climate change. The NEAP also outlines actions to be taken to ensure adequate environmental protection. Hence, the project must protect the environment by avoiding as many of the significant impacts as possible in the first place; and where this is not possible, mitigate them through measures implemented through management plans while ensuring effective monitoring.
2.2.6 GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT, 1997

The EIA Guidelines of 1997 outline the process for conducting ESIs to ensure compliance with the ESIA process as required in the Environment Management Act of 1996.

The Guidelines contain a list of prescribed projects for which an ESIA is mandatory and those that may require an ESIA. The project falls under List A (A6.2) that is the construction of electrical transmission facilities operating at a voltage of 132 kV or greater, an ESIA is consequently required.

In accordance with the guidelines, a project developer is required to prepare a project brief and submit it to the EAD, to inform the Director that a project is being considered and to facilitate project screening for a decision on whether a full ESIA should be carried out or not. The Project Brief has been prepared and the ESIA study will be conducted in recognition of the need to integrate environmental and social considerations in development planning.

The Guidelines require that no licensing authority issues any license for a project unless the Director of Environmental Affairs (DEA) has given consent to proceed, on the basis of a satisfactory ESIA or non-requirement of an ESIA. The project, will comply with this requirement.

2.2.7 ENERGY POLICY, 2003

This is the operational framework for the energy sector. The policies recognize the difficulties in the security and reliability of power supplies resulting from:

→ dependence on the Shire River for hydropower generation and the problems caused by frequent drought and the siltation consequent on deforestation;
→ the instability of power systems due to the limited maintenance and investment;
→ the lack of connection between Malawi’s transmission system and that of its neighbours, which denies the country access to the emerging intra-regional trading opportunities through the SAPP.

Therefore, the Government requests that its electricity supply industry participate effectively in the emerging regional electricity market through the SAPP so it can reap the benefits that accrue to an operating member. This will be achieved by implementing the project.

2.2.8 GENDER POLICY, 2008

The Gender Policy (2008) identifies gender equality as a basic human right. More importantly, in relation to the project, gender is recognized by the MGDS II as one of the elements for sustainable, social and economic development. Hence, gender mainstreaming must be prioritized in the Mozambique – Malawi Interconnection Project. Based on the objectives and strategies highlighted in the Gender Policy, this will be done, among others, by the:

→ promotion of more involvement of women, men and vulnerable groups in issues of waste management and pollution;
→ creation of awareness among women, men, girls and boys on global warming and climate change;
→ encouragement of women’s participation in decision making (e.g. on resettlement and compensation);
→ confirmation that women are not prevented from accessing or owning land;
→ promotion of a no incidence policy regarding gender based violence among the construction workers or between the workers and the community;
→ proper handling of gender based and domestic violence;
→ mainstreaming of issues of HIV/AIDS in the project activities;
→ equal access to employment.
2.2.9 NATIONAL CONSTRUCTION INDUSTRY POLICY, 2015

The development of the interconnection line triggers the Construction Industry Policy (2015), whose broad policy goals include the promotion of environmental sustainability in implementation of construction projects. In accordance with the policy’s goal, project implementers must ensure that the contractor protects the environment, in line with national and international policies for environmental sustainability. Other focus areas include disaster risk management; occupational health and welfare; gender; and HIV and AIDS.

2.2.10 NATIONAL LAND POLICY, 2002

The goal of the National Land Policy (2002) is to ensure tenure security and equitable access to land, to facilitate the attainment of social harmony and broad based social and economic development through optimum and ecologically balanced use of land and land based resources. It introduces major reforms for land planning, use, management, and tenure and provides clear definition of land ownership categories (Section 4); addressing issues of compensation payment for land (Section 4.6). The proposed interconnection line is likely to use land allocated to and used by community members. Thus, there will be need for transfer of ownership especially where the line or the line’s ROW will pass over buildings. In line with the provisions of the policy, land acquisition must be voluntary and compensation matching the appropriate value of land must be paid.

The policy also has provisions for environmental management, protection of sensitive areas, agricultural resource conservation and land use, community forests and woodland management. Provisions of significant importance are in Section 9.8.1(b) which makes ESIA studies mandatory before any major land development project is carried out.

2.2.11 NATIONAL PARKS AND WILDLIFE POLICY, 2000

The National Parks and Wildlife Policy (2000) facilitates sustainable conservation and management of wildlife resources and the sharing of benefits arising from use of these resources for both present and future generations.

One of the policy’s objectives is to ensure adequate protection of ecosystems and their biological diversity, through promotion and adoption of appropriate practices that adhere to the principle of sustainable development. In this regard, appropriate clauses will be included in the contract to protect wildlife resources.

The National Parks and Wildlife Policy ensures proper conservation and management of wildlife resources by providing for sustainable utilization and equitable access to the resources and the sharing of benefits arising from the use of the resources for both present and future generations. One of the policy’s objectives is to ensure adequate protection of ecosystems and their biological diversity, through promotion and adoption of appropriate land management practices that adhere to the principle of sustainable use (Chapter 2 (i)).

The policy recognizes the Poverty Alleviation Programme and any efforts that target the eradication of poverty so as to remove poverty driven pressures on protected areas and wildlife reserves (Chapter 2, sub section (ix)). It empowers communities to manage wildlife resources on communal land, to support the management of national parks, wildlife and forest reserves and to be involved at all stages of planning and implementation (sub section 3.2).

To adhere to the National Parks and Wildlife objectives, appropriate clauses will be included in the project’s contract to protect wildlife resources.

2.2.12 THE NATIONAL FOREST POLICY, 1996

The objective of this policy is to promote sustainable contribution of national forests, woodlands and trees towards improvement of the quality of life in Malawi, by encouraging conservation for the benefit of the nation and to the satisfaction of the Malawi population, particularly rural smallholders. The
Policy prohibits changes in land use practices which promote deforestation, or endanger the protection of forests with cultural or biodiversity significance, or water catchment conservation values. It discourages excisions in gazetted forests, except in cases of environment friendly public utility, for which suitable inter-sectoral and local consultations will be established. Part IV of the Policy highlights the need for preparing and implementing management plans through mutually acceptable agreements with local communities. The proposed project will have to prioritize protection of forests.

2.2.13 DECENTRALIZATION POLICY, 1998

The Decentralization Policy was adopted in 1998 to:

→ devolve administration and political authority to the district level;
→ integrate governmental agencies at the district and local levels into one administrative unit, through the process of institutional integration, manpower absorption, composite budgeting and provision of funds for the decentralized services;
→ divert the centre of implementation responsibilities and transfer these to the districts;
→ assign functions and responsibilities to the various levels of government;
→ promote popular participation in the governance and development of districts.

Through the Decentralization Policy, some of the roles of the authority at the district level are to implement or facilitate development projects; to ensure development projects in their area are implemented in a sustainable manner; and to mobilize masses for socio-economic development at the local level. The project developers must involve the officers of the local councils in the implementation of project activities including the implementation of the ESMP.

2.2.14 REVISED DECENTRALIZED ENVIRONMENTAL MANAGEMENT GUIDELINES, 2012

The Decentralized Environmental Management Guidelines (DEMG) were adopted in 2012 to address gaps and inconsistencies from other previous guidelines including the DEMG, 2002 and help to ensure that Councils include emerging and critical environmental issues in the preparation of district plans and actions. The DEMG aims at guiding stakeholders to manage the environment and natural resources in a sustainable manner. In line with the Decentralization Policy, the DEMG promotes local level environmental management, including planning, implementation, monitoring, and evaluation.

Therefore, the local council must be included in the implementation and monitoring of the environmental and social management measures for the construction activities of the interconnection line.

2.3 LEGAL FRAMEWORK

2.3.1 ENVIRONMENT MANAGEMENT ACT, 1996

The Act is the legal basis for the protection and management of the environment and the conservation and sustainable utilization of natural resources. Section 24, specifies the types and sizes of activities that require an ESIA before its implementation.

The Act further outlines the ESIA process to be followed in Malawi; and requires compliance with the process. Non-compliance is an offence and attracts penalties.

The Act recognizes that improper waste disposal can impact various environmental and social resources and therefore regulates the management, transportation, treatment and recycling and safe disposal of waste, as well as establishing environmental quality standards for waste. The Act also provides controls for water, soil, air and land pollution, the protection of natural resources and the ozone layer.
The project has to be undertaken in an environmentally responsible manner to ensure protection and management of the environment and the conservation as well as sustainable utilization of natural resources.

2.3.2 FOREST ACT, 1997

This Act provides for participatory forestry, forest management and protection as well as rehabilitation of environmentally fragile areas. It, among other things, seeks to: augment, protect and manage trees and forests on customary land, in order to meet basic needs of local communities and for conservation of soil and water; promote community involvement in the conservation of trees and forests in reserves and protected areas; prevent resource degradation to increase socio-economic benefits; promote community involvement in tree and forest conservation; fragile protected areas such as steep slopes, river banks and water catchments; and conserve and enhance biodiversity. The Act also prohibits construction in areas that are protected by it (e.g. forest reserves). The project has to comply with this Act in all areas where the projected activities are to be implemented.

2.3.3 LOCAL GOVERNMENT ACT, 1998

The Local Government Act was enacted to further democratic principles, accountability, transparency and participation of the Malawian people in the decision making and development process. Section 6(c), of the Act mandates local councils to promote infrastructure and economic development, through the formulation, approval and execution of district development plans. The interconnection line is in accordance with the nation's development plans and the plans of the districts it will pass through (Mwanza, Neno and Balaka) and officers at the District Council were consulted in the identification of the project implementation areas. ESCOM must ensure continued involvement of the district councils in the project implementation.

The Local Government Act also provides for local governance structures through which this ESIA report must be implemented. These include:

- **District Executive Committee (DEC):** responsible for implementation of all aspects of the District Development Planning System (DDPS).
- **District Environment Sub-Committee (DESC):** the focal point on issues of the environment. It acts as a multi-disciplinary forum for environmental management and comprises environmental and natural resources management sector district officers. Some of the functions of the DESC include appraising micro-projects and facilitating their development; conducting awareness campaigns on environmental and natural resources management; and developing capacity on sustainable environmental management at community level so that issues of environment are integrated into the decision-making process and planning systems.

2.3.4 LAND ACT, 1965

The Land Act deals with land tenure and land use. It categorizes land as customary land, public land; and private land. Proper land acquisition, as outlined by the Act will have to be observed where the land for the project is an allocated land or is being used for other activities. Section 28 of the Act states that any person who suffers any disturbance of, or loss or damage to any interest, which he may have, or immediately prior to the land acquisition, may have had in such land, shall be paid such compensation for such disturbance, loss or damage as is reasonable.

Section 20 of the Act also states that “in the event that the lessee surrenders the lease, such lessee shall be entitled to compensation in respect of the improvements effected upon the premises and such compensation is determined by the Minister”.

Further, under Section 27 the Minister is given power to convert customary land into public land by a declaration in the Gazette where the land is needed for public purpose. However, if the customary land is required for temporary public purposes, then the Minister may authorize such use provided the period does not exceed 7 years. During this period the land shall remain customary land.
2.3.5 LAND ACQUISITION ACT, 1971

This Act deals with procedures relating to the acquisition of land by either the government or individuals or developers from any form of the land tenure systems in Malawi. The purpose is to make sure that proper and fair land acquisition procedures are followed. Section 3 outlines that when the decision is desirable or expedient in the interests of Malawi, interested parties may acquire any land, either compulsorily or by agreement, paying such compensation as may be agreed or determined under this Act. The project will increase access to diversified, reliable, and affordable supplies of energy; hence it is desirable and in the interest of Malawi.

If a decision to acquire land has been reached by proper authorities, a notice is given to the affected persons with a clear explanation of the purpose of the acquisition, the area of land required and their right to compensation in accordance with the Act (section 5 to 7). The Act outlines that compensation is entitled to the affected persons. However, an assessment of the land and properties has to be carried out to make sure that it is fair and also does not exceed the market value of the land (Sections 9 and 10), and it outlines the necessary steps for land surveying and land transfer following notices in government publication (Section 11 to 14). Furthermore, in Section 17, the Act deals with the penalty for hindering land transfer.

The responsibility of identifying alternative land for those affected people rests with their village headman, their traditional authority and District Commissioner. The District Commissioner facilitates in transportation and provisions of necessary services on new sites of resettlement.

2.3.6 TOWN AND COUNTRY PLANNING ACT, 1988

This Act details the management of land use in Malawi. It advocates regulation of developments with respect to location, to ensure compatibility of land use over a project area.

It promotes protection and sustainable utilization of natural resources through optimal use of land and related service infrastructure.

2.3.7 GENDER EQUALITY ACT, 2003

The Gender Equality Act makes provisions for the Malawi Human Rights Commission (MHRC) to:

- monitor and evaluate the state organs, state agencies and public bodies including the private sector to promote gender equality and make recommendations that the Commission deems necessary;
- carry out investigations and conduct searches in relation to any gender issues on receipt of complaints or on its own accord;
- make recommendations to the Minister on any gender issues;
- provide information to any party in a gender dispute on rights, remedies or obligations;
- perform functions on implementation of the Gender Equality Act.

Gender related impacts may arise during the project’s construction and operational phases, for example unequal distribution of land; hence the project activities must include gender sensitization. In accordance with the Act, women are also to be facilitated in taking part in development activities.

2.3.8 NATIONAL PARKS AND WILDLIFE ACT, 2004

The purposes of this Act, among others are: conservation of selected examples of wildlife communities; protection of rare, endangered and endemic species of wild plants and animals; sustainable use of wildlife and minimization of conflict between human beings and animals; promotion of local community participation; and protection and management of protected areas. The Act states that any person who hunts or takes any protected species, except in accordance with a license, shall be guilty of an offence. In this regard, the contractor for the proposed project will have to be advised accordingly and this condition has to be included in the project’s contract documents.
2.3.9 PUBLIC ROADS ACT, 1962

In some sections, the proposed power transmission line will be constructed near roads, over roads, and in other areas, roads will have to be constructed for access. Provisions of this Act, which are of relevance to this project, include regulations for undertaking work in the road or road reserve and compensations for use of land for construction of roads.

Section 37 of the Act requires prior submission of details of proposed works to the Highway Authority (Roads Authority) for approval or disapproval, to carry out the road construction activities, and, where an approval has been given, before commencing works. Section 37 part 2c requires the undertaker to give notice, in a form and manner prescribed by the minister responsible for public roads. Thus, ESCOM must present its plans to the Roads Authority, especially where construction will take place on the road or in the road reserve.

Compensation provisions are covered in Part II of the Act. Section 44 provides for the assessment of compensation regarding land or surface rights of an owner or occupier. However, sub-section (2) provides a difference in treatment and less value if such land is customary (unallocated public land). Section 44 states that the owner or occupier of land, when affected by road construction works, is entitled to compensation. The market value of the land and improvement on the land, at the time of valuation, shall be the basis for calculating compensation. It requires that the payment should be made before the land or property is acquired.

Section 47(1) gives powers to the owners of the land, affected by road construction, to present their claim in writing to the Highway Authority, stating the amount and basis of the claim.

In practice however, not many people (particularly those in the rural areas of the proposed project) would be aware of such provisions. Hence ESCOM would have to adequately inform people in the areas and conduct a census rather than wait for the affected parties to submit claims.

Section 45 provides for compensation for land, which becomes public and specifically states that in the case of customary land, compensation shall be in respect of disturbance. In the case of land, which before it became public land was a road reserve sub-section; no compensation shall be paid in respect of improvements effected since the land became a road reserve.

Compensation shall be limited to that amount in respect of damage to or destruction of surface rights and shall be payable only when such damage or destruction takes place. In the case of private land, the persons interested in such land shall, according to their respective interests therein, be entitled to compensation, subject to Section 46.

Section 46 also outlines matters to be taken into consideration and matters to be disregarded in assessing compensation. Other matters to be considered include the market value of the land; the damage, if any, sustained by the PAP, at the valuation date; and any increase in the value of the land or other benefits to the PAP, likely to accrue from the construction of the road.

Section 47 outlines the procedure to be followed when pursuing claims for compensation, which includes writing to the highway authority liable to pay such compensation within the time prescribed for making claims and giving particulars of the amount claimed and the basis of the claim. Section 48 provides for procedure to be followed by compensation boards. Sections 49 and 50 are on the appeal to the High Court and there shall be no further appeal from the High Court.

2.3.10 WATER RESOURCES ACT, 2013

This Act provides for the management, conservation, use and control of water resources; for the acquisition and regulation of rights to use water; and for related matters. In addition, the Act provides for prevention and control of water pollution.

Under Part I section 5, all water resources are vested in the State, subject to any rights of a user granted by or under the Act or any other written law. In section 6, the bed and banks of water courses and lakes, including adjacent land strips, are declared public land to be determined and regulated by
the minister; who, in consultation with the relevant authorities, shall determine the width of the land and facilitate payment of compensation for loss of property. Section 7 gives the minister the power to control all water resources.

Part II, section 8 establishes the National Water Resources Authority, whose functions are, among others, to: develop principles, guidelines and procedures for allocation of water resources; determine applications for water use permits; regulate and protect water resource quality from adverse impacts; formulate catchment management strategies; and under section 85 (1), declare an area to be protected, where special measures are required to protect the area from deforestation and land degradation activities.

The implication of this Act on the proposed Mozambique-Malawi Interconnection project, is that in all activities, water degradation and depletion should be avoided.

2.3.11 EMPLOYMENT ACT, 1999

The Employment Act (1999) reinforces and regulates minimum standards of employment with the purpose of ensuring equity necessary for enhancing industrial peace, accelerated economic growth and social justice; and for matters connected therewith and incidental thereto.

Relevant to the project are the minimum wage, fair labour practices, non-discrimination, equal remuneration, and prohibition of employment of children. When hiring workers for the implementation of the project activities, ESCOM should ensure that the provisions of this Act are complied with.

2.3.12 ENERGY LAWS, 2004

Malawi’s energy sector is regulated by four Acts passed in 2004: Energy Regulation Act, Rural Electrification Act, Electricity Act, and Liquid Fuels and Gas Act; together known as the Energy Laws reviewed separately, as follows.

2.3.12.1 ELECTRICITY ACT, 2004

The Act is relevant for this ESIA as it puts the study as one of the preconditions for a license to implement an electrification project. According to Section 7 (2) (a) the ESIA must indicate the extent of any potential damage to or pollution of the environment or social disruption and the steps proposed to be taken by the applicant to prevent or minimize such damage or pollution and to restore the environment generally and in terms of existing environmental legislation. This ESIA report has been prepared in line with the Act and will be used for consideration of the project license.

The mitigation measures for the identified impacts must however be implemented accordingly as failure to do so can lead to license revocation in line with the provision of the Electricity Act.

The Electricity Act has provisions for notifying and compensating for land affected by development of electricity infrastructure. Section 39 of the Act allows easements without compensation, for construction of transmission and distribution lines, provided a 30-day notice is given and no structures are affected. Compensation is however required, if any structures are affected and for any losses or damages caused. This is contrary to OP 4.12 for World Bank, which requires compensation to be paid for affected areas, whether or not they have structures.

The Electricity Act defines a transmission line as:

"...any cable or overhead line for the transmission and reticulation of electricity from one undertaking to another or from an undertaking to a consumer, together with any transformers, switchgear and other works necessary to and used in connection with such cable or overhead line and the buildings and such part thereof as may be required to accommodate such transformers, switchgear and other works”.

The Act provides for the regulation of the generation, transmission, wheeling distribution, sale, importation and exportation, use and safety of electricity and related matters. It stipulates that no
person, owner, occupier or lessee shall grow trees or undergrowth or allow trees or undergrowth to grow or to be grown on the land he owns, occupies or leases in such a manner as to interfere with the supply of electricity.

According to the Act, a licensee has the right to enter any land they may need to survey in the course of their duties, subject to giving the land owners/occupiers a 14-day written notice. The same period of notification is required if plants are to be removed. ESCOM or a licensee:

- has to obtain the permission of the occupants of any building under which it wishes to lay an electricity cable or related fixtures;
- is required by law to give landowners/occupiers a month notice prior to construction work;
- shall make good, to the reasonable satisfaction of local or other authority, or the owner as the case may be, of all public/private roads, streets and paths opened or broken in the course project implementation and operation;
- shall pay fair and reasonable compensation or rent or both for all losses or damage caused in the execution of its powers in the Act;
- is liable for any damages that may result from work carried out on its behalf;
- is required to notify the relevant Minister, of any accident to have caused loss of life or serious injury in connection with transmission lines or other equipment.

On the other hand, ESCOM or a licensee may place any overhead line or associated structures (substations and towers) in, on, through or over any land or against any building; with the consent of the Authority if, in their opinion, the consent is being unreasonably withheld. In any such cases, the Authority shall determine the amount of compensation, whether as lump sum payment, annual rental, or of both to the owner, lessee or occupier.

2.3.12.2 ENERGY REGULATION ACT, 2004

Part II of the Act refers to the establishment of the Malawi Energy Regulatory Authority (MERA) with powers, among others, to:

- regulate the energy industry in accordance with the Energy Regulation Act and the Energy Laws; facilitate increasing access to energy supplies;
- grant, revoke or amend licenses granted under the Energy Regulation Act and the Energy Laws;
- monitor compliance with licenses granted under the Energy Regulation Act and Energy Laws;
- develop and enforce performance and safety standards for the energy sector;
- arbitrate commercial disputes under the Energy Regulation Act and Energy Laws;
- resolve or mediate consumer complaints against licensees;
- in conjunction with other relevant agencies, formulate measures to minimize the environmental impact of the exploitation, production, transportation, storage, supply and use of energy;
- enforce such measures by the inclusion of appropriate conditions to licenses held by energy undertakings.

The MERA is responsible for aspects relating to safety and environmental regulations regarding the proposed project.

2.3.12.3 RURAL ELECTRIFICATION ACT, 2004

The Rural Electrification Act makes provisions for the promotion, funding, management, and regulation of rural electrification; and for other related matters. The project should allow for rural electrification activities, especially in the areas where electricity infrastructure will be developed and there is no electricity.
2.3.13 PUBLIC HEALTH ACT, 1948

The Public Health Act 1948 has provisions that seek to preserve public health. One of the provisions, relevant to the project relates to sanitation and prohibited nuisances. According to Part IX, the contractor has to ensure that there are sanitary structures. This is important for the proposed project as the contractor is likely to build camp sites where different construction materials will be stored and subsequently some workers will reside on site. During working hours, basic access to clean water and sanitation is a fundamental public health requirement. Furthermore, the contractor must ensure that vehicles and any other materials used are not in a state that can cause accidents; that machine smoke cannot cause injuries to health and that all things defined as nuisances do not occur.

The provisions of the Public Health Act are to be followed and any deviation from the Act is punishable by fines and imprisonment. The Act gives the local authorities the right to inspect any premises for compliance with the Act.

2.3.14 OCCUPATIONAL SAFETY, HEALTH AND WELFARE ACT, 1997

The Occupational Safety, Health and Welfare Act provides for the registration of a workplace and the regulation of the conditions of employment in workplaces; with regard to the safety, health and wellbeing of employees.

The Act provides for inspection of plant and machinery, for the prevention of accidents in the workplace, including government establishments and operations, as well as building and civil engineering construction works (Section 5). It requires that employees are provided with appropriate protective clothing and equipment to prevent accident and injury.

The project will have to comply with the Occupational Safety, Health and Welfare Act when implementing the various project activities for construction of the power stations and mini-grids.

Workers will have to be provided with appropriate protective clothing to prevent accidents related to the construction and operation functions; and breathing masks, ear muffs and goggles where they will be exposed to potential risks and offensive substances as required by the Act (Sections 58, 59, 60). The contractor will also have to ensure that there is a first aid kit at the workplace in case there is an accident. The general public and animals will have to be warned and protected from open trenches through appropriate barriers, reflective tapes and warning signs.

2.4 NEWLY PASSED LAND-RELATED ACTS

In 2016, the Malawi Parliament passed some land-related bills in 2016 that will come into effect once gazetted. These have been reviewed, for this project, as follows.

2.4.1 LAND ACT, 2016

The Land Act of 2016 makes provisions for land administration and management in Malawi and for all matters related to land. The Act provides for two categories of land, “private land” and “public land” comprising of both government land and unallocated public land.

Section 5 (1) of the Act gives powers to ESCOM to own land in line with the provisions of the Electricity Act (2004). The section states that:

“Land shall not be assured to or for the benefit of, or acquired by or on behalf of a body corporate, unless the body corporate is authorized by a licence issued by the Minister in consultation with the President to hold land in Malawi, but this section shall not apply to a body corporate incorporated in Malawi in accordance with the Companies Act or a body corporate established by or under a written law which empowers it to hold land in Malawi”.
Section 13 (1) provides powers to the minister or local government in whose Traditional Land Management Area the required land for acquisition is situated, to be served with notices on the same. It states that:

"Where it appears to the minister or local government authority that any unallocated customary land is needed for public utility, the minister or local government authority, as the case may be, shall serve notice on the Traditional Authority within those Traditional Land Management Area, the customary land is situated..."

Section 13 (2) provides powers for the said authorities to grant temporary use and occupation of customary land for a period in excess of 7 years while such land shall remain customary throughout the said period and upon expiry of such period the authorities may authorize such temporary use and occupation for a further 3 years.

The section further requires the Minister or the local government authority to give notice, publishing in the Gazette, and invite any person to which the notice relates, to submit particulars of his claim to the minister or local government authority within two months of the date of publication of such notice in the gazette.

While Section 13 provides the powers to minister or local government authority to acquire or authorize use and serve notice for such use, Section 14 provides that:

"any person who by reason of any acquisition made under section 13 (1) or Section (2) and (3), suffers any disturbance of or loss or damage to any interest which he may have or immediately prior to the occurrence of any of the events referred to in this section, may have had in such land shall be paid such compensation for such disturbance, loss or damage as is reasonable."

The Act has therefore maintained the provisions of the Land Act 1965 for compensations to individuals for loss, damage, or disturbance because of permanent acquisition or temporary use of land.

Thus, the Act provides powers to Minister or local government within which the required land falls to acquire or authorize its use as long as appropriate compensation is paid. The Act however, does not stipulate factors to be considered in the compensation process.

Part II of the Act provides for the office of the Commissioner of Land, whose duties include: to administer land; to sign, seal execute, perfect, and accept grants, leases, or other dispositions of public land and surrenders; and sign and issue documents including documents of consent. In the event that the office is established, the Land Commissioner must be involved in the acquisition of ROW and acquisition of land process, during the implementation of the project. ESCOM must also ensure that it gets proper documents of consent to use land and or transfer of ownership.

2.4.2 CUSTOMARY LAND ACT, 2016

The Act has formalized the powers and duties of traditional leaders in land administration and management through creation of committees and tribunals to carry out allocations, adjudication and management of land and settlement of customary land disputes.

Section 20 (1) (c) stipulates that a customary estate shall be allocated to a partnership or corporate body, the majority of whose members or shareholders are citizens of Malawi. Thus ESCOM, as a corporate body may acquire customary estate by normal procedure of acquisition. Subsection 2) further states that a customary estate shall be (d) “liable, subject to adequate notification and prompt payment of full and appropriate compensation, to acquisition by government in the public interest, in accordance with the Lands Acquisition Act”.

2.4.3 PHYSICAL PLANNING ACT, 2016

The Act seeks to provide, for all matters connected, physical planning. It makes provision for orderly and progressive development of land both in the urban and rural areas.
Part VII (Sections 64 to 67) provides for the acquisition of land and compensation in accordance with the provisions of Land Acquisition and Compensation Act to be where it is desirable to acquire land compulsorily.

2.4.4 LAND ACQUISITION AND COMPENSATION ACT 2016

This will be a Principal Act dealing with land acquisition and compensation in Malawi once it is gazetted.

The Act provides powers to the Minister or local government authority to acquire land for public utility either compulsorily or by agreement and pay appropriate compensation therefore.

Section 4 provides powers to the acquiring authority to enter, dig, clear, set out and mark the boundaries of the proposed land, do all other acts necessary to ascertain whether the land is or may be suitable, provided such entry is preceded by a notice to the occupier 7 days before and the acquiring authority is ready to pay for the damage done by the persons entering such land.

Part IIA provides for compensation assessment and matters to be considered.

Section 9 states that the acquiring authority shall pay appropriate compensation and that shall be in one lump sum.

Section 10 list the grounds for compensation being: loss of occupational rights, loss of land, loss of structure, loss of business, relocation costs, loss of good will, costs of professional costs, injurious affection, nuisance, loss or reduction of tenure or disturbance.

Section 10A lays down matters to be taken into consideration in assessing compensation for alienated land and matters to be disregarded when calculating compensation.

Section 11 brings in matters of injurious affection and the need to consider environmental impact of the project and depreciation.

2.5 CONTRACT AGREEMENT BETWEEN MALAWI AND MOZAMBIQUE (2013)

This contract was signed on April 3rd, 2013, between the Government of Malawi and the Government of Mozambique to set out the framework for interconnection of electrical power systems between the Parties for the implementation of an Interconnection of the two countries power systems. It also allows for parties to enter any other agreements with any other Southern African government in furtherance of this Agreement which shall include Power Purchase Agreements under SAPP for power supply.

The objectives of this agreements are:

- To interconnect the power systems of the Parties from Matambo Substation in Mozambique to Phombeya Substation in Malawi;
- To extend the interconnection of power systems from Phombeya substation in the Republic of Malawi to Nacala in the Republic of Mozambique; and
- To facilitate power trading between the Parties or any other member of SAPP through the Project.

The project's implementation is governed by Terms and Conditions attached in Appendix of the agreement and it is overseen by a Project Steering Committee (PSC).

2.6 ESCOM ENVIRONMENTAL POLICY

In respect of the 1996 Environmental Management Act, ESCOM developed an Environmental Policy which was adopted in September 2005. This Policy was formulated to ensure the protection and conservation of the environment as well as the promotion of sustainable utilization of natural resources for energy development project in accordance with national and international standards.
The Policy stipulates that the above-mentioned objective will be achieved through the establishment of an EMS and through:

- Efficiency in energy use;
- Reduced pollution and promotion of waste management;
- Compliance to legislation;
- Control over impacting activities on the environment;
- Proper management of river watershed areas;
- Promotion of renewable energy sources;
- Awareness to train and motivate employees to conduct their activities in an environmentally responsible manner;
- Promotion of adoption of environmental procedures by contractors and suppliers;
- Measuring environmental performance through regular audits.

2.7 RELEVANT INTERNATIONAL CONVENTIONS

As mentioned previously, Malawi is a signatory to the 1992 Rio Declaration on Environment and Development. Malawi is required, under principle 17, to undertake environmental impact assessments for all proposed activities likely to have significant adverse impacts on the environment. The Authority responsible for their review is the DEA in the Environmental Affairs Department.

In addition, Malawi also adheres to the internationally accepted principles of the 1972 Stockholm Declaration and the WEHAB (Water, Energy, Health, Agriculture and Biodiversity) principles of 2002 as adopted by the United Nations Conferences. Malawi is also a signatory to a number of international environmental conventions and protocols including the following:

- Convention on International Plant Protection;
- Convention on Wetlands of International Significant;
- Convention Concerning the Protection of the World Cultural and Natural Heritage;
- Convention on the Conservation of Migratory Species of Wild Animals;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- African Convention on Conservation of Nature and Natural Resources;
- FAO International Undertaking on Plant and Genetic Resources;
- Vienna Convention and Montréal Protocol for Protection of the Ozone Layer;
- Convention on Biological Diversity;
- Convention on Climate Change;
- Convention on combating Desertification;

Apart from these conventions, Malawi is also a party to a number of regional protocols relating to environment and natural resources management. These include the SADC Protocols on shared watercourses, wildlife management and law enforcement, energy, mining, forestry and fisheries. The ESIA will be conducted in line with the internationally acceptable conventions and protocols.
2.8 INTERNATIONAL BEST PRACTICES

In addition to the national rules and regulations, the development of this ESIA study will take into account the international best practices, notably the environmental and social policies and guidelines as defined by the World Bank (WB) and the SAPP ESIA’s guidelines for transmission infrastructure.

2.8.1 WORLD BANK

The WB’s environmental and social safeguard policies include both Operational Policies (OP) and Bank Procedures (BP). Safeguard policies are designed to protect environment and society against potential negative effects of projects, plans, programmes and policies. The potentially triggered safeguard policies which will be considered in the study are the following:

- OP/BP 4.01 Environmental Assessment, including public participation;
- OP/BP 4.02 Environmental Action Plans;
- OP/BP 4.04 Natural Habitats;
- OP/BP 4.10 Indigenous Peoples;
- OP/BP 4.11 Physical Cultural Resources;
- OP/BP 4.12 Involuntary Resettlement;
- OP/BP 4.20 Gender and Development;
- OP/BP 4.36 Forests;
- BP 17.50 Public Disclosure.

2.8.1.1 OP 4.01 ENVIRONMENTAL ASSESSMENT

The purpose of OP 4.01 is to ensure that projects funded by the WB are environmentally feasible and viable and that the decision making is improved through appropriate analysis of actions and their probable environmental impacts (OP 4.01, par. 1).

This policy is triggered if a project is likely to have potential (negative) environmental risks and impacts in its zone of influence.

OP 4.01 covers:
- impacts on the physical environment (air, water and land);
- life environment, health and safety of populations;
- cultural and physical resources;
- environmental concerns at the transboundary and world levels.

Social aspects (involuntary resettlement, indigenous populations) as well as natural habitats, pest control, forestry and safety of dams are addressed by separate policies with their own requirements and procedures.

The WB undertakes environmental screening to determine the appropriate extent and type of environmental assessment to be conducted. It classifies the proposed projects into categories, depending on the type, location, sensitivity, scale of the projects and the nature and magnitude of their potential environmental impacts.

This project has been classified as a category A project. When considered as category A, projects have potential adverse environmental impacts that could be significant on human populations or on environmentally important areas. These impacts may affect an area broader than the sites or facilities subject to physical works. The environmental assessment will examine the project's potential negative and positive environmental impacts and recommend any measures needed to prevent, minimize, mitigate, or compensate any adverse impacts and improve its environmental performance.
For all Category A or B projects, project-affected groups and local NGOs have to be consulted on the project's environmental aspects and their views must be taken into account during the environmental assessment process. The consultations must be initiated as early as possible. These groups should be consulted shortly after the environmental screening, before the terms of reference for the EIA are finalized and also once a draft EIS report is prepared. Consultations can also be conducted throughout the project's implementation to address related issues that affect the PAPs.

For meaningful consultations, all relevant material must be provided in a timely manner prior to consultations, in a form and language that are understandable and accessible to the groups being consulted.

2.8.1.2 OP 4.02 ENVIRONMENTAL ACTION PLANS

This OP aims at encouraging and supporting the efforts of borrowing governments to prepare and implement an appropriate Environmental Action Plan (EAP) and to revise it periodically as necessary. Although the Bank may provide advice, responsibility for preparing and implementing the EAPs rests with the government.

2.8.1.3 OP 4.04 NATURAL HABITATS

The 4.04 conservation policy’s purposes are to protect natural habitats and their biodiversity and to ensure the sustainability of services and products that natural habitats supply to human societies. In principle, the WB will refuse to finance project’s that may be perceived as causing significant damages in Critical Natural Habitats (CNHs).

Its objective is to circumvent the conversion or degradation of non-critical natural habitats, as much as possible. These impacts should be avoided by reconfiguring the project, even in its size or its extension, and/or by implementing acceptable mitigation measures, such as the establishment of protected areas or the strengthening of 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 are no alternative solutions 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 if the project includes appropriate mitigation measures.

The WB 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 has not fundamentally modified its zone’s main ecological functions.

CNHs are defined as:
- existing protected areas and areas officially proposed by governments to be classified amongst’ ‘protected areas’ e.g. reserves that meet the criteria of the International Union for Conservation of Nature (IUCN) classifications;
- areas recognized as protected by traditional local communities;
- sites maintaining vital conditions for the viability of such protected areas.

2.8.1.4 OP/BP 4.10 INDIGENOUS PEOPLES

The objectives of this policy are to ensure that:
- the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous peoples;
- adverse effects during the development process are avoided, or if this is not feasible, ensure that these are minimized, mitigated or compensated;
- indigenous peoples receive culturally appropriate and gender and inter-generationally inclusive social and economic benefits.
Desktop research and field investigations revealed that the study area does not contain populations that qualify as indigenous peoples under this OP. OP 4.10 is therefore not triggered and no further specific investigations will be conducted.

2.8.1.5 **OP/BP 4.11 PHYSICAL CULTURAL RESOURCES (PCR)**

This policy assists in preserving physical cultural resources (PCRs) and helps reduce chances of their destruction and/or damage. The policy considers PCRs to be resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic or other cultural significance.

According to this policy, an investigation and inventory of PCRs likely to be affected by the project have to be conducted. The investigation should document the significance of such PCRs, and assess the nature and extent of potential impacts on them. Since many cultural resources are generally not well documented or protected by law, public consultations are an important mean of identifying PCRs. Such consultations include meetings with project-affected groups, relevant government and non-governmental organizations.

If PCRs are found during an inventory, a management plan must be prepared. This management plan must include measures to avoid or mitigate any adverse impacts on PCRs, provisions for managing chance findings, any necessary measures for strengthening institutional capacity for the management of PCRs and monitoring systems to track the progress of these activities.

Finally, whether or not a PCR is found at the inventory phase, provisions for managing chance finds must be implemented to ensure that PCRs that may be discovered be properly handled.

2.8.1.6 **OP. 4.12 INVOLUNTARY RESETTLEMENT**

The main objectives of the WB Resettlement Policy (OP 4.12) are to:

- avoid or minimize involuntary resettlement, whenever feasible;
- develop resettlement activities as sustainable development programs, providing sufficient investment resources to enable the displaced persons’ share in project benefits;
- meaningfully consult displaced persons and give them opportunities to participate in the planning and implementation of the resettlement programs;
- assist displaced persons in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of the project’s implementation, whichever is higher.

This policy is usually applied for projects that require international financing. Annex A (Paragraphs 17-31), describes the scope (level of detail) and the elements that a resettlement plan should include. These include objectives, potential impacts, socioeconomic studies, legal and institutional framework, eligibility, valuation and compensation of losses, resettlement measures, relocation planning, community participation, grievance management procedures, implementation schedule, costs and budgets, and monitoring and evaluation.

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

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

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

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

WB OP 4.12 (6b&c) state that in case of physical relocation, displaced persons should be (i) provided assistance (such as moving allowances) during relocation; and (ii) provided with residential housing, or housing sites, and, if required, agricultural sites for which a combination of productive potential, locational advantages, and other factors is at least equivalent to the advantages of the old site.

In addition, displaced persons should be offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living. This development assistance comes in addition to compensation measures such as land preparation, credit facilities, training, or job opportunities.

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

2.8.1.7 OP/BP 4.20 GENDER AND DEVELOPMENT

The objective of the WB's gender and development policy is to reduce poverty and enhance economic growth, human well-being, and development effectiveness by addressing the gender disparities and inequalities that are barriers to development, and by formulating and implementing gender and development goals.

2.8.1.8 OP 4.36 FORESTS

The OP 4.36 is about forest protection. The major objectives of the policy are:

- sustainable management of forests;
- conservation of wet forest zones;
- communities’ rights respected in their traditional use of forest zones in a sustainable manner.

The WB does not finance projects that would involve significant conversion or degradation of critical sections of forests or essential (critical) natural habitats attached to them.

Should the project involve the significant conversion or degradation of natural forests or associated natural habitats that are not considered as critical, and if there are no alternative solutions 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. OP 4.36 is triggered by the project as some forest habitats are located along the projected transmission line route.

2.8.1.9 BP 17.50 DISCLOSURE POLICY

This BP supports the decision-making of the WB by allowing the public access to information on the environmental and social aspects of projects. It is a mandatory safeguard policy that has specific requirements for disclosure. It requires that during the project’s design phase, the PAPs, affected groups and local NGOs will be consulted and that the environment and social aspects of the project will be presented. Also, consultations must be undertaken throughout the approval process of the project. The policy also requires that relevant documents be disclosed to PAPs, such as the EIS and RAP and kept in places where individuals can gain access easily.

2.8.2 IFC ENVIRONMENTAL, HEALTH AND SAFETY GUIDELINES

IFC’s Environmental, Health and Safety Guidelines (EHS Guidelines) are implementation tools for IFC’s performance standards. They are technical reference documents covering cross-cutting and specific issues raised by general and specific types of projects and relevant to all performance
standards. 63 EHS guidelines (1 general guidelines document, 62 sectoral guidelines) have been developed for various types of projects, and contain performance levels and measures considered generally acceptable by the World Bank Group. The IFC EHS guidelines are directly applicable to private projects funded by the IFC, which is the branch of the World Bank Group funding private ventures. As such, they are not directly applicable to the Mozambique-Malawi Interconnector as a public project. The present ESIA, therefore, was not prepared according to those guidelines but rather according to World Bank Safeguard Policies. The EHS Guidelines were used as guides however for some aspects of the mitigation.

2.8.2.1 IFC EHS GUIDELINES FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. They are divided in two main sections: Industry-Specific Impacts and Management, Performance Indicators and Monitoring.

The EHS Guidelines for Electric Power Transmission and Distribution identify the main categories of environmental, community health & safety and occupational health & safety impacts to be expected from power transmission projects, and propose avenues for properly managing those impacts. Performance indicators are also proposed to be used at the ESMP implementation stage.

The main potential impacts identified by the EHS guidelines are the following:

- **Environmental impacts:**
  - Terrestrial habitat alteration (from construction and maintenance of right-of-way);
  - Potential promotion of forest fires;
  - Avian and bat collisions and electrocutions;
  - Aquatic habitat alterations (from construction of corridors crossing aquatic habitats);
  - Electric and magnetic fields;
  - Potential spills of hazardous materials (pesticides for maintenance of right-of-way, transformer insulating oils, liquid petroleum fuels).

- **Community health & safety impacts:**
  - Risks of electrocution;
  - Electromagnetic interference;
  - Visual amenity;
  - Noise and ozone emissions;
  - Aircraft navigation safety.

- **Occupational health & safety hazards:**
  - Electrocution from contact with live components during construction, maintenance, and operation activities;
  - Occupational hazards when working at heights during construction, maintenance, and operation activities;
  - Exposure to electric and magnetic fields;
  - Exposure to hazardous materials.
2.8.3 SOUTHERN AFRICAN POWER POOL

In September 2010, the Environmental Subcommittee of the SAPP published the Environmental and Social Impact Assessment Guidelines for Transmission Infrastructure.

This document is not regulatory in nature; it is a tool to assist in the realization of an ESIA studies. As such the guidelines provide assistance on the ESIA process leading to the project’s licencing by the respective national environmental agencies to a project’s proponent.

These guidelines document the various steps of a typical ESIA process and in relation with the project’s phases. The approach promoted includes the production of:

- the project’s official registry with the national environmental agencies through a screening report;
- the initial presentation of the project and receiving environment as well as the preliminary terms of reference through a scoping report;
- the effective environmental assessment and the elaboration of an environmental and social management plan.

The guidelines also insist on the needs for stakeholder engagement in the ESIA process and on the organization of adequate public consultations throughout the process, with more official activities realized during the scoping and ESIA stages.

Finally, an emphasis is placed on ensuring that efficient monitoring is in place to verify the evaluation of the impacts and the adequacy of the proposed mitigation measures. The guidelines also encourage the proponents to conduct an audit of the ESIA report, of the ESMP and of the institutional capacity to implement the mitigation plan following the project’s realization.
3 PROJECT DESCRIPTION

3.1 PROJECT JUSTIFICATION

Malawi integrated into the Southern African Power Pool (SAPP) at the time of its creation in 1995. At this time, only the utilities of nine of the twelve members (countries) were already interconnected, that is, Botswana, the Democratic Republic of Congo, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. The remaining member countries to connect were Angola, Malawi and Tanzania. Ensuring that all member countries are interconnected is a high priority for the SAPP and this is why, in the SAPP’s 2013 Annual Report, the Mozambique-Malawi Interconnection was identified as a high priority project.

On April 3, 2013, the Governments of Malawi and Mozambique signed a power interconnection agreement that includes two phases: (i) the construction of the Mozambique-Malawi 400 kV Transmission Line from the Matambo substation in Tete, Mozambique, to the Phombeya substation in Balaka, Malawi; and (ii) construction of a second transmission line from Balaka to Nacala, Mozambique. The current report only considers the first phase of this interconnection agreement and concentrates on the Malawi section of the proposed interconnection line as per the terms of reference of WSP’s contract. This Project will link the Cahora Bassa hydropower systems of 2,075 MW, in Mozambique to the 282 MW hydropower systems installed in the Shire River, in Malawi.

Currently, Malawi’s installed electricity generation capacity is 351 megawatt (MW), against a generation requirement of 596 MW, with a projected peak demand of 757 MW by 2020 (Malawi Government, 2014). Over 90% of this power is generated from the Shire River and in the past 2 years there has been generation challenges as a result of climate change effects (floods and droughts), resulting in intermittent power supply. The power interconnection is very much needed in Malawi, as it will address some of these problems.

The project is completely in phase with the Malawi’s power sector’s strategy, which includes (i) implementation of the interconnection with the SAPP network and (ii) expansion of low cost domestic generation capacity.

3.2 PROPOSED ALIGNMENT AND OPTIMIZATION

3.2.1 ORIGIN OF THE PROPOSED ALIGNMENT

The proposed alignment was initially evaluated through the analysis of a 2-km wide corridor originating from the initial ESIA’s of 2003 and 2004. This corridor was first optimized between 2005 and 2016 prior to the initiation of the current ESIA and again, following a preliminary site survey conducted in July 2016 at the beginning of the Scoping phase of the current ESIA process. Finally, an optimized alignment emerged based on an on-site technical survey and on the results of the Public Consultations Round 1, completed during the Scoping phase. The following sections summarize the evolution of the studied corridor and resulting proposed alignment.

3.2.1.1 CORRIDORS ALTERNATIVES EVALUATED AT THE SCOPI NG PHASE

The Mozambique-Malawi Interconnection project was initially considered in terms of its technical feasibility (2005) following an initial environmental and social impact assessment (ESIA) completed in 2003 (for Malawi) and 2004 (for Mozambique). The EIA Study was submitted and approved by EAD. However, due to several reasons, the project has not continued.

In 2003-2004, the ESIA completed proposed a preferred corridor which globally presented less environmental and social impacts. However, this corridor was confronted to a significant technical constraint related to the crossing of the Zambezi River in Mozambique.
Indeed, the river’s shores are separated by almost 1 km while the typical 400 kV towers’ span is limited to 465 m. Two alternatives were then considered for this corridor in relation with the river crossing constraint:

- Alternative 1 crossing the river near the Chamuarura village;
- Alternative 2 crossing the river near the Rupia village (see Figure 3-1).

These alternatives were compared using criteria such as river crossing facilities, presence of villages or houses, presence of agricultural activities as well as flooding and erosion risks. All of these aspects have environmental, technical and economic implications. It resulted in Alternative 2 being the selected corridor.

Between 2005 and 2016, the corridor selected in 2004 was revisited to generate a revised corridor that was presented in the terms of reference used by the ESIA consultant (see Figure 3-2). The revision was made to resolve some specific limitations such as the necessity to minimize encroaching in the International Coal Ventures Private Limited (ICVL Benga Project) and the Vale (Moatize coal Project) mine’s active concessions areas and to take into account the recently built 220 kV line between the Matambo and Vale substations in Mozambique.

**PROPOSED INITIAL MODIFICATIONS FOR CORRIDOR OPTIMIZATION FOLLOWING A PRELIMINARY SITE SURVEY**

The studied corridor was visited during an initial site survey conducted from July 21st to 23rd, 2016. The observations made by WSP during this site visit combined with the analysis of the available satellite images and initial baseline survey information were communicated to the Technical Feasibility Consultant whom evaluated potential deviations to optimize the corridor’s alignment in relation to highlighted sensitive areas. The design of the proposed modifications also took into consideration potential technical difficulties associated with the initial corridor as well as the following criteria.

**Table 3-1 Criteria for the design of the proposed deviations**

<table>
<thead>
<tr>
<th>Technical Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔ Find a path that is as short as possible to minimize the length of the line and reduces the construction and operation costs.</td>
</tr>
<tr>
<td>➔ Aim for a straight line to reduce the number of angle towers that drives costs higher.</td>
</tr>
<tr>
<td>➔ Avoid steep areas sensitive to erosion and landslide.</td>
</tr>
<tr>
<td>➔ Pair with existing right-of-way (ROW) of electrical equipment and/or existing linear infrastructure (roads, railways) to reduce visual impact and minimize footprint.</td>
</tr>
<tr>
<td>➔ Stay close to existing roads and tracks to facilitate access for construction and maintenance needs, even during the rainy season.</td>
</tr>
<tr>
<td>➔ Avoid poorly drained flooded or swampy areas, because of the poor bearing capacity of soils.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental and Social Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔ Look for existing ROWs to minimize land fragmentation and affected areas.</td>
</tr>
<tr>
<td>➔ Ensure crossing of rivers in their narrower segments, more specifically for the Mwanza River.</td>
</tr>
<tr>
<td>➔ Take the current land use into account and those anticipated by respecting regional development plans and by seeking interfaces between different land uses.</td>
</tr>
<tr>
<td>➔ Avoid urban populated areas by locating the corridor outside of the towns and villages.</td>
</tr>
<tr>
<td>➔ Avoid protected areas and zones of ecological interest (rivers, lakes, migratory corridors, dense forest areas, etc.).</td>
</tr>
</tbody>
</table>
Figure 3-1
Proposed 2005 Corridor and Zambezi River Crossing Alternatives

Sources:
- ESRI World Imagery, www.arcgis.com
- Existing Substation
- Proposed Substation

Human Environment
- City
- District Boundary
- International Boundary

Infrastructures
- Airport
- Existing Substation
- Existing Transport Line, 220 kV
- Existing Transport Line, 66 kV
- Primary Road
- Secondary Road
- Railroad

Project Components
- Phombeya Substation (Under Construction)
- Proposed Initial Modifications
  - Alternative 1
  - Alternative 2

Environmental and Social Issues
- Benga Mine's Active Concession
- Vale Coal Mine's Active Concession

Environmental and Social Issues
- Forest Reserve or Private Estate

Environmental and Social Issues
- Forest Reserve or Private Estate

Proposed 2005 Corridor and Zambezi River Crossing Alternatives

Sources:
- Existing Substation: Lahmeyer International (April 2008), Mozambique - Malawi Transmission Interconnection Project
- Proposed Substation: Millenium Challenge Account (2015-12-17) and Lahmeyer International (2017-06-07)

File: 161_07023_00_ESF3-1_071_MWI_selected2005Corridor_170607.mxd

Preparation: G. Pothier
Drawing: V. Venne
Verification: J.-M. Evenat

Basemap: ESRI World Street Map
International Boundaries: Map Library, www.maplibrary.org
District Boundaries: OCHA 2007
Proposed Interconnexion Line: Lahmeyer International (April 2008), Mozambique - Malawi Transmission Interconnection Project
Proposed Substations: Millenium Challenge Account (2015-12-17) and Lahmeyer International (2017-06-07)
Figure 3-2

Studied Corridor and Proposed Deviations

Sources:
- Analysis - GPS World Sheet Map
- Environmental Assessment Report, www.maplibrary.org
- Environmental and Social Issues
- Forest Reserve or Private Estate

Proposed Initial Modifications
1
2
3
Most of the proposed modifications made by the Technical Feasibility Consultant are minor ones to avoid isolated buildings and small communities as well as to optimize the corridor’s alignment with regards to existing infrastructures such as the EN7 road (in Mozambique) and the Sena and Nacala Railway. However, three more significant modifications are proposed for three sections of the selected corridor alternative, one in Mozambique and two in Malawi. They are presented in Figure 3-2 and the Malawi modifications are described hereafter:

- The first modification starts just west of the crossing of the S136 road in Malawi and passes the Mwanza area to the south of the privately owned Nankudwe Estate. It consists in a section of approximately 10 km.
- The second modification starts approximately 3 km west of the community of Tedzani, in Malawi, and is located on the southeast side of the M6 National Road. It concerns a section of approximately 12 km.

The proposed modification at the level of Mwanza has two major advantages in comparison to the original path of the studied corridor, because it passes to the west and south of the Estate, thus, avoiding crossing it, and it moves the corridor away from the extending southern suburbs of the City of Mwanza, thus not impairing any future development.

The proposed modification at the level of Tedzani avoids the crossing of the northwestern extension of this community and minimizes the crossing of cultivated parcels and of isolated households and farms. Furthermore, just before crossing the M6, the modification follows existing lines for its last 4 km, which limits the dispersion of the ROWs.

The optimized corridor is presented on Figure 3-3.

**FINAL MODIFICATION TO THE PROPOSED CORRIDOR FOLLOWING THE PUBLIC CONSULTATIONS ROUND 1**

In addition to the deviation made based on the initial site survey, other modifications were made to the proposed corridor, following the Public Consultations Round 1. However, all the modifications suggested by the stakeholder only concern the Mozambican section of the corridor and took into consideration concerns related to: the City of Tete’s southern expansion plans; avoiding entirely the Vale Coal mine concession limits; and a request from the District of Moatize for the Transmission line to stay south of the Nacala Railway thus avoiding a dense agricultural area.

**FINAL PROPOSED ALIGNMENT**

The selected alignment enters Malawi according to a northeast axis, less than 1 km north of the Thambani Forest Reserve of which it follows the northern limit for approximately 6 km. It then turns to the southeast to pass between the southern part of the Nankudwe Estate and northern part of the Michiru Estate. It continues towards the east, keeping this direction until reaching the southern side of the M6 National Road which it follows for 28 km crossing perpendicularly the new Railway corridor originating from the Vale Mine site and the S137 Road. After crossing the M6 National Road to the southwest of the community of Zalewa it follows the northwest side of the M6 and of the M1 National Roads until reaching the proposed construction site of the Phombeya Substation.

This alignment has a length of 76 km in Malawi for a total of 218 km for the entire project and it is presented on the map included in Appendix 3.
3.3 INVESTMENT VALUE

At this point of the project, the construction of the global Mozambique-Malawi Interconnection transmission line is estimated at US$ 127,152,000 with one circuit installed. When the second circuit will be build (when energy demand is sufficient), it will bring the total investment to US$161,225,000. Specific project cost for Malawi is presented in section 3.6 – *Construction Schedule and Costs*.

The Mozambique-Malawi interconnection project is to be composed, in Malawi, of a 76 km, 400 kV double circuit transmission line that will link with the Phombeya substation (under construction) in Malawi. Initially, only one circuit will be installed and operated. This ESIA report address the 400 kV line with one circuit installed. The second circuit is forecasted to be installed when energy demand requires it.

3.4 PROJECT COMPONENTS

3.4.1 PHOMBEYA SUBSTATION

Additional equipment will be inserted in the planned perimeter of the Phombeya Substation, whose footprint will not be extended: two (2) 400 kV transmission line bays and one (1) 400 kV shunt reactor bay which will require an area of approximately 75 m X 70 m within the substation. Only one of the two 400 kV transmission line bays will be installed initially. The second bay will be installed when energy demand requires it.

Each 400 kV line feeder bay shall consist of the following HV equipment:

- Three (3) surge arresters;
- Three (3) capacitor type voltage transformers;
- One (1) three-phase line disconnector with two earthing switches;
- Three (3) current transformers;
- One (1) three-phase circuit breaker;
- Three (3) Disconnectors;
- Two (2) three-phase busbar disconnectors.

The 400 kV reactor bay shall consist of the following HV equipment:

- One (1) shunt reactor
- Three (3) surge arresters;
- One (1) three-phase line disconnector with two earthing switches;
- Three (3) current transformers;
- One (1) three-phase circuit breaker;
- Two (2) three-phase busbar disconnectors.
Furthermore, the existing 400 kV single bus will be extended, and a second 400 kV bus will be installed within the Phombeya Substation premises.

The substation layout is presented in appendix 4. It should be noted that final plans are not included in the Feasibility Study and will come at a later stage.

3.4.2 TRANSMISSION LINE

As part of its internal procedures, ESCOM will acquire the entire right-of-way (ROW) of 55 m width, that is, 27.5 m on both sides of the centre line (Fichtner, 2016). This ROW, when not on public lands, will be acquired through mutual agreement with owners or through an official expropriation process.

The towers designed for this transmission line will be the self-supporting towers as presented in the photo below.

Photo 3-3 Typical Examples of Self-Supporting Towers

The following table summarizes the main characteristics of typical 400 kV transmission lines and figure 3-4 show typical tower configurations. Furthermore, typical measures such as the installation of corona rings and careful selection of all fittings have been planned to reduce electrical and magnetic fields as well as audible noise. The objective is to limit these emissions to acceptable ranges as per relevant industry accepted guidelines such as those of the International Council on Large Electric Systems (CIGRE).
### Table 3-2 Characteristics of the Proposed 400 kV Transmission Line

<table>
<thead>
<tr>
<th>Technical aspect</th>
<th>400 kV line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated length</td>
<td>218 km</td>
</tr>
<tr>
<td>Length in Malawi</td>
<td>76 km</td>
</tr>
<tr>
<td>Typical ROW</td>
<td>55 m</td>
</tr>
<tr>
<td>Type of towers</td>
<td>Self-supporting towers</td>
</tr>
<tr>
<td>Tower spacing</td>
<td>450 m</td>
</tr>
<tr>
<td>Height of the towers</td>
<td>44 to 53 m*</td>
</tr>
<tr>
<td>Width of base</td>
<td>18 to 23 m</td>
</tr>
<tr>
<td>Type of conductors</td>
<td>ACSR Tern conductor</td>
</tr>
<tr>
<td>Capacity of transport required</td>
<td>1200 MVA per circuits</td>
</tr>
<tr>
<td>Height of line from ground (minimum)</td>
<td>10 to 12 m</td>
</tr>
</tbody>
</table>

* Regarding river crossings, it is to be noted that it may be required to be higher depending on the river’s width.
Sources:

- Basemap: ESRI World Street Map
- International Boundaries: Map Library, www.maplibrary.org
- District Boundaries: OCHA 2007
- Proposed Interconnexion Line: Lahmeyer International (April 2008), Mozambique - Malawi Transmission Interconnection Project
- Proposed Substations: Millennium Challenge Account (2015-12-17) and Lahmeyer International

Projection: WGS84, UTM Zone 36S

1:350,000

0 3.5 7 14 km

EDM - ESCOM

Environmental and Social Impact Assessment Report

Interconnexion Mozambique-Malawi, Malawi

Figure 3-3

Final Optimized Corridor

Project Components
- Phombeya Substation (Under Construction)
- Final Optimized Corridor
- Final Study Area (2 km)

Environmental and Social Issues
- Forest Reserve or Private Estate
- Human Environment
  - City
  - Airport

Infrastructures
- Primary Road
- Secondary Road
- Railroad

Affected Community Assets
- Borehole
- Church
- Cemetery
- School

Sources:
- Basemap: ESRI World Street Map
- International Boundaries: Map Library
- District Boundaries: OCHA 2007
- Proposed Interconnexion Line: Lahmeyer International (April 2008), Mozambique - Malawi Transmission Interconnection Project
- Proposed Substations: Millennium Challenge Account (2015-12-17) and Lahmeyer International
3.4.2.1 TOWER FOUNDATIONS

The type of foundation proposed for the transmission line's towers is composed of four concrete bases normally installed 3 to 4 metres in the soil. A concrete post with rebar and a steel support (Stub) is part of the concrete base (See Figure 3-5). This post rises to ground level. Once the base is buried and the material compacted, the first section of the towers can be bolted to each of the four stubs.

(Fichtner, 2016)
3.4.2.2 CONSTRUCTION AND MAINTENANCE OF ACCESS ROAD

Unpaved access roads will be built to and within the axis of the transmission line’s ROW to allow for construction, surveillance, inspection and maintenance work. These roads link the line’s ROW with the existing road network and will run for the entire length of the proposed line except over significant rivers such as the Mwanza River. Since the proposed line’s ROW is often close to National roads from which many penetration roads already emerge, its linking to the main network should be facilitated.

3.5 PROJECT ACTIVITIES

Various activities are associated with the realization of the project. The following table supplies a list of typical activities per project phase with a short description. Additional information is presented in the following section for some of the most important activities. More detailed information is provided in Technical reports (Fichtner, 2016).
### Table 3.3  Typical Project Activities for the Construction of a Transmission Line

<table>
<thead>
<tr>
<th>Pre-construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land acquisition</td>
</tr>
<tr>
<td>Displacement of populations / economic activities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site preparation</td>
</tr>
<tr>
<td>Installation of work site</td>
</tr>
<tr>
<td>Construction works</td>
</tr>
<tr>
<td>Exploitation of borrow pits</td>
</tr>
<tr>
<td>Transportation / circulation</td>
</tr>
<tr>
<td>Purchase of materials / goods and services</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation of the transmission line and substations</td>
</tr>
<tr>
<td>Vegetation management</td>
</tr>
<tr>
<td>Waste and hazardous materials management</td>
</tr>
<tr>
<td>Transportation / circulation</td>
</tr>
<tr>
<td>Purchase of materials / goods and services</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Decommissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of installations</td>
</tr>
<tr>
<td>Purchase of materials / goods and services</td>
</tr>
</tbody>
</table>

### 3.5.1  PRE-CONSTRUCTION

#### 3.5.1.1  DISPLACEMENT OF POPULATIONS / ECONOMIC ACTIVITIES

The presence of infrastructures within the line’s ROW is low since a total of approximately 89 structures (45 main, 39 secondary and 1 community building) were located for a total length of 76 km in Malawi.\(^1\)

Displacement activities are necessary they will involve the demolition and reconstruction on immediate vicinity of a variety of infrastructure such as houses, farm buildings, commerce, fences, etc.

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\(^1\) The number of structures was determined through the analysis of the most recent satellite images and confirmed during field surveys completed in April 2017.
3.5.2 CONSTRUCTION PHASE

3.5.2.1 SITE PREPARATION

Although the entire ROW needs to be cleared of built infrastructures, total clearance of vegetation and soil levelling is not necessarily required for its entire width.

Indeed, these activities must be completed for the access road, which will become at the operation phase the maintenance road, for the tower sites, for the storage areas and for the work camps.

At this time, a precise estimate of the area to be cleared and levelled cannot be calculated as the project is still in its design phase. However, the following general clearance requirements can be described:

- All vegetation above 4 m in height for the entire length of the line (76 km) and for its total width (55 m), that is for an area of 4.2 km². This is required to ensure long term minimal clearance under the conductors;
- All vegetation for the entire length of the line (76 km) and for 2 to 5 m in width for a total area of 0.4 km². This is required to allow for the stringing of the conductors on the towers.

3.5.2.2 INSTALLATION OF THE WORK CAMPS

Except for some of the local population that will be hired to work on the project, most of the workers will come from some distances and will be living in work camps that will be located along the proposed alignment. The number of camps required will depend on the detailed work schedule to be elaborated by the selected contractor and on the number of work teams required to respect this schedule.

These camps will be living and operational centres and will have to be supplied with water, sanitary facilities, dormitories, health facilities, cafeterias, etc.

Part or all the material, machinery and vehicles required for the construction activities will be stored within storage areas integrated in the work camps. Some of the material can be delivered directly at the construction site such as transformers and concrete blocks.

Location of work camps will be determined in agreement with ESCOM Environment Officer before construction starts.

3.5.2.3 LINE CONSTRUCTION ACTIVITIES

The typical line construction activities included, in logical order:

- The installation of the tower foundations which will require excavation machinery, concrete production equipment and transport vehicles.
- The erection of the towers which requires transport vehicles and a crane for lifting tower sections.
- The installation of the grounding equipment on each tower to avoid shocks for the future maintenance workers. Figure 3-6 shows a typical grounding installation at the foot of a tower.
- The installation of the insulators on the towers.
- The installation and hauling of the conductors and of the shield wires also called optical ground wires (OPGW).

The exact nature and number of machinery and equipment that will be used will be determined by the selected contractor for him to ensure efficient construction and respect of the established work schedule.
3.5.2.4 SUBSTATION RELATED CONSTRUCTION ACTIVITIES

As there will be some additional equipment to install at Phombeya substations, the following construction activities will have to be realized:

- Construction of the substation’s foundation using excavation machinery and transport vehicles.
- Construction of the ground grid and of cable trenches and conduits again using excavation machinery and transport vehicles.
Erection of the steel support structures with the use of cranes and transport vehicles.
Installation and assembly of equipment and bus work.
Preparation of final grade including substation gravel.
Testing and commissioning of the substation.

3.5.3 OPERATIONAL PHASE

During the operational phase the main activities will be linked to inspection and maintenance work including vegetation control. These activities will require the use of machinery, transport vehicles and replacement parts to replace broken or failing elements.

3.5.4 DECOMMISSIONING PHASE

Transmission lines are normally designed for a life span of 50 years and more and they are rarely decommissioned but rather undergo regular maintenance. However, if decommissioning is effectively required, the use of heavy machinery and cranes for the dismantling of the towers and transport vehicles to bring the material to elimination or recycling sites would be required. The same is effective for substation, as with regular maintenance, they are expected to be operational for much more than 50 years. Anyhow if a substation must be decommissioned, some decontamination works may be required if transformers or other oil containing equipment have leaked through the years. This type of activity will imply the use of excavation material and vehicles to send the contaminated soil to authorized sites.

3.6 CONSTRUCTION SCHEDULE AND COSTS

Detailed construction schedules for line and substation construction cannot be presented at this time as they will be prepared by the contractor. However, typically, for a 400 kV transmission line of similar length, total construction time is approximately 24 to 30 months.

According to the estimates realized by the Feasibility consultant (Fichtner, 2017), the construction costs for the transmission line and for the work required at Phombeya substation are:

- 400 kV double circuit line with only one circuit installed: US$30,202,000
- New equipment at Phombeya Substation: US$5,105,000
- Total project costs for Malawi: US$35,306,000

3.7 LABOUR

The construction of a transmission line and of substation equipment will require hiring specialized and non-specialized work force for the various activities described above. The specialized workers may come from various areas of the country while the non-specialized workers should come mainly from the immediate regions through which the project will be developed. Qualified and non-qualified women present locally will be employed to reduce vulnerability effects that could be generated by the project.

Exact number of work force is difficult to estimate at this time as it will depend, amongst other factors, on the availability of mechanical equipment. However, a gross estimate would be of at least 200 workers (150 specialized and 50 non-specialized) for the construction of the transmission line and probably from 50 to 100 (37 to 75 specialized and 13 to 25 non-specialized) for the various substation equipment, to be installed.
4 PROJECT’S AREAS OF INFLUENCE

The baseline description and the impact assessment of the Project is based on the delineation of two study areas that cover all physical, biological and social elements that may be directly or indirectly affected by the Project or that could affect the implementation of the Project, in all of its phases.

The area of direct influence (ADI) is defined as the area affected by the project's direct impacts, whose delimitation is based on the physical, biological and socioeconomic characteristics of the ecosystems and on the activities of the project. The area of indirect influence (AII) is defined as the area (including the ecosystems and the physical, biological and socioeconomic environments) that can suffer from the project’s indirect impacts, resulting from implementation of the project activities.

It should also be noted that the AI definition process should be continuous in the EIA process, as the knowledge, regarding the environmental and social baseline and the project impacts, increases. If necessary, the AIs defined can be reviewed or refined to improve the impact assessment.

4.1 AREA OF DIRECT INFLUENCE

A practical approach for this ESIA and RPF was applied by using the center of a 2 km wide corridor as a proxy alignment to conduct the assessment. The actual alignment and tower locations will be determined as an outcome of the geological and topographical surveys leading to the preparation of a detailed design that will define the positioning of the tower footing.

The project’s ADI is the combination of two different areas:

→ the project footprint (the area directly occupied by the power line corridor and substations);

→ the area where the construction and operation direct impacts are likely to be felt.

The footprint includes the area occupied by the line’s ROW and substations. In the construction phase, the footprint also includes the ancillary infrastructures, such as temporary access roads, construction camp sites, borrow pits created from soil excavation and stripping and waste disposal sites, among others. It is expected that this ancillary infrastructure will be located in the immediate vicinity of the transmission line. In this area, several direct impacts will be felt, such as vegetation clearing, soil stripping, etc., but these will be contained to the footprint.

When considering the project’s direct impacts outside of the footprint area, it is useful to separate the biophysical and socio-economic impacts. Therefore, the project’s ADI is delineated as follows:

→ **Biophysical environment**: a 300 m wide and 76 km long corridor, centered on the project’s alignment, as most of the direct biophysical impacts are expected to be felt in the immediate surroundings of the footprint area.

→ **Socio-economic environment**: the communities and their property affected by the proposed ROW. Although employment and economy stimulation may extend to other communities, direct socioeconomic impacts are expected to be felt mostly by the villages and communities crossed, or near, the alignment. However, a map of community boundaries is not available for the project area and therefore the socioeconomic ADI is illustrated using a 2 km wide corridor centered on the line’s route.

Figure 4-1 illustrates the socioeconomic ADI, which includes the biophysical ADI.
4.2 AREA OF INDIRECT INFLUENCE

Globally, the interconnection project will have a substantial indirect economic influence on the entire country as it will induce the benefits of improved and increased power supply, facilitating the exchange and selling of surplus electricity to the neighbouring countries. However, when focusing more specifically on the project infrastructure and the biophysical and socioeconomic components, the project’s Area of Indirect Influence (AII) will be defined as follows:

→ **Physical environment**: a 2 km wide and 76 km long corridor, centered on the project’s alignment, as most of the indirect physical impacts are expected to be felt in a corridor surrounding the new transmission line.

→ **Biological environment**: the area of indirect influence includes areas where the natural environment shows a high ecological integrity (e.g. hotspot biodiversity area) and anticipated to host species transitioning inside the project area.

→ **Socioeconomic environment**: the affected districts (Mwanza, Neno and Balaka) as benefits and impacts from project-induced changes in the ADI are likely to extend to other communities within these districts.

Figure 4-1 illustrates the AII associated with the physical environment and with the socioeconomic environment.
**Figure 4-1**

Areas of Influence

- **Project Components**
  - Phambeya Substation (Under Construction)
  - Study Area (2 km)

- **Areas of Influence**
  - Area of Direct Influence (2 km)
  - Area of Indirect Influence (District's limits)

- **Environmental and Social Issues**
  - Forest Reserve or Private Estate

**Sources:**
- Basemap: ESRI World Street Map
- International Boundaries: Map Library, www.maplibrary.org
- District Boundaries: www.gadm.org (November, 2015)
- Proposed Interconnexion Line: Lahmeyer International (April 2008), Mozambique - Malawi Transmission Interconnection Project
- Proposed Substations: Millenium Challenge Account (2015-12-17) and Lahmeyer International

**Preparation:** G. Pothier

**Drawing:** V. Venne

**Verification:** J.-M. Evenat

**Projection:** WGS84, UTM Zone 36S

**Legend:**
- River
- Human Environment
  - City
  - District Boundary
  - International Boundary
- Infrastructure
  - Airport
  - Primary Road
  - Secondary Road
  - Railroad
- Project Components
  - Phambeya Substation (Under Construction)
  - Study Area (2 km)
- Areas of Influence
  - Area of Direct Influence (2 km)
  - Area of Indirect Influence (District's limits)
- Environmental and Social Issues
  - Forest Reserve or Private Estate
5 DESCRIPTION OF ENVIRONMENTAL AND SOCIAL COMPONENTS

5.1 PHYSICAL ENVIRONMENT

5.1.1 CLIMATE

5.1.1.1 TEMPERATURE AND RAINFALL

The study area has a Tropical Savannah Climate (according to the Köppen-Geiger classification scheme), characterized by two seasons (wet and dry). The wet season starts in November and ends in March, while the dry season runs from April to October. However, it is common for some parts of the Mwanza and Neno Districts to receive rain in the month of April (Government of Malawi, 2012a, b). Tropical cyclones have also been known to move as far inland as Malawi, bringing with them torrential rain and strong winds (Pike & Rimmington, 1965). The key climatic characteristics of the study area are shown in Table 5-1.

Table 5-1 Climate of the Study Area

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mwanza</th>
<th>Neno</th>
<th>Balaka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rainfall</td>
<td>800 mm – 1,200 mm</td>
<td>500 mm – 1,200 mm</td>
<td>700 mm – 1,100 mm</td>
</tr>
<tr>
<td>Mean annual temperature</td>
<td>15°C to over 30°C</td>
<td>8°C to over 32°C</td>
<td>N/A</td>
</tr>
<tr>
<td>Hottest months</td>
<td>September to April</td>
<td>September to April</td>
<td>September to April</td>
</tr>
<tr>
<td>Temperature in the hottest months</td>
<td>23°C to 35°C</td>
<td>23°C to 30°C</td>
<td>28°C to 39°C</td>
</tr>
<tr>
<td>Coldest months</td>
<td>May to August</td>
<td>May to August</td>
<td>May to August</td>
</tr>
<tr>
<td>Temperature in the coldest months</td>
<td>8°C to 15°C</td>
<td>11°C to 15°C</td>
<td>9°C to 18°C</td>
</tr>
</tbody>
</table>

Source: Mwanza District Socio-economic Profile, 2013; Balaka District Socio-economic Profile, 2013; Neno District Socio-economic Profile, 2012

According to Balaka District’s Socio-economic profile (Government of Malawi, 2013), Balaka District is a rain-shadow area where rain is erratic, especially in the Shire Valley Area. This area has the highest temperatures in the district. Phalula is in this area and the average rainfall for the year 2001 was 508 mm, for 2002, 531 mm, and for 2003, 631 mm. Average temperatures are also high in Neno and Mwanza, in the line corridor.

5.1.1.2 WIND SPEED AND DIRECTION

During the dry season (March to September), prevailing winds are largely influenced by the subtropical high-pressure zone in southern Malawi. The winds are largely south-easterly. As the hot season progresses, pressure decreases from September onwards over Malawi, and winds become increasingly northerly.

Other notable wind developments in Malawi are the Mwera and Chiperoni. Mwera is a local name for strong south-easterly winds, whereas Chiperoni is a Malawian name for an influx of cool moist air from the south-east, which brings overcast conditions with drizzle on windward slopes along the northern lakeshore and in particular to many areas in the south of Malawi.

This phenomenon can persist for up to a week but the usual duration is two to three days. Mwera winds occur immediately before and occasionally during a Chiperoni outbreak (Department of Climate Change and Meteorological Services, 2006).
Lake Malawi is particularly affected by the Mwera due to the flat and obstruction-free nature of its surface, allowing winds of considerable strength to develop. Wind data in Malawi are limited due to a lack of complete meteorological stations. The existing wind map was developed in 1983 and it shows the wind rose developed up to that time (Government of Malawi, 2003). The wind roses are shown in Figure 5-1.

**Figure 5-1 Wind Roses for Malawi before 1983**

![Wind Roses for Malawi before 1983](image)

*Source: Government of Malawi, 2003 (with project routing superposed)*

Due to a lack of suitable wind data from localities close to the route or the study area districts, the wind speeds and wind directions derived by Meteoblue have been used to describe the winds in the area. The wind data was developed through simulations of historical wind data, from 1984 to 2014 (see Figure 5-2). They show that for most of the year, winds blow at an average of 5 km/hour. Approximately four days, from August to October, have high wind speeds at an average of 12 km/hour (Meteoblue, 2016). The study area largely experiences south to south-easterly winds.
5.1.1.3 CLIMATE CHANGE

Recent climate trends in Malawi show a temperature increase of 0.9°C between 1960 and 2006, an average rate of 0.21°C per decade (McSweeney et al., 2008).

The increase in temperature has been most rapid in December-January-February (DJF) and slowest in September-October-November (SON). Daily temperature observations show an increase in the frequency of hot days and nights in all seasons. The frequency of cold days and nights has significantly decreased in all seasons except in SON. Observed rainfall over the country does not show statistically significant trends. In addition, there are no statistically significant trends in the extreme indices calculated using daily precipitation observations (McSweeney et al., 2008).

Source: CDIAC, 2009
Climate change studies undertaken by the Government of Malawi, for input into the United Nations Framework Convention on Climate Change (UNFCCC) (through the Initial and Second National Communication reports) revealed the following on climate change in the country (Government of Malawi, 2002b):

- Temperatures would rise between 1°C and 3°C under a climate change scenario;
- Rainfall would increase by 5-22%, or decrease by 1-16%, depending on the model used and location; and
- Rivers in Malawi are very sensitive to changes in rainfall, generally the frequency and magnitude of heavy storms and droughts would result in severe floods or devastating droughts.

Although there are a number of approaches for establishing future climate scenarios, the common approach is to use General Circulation Models (GCMs). Using GCMs, six global emission scenarios were developed, namely: A1FI, A1T, A1B, A2, B1 and B2 (IPCC, 2001). According to IGAD and ICPAC (2007), the “A” scenarios emphasize economic growth while the “B” scenarios emphasize environmental protection. The “1” scenarios assume more globalization while the “2” scenarios assume more regionalization. The A1 scenario families further lead to three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil intensive (A1FI), non-fossil energy sources (A1T), or a balance across all sources (A1B), i.e., where balance is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end use technologies.

In the climate change studies of 2002 and 2011, the A1B scenario was selected since it best describes the situation in the country, i.e., limited technological advances. The future climate changes in temperature and rainfall are presented in figures 5-4 and 5-5 respectively, for the year 2030 and 2050.

**Figure 5-4 Composite Change in Mean Annual Temperature by 2030 and 2050 in Malawi**

Note: The six GCMs used are CSM_98, ECH395, ECH498, GFDL90, HAD295, and HAD300. (with project routing superposed)
All GCM projections show an increase in days and nights considered hot under the current climate; and a decrease in the number of days and nights considered cold (McSweeney et al., 2008). Seasonal rainfall projections tend towards decreasing trends for dry season rainfalls in June-July-August (JJA) and SON, and an increase in wet season rainfalls in DJF and March-April-May (MAM). Considering that most of the rain in Malawi falls during the period of December-January-February-March-April (DJFMA), GCMs suggest a general increase in the amount of rainfalls in the country during the DJFM period, especially in the Central and Northern Regions of the country (Figure 5-5). However, model simulations show wide disagreements in the projected amplitude changes of future El Nino events. It is worth noting that Malawi’s climate is strongly influenced by ENSO, thus contributing to uncertainty in climate projections for this region (McSweeney et al., 2008). Current observations in Malawi show increased magnitude and frequency of extreme events such as floods and droughts.

According to the Government of Malawi (2002), climate change in Malawi is attributed to global increases in atmospheric concentrations of greenhouse gases: carbon dioxide, methane, chlorofluorocarbons, and nitrous oxide, which are all a result of emissions from human activities. These gases trap outgoing long wave radiation in the lower levels of the atmosphere, thereby resulting in global warming. The other contributing factors to climatic change are deforestation, which lays bare the Earth’s surface resulting in a radiation imbalance, and poor agricultural practices, for example, clearing gardens with fire.

In the study area, there is rampant deforestation due to increased demand for agricultural land, as well as for charcoal, curios and fuel wood, which are sold for income. The effects of climate change in the area include changes in precipitation, evaporation rates, and soil moisture among other things. These have serious effects on agriculture, water resources, energy, vegetation, health and the economy. To mitigate the impacts and reduce deforestation rates, the Government of Malawi through the forestry department, non-governmental organizations such as Action Aid, World Vision, WOLREC and Blantyre Synod have been carrying out projects aimed at afforestation, forest conservation, sustainable agricultural practices and economic empowerment (Government of Malawi, 2012c).

5.1.2 TOPOGRAPHY

Malawi’s topography is divided into four regions: the Rift Valley Plain, Rift Valley Escarpment, Plateau Area, and Highland Area (Ministry of Irrigation and Water Development, 2011). The topographical regions are shown in Figure 5-6.
The Highland Area is located in the western part of the Rift Valley and is 900m to over 1,200m in elevation, especially the famous Nyika Highlands with an elevation of about 2,000m. Mulanje Mountain in the south-east has an elevation of 3,000m, which is the highest mountain in Central Africa.

The project site belongs to Rift Valley Escarpment in the west and to the Plateau Area in the east. The site can be described as follows:

- The area along the Mwanza border which has a moderate altitude, with an elevation ranging from 500 – 1,000m (Mwanza District Socio-economic Profile, 2013). The terrain in this area is dissected and steep. There are the Dzobwe, Dzobwe-Mwana and Mfulanjobvu hills in the line corridor. This is the Rift Valley Escarpment Area.

- After the border area, the area along the line lies in the flat plains of the Mkulumadzi and Shire river valleys. The areas of TA Kanduku in Mwanza, TA Mlauli and TA Symon in Neno and the area of TA Nsamala in Balaka lie at an altitude of below 500m, (Government of Malawi, 2012b; Government of Malawi, 2013). This is the Plateau Area.

5.1.3 SEISMICITY

Malawi is under the influence of the Great Rift Valley, which separates the Arabian, African and Indian plates, is about 5,000km long and extends in the north-south direction from northern Syria to central Mozambique. The rift begins in the Red Sea, at the separation of the African and Arabian plates, extending in a north-west-south-east direction to the Gulf of Aden. Then it is directed southward to the Urema region, within the African plate.
Extensions of this Rift to the south can also be observed, in the area of Machaze (Manica) in the Graben region of Funhalouro, apart from others in the same region. The southern section is part of Lake Malawi, following the Shire River until it flows into the Zambezi River, about 250km downstream from Moatize. Figure 5-7 shows the location of the Great Rift Valley, while the seismic activity in Malawi, all earthquakes of magnitude 3.0 and above, is shown in Figure-5-8.

**Figure 5-7  Location of Great Rift Valley, Detail in Mozambique**

The Great Rift Valley area in Malawi extends for about 800km from Rungwe in southern Tanzania to the middle of the Shire Valley in southern Malawi (Chapola, 2000). The rift structures extend further south by the Shire trough in Malawi and Urema graben in Mozambique. However, most of the Malawi Rift, as it is also called, is largely occupied by Lake Malawi. According to Chapola, this is also where seismic activity is concentrated, particularly in the centre and northern part of the lake. Shire trough shows low seismic activity which increases tremendously at the southern tip of the country and continues at that rate into Urema graben.

From the figure, it can be seen that there are few epicentres in the study area. Data by the United States Geological Survey (USGS, 2006) indicate that there have been over 80 earthquakes in Malawi since 1990, with the highest measuring 6 on the Richter scale. Its epicentre was in Kalonga, the northern part of Malawi and it displaced 3,000 people. The earthquake activity in Malawi, though recurrent, is generally of low magnitude (Figure 5-8). However, the recent tectonic evolution of the Miocenic rift system across East Africa, represented in Mozambique by the Lake Niassa-Chire-Urema-Sofala branch, could be responsible for the greater frequency of recorded earthquakes.
5.1.4 GEOLOGY

Crystalline metamorphic and igneous rocks of Precambrian to Lower Palaeozoic age referred to as the Basement Complex Pre-Cambrian underlie most of Malawi (Water Department/UNDP, 1986). These rocks are also dominant in the area covered by the project; other rock types found in the project area are the Quaternary alluvium and Permo-Trias Karoo sediments (Figure 5-9).
Historically, Pre Cambrian Basement Complex rocks have been subjected to several phases of deformation and metamorphism affecting large tracks in Malawi and Africa as a whole (Castaing, 1990). The Mozambican orogeny that followed the Rusizi-Ubendian and Irumide orogeny affected a vast area in southern Malawi, including the project area, with high-grade metamorphism together with brittle deformation of already metamorphosed rocks. Structural trends follow several directions, the most common being NW-SW and NNE-SSW. The strata are generally folded isoclinically, often intensely and steeply dipping. Igneous intrusions occurred at various stages of these orogenies.

During the phases of crustal stability, pronounced weathering occurred, and parallel escarpment retreat created extensive pediplains or erosion surfaces, eliminating the higher surfaces (older pediments) and occasionally creating inselbergs, isolated erosive remnants modelled in more resistant rocks. In the study area, this resulted in the placement of different types of placer deposits e.g. kaolinite, marble, fluorite, monazite, limestone and gold (Government of Malawi, 2012b). Figure 5-10 illustrates the placer deposits. Also, a Kangankunde rare earth deposit lies 14-15 km north of the proposed Phombeya substation.
5.1.5 SOILS

Two major soil types dominate the project area, namely:

- The Eutric Cambisols, known as lithosols. Lithosols include regosol soils which are sandy soils and of low fertility; and
- The Chromic Luvisols, generally known as latosols. These are red to yellow clayey soils of freely drained sites and are widespread in the Mwanza area of the project.

Figure 5-11 illustrates the soil types in the southern region of Malawi.
Figure 5-11 Soils in the Project Area

Source: Shire River Basin Atlas, 2016 (with project routing superposed)
5.1.6 HYDROGRAPHY AND WATER RESOURCES

5.1.6.1 SURFACE WATER

Malawi is generally considered to be relatively rich in water resources, with surface water resources covering one-fifth of the country (FAO, 2006). The water is stored in lakes, rivers, and aquifers. There are two major drainage systems (Figure 5-12):

- The Lake Malawi system, which is part of the Zambezi River basin. The Shire River is the only outlet of the lake with an average flow of 400 m³/s. About 91% of the country is located in the Zambezi River basin;
- The Lake Chilwa system, which is shared with Mozambique. Lake Chilwa is an endorheic basin draining rivers originating from the eastern slopes of the Shire Highlands, the Zomba Plateau and the northern slopes of the Mulanje Massif.

The project area lies in the Shire River Basin. Major rivers including the Mwanza, Mpandadzi, Wamkurumadzi, and Lisungwi rivers originate from the Kirk Range, north-west of Neno (Government of Malawi, 2012b). There are also a number of small rivers, which dry up during the dry season. The rivers drain into the Shire River as shown in Figure 5-13.

The availability of surface water is a major factor governing settlement in Malawi. Subsistence agriculture is largely rain-fed but the rivers are also used for irrigation.

Figure 5-12 Major Surface Water Elements in Malawi

Source: Earthwise, 2016 (with project routing superposed)
5.1.6.2 GROUNDWATER

The basement complex rocks, which are in the line corridor, in their un-weathered and un-fractured states, have virtually no permeability. Hence, the areas are low aquifer areas. Aquifers form where the rocks have been sufficiently weathered in-situ, to form a layer of unconsolidated saprolitic weathered material, which is associated with fractures. Groundwater is stored and flows through fractures, where these exist; and a weathered mantle if it develops in the uppermost part of the bedrock. Aquifer productivity principally depends on the thickness and texture of the weathered mantle and on the presence and characteristics of fractures. Because of the localised nature of fracturing and weathering, the aquifers are typically of limited extent and discontinuous. The quality of the groundwater is generally dependent on aquifer lithology such that groundwater basement aquifers are less mineralized (Chavula, 2012).

During the initial site visit of the area, a number of boreholes were observed and the groundwater was reported to be of good quality. Studies have shown that boreholes tend to be 45 to 50 m deep and the average borehole yield is 1 to 2 l/s (Chavula, 2012). However, communities face acute water shortages, especially during the dry season, as the area becomes too dry and correspondingly the groundwater table lowers. Likewise, streams and wetlands dry up, leaving communities without a reliable source of water.
5.1.7 AIR QUALITY

In Malawi, ambient air quality is regulated by the Malawi Bureau of Standards (MBS) under the MS 740:2005 Ambient Air – Methods of Sampling and Test. This regulation establishes, amongst other things, the air quality standards for nine major air pollutants (suspended PM, PM$_{10}$, PM$_{2.5}$, carbon monoxide (CO), sulphur dioxide (SO$_2$), nitrogen dioxide (NO$_2$), ozone, lead and photo-chemical oxidants) as shown in Table 5-2.

Table 5-2 Ambient Air Quality Standards for Malawi

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sampling Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 hour</td>
</tr>
<tr>
<td>Suspended PM, µg/m$^3$</td>
<td>--</td>
</tr>
<tr>
<td>PM$_{10}$, µg/m$^3$</td>
<td>--</td>
</tr>
<tr>
<td>PM$_{2.5}$, µg/m$^3$</td>
<td>--</td>
</tr>
<tr>
<td>Carbon monoxide (CO), ppm</td>
<td>35</td>
</tr>
<tr>
<td>Sulphur dioxide (SO$_2$), ppm</td>
<td>0.2</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO$_2$), ppm</td>
<td>0.12</td>
</tr>
<tr>
<td>Ozone, ppm</td>
<td>0.12</td>
</tr>
<tr>
<td>Lead, µg/m$^3$</td>
<td>--</td>
</tr>
<tr>
<td>Photo-chemical oxidants, ppm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

In the project’s area of direct influence, there are no significant air pollutant emission sources; the main sources that can be associated with the project’s area include:

- Road traffic and railway traffic - vehicles and trains are likely to affect air quality through fuel combustion and dust emissions. The proposed alignment follows the M6 and M1 Roads from its intersection with the S137 Road to the level of the Phombeya substation and generally stays within 1 km of these roads. Thus this segment is the most likely to be affected by the road emissions. The alignment also crosses the M6 Road once and the Nacala Railway twice.

- Emissions generated by agricultural activities - the proposed alignment crosses an area dominated by traditional farming activities. Slash-and-burn practices are widespread in the area and may result in significant emissions of dust and particles, affecting ambient air quality. Even though they are found throughout the proposed alignment, traditional agricultural activities increase in density in the area between the border with Mozambique and the Mwanza River and in the area between Tedzani and the Pombeya substations.

- Bush fires and dust dispersion due to wind - mobilization of fugitive dust due to wind erosion is another local emission source of particulate matter in the region. This phenomenon occurs mostly during the dry season and in open areas or areas with poor vegetation cover.

Sensitive air quality receptors in the study area include the rural communities and hamlets, the agricultural fields and the livestock raising areas along the alignment. Communities crossed by the alignment are mostly found between the border with Mozambique and the Mwanza River and in the Tedzani area. In particular, those communities host schools, health facilities, markets/trading centers and places of worship which are listed in Appendix 5. A mixture of agricultural fields and livestock raising activities are found throughout the alignment.

5.1.8 NOISE

In Malawi, noise is regulated under the Department of Labour, which is under the Ministry of Labour, Sports, Youth and Manpower Development, by the Act 21 of 1997 on Occupational Safety, Health and Welfare. This Regulation specifies standards related to workers exposed to noise and vibration levels likely to impair their health. Article 63 of this Act specifies time exposure and noise levels in dB(A) that render obligatory the use of ear-protection equipment. Thus, there are no specific standards as to general exposure to noise outside of an industrial context.
In 1998, the World Bank (WB) developed a pollution management program, so as to ensure that WB financed projects in developing countries were environmentally sustainable (WBG, 1999), the scope of which included noise.

The results were then incorporated into WB and International Finance Corporation (IFC) guidelines, which state that noise impacts from a particular project should not exceed the levels presented in the next table or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

The Environmental, Health and Safety (EHS) Guidelines of the World Bank Group contain the following noise level guidelines.

**Table 5-3  World Bank Noise Level Guidelines**

<table>
<thead>
<tr>
<th>Receptor</th>
<th>One Hour $L_{Aeq}$ (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime 07:00 – 22:00</td>
</tr>
<tr>
<td>Residential, institutional, educational</td>
<td>55</td>
</tr>
<tr>
<td>Industrial, commercial</td>
<td>70</td>
</tr>
</tbody>
</table>

The general existing noise levels associated with the proposed corridor are currently generated by vehicle movements on the M1, the M6 and other local access roads, by rail traffic on the Nacala railway corridor as well as by other local human activities conducted in the vicinity of surrounding settlements.

So generally speaking, noise levels, although unmeasured, are more typical of natural and rural areas, meaning low to very low.

Sensitive noise receptors identified in the study area are limited to the rural communities and hamlets located along the alignment. Such communities are mostly found in the area between the Mozambican border to the Mwanza River as well as more sporadically along the M6 and M1 Road. As mentioned in section 5.1.7 above, schools, health facilities, markets/trading centers and places of worship hosted by theses communities are listed in Appendix 5.

### 5.2 BIOLOGICAL ENVIRONMENT

#### 5.2.1 REGIONAL BIODIVERSITY CONTEXT

The study area is located inside the Zambezian and Mopane woodland ecoregion. The ecoregion is characterized primarily by woodlands dominated by mopane trees (*Colophospermum mopane*). Mopane often forms pure stands to the exclusion of other species, but is generally associated with several other prominent trees and shrubs, such as *Kirkia acuminata*, *Dalbergia melanoxylon*, *Adansonia digitata*, *Combretum apiculatum*, *C. imberbe*, *Acacia nigrescens*, *Cissus cornifolia*, and *Commiphora spp* (White 1983, Low and Rebelo 1996, Wild and Fernandes 1967, Smith 1998, Farrell 1968). Within this ecoregion, mopane communities show considerable variation in height and density. Trees in dense woodland or in more open savannah woodland may reach heights of 10 m to 15 m on deep alluvial soils, while mopane tends to be stunted and shrubby (1 to 3 m) where it occurs on impermeable alkaline soils (WWF, 2016).

Although the ecoregion, particularly the mopane communities, is considered to be poor in endemics, it supports some of the largest and most significant wildlife populations in Africa. Vegetation here is more nutritious than surrounding ecoregions with higher rainfall, and as a result the area is well known for supporting large concentrations of ungulates (Mills and Hes 1997, Huntley 1978). The ecoregion is famous for sensational concentrations of mammals (elephants, rhinos, ungulates). Indeed, elephant browsing and fire are the two major factors that shape the vegetation and ecosystems of the
ecoregion. The Zambezian and Mopane Woodlands enjoy a healthy conservation status, with 45% of this ecoregion being devoted to various forms of state and private conservation.

Outside these areas, the poor agricultural potential of the region means that the majority of habitats are still relatively intact (Huntley 1978).

5.2.2 NATIONALY AND INTERNATIONALLY RECOGNIZED AREAS

In terms of nationally and internationally recognized area, the study area doesn’t cross any protected areas or forest reserves. However, it follows the northern border of the Thambani forest reserve without entering inside. This forest reserve is the oldest forest reserve in the country and covers 10,670 ha. It was gazetted in 1927 to serve as a water catchment area, to conserve unique flora and fauna of the district and to conserve soil. This forest reserve is located approximately 8 km from Mwanza Boma and 0.5 km south of the proposed power line.

Additionally, the regional biodiversity context comprises few areas of high ecological importance. The Majete Wildlife Reserve is situated in the Lower Shire Valley in the south-west of Malawi.

The amazing success story of recovery and restoration and the continued protection of endangered species, including black rhinoceros, elephants, leopards and lions, have led Majete to become one of the most popular reserves in Malawi. Also, even if they are relatively far from the study area, there are Key Biodiversity Areas and Endemic Bird Areas inside the region.

The Lengwe National Park that lies along the border with Mozambique is considered as a Key Biodiversity Area because of the biological attributes it hosts, notably 330 species of birds. The Malawi-Tanzania Mountains Endemic Bird Area, as its name implies, hosts many restricted-range or endangered species that occur in montane forest, lowland forest or non-forest habitats. These areas may contribute to the avian diversity inside the study area.

None of these protected areas are crossed by the powerline. They are just part of the regional biodiversity context and could influence the presence of some species, mainly bird species, inside the project area.

Apart from these protected areas, the Nankudwe and Michiru private estates, located inside the Mwanza district, constitute areas with an ecological potential despite the fact that significant human activities are held within their limits. Indeed, they are used for cultivation of pigeon peas (Cajanus cajan) and maize (Zea mays), and for rearing of cattle (Bos taurus), goats (Capra aegagrus hircus) and pigs (Sus scrofa domesticus). These estates still have diverse plant communities, and provide habitat for threatened and sensitive flora and fauna.

5.2.3 FLORA

5.2.3.1 METHODOLOGY

The objective of the study was to identify the habitat types inside the study area and provide a representative characterization of the flora communities in place, while identifying the presence of the species of special status.

LITTERATURE REVIEW

Important sources of available information that were used for this study included the following:

→ Environmental Impact Assessment Guidelines for Energy generation and transmission in Malawi (MNRE, 2002b);
→ Environmental Impact Assessment (EIA) Guidelines for Malawi (EAD, 1997);
→ Google Earth™ images;
Identification field guides, including:

- Terrestrial vegetation: Bauman (2005);
- Malawi Plant Red List: Msekandiana & Mlangeni (2002);
- Aquatic Vegetation: Cook (2004).

Various databases, including:

- Flora zambesiaca (http://apps.kew.org.efloras/search.do);
- The International Union for the Conservation of Nature (IUCN) Red list of Threatened species (http://www.iucnredlist.org);
- Global Biodiversity Information Facility (GBIF) (http://data.gbif.org);

FIELD SURVEYS

One flora field survey was undertaken during the late dry season (September 28th –October 3rd, 2016). The survey was ideally timed for fruiting of terrestrial plants. The analysis of aerial photographs and satellite images of the project area has helped to identify ten (10) pre-selected areas of interest where flora survey sites were focused on. The selection of these survey sites was based on their representativeness of habitat diversity, and with a focus on habitats with the most ecological importance in terms of biological diversity and ecological processes.

These were also areas, which seem to harbor sensitive sites and hence could have diverse species of flora, some of which might be of conservation concern.

The 10 pre-selected survey areas of interest were new Phombeya substation, edges of the north-west of Thambani Forest Reserve, south-western part of Nankudwe Estate, span of the banks of Lisungwi River, span of the banks of Wamkurumadzi River, span of banks of Mwanza River, span of banks of Mpandadzi River, forest hills found 2 km south of Matope Trading Centre, Mwanza Hills (found in the eastern part of Mwanza Administrative District Council) and Matope Hills. Special habitats inside the study area that were also focused on for flora surveys, included but not limited to seasonal wetlands, open forests on hills & scarps, open forests on small plateaux, and grasslands.

In each vegetation type and/or habitat, 2 or more quadrats of radii 25 m (i.e. quadrat size) were laid down at the central line of the proposed transmission powerline. The quadrats were spaced at an interval of 1 km from each other. In each quadrat, multiple small plots of radii 2 m, 5 m and 10 m in size were laid down for grasses and herbs, shrubs and trees, respectively, as recommended by Ravindranath and Premnath (1997). Thus, plot sizes varied according to the different habitats and/or vegetation communities. This was done in order to thoroughly survey the entire study area. A total of 80 quadrats were laid down along the ROW, within the pre-selected survey sites (Figure 5-14).

Identification of species inside a dedicated quadrat only stopped, if and only if, a redundant list of species from plot to plot was reached. In this respect, identification of species started from one or two plots inside a specific vegetation or habitat type to estimate the density and wood volume and thereafter, moved inside the vegetation or habitat community in order to identify all species present until species became redundant. All species seen were identified to species level and recorded in the field notebook by a team of well-qualified botanists and para taxonomists. Photographs and specimen of plant species which could not be identified in the field were taken, to be identified at the field work station using flora field guides such as Flora Zambesiaca. Plants that could not be positively identified in this way were taken to Zomba National Herbarium in order to be accurately identified by matching each specimen and/or photograph with similar plant specimens that are kept in the herbarium.

Particular attention was paid to species of conservation concern such as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Near-threatened (NR,t) and Endemic species. Species which were discovered to be of conservation concern were subjected to both the National Red list and the
IUCN Red list of Threatened species (2016) in order to be assigned an appropriate Species conservation status category.

Further, the total number of tree species in each plot were recorded in the field notebook in order to estimate the average tree density of each vegetation community sampled and a concise description of each habitat type observed inside the project area, based on typical flora communities and species as well as environmental parameters influencing their presence (e.g. water, soils, topography, human disturbances, climate change, etc.) were given.

**Figure 5-14 Pre-Selected Sites for Flora Surveys**

**IDENTIFICATION OF THE PRESENT ECOLOGICAL STATE OF THE STUDY AREA**

Identification of the Present Ecological State of the terrestrial and aquatic ecosystems of the Study area was based on IFC Performance Standard 6. In addition, an objective assessment of expected and observed species abundance, and diversity of sensitive species and habitats were also used to supplement categorization of the Present Ecological State of the Study Area. The results obtained from this Study were classified into six Categories, ranging from *Unimpaired* (Category A) to *Very Severely Impaired* (Category F) Ecological State (Table 5-4).
### Table 5-4: FC Guidelines for Categorizations of Present Ecological State of Terrestrial and Aquatic Ecosystems Applied in this Assessment

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Unmodified</td>
</tr>
<tr>
<td></td>
<td>• natural diversity of taxa, and;</td>
</tr>
<tr>
<td></td>
<td>• numerous sensitive taxa, and</td>
</tr>
<tr>
<td></td>
<td>• abundance of species as expected under natural conditions;</td>
</tr>
<tr>
<td></td>
<td>• no taxa dominating each other, and;</td>
</tr>
<tr>
<td></td>
<td>• no alien invasive species.</td>
</tr>
<tr>
<td>B</td>
<td>Slightly Modified</td>
</tr>
<tr>
<td></td>
<td>• As above, but fewer sensitive taxa and slightly lower taxa, and;</td>
</tr>
<tr>
<td></td>
<td>• No alien invasive species.</td>
</tr>
<tr>
<td>C</td>
<td>Moderately Modified</td>
</tr>
<tr>
<td></td>
<td>• Moderate diversity of taxa relative to diversity expected under natural conditions, and;</td>
</tr>
<tr>
<td></td>
<td>• moderate numbers of sensitive taxa, or;</td>
</tr>
<tr>
<td></td>
<td>• moderate reduction in abundance of some or all taxa relative to that expected under natural conditions, and;</td>
</tr>
<tr>
<td></td>
<td>• alien invasive species may be present.</td>
</tr>
<tr>
<td>D</td>
<td>Considerably Modified</td>
</tr>
<tr>
<td></td>
<td>• low diversity of taxa relative to diversity expected under natural conditions, and;</td>
</tr>
<tr>
<td></td>
<td>• mostly tolerant taxa, and;</td>
</tr>
<tr>
<td></td>
<td>• considerable reduction in abundance of some or all taxa relative to the expected under natural conditions, and;</td>
</tr>
<tr>
<td></td>
<td>• more than one taxa dominating other taxa for extended periods, and;</td>
</tr>
<tr>
<td></td>
<td>• alien invasive species may be common.</td>
</tr>
<tr>
<td>E</td>
<td>Severely Modified</td>
</tr>
<tr>
<td></td>
<td>• very low diversity of taxa relative to diversity expected under natural conditions, and;</td>
</tr>
<tr>
<td></td>
<td>• only tolerant taxa present, or;</td>
</tr>
<tr>
<td></td>
<td>• severe reduction in abundance of some or all taxa relative to that expected under natural conditions, and;</td>
</tr>
<tr>
<td></td>
<td>• only one taxon dominating other taxa for extended periods, and;</td>
</tr>
<tr>
<td></td>
<td>• alien invasive species may be abundant.</td>
</tr>
<tr>
<td>F</td>
<td>Very Severely Modified</td>
</tr>
<tr>
<td></td>
<td>As above under Category E, but with very severe reduction in taxa diversity and abundance.</td>
</tr>
</tbody>
</table>

Although no method has been widely accepted for determining ecological state of a particular ecosystem, subjective qualitative estimates can be made using criteria such as level of transformation of natural habitat, presence of threatened species, etc. Thus, the present ecological state of the Study area from Mozambique-Malawi border in Mwanza District to the new Phombeya substation in Balaka District via Neno District was thoroughly and qualitatively assessed and has been generally classified as Considerably Modified, which is Category D.

### IDENTIFICATION OF ECOLOGICAL IMPORTANCE AND SENSITIVE HABITATS AND SPECIES

Ecological importance and sensitivity was based on the following criteria:

- **Threatened species.** Observed occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Near-threatened (NR.t) flora species as recognized by both National and IUCN Red Data Lists (Msekandika & Mlangeni, 2002; www.iucnredlist.org, 2016) or regional red data publications.

- **Endemic or Range-restricted species.** Observed occurrence of regional or national endemic or range-restricted species.

- **Unique assemblages of species.** Observed occurrence of flora species of scientific and/or pharmaceutical importance.
Key ecological processes. Observed habitats and ecosystems or vegetation communities important for connectivity of landscape features needed to facilitate gene transfer and/or migration of wildlife species.

Key ecosystem services (e.g. fuelwood; medicinal plants, fiber, potable water, edible food, livestock grazing, etc.).

5.2.3.2 RESULTS

Four vegetation communities were recognized within the Study Area. These vegetation communities were as follows:

- Dry Deciduous Brachystegia/Savannah Woodland;
- Open Semi-deciduous Savannah Woodland of Plateaux;
- Open Deciduous Savannah Woodland of hills and scarps;
- Agricultural crops.

DRIY DECIDUOUS BRACHYSTEGIA AND SAVANNAH WOODLAND

(a) Species Composition

The primary sampling area in this vegetation community was the dry deciduous Brachystegia woodland located along the edge of Thambani Forest Reserve and Mpandadzi River in Golowa Village in Mwanza District. Deciduous Savannah Woodland of hills and scarps was also surveyed in Mwanza, Neno and Balaka districts. A total of 132 species of plants belonging to 39 families was recorded from the survey sites (Appendix 6), representing 2.2% of the total species list of Malawi. Habitat diversity was high, with rich-loam soils and wet environmental conditions along the riverbanks of Mpandadzi, Mwanza, Wamkurumadzi and Lusingir rivers. This is the type of vegetation community and seasonal wetlands, where unique soil and hydrological conditions are favorable for the growth and survival of specialized plant species restricted to such conditions. The families Caesalpinioideae, Papilionoideae, Mimosoideae and Poaceae (grasses) contained the highest number of species in these areas. Very few wetland woody species were present, the most prominent being scattered Syzygium cordatum and Khaya anthotheca.

(b) Abundance

Dominant species were Andropogon shirensis, Loudentia simplex, Heteropogon contortus, Chloris gayana, and C. pycnothrux. The most abundant tree species were Pterocarpus rotundifolius, Terminalia serecea, Lonchocarpus capasssa, L. bussei, Acacia galpinii, Brachystegia boehmii, B. manga, B. bussei, B. longifolia, Pterocarpus angolensis, Lannear discolor and Acacia nigrescens.

(c) Tree Density

The tree density in these woodlands was estimated to be about 1,190 individual trees per hectare (ha.) and over 1000 individual trees belonged to the genera Brachystegia, Acacia, Combretum, Pterocarpus and Terminalia.

(d) Present Ecological State

The present ecological state of this woodland vegetation in the study area varied from moderately modified to considerably modified (i.e. Category C and D) in some places. Moderately modified areas have been cultivated, but were heavily degraded due to felling of trees for charcoal production and livestock grazing throughout the year, especially along the riverbanks and seasonal wetlands. Species composition was still moderately representative of the original floristic make-up of this vegetation community, and potential for supporting high biodiversity was moderate. These vegetation woodlands, including the seasonal wetlands were still functionally intact and provided ecological services such as fuelwood, flood attenuation, dry season grazing and wet season refuges for fauna. However, most woodlands in the study area were considerably modified through cultivation of crops and cutting down of trees for fuelwood (e.g. charcoal), no longer had the potential to sustain high biodiversity, and were functionally impaired.
(e) Conservation Importance

The moderately modified woodland was seen to support relatively higher biodiversity species than the considerably modified (Category D) woodlands. As a result, the former woodlands were able to harbor some threatened species in the category of Vulnerable (VU), but also a good number of nationally protected flora species. Thus, the vegetation communities were rated as of relatively high conservation importance.

(f) Threatened and Protected Species

Three (3) flora species recorded from the project area have been classified as Threatened in the National Red list and two as near threatened in the global IUCN Red list as indicated in Table 5-5. In addition, 16 nationally protected flora species were also recorded from the study area (Appendix 6). No endemic or species on CITES list was recorded from this vegetation community.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>National red list category</th>
<th>IUCN (globally) category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pterocarpus angolensis</td>
<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
<tr>
<td>Afzelia quanzensis</td>
<td>Vulnerable (VU)</td>
<td>Not evaluated</td>
</tr>
<tr>
<td>Dalbergia melanoxylon</td>
<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
</tbody>
</table>

(g) Alien Species

Four alien species were recorded inside this vegetation type. These were Lantana camara, Psidium guajava, Toona ciliate and Mangifera indica. Of these species, only Lantana camara has been confirmed to be an alien invasive species, while the invasiveness of other alien species had not yet been seen. These species were mostly surveyed in degraded woodlands where agricultural activities were predominant.

OPEN SEMI-DECIDUOUS SAVANNAH WOODLAND OF PLATEAUX

(a) Species Composition

The vegetation of this woodland was confined to the small plateau areas that were found on top of hills and slopes. A total of 61 species belonging to 26 families were recorded from this vegetation community, representing 1.1% of the entire plant list of Malawi (Appendix 6).

This is typical of most plateaux, where poor weathered red-clay soil coupled with dry weather conditions such as low rainfalls due to climate change and bush fires result in specialized plants restricted to such conditions. Asteraceae and Caesalpinioideae contained the highest number of species in this vegetation community.

(b) Abundance

Vernonia and few woody species of Brachystegia were the most abundant plant groups in this vegetation community, accounting for over 55% of the plant canopy cover. Dominant species were Vernonia amygdalina, Vernonia adoensis, Vernonia colorata, Vernonia glabra, Vernonia natalensis, Vernonia nestor, and Hibiscus cannabinus. The most abundant grasses were Hyparrhenia cymbaria, Hyparrhenia filipendula and Setaria sphacelata.

(c) Tree density

The tree density in the vegetation community was estimated to be 1,027 individual trees per ha belonging to the following genus Brachystegia, Terminalia, Combretum and Commiphora.
(d) Present Ecological State
The present ecological state of this study area is moderately modified (Category D) even though most of the hill slopes are cultivated for agriculture. Species composition was moderately representative of the original floristic make-up of this vegetation community, and the potential for supporting biodiversity was moderate. However, human induced fires and habitat loss in this vegetation community lead to functionally impaired vegetation communities, which had little potential to support biodiversity.

(e) Conservation Importance
The semi-deciduous savannah woodland of plateau areas was rated as having moderate conservation importance because of the fragmented nature of the vegetation community due to bush fires, cutting down of trees and cultivation on hill slopes. The vegetation community had also very limited species of conservation importance.

(f) Threatened and Protected Species
One flora species (*Pterocarpus angolensis*) was recorded from this vegetation community and has been classified as Vulnerable in the National Red list and near threatened in the IUCN (Table 5-6). In addition, two (2) species of trees (*Pericopsis angolensis* and *Lonchocarpus capassa*) that are protected by forestry national laws were also recorded from this vegetation community. Similarly, no endemic or species on CITES list was recorded from this vegetation community.

<table>
<thead>
<tr>
<th>Name of species</th>
<th>National red list category</th>
<th>IUCN (globally) category</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pterocarpus angolensis</em></td>
<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
</tbody>
</table>

(g) Alien Species
Few alien species were noted in this vegetation community, the most prominent being *Gmelina arborea*, which has the potential to displace indigenous biodiversity. Again, this species was mostly surveyed in degraded savannah woodlands where agricultural activities were predominant. The presence of the alien invasive species indicates that this vegetation community had been disturbed by communities.

OPEN CANOPY SAVANNAH WOODLAND OF HILLS AND SCARPS

(a) Species Composition
The vegetation of this woodland was confined to the hills and scarps found in the Study area. A total of 82 flora species belonging to 39 families were recorded from this vegetation community, representing 1.6% of the entire plant list of Malawi (Appendix 6). The soils of open canopy savannah woodland of hills and scarps were weathered red-clay, except in runoff channels where the soils were hydromorphic and hence had relatively diverse species of flora due to the presence of moisture in the soil resulting in specialized plants restricted to such conditions. Families *Caesalpinioideae*, *Papilionoideae* and *Combretaceae* had the highest number of species in this vegetation community.

(b) Abundance
*Combretum* and *Brachystegia* were the most abundant plant groups in this vegetation community, accounting for over 60% of the total plant canopy cover. Dominant species were *Combretum apiculatum*, *C. erythrophyllum*, *C. fragrans*, *C. mossambicense*, *C. zeyheri*, *C. imberbe*, *Brachystegia oehmii*, *B. longifolia*, *B. manga*, *Terminalia sericea*, *T. stenostachya* and *T. orientalis*.

(c) Tree density
The tree density in the vegetation community was estimated to be 912 individual trees per ha and over 375 individual trees of these belonging to the genus *Combretum*, *Brachystegia* and *Terminalia*.
(d) Present Ecological State

The present ecological state of this vegetation type is moderately modified even though some trees in most of the hills and scarp areas are cut down for charcoal production. This is discernable because of the fragmented nature of the vegetation community. Species composition was moderately representative of the original floristic make-up of the vegetation community, and the potential for supporting high biodiversity was moderate. However, the vegetation community has the potential to support moderate species diversity and has moderate functional value, particularly for stabilization of watersheds, catchments and flood attenuation and, fuelwood, important to the population’s well-being.

(e) Conservation Importance

The open canopy savannah woodland of hills and scarp areas was rated as having Moderate Conservation Importance because of the fragmented nature of the community and having few species of conservation concern.

(f) Threatened and Protected species

Three flora species (Pterocarpus angolensis, Dalbergia melanoxylon & Afzelia quanzensis) were recorded from this vegetation community and have been classified as Threatened in the National Red list and the first two as Near threatened in the global IUCN Red list (Table 5-7). In addition, ten (10) species of trees (Appendix 6) that are protected by the forestry national law because of their conservation importance were also recorded from this vegetation community. No endemic or species on CITES list was recorded from this vegetation community during the field survey.

Table 5-7 Threatened and Protected Flora Species Recorded in the Open Canopy Savannah Woodland of the Hills and Scarp Areas

<table>
<thead>
<tr>
<th>Name of species</th>
<th>National Red List Category</th>
<th>IUCN (Globally) Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pterocarpus angolensis</td>
<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
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<td>Vulnerable (VU)</td>
<td>Lower Risk/near threatened (Lr/NT)</td>
</tr>
<tr>
<td>Afzelia quanzensis</td>
<td>Vulnerable (VU)</td>
<td>Not Evaluated</td>
</tr>
</tbody>
</table>

(g) Alien Species

One alien plant species (Eucalyptus camaldulensis) was recorded in this vegetation community. This species has the potential to displace indigenous biodiversity. These species were mostly surveyed in degraded woodland where agricultural activities were predominant. The presence of this alien invasive species elsewhere indicates that this vegetation community had been disturbed by humans in the past.

AGRICULTURAL CROPS

(a) Species Composition

This vegetation community is confined to cultivated arable land and seasonal wetlands locally known as dambos. A total of 25 flora species belonging to 21 families were recorded from this vegetation community (Appendix 6). Of these species, 8 were indigenous species while the rest were exotic-cultivated and introduced species. The soils in this vegetation community range from sand to loam, and, in some areas, the soils are hydromorphic (i.e. alluvial soils), which are suitable for agricultural crops such as maize. Because of human disturbance resulting from cultivation and removal of indigenous plant species in favor of agricultural crops, there was a poor representation of indigenous species in this vegetation community.

(b) Abundance

Maize, Citrus and Musa were the most abundant plant groups in this vegetation community, accounting for over 80% of the total plant canopy cover while 20% of the canopy cover was...
indigenous species of the genera *Annona*, *Combretum*, *Terminalia*, *Brachystegia*, *Ziziphus*, *Faidherbia*, *Azanza*, and *Flacourtia*. Dominant species were *Zea mays*, *Citrus reticulate*, *C. aurinuntium*, *Mangifera indica*, and *Musa parasidiaca*.

(c) **Tree density**

The tree density in the vegetation community was estimated to be 48 individual trees per ha; the majority of these trees belonging to the genus *Mangifera*, *Citrus*, *Terminalia*, *Senna*, and *Eucalyptus*. The tree density was low because most of the areas are dedicated to cultivation of crops.

(d) **Threatened and Protected Species**

Neither threatened nor endemic, protected and/or species on CITES list were recorded from this vegetation community during the field survey. It was not expected to encounter any threatened species in this vegetation because of intensive cultivation and removal of indigenous plants in favor of agricultural crops.

(e) **Present Ecological State**

The present ecological state of this study area is considerably modified due to cultivation and removal of indigenous plants in favor of agricultural crops.

(f) **Conservation Importance**

No species of conservation importance and ecological sensitive areas were found in this cultivated degraded woodland, this vegetation community was rated as of low conservation importance. However, fruit trees play a crucial role in the nutritional status of some communities living along the proposed interconnection powerline. Thus, measures should be taken to ensure that loss of these fruit trees, including timber trees are replenished to ensure the communities are not negatively affected because of this project.

(g) **Alien Species**

Few alien plant species were recorded from this vegetation community, as *Gmelina arborea* and *Eucalyptus species*. These species have the potential to displace indigenous biodiversity.

**FLORA SPECIES ON CITES LIST**

No species on CITES list (Appendix I, II or III) were recorded from the Study area. The only Malawian flora species, which is currently on CITES list according to the 2016 publication is *Prunus africana*. This species does not occur in the Study area. According to the National Herbarium records, this species has been recorded from Mulanje and Zomba among other few districts where it occurs in small populations.

**SENSITIVE SITES**

Six sensitive sites that were observed in the Study area were:

- **Thambani Forest Reserve.** This forest reserve is the oldest forest reserve and covers 10,670 ha. It was gazetted in 1927 to serve as water catchment areas, to conserve unique flora and fauna of the district and to conserve soil. This forest reserve is located approximately 8 km from Mwanza Boma (District Administrative Centre) and 0.5 km south of the proposed powerline.

- **Mwanza River.** The Mwanza River is a naturally perennial river that provides suitable habitat for aquatic and fauna to meet their ecological requirements. Most of the aquatic flora taxa recorded here comprised water tolerant hardy, widespread taxa that are not ecologically sensitive, but the river remains important as an ecological corridor, and for provision of goods and services. This river is located about 1 km north-east of Mwanza Boma.

- **Mpandadzi River.** This is a naturally perennial river found in Mwanza District, and marks the boundary between Thambani Forest Reserve to the south-west and customary land to the north. The river has a number of isolated pools, which are suitable habitats for aquatic flora and fauna. It
is located at about 6 km from Mwanza Boma and 0.1 km north of the proposed powerline. Most of the aquatic flora taxa recorded here comprised hardy, widespread taxa that are not ecologically important or sensitive, but the river remains important as an ecological corridor, and for provision of goods and services.

Nankudwe Estate. This is a private estate, which is found in Mwanza District, and it is located at about 2.5 km from Mwanza Boma and marks the boundary with Mwanza River in the East. It is used for cultivation of pigeon peas (Cajanas cajana) and maize (Zea mays), and for rearing of cattle (Bos taurus), goats (Capra aegagrus hircus) and pigs (Sus scrofa domesticus). The estate still has diverse plant communities, and provides habitat for threatened and sensitive flora and fauna.

Wamkurumadzi River. This is another perennial river, which is found in Neno District. It is suitable habitat for both aquatic flora and fauna. The river is located at a distance of approximately 8.5 km from Mwanza Boma

Lisungwi River. A perennial river also found in Neno District and located at a distance of about 18 km from Mwanza Boma. It is a suitable habitat for aquatic flora and fauna species.

**ECOLOGICAL GOODS AND SERVICES**

Ecological goods and services identified within the project area included the following:

Fuelwood and Charcoal: *Brachystegia* and Savannah woodlands provide the main source of energy (fuelwood and charcoal) for the communities living in the study area.

Food plants: The *Brachystegia* and Savannah woodland provides local communities, living around, with edible fruits such as matowo (*Azanza garckeana*), malambe (*Adansonia digitata*), mpoza (*Annona senegalensis*), bwemba (*Tamarindus indica*), mphinjipinji (*Ximenia caffra*), mdima (*Diospyros kirkii*), nthudza (*Flacourtia indica*), Ntonongoli (*Vitex payos*), and masau (*Ziziphus mauritianus*). These food plants are very important to the nutritional status of local communities.

Medicinal plants: Some plants provide local communities with medicinal products. Some of medicinal plant species mentioned were mwamphepo (*Cissus spp.*), mdima (*Diospyros kirkii*), and mpoza (*Annona senegalensis*), and Mserera (*Antidesma venosum*) just to mention a few.

Soil productivity and fertility: Fertile soils in the study area enable subsistence farmers to crop different varieties of crops such as maize, sorghum, sweet potato and cotton. These crops are the main source of livelihoods for the local communities.

**5.2.4 FAUNA**

**5.2.4.1 METHODOLOGY**

**APPROACH**

The objectives of the fauna study were to:

- Characterize, in terms of specific diversity, the fauna species found or likely to be found in the study area;
- Identify preferred habitats for fauna and link them to the ecological requirements of the species present or likely to be present in the area;
- Identify the presence of special-status species (endemic, IUCN, National list) and of species used by the population.

The selection of these survey sites was based on their representativeness of habitat diversity, and with a focus on habitats with the most ecological importance in terms of biological diversity and ecological processes. Surveys areas were then concentrated in the same areas where the flora surveys have been undertaken (See Figure 5-14).
LITERATURE REVIEW

Important sources of available information that were used for this study included the following:

→ Environmental Impact Assessment Guidelines for Energy generation and transmission in Malawi (MNRE, 2002b);
→ Environmental Impact Assessment (EIA) Guidelines for Malawi (EAD, 1997);
→ Environmental Impact Report – Mozambique Malawi Powerline Interconnection (CES, 2003);
→ Google Earth™ images;
→ Identification of field guides, including:
  ■ Mammals: Van Cakenberghe et al., (2009) and Monadjem et al., (2010);
  ■ Birds: Dowsett-Lemaire and Dowsett (2006);
  ■ Fish: Skelton (2001) and Eccles et al., (2010);
  ■ Reptiles and Amphibians: Channing (2010);
  ■ Biological Diversity in Malawi (2005).
→ Various databases, including:
  ■ Avibase – Birds Checklists of the World (http://www.africanbirdclub.org/countries/checklists/download);
  ■ The International Union for the Conservation of Nature (IUCN) Red list of Threatened species (http://www.iucnredlist.org);
  ■ Global Biodiversity Information Facility (GBIF) (http://data.gbif.org);
  ■ The Convention on International Trade in Endangered Species of Fauna and Flora (www.cites.org);
  ■ Fishbase (www.fishbase.org);
  ■ Reptiles (http://tigr.org/reptiles);
  ■ Amphibians (http://amphibiaweb.org).

FIELD SURVEY

Two fauna field surveys were undertaken inside the same pre-identified areas of the flora surveys as follows:

→ Late dry season Survey (September 28th –October 3rd, 2016). This field survey was aimed at collecting baseline data on fauna species, micro-habits that are, or likely to be, associated with those fauna species and present ecological state of the micro-habits.

→ Wet season survey (December 13th-19th, 2016). This field survey was aimed at collecting baseline data on bird species that tend to migrate to meet their ecological requirements. The survey was ideally timed for waterbird species and other species that require wet and warm climatic conditions for survival.

BIRDS SURVEYS

Birds were surveyed using non-lethal conventional methods and during the most favorable season associated to the presence of migratory birds. Transects were laid down inside each habitat type. The survey team walked slowly along a 400-500m transect (which sometimes changes according to habitat patch size) and stopped at each 150 or 200m interval for a bird count. In addition, each species observed along the transect was identified. Care was taken to remain at any point of bird activity and record all species present, particularly mixed-species flocks in dense forests. Surveys were conducted during the first five hours of daylight, with incidental observations being recorded towards the mid-day. Playback calls were used to encourage cryptic species to reveal themselves.
Some birds were viewed using Swarovski 10x42 EL binoculars and recorded in the field notebook simultaneously. Further, recordings of bird species were made of twilight choruses in order to supplement visual observations. A semi-structured questionnaire was also administered to local communities living along the study area in order to supplement field baseline data that was collected. Particular attention was paid to species of conservation concern such as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near-threatened species (NT) and Endemic species. Species which were suspected to be of conservation concern were subjected to both national red-list and global IUCN red-list (2016) in order to verify their conservation status.

MAMMAL SURVEYS

Mammals were recorded incidentally while conducting bird surveys. Indirect evidence such as spoor or dung and/or footprints were used to identify and confirm presence of mammal species, in conjunction with limited visual or audio confirmation. Species encountered or spotted were identified to species level. A semi-structured questionnaire was also administered to local communities living in the study area in order to supplement field baseline data that was collected. Particular attention was paid to species of conservation concern such as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near-threatened species (NT) and Endemic species.

FISH SURVEYS

Fish were surveyed by careful visual observations in water bodies such as rivers and fish ponds present in the study area. Species of fish that could not be identified on-site were photographed and ultimately compared to photographed fish species available in various fish field guides that were taken so that they could be accurately identified to species level.

HERPETOFAUNA SURVEYS

Reptiles and amphibians were surveyed by visual scanning or searching in likely habitats, under logs, beneath old bark of dead trees, and leaf litters. All species encountered were identified to species level and recorded in the field datasheet. Those species that could not be identified on-site were photographed and compared to various herpetofauna pictures that are available in different field guides so they could be accurately identified to species level. In addition, a semi-structured questionnaire was administered to local communities in order to supplement baseline data collected during the field survey. Particular attention was also paid to species of conservation concern such as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near-threatened species (NT) and Endemic species.

5.2.4.2 RESULTS

BIRDS

a) Species Diversity

Malawi has approximately 635 species of birds (Birdlife, 2017). Of these, 107 are non-breeding migrants or vagrants, leaving more than 450 species which breed in the country. There are 7 species listed as threatened for Malawi and 12 species of conservation concern (BirdLife International, 2004). There are 4 endemic subspecies that have been recorded in country (Kaliba, 2005).

A total of 66 bird species were recorded from the study area during the field surveys. Of these, 59 species were identified during the field survey while 7 were reported to occur in the Study area by local communities. Including the results from the Global Biological Information Facility and the surveys undertaken by Coastal & Environmental Services (2003), a total of 86 species are present inside the study area (Table 5-8).

The ten most abundant bird species identified and/or reported by local communities are presented in Table 5-9.
b) Threatened and Endemic Species
One (1) threatened bird species was recorded within the Study area. A resident bird, Yellow-breasted Apalis was confirmed to occur in the dry Brachystegia and open Savannah woodlands, and in open Savannah Woodland of Hills and Scarps. This species has been classified at National level as Endangered. It is known to nest mainly during rainy season (HBW Alive, 2017). Even if it is threatened at national level, the species is of least concern globally according to IUCN and was the niniest most abundant species surveyed.

c) Species of CITES List
No species of birds that are on CITES list or in Appendix I, II or III were recorded from the Study area during the field work (CITES, 2017).

d) Bird Species of Use-Value
A total of 18 species of birds were reported to be of use-value to local communities who live along and adjacent to the proposed powerline corridor. These species are presented in Table 5-10 and were reported to be used for bush meat, traditional medicine, guides, pest control and traditional dance regalia.

e) Migratory species
Billions of birds commute thousands of kilometres between temperate breeding sites and the tropics as a natural part of their annual cycle. There are two flyways which encompass the study area: the East Asia/East Africa flyway and the Black sea/Mediterranean flyway. Based on the list provided by BirdLife Internationale, there are 12 species of migratory species that have been surveyed inside the study area. Two of these species, Streptopelia capicola and Terpsiphone viridis, are comprised in the ten most surveyed species. They were frequently surveyed among the survey sites along the corridor.

Figure 5-15 Global Birds Flyways
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
<th>TAXONOMY</th>
<th>SPECIAL STATUS</th>
<th>ECOLOGY</th>
<th>DATA SOURCES</th>
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<td>Scopidae</td>
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<td>Columbidae</td>
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<td>Columbidae</td>
<td>Turtur afer</td>
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<td>Columbidae</td>
<td>Turtur chalcospilos</td>
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<td>Uraeginthus angolensis</td>
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<td>Zosteropidae</td>
<td>Zosterops senegalensis</td>
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</table>
Table 5-9  Summary of Ten Most Abundant Bird Species Recorded from the Study Area

<table>
<thead>
<tr>
<th>Name of Species</th>
<th>Status</th>
<th>Habitats Encountered/Reported</th>
<th>Frequency</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phyllastrephus flavostriatus (Yellow-streaked Bulbul)</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.85</td>
<td>1</td>
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<tr>
<td>Phyllastrephus placidus (Placid Bulbul)</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.79</td>
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<tr>
<td>Nectarinia olivacea (Olive Sunbird)</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.74</td>
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<tr>
<td>Nectarinia talatala (White-bellied Sunbird)</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.73</td>
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<tr>
<td>Uraeginthus angolensis (Blue Waxbill)</td>
<td>C</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.66</td>
<td>5</td>
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<tr>
<td>Serinus gularis (Streaky-headed Canary)</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.66</td>
<td>5</td>
</tr>
<tr>
<td>Terpsiphone viridis (Paradise Flycatcher)</td>
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<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scars, Cultivated land</td>
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<td>Anthreptes collaris (Collared Sunbird)</td>
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<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scars, Cultivated land</td>
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<tr>
<td>Apalis flavida (Yellow-breasted Apalis)</td>
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<td>0.28</td>
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<tr>
<td>Streptopelia capicola (Cape Turtle Dove)</td>
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<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scars, Cultivated land</td>
<td>0.25</td>
<td>10</td>
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</table>

Legend: VC = Very Common, C = Common

Table 5-10  The Ten Bird Species Most of Use-Value to Local Communities Recorded in the Study Area

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<thead>
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<th>English Name</th>
<th>Scientific Name</th>
<th>Use</th>
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<tr>
<td>Black Sawing Swallow</td>
<td>Psalidoprocne holomelas</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Black-eyed Bulbul</td>
<td>Pycnonotus barbatus</td>
<td>Bush meat</td>
</tr>
<tr>
<td>Blue-spotted Dove</td>
<td>Turtur afer</td>
<td>Bush meat</td>
</tr>
<tr>
<td>Blue Waxbill</td>
<td>Uraeginthus angolensis</td>
<td>Bush meat</td>
</tr>
<tr>
<td>Bronze Mannikin</td>
<td>Spermestes cucullatus</td>
<td>Bush meat</td>
</tr>
<tr>
<td>Cape Turtle Dove</td>
<td>Streptopelia capicola</td>
<td>Bush meat</td>
</tr>
<tr>
<td>Cattle Egret</td>
<td>Bubulcus ibis</td>
<td>Pest control as it removes ticks from cattle</td>
</tr>
<tr>
<td>Green Pigeon</td>
<td>Treron calva</td>
<td>Bush meat</td>
</tr>
<tr>
<td>Grey-headed Heron</td>
<td>Ardea cinerea</td>
<td>Feathers for making traditional regalia &amp; bush meat</td>
</tr>
<tr>
<td>Helmeted Guinea Fowl</td>
<td>Numida meleagris</td>
<td>Bush meat</td>
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<tr>
<td>Red-necked Francolin</td>
<td>Francolinus afer</td>
<td>Bush meat</td>
</tr>
</tbody>
</table>

MAMMALS

a) Species Diversity

About 190 species of mammals have been recorded for Malawi (Ansell & Dowsett, 1988; Chitaukali, 2005). Of these, 9 species representing 4.7% are threatened and 10 are near-threatened (IUCN, 2017), including the critically endangered black rhino as well as the endangered African wild dog, cheetah and Nyika burrowing shrew.

A total of 29 species of small to large mammals were recorded from the study area during the field surveys (Table 5-11). Of these, 8 species were identified during the field survey while 19 were reported to occur in the study area by local communities that were interviewed during the field survey. There are no threatened species expected to be present inside the study area.
Table 5-11  Mammal Species Present or Potentially Present Inside the Study Area

<table>
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<th>Scientific name</th>
<th>Species</th>
<th>Conservation status</th>
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<tr>
<td>Bathyergidae</td>
<td>Acomys spinosissimus</td>
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<tr>
<td>Bovidae</td>
<td>Aepyceros melampus</td>
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<tr>
<td>Cercopithecida</td>
<td>Cercopithecus aethiops</td>
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<td>Cercopithecida</td>
<td>Cercopithecus albogularis</td>
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<td>Viverridae</td>
<td>Civettistics civetta</td>
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<td>Crocuta crocuta</td>
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<td>Cryptomys hottentotus</td>
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<td>Herpestidae</td>
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<td>Viverridae</td>
<td>Genetta genetta</td>
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<td>Graphiurus microtis</td>
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<td>Lepus saxatilis</td>
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<td>Lophuromys flavipunctatus</td>
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<td>Mastomys natalensis</td>
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The most frequently reported or identified mammal species are presented in Table 5-12.
Table 5-12  Summary of the Ten Most Frequently Reported or Identified Mammal Species

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Habitats encountered/reported</th>
<th>Frequency</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cryptomys hottentotus</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.66</td>
<td>1</td>
</tr>
<tr>
<td>Acomys spinosissimus</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.63</td>
<td>2</td>
</tr>
<tr>
<td>Lophuromys flavipunctatus</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.59</td>
<td>3</td>
</tr>
<tr>
<td>Mus triton</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.55</td>
<td>4</td>
</tr>
<tr>
<td>Mus musculus</td>
<td>C</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.52</td>
<td>5</td>
</tr>
<tr>
<td>Thamnomyys dolichurus</td>
<td>VC</td>
<td>Secondary Brachystegia/Savannah Woodland, Cultivated land</td>
<td>0.47</td>
<td>5</td>
</tr>
<tr>
<td>Crocuta crocuta</td>
<td>C</td>
<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scarp</td>
<td>0.45</td>
<td>7</td>
</tr>
<tr>
<td>Lepu saxatilis</td>
<td>C</td>
<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scarp, Cultivated land</td>
<td>0.39</td>
<td>8</td>
</tr>
<tr>
<td>Genetta genetta</td>
<td>C</td>
<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scarp, Cultivated land</td>
<td>0.36</td>
<td>9</td>
</tr>
<tr>
<td>Hystrix africaceaustalis</td>
<td>C</td>
<td>Secondary Brachystegia/Savannah Woodland, Open Savannah of Hills and Scarp, Cultivated land</td>
<td>0.28</td>
<td>10</td>
</tr>
</tbody>
</table>

Legend: VC = Very common, C = Common

b) Threatened and Endemic Species

There were no threatened or endemic species of mammals recorded inside the study area. Similarly, no threatened or endemic mammal species were recorded in documents that were previously reviewed during this study and concerning areas closed to the study area.

c) Species of CITES List

No species of mammals that are on CITES list or in Appendix I, II or III were recorded from the Study area during the field work (CITES, 2017).

d) Mammal Species of Use-Value

A total of 11 species of mammals were reported to be of use-value to local communities who live along and adjacent to the proposed powerline corridor. These species are presented in Table 5-13 and were reported to be used for bush meat, traditional medicine and traditional dance regalia.

Table 5-13  List of Mammal Species of Use-Value to Local Communities

<table>
<thead>
<tr>
<th>English name</th>
<th>Scientific name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue monkey</td>
<td>Cercopithecus albogularis</td>
<td>Skin used for making traditional dance regalia</td>
</tr>
<tr>
<td>Hyena</td>
<td>Crocuta crocuta</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Mole-rat</td>
<td>Cryptomys hottentotus</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Genet</td>
<td>Genetta genetta</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Porcupine</td>
<td>Hystrix africaceaustalis</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Scrub hare</td>
<td>Lepu saxatilis</td>
<td>Bush meat and traditional medicine</td>
</tr>
<tr>
<td>Honey badger</td>
<td>Melivora capensis</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Aardvark</td>
<td>Orycteropus afer</td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Bush pig</td>
<td>Potamochoerus larvatus</td>
<td>Bush meat and traditional medicine</td>
</tr>
<tr>
<td>Bush buck</td>
<td>Tragelaphus scriptus</td>
<td>Bush meat and horns for storing traditional medicine</td>
</tr>
<tr>
<td>Civet</td>
<td>Viverra civetta</td>
<td>Traditional medicine</td>
</tr>
</tbody>
</table>
FISH

a) Species diversity

The total number of fish species in Malawi is estimated to exceed 1,000 (Banda, 2005). The majority of these species is found in Lake Malawi, Lake Chilwa and Lake Chita. Major rivers of the country such as the Shire River, North and South Rukuru, Songwe, Bua, Dwangwa, Mkulumadzi, Mwanza, Lisungu and Linthipe are also homes to important fish species of the country whose data, however, are not consistently recorded except for the Shire River. The fish species of most rivers comprise Cyprinids (mpasa, kadyakolo, sanjika) and catfishes which usually migrate from Lake Malawi and the Shire River into its tributaries during spawning season which coincides with the rainy season. A preliminary fish survey in 14 rivers in the Central and Southern Regions of Malawi recorded a total of 199 species. Fish is of economic importance to Malawi as they are the major source of protein and income (Ambali et. al., 2001).

A total of 11 fish species were identified from the fishermen catches and reported by local communities inside the study area to occur in Mpandadzi, Mwanza, Wamkurumadzi and Lisungwi rivers, including the Shire River. These species were Barbus paludinosus (Matemba), B. eurystomus (kadyakolo), Ctenopharynx intermedius (Gundamwala), Labeo cylindricus (Mbununu), L. mesops (Nchila), Oreochromis lidole (Chambo cha ching’ono), Clarias liocephalus (Mulamba), Anguilla bengalensis labiata (Mkunga), Oreochromis shiranus chirwae (Makumba), Pollimyrus castelnau (Nthache) and Tilapia rendali (Chilunguni). Cumulated with the data obtained by the GBIF, a total of 31 species are present or susceptible to being present inside the study area (Table 5-14).
### Table 5-14 Fish Species Present or Potentially Present Inside the Study Area

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Species</th>
<th>Biological diversity in Malawi, 2005 (PDF)</th>
<th>Threatened species</th>
<th>Special status</th>
<th>Field surveys</th>
<th>Data sources</th>
<th>GBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td></td>
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<td>Amphilius uranoscopus</td>
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<td>Anguillidae</td>
<td>Anguilla bengalensis labiata</td>
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</tr>
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<td>Astatotilapia calliptera</td>
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<td>Cichlidae</td>
<td>Aulonocara brevinidus</td>
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<td>Bagridae</td>
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</tr>
<tr>
<td>Cyprinidae</td>
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<td>Barbus macrotaenia</td>
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<td>Barbus paludinosus</td>
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<tr>
<td>Bagridae</td>
<td>Bagrus meridionalis</td>
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<td>Cyprinidae</td>
<td>Barbus viviparatus</td>
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</tr>
<tr>
<td>Alestidae</td>
<td>Brycinus imberi</td>
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<td></td>
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<tr>
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<td>Claridae</td>
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<td>Cyprinidae</td>
<td>Labeo cylindricus</td>
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<td>Cyprinidae</td>
<td>Labeo mesops</td>
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<td>EN</td>
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</tr>
<tr>
<td>Cichlidae</td>
<td>Labeotropheus trewavasae</td>
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<tr>
<td>Mastacembelidae</td>
<td>Mastacembelus shiranus</td>
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<td>Mormyridae</td>
<td>Mormyrus longirostris</td>
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<td>Cyprinidae</td>
<td>Opsaridium microcephalum</td>
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<tr>
<td>Cyprinidae</td>
<td>Opsaridium microlepis</td>
<td>EN</td>
<td>EN</td>
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</tr>
<tr>
<td>Cichlidae</td>
<td>Oreochromis lidole</td>
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<td>EN</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cichlidae</td>
<td>Oreochromis shiranus chinwae</td>
<td>EN</td>
<td>EN</td>
<td></td>
<td>x</td>
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<tr>
<td>Mormyridae</td>
<td>Pollimyrus castelnau</td>
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<td>Mochokidae</td>
<td>Synodontis njassae</td>
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<td>Tilapia rendali</td>
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<td>Amphiliidae</td>
<td>Zaireichthys monomotapa</td>
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<td></td>
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<td>x</td>
</tr>
</tbody>
</table>

#### b) Threatened and Endemic Species

Six threatened fish species were recorded from the river flowing within the Study area (Table 5-15).

Three species were recorded but also reported by local communities to occur in Mwanza and Wamkurumadzi rivers which are *Labeo mesops*, *Oreochromis shiranus chinwae* and *O. lidole* while two species of fish *Labeo mesops* and *Oreochromis lidole* were recorded and reported to occur in Lisungwi River.

The identified habitats important for these species were relatively deep waters and algae colonized riverbanks where the females lay eggs in shallow pits dug by male fish. These species have been
classified by both National and IUCN red-lists as Endangered. Besides, *Oreochromis shiranus chirwae* and *O. lidole* being Endangered, they are also both Endemic to Malawi (Banda, 2005).

Table 5-15 Threatened Fish Species Recorded from Some Rivers of the Study Area

<table>
<thead>
<tr>
<th>Name of species</th>
<th>National red list category status</th>
<th>IUCN (globally) category status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labeo mesops</td>
<td>Endangered (EN)</td>
<td>Endangered (EN)</td>
</tr>
<tr>
<td>Opsaridium microcephalum</td>
<td>Vulnerable (VU)</td>
<td></td>
</tr>
<tr>
<td>Opsaridium microlepis</td>
<td>Endangered (EN)</td>
<td></td>
</tr>
<tr>
<td>Oreochromis shiranus chirwae</td>
<td>Endangered (EN)</td>
<td></td>
</tr>
<tr>
<td>Oreochromis lidole</td>
<td>Endangered (EN)</td>
<td>Endangered (EN)</td>
</tr>
</tbody>
</table>

c) Species of CITES List

No species of fish that are on CITES list or in Appendix I, II or III were recorded from the Study area during the field work (CITES, 2017).

d) Fish Species of Use-Value

All the 11 species of fish that were recorded or reported by local communities inside the study area are of use-value to local communities. Fish species recorded or reported are sources of protein and income for the local communities.

HERPETOFAUNA

a) Species Diversity

There are 228 species in Malawi consisting of 83 species of amphibians and 145 species of reptiles. There are 6 endemic species of amphibians in Malawi. These species are, however, restricted to high altitudinal areas of Nyika, Zomba and Mulanje plateaus. There are also 8 endemic species of reptiles in the country, restricted to Mulanje Mountain, Nyika plateaux, Misuku Hills and Ntchis Forest Reserve.

Twenty-five (25) species of reptiles and 13 species of amphibians were recorded and reported inside the study area by the local communities, both during field surveys and by CES (2003). The most common reptile species that were frequently encountered in the study area were *Proscelotes arnoldi* (Arnold’s Skink), *Mabuya varia* (variable Skink), *M. striata* (Striped Skink), *M. margaritifer* (Rainbow Skink) *Agama aculeata* (Ground Agama), and *Lygodactylus bradfieldi* (Bradfield’s Dwarf Gecko) while the common amphibians were *Bufo gutturalis* (Guttural Toad), *B. maculatus* (Flat-backed Toad), *Ptychadena oxyrhynchus* (Sharp-nosed Ridged Frog), *P. mossambicus* (Mozambique Ridged Frog) and *Schoutedenella xenodactyloides* (Dwarf Squeaker).
## Table 5-16  Herpetofauna Species Present or Potentially Present Inside the Study Area

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Global UICN red-list</th>
<th>National red-list</th>
<th>Endemic species</th>
<th>Field surveys</th>
<th>CES</th>
</tr>
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<tr>
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<td>Agama aculeata</td>
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<td>Agamidae</td>
<td>Agama atra</td>
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<tr>
<td>Agamidae</td>
<td>Agama mossambicus</td>
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<td>Viperidae</td>
<td>Atheris rungwensis</td>
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</tr>
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<td>Viperidae</td>
<td>Bitis arietans</td>
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<td>Chamaeleo dilepis</td>
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</tr>
<tr>
<td>Elapidae</td>
<td>Dendroaspis polylepis</td>
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</tr>
<tr>
<td>Gerrhosauridae</td>
<td>Gerrhosaurus flavigularis</td>
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<tr>
<td>Gekkonidae</td>
<td>Hemidactylus maboula</td>
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<tr>
<td>Colubridae</td>
<td>Lamprophis fuliginosus</td>
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<tr>
<td>Gekkonidae</td>
<td>Lygodactylus bradfieldi</td>
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<td>Scincidae</td>
<td>Mabuya bourengeri</td>
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<td>Mabuya striata</td>
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<td>Naja melanoleuca</td>
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<td>Naja mossambica</td>
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<td><strong>AMPHIBIANS</strong></td>
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</tr>
<tr>
<td>Bufonidae</td>
<td>Bufo gutturalis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Bufonidae</td>
<td>Bufo maculatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Ranidae</td>
<td>Phrynobatrachus natalensis</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ranidae</td>
<td>Ptychadena anchietae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Ptychadenidae</td>
<td>Ptychadena mascareniensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Ptychadenidae</td>
<td>Ptychadena mossambica</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Ptychadenidae</td>
<td>Ptychadena oxyrhynchus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Arthroleptidae</td>
<td>Schoutedenella xenodactylida</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Pipidae</td>
<td>Xenopus muelleri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

### b) Threatened and Endemic Species
Neither threatened nor endemic species of reptiles and amphibians were recorded.

### c) Species of CITES List
One species of Python (*Python sebae*), which is on CITES list Appendix I was reported by local communities to occur in the study area (CITES, 2017).
d) Herpetofauna Species of Use-Value

A total of 6 species of herpetofauna were reported to be of use-value for local communities. Their products are used for making traditional regalia, and traditional medicine. Species of this use-value are presented in Table 5-17.

<table>
<thead>
<tr>
<th>English name</th>
<th>Scientific name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Python</td>
<td><em>Python sebae</em></td>
<td>Traditional medicine and for making traditional regalia</td>
</tr>
<tr>
<td>Leopard Tortoise</td>
<td><em>Stigmochelys pardalis</em></td>
<td>Bush meat and traditional medicine</td>
</tr>
<tr>
<td>African puff adder</td>
<td><em>Bitis arietans</em></td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Nile monitor</td>
<td><em>Varanus niloticus</em></td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Flap-necked Chameleon</td>
<td><em>Chamaeleo dilepis</em></td>
<td>Traditional medicine</td>
</tr>
<tr>
<td>Black Mamba</td>
<td><em>Dendroaspins polyplepis</em></td>
<td>Traditional medicine</td>
</tr>
</tbody>
</table>

5.2.5 ECOSYSTEM SERVICES

An ecosystem is defined as a dynamic complex of plants, animals, micro-organisms and non-living components interacting as a functional unit (MEA, 2005). Human communities are an integral part of ecosystems and are beneficiaries of many goods and services they provide. These benefits are recognised as Ecosystem Services (ES).

ES are grouped into four categories that have been studied:

- **Provisioning services**: which refer directly to products people obtain from ecosystems (e.g. agricultural products, plants to eat, game, medicinal plants, fresh water, biofuel, timber, etc.). Inside the project area, the miombo woodlands and the aquatic habitats provide natural resources that are used by local communities. The main supply services are agricultural production, livestock and forage resources, wild food products, traditional medicine, fuelwoods and fisheries.

- **Regulating services**: which are the benefit local communities obtain from the regulation of ecosystem processes (e.g. climate regulation, waste decomposition, purification of water and air, etc.).

- **Cultural services**: which refer to the non-material benefits people obtain from ecosystems (e.g. sacred and spiritual sites, ecotourism, education, etc.). It may be materialized by the presence of sacred sites or sacred species protected by communities. Social baseline will provide more information on the presence of these elements inside the interconnection corridor.

- **Supporting services**: which are the natural processes that maintain the other services (e.g. nutrient cycling, genetic production and genetic exchange channels, etc.).

Multiples ecosystem services are provided by natural habitats inside the study area. They were assessed based on interviews that we had with local communities living within and along the proposed transmission powerline. Based on these interviews, seven most important services have been identified: fodder, wildlife edible food products, medicinal plants, construction material, art and craft material, fuelwood, income and bio-fertilizer.

The most common use of flora species in the study area was fuelwood (91%), medicinal products (62%) and construction material (50%). A total of 147 flora species belonging to 44 families were recorded to be of use-value to communities living in the Study area (Appendix 7). The following table summarizes the number of recorded species used for each identified service. It seems like species used for fuel woods are numerous and not so specific, communities using dry wood they found as energy.
Table 5-18 Main ecosystem services

<table>
<thead>
<tr>
<th>Ecosystem services</th>
<th>Number of plants species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fodder</td>
<td>6</td>
</tr>
<tr>
<td>Wild food products</td>
<td>38</td>
</tr>
<tr>
<td>Medicinal</td>
<td>62</td>
</tr>
<tr>
<td>Construction material</td>
<td>29</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>138</td>
</tr>
<tr>
<td>Art and craft material</td>
<td>36</td>
</tr>
<tr>
<td>Income</td>
<td>58</td>
</tr>
<tr>
<td>Biofertilizer</td>
<td>3</td>
</tr>
</tbody>
</table>

Flora species play a crucial role in the well-being and socio-economic development of the communities. Thus, care must be taken in order to ensure that these species are protected from unnecessary removal and where this is not possible; species should be replanted in the target villages in order to replenish the losses.

5.3 SOCIO-ECONOMIC ENVIRONMENT

5.3.1 ADMINISTRATIVE STRUCTURE

In Malawi there are three (3) administrative regions – the Central Region, the Southern Region, and the Northern Region. In addition to these regions, the political division of the country includes a fourth region: the Eastern Region, which includes Ntcheu, Mangochi, Machinga, Zomba and Balaka districts (also in the Southern Region, administratively). The capital is the City of Lilongwe, in the Lilongwe District of the Central Region.

Malawi is composed of a total of 28 districts – with 13 districts (including Mwanza, Neno and Balaka) in the Southern Region – four (4) city councils, two (2) municipal councils and one (1) town council. District Commissioners, appointed by the President, head the districts. Local administration is through the District Councils in the districts; or the City Councils in the cities. The proposed corridor passes through areas governed by the Mwanza, Neno and Balaka District Councils. Local governance structures, through which the project must be implemented, include the District Executive Committee (DEC), and the District Environment Sub-Committee (DESC).

The district councils are responsible for raising and collecting local taxes, user fees and charges. However, the majority of their revenue comes from central government grants, both conditional (sectoral funds) and unconditional (general resource funds). The 28 district councils, which are predominantly rural, are coterminous with the administrative districts. All councils have the same responsibilities including primary education, primary health, forestry, natural resources and community services. Responsibility for local government rests with the Ministry of Local Government and Community Development (MLGCD).

The Districts are further divided into Traditional Authority (TA) areas, which are also further divided into villages. The Traditional Authority heads traditional areas, while a chief heads the villages. A senior chief or a Group Village Headman (GVH) heads a group of villages. Both the TA and village headman (including GVH) are responsible for administration of customary land, spearheading development activities and mobilizing community participation in development programmes, as well as ensuring law and order among their subjects. The proposed corridor lies in the areas of TA Kanduku and TA Nthache in Mwanza District, TA Mlauli and TA Symon in Neno District, and TA Nsamala in Balaka District. Structures within which the tradition leaders preform their functions include the Village Development Committees (VDC) at the village level and the Area Development Committee (ADC) at the Traditional Authority level (Government of Malawi, 2012a, b, c).
### 5.3.2 DEMOGRAPHIC AND SOCIO-ECONOMIC CONDITIONS

The projected national population indicates that Malawi has a population of about 16.8 million people. This is a 30% increase from the population number established during the 2008 National Population Census. In 2008, Malawi had just over 13 million people, 49% of which were male. The highest population was in the southern region, with 45% of total population, while the centre and north had respectively 42% and 13% of the total population.

According to the National Statistical Office (NSO) of Malawi, the Southern region’s projected population was 6,890,375 inhabitants in 2014, given that there is a total population of 15,805,240 inhabitants at the national level. Women account for 51.2% of the population and men 48.8%. Within the 1998-2008 period, the Southern region’s annual growth rate was about 2.4, a high rate typical of sub-Saharan countries. The Southern growth rate was nonetheless lower than in the Northern (3.3) and Central (3.1) regions or the national rate (2.8). The Neno and Balaka districts are around this rate, with annual growth rates of 2.3 and 2.7, respectively. The Mwanza district also has a significantly higher rate with 4.1 (NSO, 2009a).

This increase in population is essentially related to naturally born children. Malawi had an average Total Fertility Rate of 5.6 children per woman in 2015, which ranks the country 8th in the world (CIA, 2016).

Population density has increased with the size of population and density now stands at 139 persons per square kilometre (ppsk) at the national level (NSO, 2009b), while it was “only” 105 ppsk in 1998. This average is way above the African average of 39 ppsk. Malawi ranks as the 12th most densely populated African country.

The Southern region has a much higher population density (184 ppsk) than the national average. However, the population density of the project-affected districts is lower than the Southern region’s average. Mwanza has the lowest density (40 ppsk) followed by Neno (73 ppsk) and Balaka (145 ppsk) (NSO, 2009a).

Table 5-19 shows the population statistics according to the regions and districts affected by the project.

**Table 5-19 Demographic Data of Regions and Districts Affected by the Project - 2008 and 2014**

<table>
<thead>
<tr>
<th>Regions and districts</th>
<th>Number of households*</th>
<th>2008</th>
<th>Population</th>
<th>2014 (projected)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,341,192</td>
<td>2,821,343</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5,036,692</td>
<td>5,858,035</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3,348,659</td>
<td>3,541,719</td>
<td>9</td>
</tr>
<tr>
<td>Southern Region</td>
<td></td>
<td>6,890,375</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neno</td>
<td>24,570</td>
<td>51,974</td>
<td>107,317</td>
<td>143,824</td>
</tr>
<tr>
<td>Balaka</td>
<td>74,195</td>
<td>152,056</td>
<td>317,324</td>
<td>383,887</td>
</tr>
<tr>
<td>Mwanza</td>
<td>21,040</td>
<td>44,679</td>
<td>92,947</td>
<td>102,571</td>
</tr>
</tbody>
</table>

(*) Note: data of 2008.
Source: NSO, 2009a and b.

In 2008, Mwanza District, had the lowest population of the country, and is still today the least populated district.

The vast majority (85%) of the population of Malawi lives in rural areas and only 15% in urban centres. Urban Areas refer to the four major cities of Blantyre, Lilongwe, Mzuzu and Zomba and other urban areas, which consist of Bomas and gazetted town planning areas. The majority (80%) of the urban population is concentrated in these four main cities.

Malawi has a relatively larger population in the younger age groups. Almost 48% of the population is less than 15 years of age and the median age is 17. The members of the households affected by the
project are young. About 30.0% are between 16 and 35 years of age and 38.7% are between 5 and 15 years of age. Moreover, around 11.6% of the members are between 0 and 4 years of age. The proportion of older members (55 years of age or older) is relatively small, being 6.6%. Females (53.7%) are present in a higher proportion than males (46.3%).

Household size is 4.6 persons on average in Malawi, and the household sizes for rural (4.6) and urban (4.4) areas are close to the national ones. The northern (4.7) and central (4.8) regions have almost the same household sizes and both are higher than the southern region (4.3) (NSO, 2009a).

5.3.3 ETHNIC AND RELIGION

Malawi is populated by a mosaic of ethnic groups. The dominant ethnic groups within the Southern region are far the Lomwe (36.6%) and the Yao (24.6%) with over a million people each (NSO, 2009a). Table 5-20 shows the main ethnic groups in the region concerned by the project.

<table>
<thead>
<tr>
<th>Tribe</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>5,852,755</td>
</tr>
<tr>
<td>Chewa</td>
<td>296,065</td>
</tr>
<tr>
<td>Lomwe</td>
<td>2,141,858</td>
</tr>
<tr>
<td>Yao</td>
<td>1,439,932</td>
</tr>
<tr>
<td>Ngoni</td>
<td>546,622</td>
</tr>
<tr>
<td>Tumbuka</td>
<td>39,168</td>
</tr>
<tr>
<td>Nyanja</td>
<td>56,910</td>
</tr>
<tr>
<td>Sena</td>
<td>440,877</td>
</tr>
<tr>
<td>Tonga</td>
<td>33,370</td>
</tr>
<tr>
<td>Ngonde</td>
<td>15,113</td>
</tr>
<tr>
<td>Nyakyusa</td>
<td>695</td>
</tr>
<tr>
<td>Lambya</td>
<td>2,679</td>
</tr>
<tr>
<td>Senga</td>
<td>2,374</td>
</tr>
<tr>
<td>Others</td>
<td>171,187</td>
</tr>
</tbody>
</table>

Source: NSO, 2009a.

In the project area, Yao and Ngoni are the most represented. The heads of households affected by the project are mainly Chewa (36.1%) or Ngoni, (34.2%). About 15.8% of heads of households are of Lomwe ethnic descent.

5.3.3.1 YAO

The Yao (Yawo) moved into what is now the eastern region of Malawi around the 1830s, when they were active as farmers and traders. Primarily Muslim today, the Yao had close ties with the Swahili on the coast during the late 19th century, and adopted some parts of their culture, such as architecture and Islam, but still kept their own national identity. They speak a Bantu language known as Chiya (chi- being the class prefix for "language"), with an estimated 1,000,000 speakers in Malawi (Wikipedia, 2016).

The Yao are a matrilineal and largely matrilocally society. Family leadership roles are passed down through the female's family and upon marriage. A husband must move to his wife's village, where he remains somewhat of an outsider. Divorce rates are high and polygamy is common. The Yao of Malawi are mainly subsistence farmers and fishermen.

They have their own system of traditional governance, sorting out problems in local village courts, although ultimately, the Malawian government holds political and legal authority (Joshua Project, 2016).

5.3.3.2 NGONI

The Ngoni (also called Angoni) fled from Shaka Zulu who defeated many Ngoni Chiefs in South Africa in 1819. The Ngoni who entered Malawi came in two (2) groups. After their defeat, Zwangendaba Jere fled with his followers and settled at Mabiri in Mzimba District.
The group that was led by Ngwane Maseko arrived in Malawi in 1837 and settled in Ntcheu, near Dedza. But after a short stay, they left for Songea in southern Tanzania where they lived for some time before returning to Malawi, and they finally settled in Ntcheu in 1867. Today, this group has spread to other districts such as Mchinji and Dedza in the centre, and Mwanza and Neno in the south.

The Ngoni language is known as Chingoni. They are hunters, and eating meat and drinking beer are considered as the most important Ngoni principles (Earth Cultures Ltd, 2016).

5.3.3.3 RELIGIONS AND BELIEFS

In Malawi, a majority of the inhabitants are of Christian faith although there is also a large and significant number of Muslims. The number of Muslims is variable depending on the area. The highest numbers are found in Balaka where almost a third of the population is of Islamic faith (31.5%) and in rural areas of the Southern region where they represent nearly a quarter (23%), whereas in Neno it is only 1.2% (NSO, 2009a). Table 5-21 shows the dominant religions in the region and districts affected by the project.

Table 5-21 Dominant Religious Groups in the Region and Districts Concerned by the Project, 2008

<table>
<thead>
<tr>
<th>Region and districts</th>
<th>Dominant religious groups</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Christian</td>
</tr>
<tr>
<td>Southern Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>899,856</td>
<td>774,704</td>
</tr>
<tr>
<td>Rural</td>
<td>4,952,899</td>
<td>3,644,868</td>
</tr>
<tr>
<td>Total</td>
<td>5,852,755</td>
<td>4,419,572</td>
</tr>
<tr>
<td>Neno</td>
<td>108,339</td>
<td>104,235</td>
</tr>
<tr>
<td>Balaka</td>
<td>316,574</td>
<td>212,965</td>
</tr>
<tr>
<td>Mwanza</td>
<td>92,237</td>
<td>85,435</td>
</tr>
</tbody>
</table>

Source: NSO, 2009a.

The religious leaning of the Lomwe vary greatly with the degree of penetration of Christianity. The Baptist Union in Mozambique has had a strong influence in areas surrounding its churches.

However, in general, the Lomwe are animists who still worship ancestral spirits. Though most Lomwe would consider themselves Christian, the traditions of the ancestors greatly influence their daily lives (SLRK, 2007).

Conversely, after being introduced to Islam in the late 1800’s by Swahili-Arab slave traders, the Yawo converted to Islam and many began practicing Islam and their traditional religion, in parallel.

The village’s population involved in the project is mainly Christian (92.6%), with only a small proportion of Muslims (6.2%). Approximately 28.6% of heads of households affected by the project are Protestant (including Abraham (6.8%) and Zionist/Zion (5.6%), while 27.4% are Catholic and 2.3% are Muslim. Other religions practiced by the project impacted heads of households include: Seventh Day Adventist (5.3%), Jehovah’s witness (4.5%) and African International (3.0%).

5.3.4 OCCUPATION, INCOME AND POVERTY

The main occupation of households in Malawi is agriculture, with 85% of households engaged in such activity, 93% in rural and 36% in urban areas. A vast majority (88.0%) of heads of households affected by the project are farmers.

The Gross Domestic Product per capita was US $1,100 in 2015, which ranks Malawi 223rd (over 229) in the world (CIA, 2016).
The national poverty rate is 50.7%, indicating that almost half of the population is poor and 25% of the population is ultra-poor. That is, about one (1) in every four (4) people lives in such dire poverty that they cannot even afford to meet the minimum standard for daily-recommended food requirements. The ultra-poverty rate is higher in rural areas (28%) than in urban areas (4%).

The Southern region has the largest poverty rate (63%), indicating that three (3) out of five (5) people live in poverty in rural areas. The Northern region has the second highest proportion of poor people (60%). The Central region has the lowest proportion (49%) of poor people. About 17% of the population in urban areas lives in poverty compared to 57% of the rural population.

Within rural areas, the South rural area has the highest ultra-poverty rate (34%), while the North rural area has the second highest ultra-poverty rate (29%) and the Central rural area has the lowest (22%).

Analyses show the poverty rate is higher than average amongst females and less educated heads of households, and also that poverty increases with the size of households (NSO, 2012).

5.3.5 LAND USE

5.3.5.1 AGRICULTURE

Malawi is a predominantly rural country and the majority of its households is at least partially dependent on rainfed agriculture for their livelihood.

Agriculture in Malawi is characterized by a rainy and a dry season. The rainy season generally runs from October to June, with the harvest occurring between March and June depending on the crop variety and location. The dry season generally starts in July and lasts through September.

An estimated 85% of the Malawian population practice subsistence farming as agricultural smallholder farmers and rely on agricultural output, either directly or indirectly, for their livelihood. Agricultural output generates over 90% of export earnings, and 33% of Gross Domestic Product (GDP), most of which is produced by smallholder farmers.

In rural areas, 95% of the households are engaged in agriculture. Of these households, about 84% are engaged in crop production, while 52% raise livestock (NSO, 2010 and IHPS, 2014).

The Southern region has a slightly lower (82%) proportion of households engaged in agriculture compared to the Northern (87.9%) and the Central (87.1%) regions. It is further noted that 43% of households engaged in agricultural activities do a mixture of both livestock rearing and crop cultivation (NSO, 2010).

SIZE OF LAND

In Malawi, the average total cultivated area is 3.6 acres (which is about 1.4 hectares). Rural areas have larger average cultivated areas (3.7 acres) compared to urban areas (1.2 acres). The Southern region has a slightly higher average (3.9 acres) than the Northern (2.1 acres) and the Central (3.7 acres) regions. It is further noted that 43% of households engaged in agricultural activities are engaged in both livestock rearing and crop cultivation (NSO, 2012).

The land holding characteristics are pretty constant among the PAPs from different traditional authorities, ranging from 1.6 to 2.0 parcels on average. The average land parcel areas vary from 809 m² to 10,522 m² on average, by traditional authority.

CROPS

Maize is cultivated by 95% of the cultivating households, the other crops being much less frequently cultivated. Groundnuts are cultivated by only 37% of the households, with pigeon peas and beans by 29% and 23% of households, respectively.
Maize is the most important cultivated crop in terms of space: 35% of the plots in Malawi are planted with local maize, and 32% of plots have grown hybrid maize. The most plots growing local maize are in the Southern region (45%), followed by the Northern region (33%), and finally the Central region (27%). Pigeon peas and ground nuts are, besides maize, the most largely planted crops, with 16% and 15% of the plots used to grow them.

It is important to note that about 31% of plots are intercropped in Malawi. There are more plots that are intercropped in rural areas (32%) compared to urban areas (17%). The Southern region has the highest proportion of plots that are intercropped (58.7%) compared to the Northern (20.6%) and Central (10.3%) regions.

Maize is the most important staple crop; the others being rice, sorghum, millet and cassava. The crops that are cultivated for cash are principally tobacco (94% of production sold), beans (50% of production sold), rice (40% of production sold) and groundnuts (38% of production sold) (*Ibid.*).

According to the socio-economic surveys, the main seasonal crop farmed by the PAPs is maize, as 35.7% of all households grow it. From this group, 14.7% of them sell some of their produce at the local market. The average quantity of maize produced per household is 10.1 bags. Other annual crops cultivated include: cowpeas (12.4%), groundnuts (8.3%), sorghum (5.6%) and pumpkin (5.3%).

**DIVISION OF LABOUR**

In almost all the plots (94%) women are involved in the cultivation activities. Nonetheless, men are also involved in a large proportion (82%). Regardless of the sex, children are involved in the operations in 25% of the cultivated plots, while hired labour participate in the cultivation activities in 23% of the plots. The proportion of plots where women are involved in the cultivation operations do not vary among the different regions. However, in the Southern region, the proportion of men involved is slightly lower (77%) than in the Northern (86%) and Central (85%) regions (*Ibid.*).

**LAND TENURE AND INHERITANCE**

The types of tenure in the areas straddled by the project are customary, public and private land holdings.

Customary land is land belonging to the people and it is held in trust and administered by Traditional Authorities.

Public land is land the government sets aside through appropriate legislation for specific reasons like national development, security and tourism. Private land is land formally leased from customary land.

Agricultural smallholder farmers operate under the customary land tenure system. The customary system of land tenure has the traditional concept of considering land in a village as belonging to the community although individuals in the community have the right to cultivate it and use the land as though they were the owner. Individuals in the community use the land, and have the right to dispose of it although within the limits set up by the customary law of the tribe or clan. Therefore, in this case, the individual does own the land. The chiefs, sub-chiefs, and village headmen are there to protect the customary land against outsiders, making it look like they actually own the land, causing misinterpretation. (United Nations University, 2010).

With the Land Bill 2016, passed by the Parliament in July 2016, customary land will become public land so that there will only be two (2) land tenure systems in the country: private and public.

Concerning the ownership of the parcels used, about 85.3% of the lands used (affected or not) by the affected PAPs interviewed are customary lands. PAPs that own or have a certificate of ownership/leasethold account for 13.5%.

Most of the cultivated plots (79%) are acquired through inheritance or as a bride price. This is followed by those plots that are granted by local leaders (9%), rented (6.9%) and purchased (2.6%). Rural
areas have a higher proportion of plots acquired though inheritance (80%) compared to urban areas (55%). In Mwanza, customary land covers about 79% of the land, whereas public and private land covers 19% and 2% percent respectively.

In Neno, 77% is customary land, 16% is public land, and 6% is private land. In Balaka, 89% is customary land while the rest is shared between public and private.

The dominant Tradition system of the study area is matrilineal where women hold power to land. Hence, it is expected that more women will be involved in land administration. Distribution of land to children has nothing to do with whether one is a male or female.

There is an equal distribution of ownership of plots between males and females with both registering 35% of the plots owned by the households. About 11% is jointly owned by men and women managers. Nearly a fifth (19%) of the plots is not owned by the managers of the plot.

These proportions vary across regions. In the Southern region, 50% of the plots are owned by women and only 20% by men (NSO, 2012).

Public land is mainly used for roads and public institutions such as schools and health facilities. On the other hand, private and customary land is used for settlements, agriculture, and forests. Table 5-22 presents the land use distribution in the study area.

<table>
<thead>
<tr>
<th>Districts</th>
<th>Total area (HA)</th>
<th>Cultivable land (%)</th>
<th>Forest land (%)</th>
<th>Estates (%)</th>
<th>Wetland (%)</th>
<th>Average land holding (HA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neno</td>
<td>146,900</td>
<td>25</td>
<td>17</td>
<td>1</td>
<td>57</td>
<td>1.30</td>
</tr>
<tr>
<td>Balaka</td>
<td>211,716</td>
<td>69</td>
<td>11</td>
<td>5</td>
<td>15</td>
<td>0.35</td>
</tr>
<tr>
<td>Mwanza</td>
<td>82,600</td>
<td>32</td>
<td>15</td>
<td>1</td>
<td>52</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Source: Government of Malawi, 2012a, b, c.

Table 5-22 shows that in Balaka District, despite there being a large area of cultivable land, the average land holding is small. This is because of the high population density. As such, it is common to have land conflicts in the district. In other districts, it is common to find idle land.

5.3.5.2 LIVESTOCK REARING

Ownership of livestock and poultry at the household level is important for food security as a source of food and as an asset to be sold if the need arises.

In 2006-2007, the majority of the agricultural households in Malawi (57%) owned or kept livestock or poultry. The proportion that owned or kept livestock was larger among male headed households (61%) than female headed households (48%).

Households in the Northern region (77%) were more likely to have owned or kept livestock than households in the Southern (51%) and Central (57%) regions.

The ownership of the different types of livestock varies across the regions. For example, while 25% of the households in the Northern region own cattle, only 4% and 3% of households in the Central and Southern regions, respectively, do.

In the Southern region, besides chickens owned by 40% of the households, goats are the only other livestock owned by a fairly large proportion (21%) of the households, the others (pig, sheep, cattle) being much less popular (NSO, 2010).
Table 5-23 Proportion of Households that Kept or Owned Major Classes of Livestock, 2007

<table>
<thead>
<tr>
<th>Region and districts</th>
<th>Classes of livestock (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cattle</td>
</tr>
<tr>
<td>Southern Region</td>
<td>3</td>
</tr>
<tr>
<td>Balaka</td>
<td>2</td>
</tr>
<tr>
<td>Neno*</td>
<td>-</td>
</tr>
<tr>
<td>Mwanza</td>
<td>5</td>
</tr>
</tbody>
</table>

(*) Note: Information not available

Goats (25.2%) and chickens (24.1%) are the main animals possessed by the affected stockbreeders.

5.3.5.3 FISHING

Fishing also contributes to the livelihood of the communities in the project districts. Fish is a source of income to fishermen and fish vendors. In the study area, fish is mainly sourced from the Shire River. The preferred route also crosses the Wamkurumadzi River south of Mwanza District, and Lisungwi River to the east of Neno District, which are also sources of fish. There are some fish farms in the line corridor, especially in Mwanza District, in the area of TA Nthache and TA Kanduku.

According to the fish farming inventory survey conducted in 2011, TA Kanduku is home to 50% of fish farmers in the Mwanza District, which is the highest; while TA Nthache is second, having 42%. The remaining 8% is in the area of GVH Govati, which is outside the study area.

Mwanza District has high potential for fish farming because of high temperatures that are favourable to fish growth, as well as the availability of perennial sources of water. Most ponds rely on spring water. The fish being reared are *Tilapia rendalli* and *Oreochromis shiranus* (Coastal & Environmental Services, 2003).

NGOs and the Government of Malawi, through the department of fisheries, have played a crucial role in the development of fish ponds. Fish farming is important because the fish demand-supply gap is increasing in Malawi and in the study area due to the growing population, lowering of water levels and drying up of some rivers as a result of climate change. Fish are a common source of cheap animal protein.

According to the socio-economic surveys, no affected households practice fishing.

5.3.5.4 TRADING

Household non-farm enterprises provide profit based income and off-farm employment to a significant proportion of households in the country. Approximately 20% of households in Malawi operated non-farm enterprises in 2010 and 30% in 2013. The proportion of households engaged in the small economic activities in urban areas (36%) is more than double the rural proportion (17%), reflecting the wide intra-country disparities in the distribution of non-agricultural enterprises.

Very few household non-farm enterprises are officially registered. Overall, only 9% of businesses report being registered by any of the official registration bodies (Registrar of Companies, Malawi Revenue Authority or Local Assemblies).

The proportion of households owning non-farm enterprises ranges from 17% in the Northern region to 34% and 29% in the Southern and Central regions, respectively.

Most of the enterprises in the Northern region are in the trading sector (50%) followed by manufacturing (38%), while in the Central region 58% are engaged in trading activities followed by manufacturing (27%). The sectoral distribution of enterprises in the Southern region follows a pattern
fairly similar to the other regions. Slightly over 59% were engaged in trading seconded by manufacturing (33%).

About 43% of household non-farm enterprises are located within or near the home and about 33% at traditional market place. Only 0.3% are located at industrial sites, while 13% are owned by mobile vendors – people who move their goods or services from place to place.

Savings from agriculture constitute the main source of finance for most enterprise start-ups (32%), followed by own savings from non-agricultural activities (22%). About 13% rely on funds from family or friends to provide initial financing for their businesses, and about 6% use proceeds from another business account. Other sources of funding include loans from family or friends (5%), credit from banks or other institutions (2%), and loans from money lenders (2%) (NSO, 2012 and IHPS, 2014).

No markets are located in the villages traversed by the wayleave, however a total of 10 trading centers can be found (representing 28.1% of total number of villages). Three (3) administrative buildings are also present in the Mlauli and Symon traditional authority.

5.3.5.5 TOURISM

South Malawi has more national parks and wildlife reserves than any other region. Notable for their spectacular scenery, unspoilt beauty and rich diversity of wildlife, three of them are in the low lying Lower Shire Valley, home to vast sugar estates and accessed by descending the dramatic Thyolo Escarpment south–west of Blantyre.

There are: the Majete Wildlife Reserve, the Lengwe National Park and the Mwabvi Wildlife Reserve – which are now being developed under a community-based conservation project. The area furthest south in the Lower Shire Valley is Elephant Marsh, and further north and on the upper reaches of the Shire River, is Liwonde National Park.

The last of South Malawi’s national parks is the Lake Malawi National Park at Cape Maclear. This UNESCO World Heritage Site is a veritable aquarium of tropical fish. Between the port of Monkey Bay and the historic Mangochi is Mangochi Lakeshore – Lake Malawi’s greatest concentration of hotels and lodges, with a long line of wonderful sandy beaches backed by a variety of accommodation options. Furthermore, the Southern Region has two (2) other lakes of note, Malombe, which is a broadening of the Shire River shortly after it leaves Lake Malawi, and Lake Chilwa, a wetland area of international importance.

Blantyre is the regional capital and the country’s commercial heart. It has modern shops and a number of interesting historical buildings. Zomba was the capital in colonial times and that legacy remains today with a gymkhana club, war memorials and colonial buildings to be visited. Sitting in the shadow of the Zomba Plateau, it’s also a great place to witness a modern-day African market (Malawi Tourism Guide, 2010).

A total of five (5) lodging centers (9.4% of villages) are found in the villages traversed by the ROW.

5.3.5.6 UN EXPLODED ORDINANCE

There is a risk that some Un Exploded Ordinance (UXO) may still be present in the border areas of both countries crossed by the project. The current situation is not precisely known and should be investigated before the start of the construction. The Contractor would need to assess the situation with the local security authorities to evaluate the need to prepare a specific security protocol to that effect (see section 7.3.1.2 and 8.1.2 for impacts and measures).

5.3.6 EXISTING INFRASTRUCTURE

Most of the areas along the line corridor are rural, characterized by basic infrastructure and services. The main community infrastructure includes schools and health facilities. This section details the existing community services and infrastructure including the existing transport, water and electricity services.
5.3.6.1 EDUCATION

The formal education system in Malawi follows an 8-4-4 structure: eight (8) years of primary education (Standard 1 to Standard 8), four (4) years of secondary (Form 1 to Form 4), and four (4) years of university level education. At the end of their primary education, students take the Primary School Leaving Certificate Examination (PSLCE), which determines their eligibility for entry into secondary school. Public school secondary students attend either Community Day Secondary Schools (CDSSs, previously MCDE) or Conventional Secondary Schools (CSSs). At the end of two (2) years of secondary education, pupils take the national Junior Certificate of Secondary Education (JCE), which is followed by the Malawi School Certificate Examination (MSCE) two (2) years later. Tertiary education is provided by an array of educational institutions, including primary and secondary teacher training colleges, technical and vocational training schools, and university colleges.

Education in the project districts is mainly offered at primary and secondary school levels by public and private institutions. Table 5-24 shows the number of schools, number of pupils and the pupil to teacher ratio.

Table 5-24 Education Characteristics in the Districts Concerned by the Project

<table>
<thead>
<tr>
<th>Districts</th>
<th>Primary schools</th>
<th>Secondary schools</th>
<th>Primary pupils</th>
<th>Secondary pupils</th>
<th>Pupil to teacher ratio in primary school</th>
<th>Pupil to teacher ratio in secondary school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balaka</td>
<td>156</td>
<td>18</td>
<td>93 944</td>
<td>N/A</td>
<td>93:1</td>
<td>44:1</td>
</tr>
<tr>
<td>Neno</td>
<td>7</td>
<td>N/A</td>
<td>40 192</td>
<td>8</td>
<td>94:1</td>
<td>22:1</td>
</tr>
<tr>
<td>Mwanza</td>
<td>6</td>
<td>42</td>
<td>22 566</td>
<td>1 030</td>
<td>64:1</td>
<td>27:1</td>
</tr>
</tbody>
</table>

Source: Government of Malawi, 2012a, b, c.

In Mwanza District, 22 primary schools out of a total 42 are in the TA Kanduku area, whereas only 11 schools are in the TA Thache area. According to the Mwanza District Socio-economic Profile, most of the schools are in bad condition due to lack of maintenance. Several schools, built more than a decade ago, are dilapidated and in need of urgent renovation. This is also the general characteristics of the schools in other districts (Government of Malawi, 2012a, b, c).

The community survey indicated that there are no tertiary institutions in the villages crossed by the wayleave. Primary schools are the most common (23), surveyed in 65.6% of the villages. Two (2) secondary schools were also found in the villages of the Mlauli traditional authority.

LITERACY

Literacy, which is defined as the ability to read and write in any language, has increased by 6% from 65% in 2010 to 71% in 2013 in Malawi. Accordingly, the proportion of household members that have never attended school has reduced by 4%. Urban areas depict higher literacy statuses (89%) than rural areas (68%). Literacy levels have not changed in urban areas between 2010 and 2013, but increased by 8% in rural areas.

Across the regions, the Northern region continues to register a higher literacy status (79%) than other regions. It is followed by Central (71%) and Southern (69%) regions. Literacy rates increased in Central and Southern regions by at least 6% between 2010 and 2013 (IHPS, 2014).

The majority (62.0%) of the heads of households affected by the transmission line project have attended primary school, while an additional 16.5% of them have also attended secondary school. A total of 80% of the control group heads of households are educated at either the primary level (71.4%) or the secondary level (8.6%). Generally, about 21.8% of the heads of households affected by the project followed an informal education program (adult education, vocation, etc.).
ENROLLMENT

Net enrollment rate refers to the number of pupils in the official school age group, expressed as percentage of the total population in the age group.

Primary net enrollment at national level has increased by 4%, from 85% in 2010 to 89% in 2013. The Southern region displays a somewhat lower rate (86%) than the Northern (93%) and Central (90%) regions.

Secondary school net enrollment rates remained at 11% in 2010 as well as in 2013. The Southern region has a lower secondary enrollment rate (10%) than Central (11%) and Northern (14%) regions.

Malawi’s higher education system is still very small compared to those of other countries in the region. The public universities enroll the majority of students. Total university enrollment constitutes roughly 0.3% of students of eligible age.

Malawi has a very limited university enrollment (51 per 100 000 inhabitants) when compared to some SSA countries whose average is 337. Limited infrastructure constrains the growth of university education (Ibid.).

SCHOOLS

Types of primary and secondary schools attended by household members in Malawi include public, private and religious.

At national level, the proportion of household members attending primary public school increased from 86% in 2010 to 92% in 2013.

Interestingly, percentage distribution of individuals attending religious schools dropped from 11% in 2010 to 5% in 2013. Similarly, the trend is the same across urban and rural areas.

Always at national level, the proportion of household members attending secondary public school declined from 83% in 2010 to 81% in 2013.

On the other hand, the percentage age distribution of household members attending private secondary schools increased from 9% in 2010 to 12% in 2013. Similarly, the trend is the same across urban areas (Ibid.).

5.3.6.2 HEALTH

Healthcare in Malawi is provided at three levels: primary, secondary and tertiary.

Primary level health care is provided through community-based outreach programmes at health posts and static health facilities, including dispensaries and health centres (Malawi Government, 2013; Chitsulo, Lipato & Masiye, 2014). There are also community hospitals which are limited to providing mainly health promotion and Essential Health Packages (EHP).

Secondary health care is provided through District Hospitals for the public health sector, non-profit mission hospitals under Christian Hospitals Association of Malawi (CHAM) and profit hospitals in the private health sector. Health services at secondary level include EHP, diagnostic services, limited specialized care and limited operational researches.

At the tertiary level, health care is provided by Central Hospitals, which are under the Ministry of Health. There are four (4) Central Hospitals in the three (3) regions of Malawi (Malawi Government, 2013), namely: Queen Elizabeth Central Hospital and Zomba Central Hospital in the southern region, Kamuzu Central Hospital in the central region, and Mzuzu Central Hospital in the northern region. Central Hospitals provide advanced specialized and sub-specialized health care services and research as well as tertiary teaching services.
Of great importance in the levels of health care service delivery are the referral and communication systems. District Hospitals are referral institutions for the district.

Cases beyond primary healthcare are referred to District Hospitals, while Central Hospitals provide healthcare to referral cases from the districts in their region. Central Hospitals also provide healthcare to communities surrounding the hospital.

District Hospitals in the study area include Mwanza, Neno and Balaka District Hospitals. Mwanza District Hospital, in addition to being a referral hospital for the district, assists communities in Chikwawa District (Gaga, Chithumba and Chang’ambika Health Centres), which are separated by the Mwanza River from Chikwawa District Hospital. Patients from Mozambique, especially from Zobue and Mkondezi Health Centres, are also referred to Mwanza District Hospital. Mozambique and Mwanza have a good working relationship (e.g.: learning visits are carried out on either side).

The District Hospitals have the following departments: eye, skin, casualty, maternal and child health care unit, environmental health, dental, paediatrics, X-ray and psychiatry.

Referral cases from Mwanza are transported by ambulance to Queens Elizabeth Hospital, as well as cases from Neno District Hospital. Cases from Balaka District Hospital are referred to Zomba Central Hospital, which is the nearest.

Table 5-25 presents the health facilities located in the study area.

**Table 5-25** Health Infrastructure in the Districts Concerned by the Project

<table>
<thead>
<tr>
<th>Districts</th>
<th>Health Facility Type</th>
<th>Ownership</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balaka</td>
<td>Phalula Health Centre</td>
<td>Government</td>
<td>TA Msamala</td>
</tr>
<tr>
<td></td>
<td>Chifunga Health Centre</td>
<td>Government</td>
<td>TA Mlauli</td>
</tr>
<tr>
<td></td>
<td>Magareta Health Centre</td>
<td>Government</td>
<td>TA Mlauli</td>
</tr>
<tr>
<td></td>
<td>Luwani Health Centre</td>
<td>Government</td>
<td>TA Symon</td>
</tr>
<tr>
<td></td>
<td>Liwani Health Centre</td>
<td>Government</td>
<td>TA Symon</td>
</tr>
<tr>
<td></td>
<td>Lisungwi Community Hospital</td>
<td>Government</td>
<td>TA Symon</td>
</tr>
<tr>
<td></td>
<td>Midzemba Health Centre</td>
<td>Government</td>
<td>TA Symon</td>
</tr>
<tr>
<td></td>
<td>Matope Health Centre</td>
<td>Government</td>
<td>TA Symon</td>
</tr>
<tr>
<td>Neno</td>
<td>Mwanza District Hospital</td>
<td>Government</td>
<td>TA Kanduku</td>
</tr>
<tr>
<td></td>
<td>Tulonkhondo Health Centre</td>
<td>Government</td>
<td>TA Kanduku</td>
</tr>
<tr>
<td></td>
<td>Banja la Mtsogolo Clinic</td>
<td>Private</td>
<td>TA Kanduku</td>
</tr>
<tr>
<td></td>
<td>Wellness Centre Clinic</td>
<td>Private</td>
<td>TA Kanduku</td>
</tr>
<tr>
<td></td>
<td>Tiyendebrwino clinic Clinic</td>
<td>Private</td>
<td>TA Kanduku</td>
</tr>
</tbody>
</table>

Source: Government of Malawi, 2012a, b, c; Malawi Government, 2013.

Table 5-25 shows that the Kanduku TA area has the best access to health facilities of all the TA areas. It has a District Hospital with a doctor, a pharmacy and an environmental health officer. In contrast, the health centres and clinics in the other TA areas are characterized by inadequate health personnel, shortage of drugs, lack of adequate hospital space and inadequate relevant capacity for service providers. The problem is critical in some health centres. For example, Phalula health centre operates erratically due to inadequate personnel (Fichtner, 2015).

Distance to the health facilities is also a problem. During the 2010 Demographic and Health Survey, the percentage of women aged between 15 and 49 who reported to have had serious problems accessing health care when they were sick because of the distance was as follows: Mwanza – 48.3%, Neno – 71.0%, Balaka - 57.4% (NSO, 2010).
Malaria is a major issue in the area impacted by the project. In the last year alone, 10.9% of impacted households had a death attributed to malaria. Professional medical care is generally favoured by impacted households over traditional medicine (83.8%). However, access can be demanding since 30.1% of households will need to walk for one (1) to two (2) hours or for 53.8% of them for over two (2) hours. The majority of households travel to the Mwanza district hospital for care (60.2%).

Generally, households need to complement their food needs by purchasing extra goods (98.1% of all affected households, 100% in the control groups). They do not eat much meat (64.3%, 0 times per week) nor fish (60.5%, 0 times per week).

Households that consume these products usually do so two (2) times or less per week (approximately 25% of them). Additionally, the majority of households (66.9%) consume two (2) meals per day, while 30.1% eat three (3).

5.3.6.3 WATER

Increasing household access to safe drinking water and sanitation facilities is a long-standing development goal of Malawi.

Sources that are likely to provide water suitable for drinking include piped sources, public taps or standpipes, tube wells or boreholes, and protected wells or springs. The majority of households in Malawi (87%) obtain drinking water from an improved source. This is an improvement since the 2010 Malawi Demographic and Health Survey (MDHS), when 80% of households obtained drinking water from an improved source.

Improved drinking water sources are more common among households in urban areas (98%) than among those in rural areas (85%). The most common source of drinking water in urban areas is water piped into the dwelling/yard/plot, to a neighbour or to a public tap, with more than 8 in 10 urban households (86%) using this source. In rural areas, the most common sources of drinking water are tube wells or boreholes (72%). In rural areas, nearly half of households (47%) spend 30 minutes or more obtaining their drinking water, as compared with only 2 in 10 urban households (19%). Overall, 15% of households have the source for their drinking water on their premises, but 43% of households spend 30 minutes or longer getting their drinking water (NSO and ICF Macro, 2011).

The Southern Region Water Board supplies water in some parts of the project districts. In the rural areas, the people source water from boreholes, rivers and watershed areas. There is a general shortage of water during the dry season in both urban and rural settlements as the rivers dry up and the groundwater table lowers.

Almost all villages involved in the project have access to water supply infrastructure (93.8%), representing a total of 163 sites. It is the most common community facility.

The water sources that supply the households with drinking water during the dry season are almost identical to the ones used in the wet season. Indeed, 96.6% of affected households use boreholes. The average distance traveled by households to fetch water is 10.9 km. The frequency of drinking water fetching trips is almost always daily (98.1% in dry and 98.5% in wet seasons).

5.3.6.4 TRANSPORT

Malawi has been spending heavily on its road network in recent years, and as a result has achieved better levels of road quality. Paved road density is comparatively high. Paved road quality is somewhat better, while unpaved road quality is substantially better with nearly 90% of the network in good or fair condition, compared with less than 60% elsewhere. Road preservation expenditure still falls significantly short of what is needed to preserve the network in good condition.

Beyond the truck network, accessibility falls off. About 26% of Malawi’s population lives within 2 km of an all-weather road. While this is significantly better than the benchmark for low-income countries, the number is low in absolute terms and remains a concern for a country so heavily reliant on agriculture (AICD, 2011).
The proposed line route follows the M6 road in Mwanza and some parts of Neno and the M1 road in some parts of Neno and Balaka Districts. These are primary roads, with M1 being the backbone of Malawi, running from the southern end in Nsanje District, to the Northern end in Chitipa District. The M6 connects Malawi to Mozambique and to the rest of other southern Africa Countries. The roads are used by a lot of traffic, including heavy goods vehicles, especially the M6 road. The transmission line crosses the M6 road near the turnoff to Tedzani Power Station. The primary roads are tarred and generally in good shape.

In addition, there are a number of secondary roads, tertiary roads and footpaths in the line corridor. For example, in Mwanza District there is the 137 road, which branches from the M6 road at Mpatamanga turn-off.

This is a secondary road but not tarred like most of the secondary and tertiary roads in the study area. Through public works programmes such as the Local Development Fund, most of the secondary and tertiary roads in the project districts are well maintained. However, there are some roads with bridges that are in such bad shape that vehicles cannot use them (see Photo 5-1).

Photo 5-1 A Bridge at Chifunga, Neno District

However, almost 80% of the roads in the project area are earth or gravel surfaces. The network is extensive. Several villages become inaccessible during the rainy season due to the bad conditions of the road. Bicycles and minibus services are the most popular modes of transportation. Cars, buses and minibuses are used for distant travels (Coastal & Environmental Services, 2003).

5.3.6.5 ENERGY

Electricity services, like water distribution, are concentrated at the Bomas and in trading centres that are near the primary roads; for example Chifunga, Zalewa, Kam’wamba and Phalura trading centres. Ironically, there are transmission lines in the rural areas. The trading centres were electrified through the Malawi Rural Electrification Project (MAREP) implemented by the Government of Malawi.

In areas with no electricity, communities use candles, battery torches and paraffin lamps for lighting. The lack of electricity negatively affects the delivery of health and education services.

Firewood is the most common source of fuel for cooking in Malawi, with 84% of households using this type of fuel for cooking. The second most common fuel is charcoal, used by 12% of households. Only 2% of households use electricity.

There are substantial differences between the rural and urban contexts. Charcoal is used by 51% of urban households but only by 4% of rural households.

More households in the Southern region (15%) use charcoal than in the Northern (7%) or Central (11%) regions. Consequently, firewood is used by a smaller proportion of Southern households (81%) than the Central (86%) or Northern (92%) households.
Dry-cell battery torches are the most commonly used source of lighting, with 65% of households using them, followed by paraffin (13%) and electricity (9%).

Again, there is large difference between the urban and rural sectors. Electricity is dominant in urban areas, with 37%, but it is still fairly rare in rural households (3%). As for dry-cell battery torches, 19% of the urban households used it as their main source of lighting compared to 74% of the rural households.

On average electricity is used in more households (12%) in the Southern region than the Northern (7%) or the Central (6%) regions. Thus, dry-cell battery torches are used in fewer households (57%) in the Southern region than the Northern (77%) or the Central (69%) regions (IHPS, 2014).

About 14 villages among the 32 traversed by the wayleave are connected to the power grid. However, the dominant energy source for cooking among the affected households of the project area is firewood (biomass): 91.7% of affected households use this source. A small portion of affected households also uses charcoal (8.3%) for meal preparations. A great number of households (89.1%) also uses torches for light.

5.3.6.6 TELECOMMUNICATION

In Malawi, 46% of households have mobile phones because mobile services are available within the communities. In urban areas, 80% of the households have access to mobile phones compared to 39% of rural households.

On average, mobile phones are used in 47% of the Southern region households. This proportion is somewhat lower in the Central region (43%) but higher in the Northern region (55%) (ibid.).

According to the socio-economic survey, 50.8% of the affected households have a telephone/cellular.

5.3.6.7 HOUSING AND FAMILY ASSETS

Most houses are semi-permanent in the Southern Region. Nearly 41.4% of the principal structures are of this type, while 33.5% are traditional and 25.1% are permanent. The situation is quite similar in the district of Balaka, while traditional structures are more numerous in Mwanza and Neno districts, representing 53.8% and 48.5%, respectively. In addition, in the Southern Region as well as in the three districts concerned by the project, most dwellings have two (2) rooms.

In terms of tenure, the vast majority of households own their structure or it belongs to the family (NSO, 2009a).

Table 5-26 shows the situation regarding housing characteristics.

<table>
<thead>
<tr>
<th>Region and districts</th>
<th>Housing characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type of dwelling structure</td>
</tr>
<tr>
<td></td>
<td>Permanent</td>
</tr>
<tr>
<td>Southern Region</td>
<td>1,420,943</td>
</tr>
<tr>
<td>Neno</td>
<td>16,585</td>
</tr>
<tr>
<td>Balaka</td>
<td>67,300</td>
</tr>
<tr>
<td>Mwanza</td>
<td>17,623</td>
</tr>
</tbody>
</table>

Source: NSO, 2009a.

The initial site visit revealed that along the preferred line corridor there are houses that can be categorized as grass thatched and iron thatched.
Most of the houses with iron sheets were built with burnt bricks, while the others were built with mud or unburnt bricks. Photo 5-2 shows pictures of houses seen in the line corridor.

![Photo 5-2 House Near the Line Point at Mpatamanga Turn-Off in Mwanza (left) and House at Kam’mwamba Point Along the Line (right)](image)

The project districts have different settlement patterns depending on the area. In most rural areas, communities prefer to settle in clustered patterns, especially where the terrain is flat; and scattered pattern where the terrain is dissected by mountains, hills and valleys. There are also linear and nucleated settlements, especially in trading centres, for example Chifunga, Kam’mwamba and Phalula trading centres.

As for primary housing residences of the affected PAPs, the main materials for their walls are: burnt bricks (62.0%) and mud bricks (22.9%). The predominant roof materials of these structures are thatch (52.6%) and corrugated iron sheets (46.6%).

**SANITATION**

The sanitation and hygiene of a household directly impacts the quality of life of its members. Use of appropriate toilet facilities is important in controlling hygiene related illnesses like diarrhea, intestinal infections and cholera, among others.

The most common type of toilet facility in rural areas is a pit latrine with a slab that is not shared with other households (52% of rural households) or shared with others (27%). While pit latrines with a slab are also the toilet facilities most commonly used by urban households, they are usually shared with other households (50% of urban households). The “private” slab latrine is used by 30% of the urban households.

The other “main” types of facility are the pit latrine without slab, used by 10% of rural and 3% of urban households, and the flush toilet, accessible to 14% of urban and 0.5% of rural households.

Overall, 6% of households have no toilet facility at all; they are almost exclusively rural, accounting for 7% of rural households (NSO, 2016).

**5.3.7 GENDER ASPECTS**

Several obstacles to equality perpetuate gender disparities in many aspects of life in Malawi, such as the law, education, agriculture, health, employment, credit accessibility, and political participation. Although the 1995 Malawian Constitution guarantees equal rights to men and women, these disparities produce gender inequalities in the division of power, participation and control over resources and decision-making processes.
Thus, despite the 1995 Malawi Constitution that guarantees equal rights to both genders, Malawian women remain disadvantaged in the socio-economic, legal and political arenas of society.

In Malawi, female headed households represent 30% of all households. The proportion is higher in some areas.

This is due to several causes: 1) the impacts of the dominance of the matrilineal system of marriage, where the divorce rate is higher than in patrilineal marriages and women tend to be left to head households, as men move on; 2) the breakdown of traditional family networks where widowed women were taken care of by male relatives, so that even in patrilineal communities an increasing number of women are heading households; 3) the high death rate of the young owing to the impacts of AIDS that has led to older women taking in grandchildren and heading households.

Female headed households are poorer in terms of income and more often they have fewer means to move out of poverty. Most Malawians make their living from small scale agriculture. Women produce most of the food, but tend to have less land (0.8 hectares on average compared to 1.0 hectares for male farmers). They also have less labour (due to absence of an adult male), and less access to inputs, credit and extension.

Moreover, although labour force participation is nearly the same for men and women, women make less money than men. In the informal economy and smallholder agriculture, women make only 50% and 71% respectively of what men make. The reasons are low productivity on land and less engagement in value-adding activities.

Today, school enrollment stands at 82%. However, while girls and boys start primary school in equal numbers, girls drop out faster and tend to have poorer results (Malawi Government, Ministry of Education, 2009, National Education Sector Plan). The primary school dropout ratio is 2.3 for girls and 2.1 for boys. At the national level, 68% of women and 73% of men have completed primary education. The efficiency indicators for the sector are poor, and are among the worst in Africa (e.g. it takes, on average, 23 years of schooling to produce a primary school graduate, and many of those who leave school early do so before gaining competences in reading and writing) (Ngwira).

Violence against women is a significant problem in Malawi that is occurring in the home, community and the workplace. Women are particularly vulnerable to violence, including wife-battering, sexual harassment and assault, girl-child defilement, marital rape, incest, femicide, and widowhood rites. Sexual abuse also occurs within some traditional practices, and at school – where it is a significant problem with 27% of secondary school girls having experienced some form of sexual harassment. Sexual exploitation of women is common with very young girls walking the streets to sell their bodies for money, which results too often in unwanted pregnancies. Furthermore, these women also face abuse and rape by the police. These various forms of gender-based violence significantly have severe psychological impacts on women’s ability to participate in the social and economic activities of their community. Although legal measures exist in society that protect women and girls from some forms of violence, the existing discriminatory legal system often leaves women without adequate judicial recourse (WLSA-Malawi).

5.3.8 VULNERABLE GROUPS

According to the definition of the World Bank, the disadvantaged or vulnerable groups refers to:

“Those who may be more likely to be adversely affected by the project impacts and/or more limited than others in their ability to take advantage of a project’s benefits. Such an individual/group is also more likely to be excluded from/unable to participate fully in the mainstream consultation process and as such may require specific measures and/or assistance to do so. This will take into account considerations relating to age, including the elderly and minors, and including in circumstances where they may be separated from their family, the community or other individuals upon which they depend” (World Bank, 2016).
Considered as such are widows, the elderly, the physically and mentally disabled, and the chronically ill. With the current circumstances in Malawi, albinos should also be considered as vulnerable people – such as physically disabled people.

Moreover, households headed by women or children, the very poor and disadvantaged groups in economic and social terms, including minorities (e.g. groups of migrants, refugees), should also be considered vulnerable. It is important to note that there are no indigenous peoples within the meaning of OP 4.12 in the project area.

Such individuals may require special or extra help for resettlement because they are less able to cope with physical and/or economic displacement than the relevant general population.

According to the socio-economic surveys, 75 affected households have a sick or handicapped member (whom can be the head of household), 74 affected households are headed by women and 105 affected households own only one (1) land parcel that is likely to be impacted by the project. The main cause of disease or handicap identified by households is malaria (87.6% of households included in the category). There are actually no children head of households impacted by the project. The vast majority of heads of households that are widowed are also women (90.4%).

5.3.9 CULTURAL AND ARCHAEOLOGICAL HERITAGE

A field survey was undertaken to identify any cultural and/or archaeological heritage sites. A walk through of the 84km of the line was completed. The aim of the survey was to identify and document any cultural and archaeological sites/remains, including traces or parts of cultural and archaeological remains that could be found along the powerline corridor and in adjacent areas of the proposed powerline.

Interviews were conducted with key stakeholders, such as local communities (mainly chiefs), traditional leaders, social workers, group village headmen, area development committee chairpersons and vice chairpersons, and village development committee chairpersons and vice chairpersons that reside along the proposed ROW or in adjacent areas. They were questioned on the existence of the cultural and archeological sites/remains that could be found in their respective areas. A literature review was also completed.

No legally protected or internationally recognized cultural or archaeological sites/remains were identified in the project area during the field survey, interviews and literature review. One cultural site (Salifosi graveyard) was identified relatively close to the proposed transmission line but it is located 20m outside the ROW. This cultural site is in Neno District, near Zalewa.

5.3.10 LANDSCAPE

The landscape along the line corridor consists of hills, rivers, agriculture areas, settlements, vegetation, and idle land. Fruit trees including mangoes and bananas surround human settlements. The hills are mainly in the Mozambique-Malawi border area where the proposed line enters Malawi. The hills are covered with grass and Brachystegia tree types, while the soil is stony and not good for agriculture (see Photo 5-3).
After the border area, the landscape is relatively flat, lying in the Mwanza River Valley and Shire River Valley in Neno and Balaka Districts.

Agricultural areas, including some cultivated land and some idle or abandoned land dominate the valley area. Some parts of the study area have sandy clay soils – of good depth, permeable and well drained – while other parts have stony soils as can be seen in Photo 5-4. Stony soils are mostly found in Neno District.
6 STAKEHOLDER ENGAGEMENT

This chapter outlines the public information and consultation process conducted in Malawi to support the development of the EIA and RPF studies, for the Mozambique – Malawi Power Interconnection Project. Relevant national and international requirements for stakeholder engagement and public disclosure are first briefly reminded, followed by the description of the process implemented by the consultant to enable the informed consultation and participation of stakeholders in the development of the studies. The stakeholders reached at the different stages of the studies, as well as their concerns, expectations and recommendations, in view of the project, are reported. Finally, indications are provided on how stakeholders’ inputs have influenced the project design and the studies’ final recommendations.

6.1 NATIONAL AND INTERNATIONAL REQUIREMENTS

Key elements of the national and international requirements, relative to stakeholder engagement and applicable to the Mozambique – Malawi Interconnection ESIA and RPF studies, are highlighted below.

6.1.1 NATIONAL REQUIREMENTS

National legal requirements with regard to stakeholder engagement activities, to be conducted by project proponents as part of the ESIA studies, are found in Malawi’s Environment Management Act (1996) and emphasized in the Guidelines for Environmental Impact Assessment (1997). Provisions of the Guidelines include, amongst other things, the following:

→ Public consultation is mandatory when undertaking an EIA. At a minimum, the proponent must meet with the principal stakeholders to inform them about the proposed activity and to solicit their views about it. [...] The methods and results of these consultations must be documented in the EIA report. (Chap. 2, al. 2.2.2).

→ Consultations are to be carried out throughout the EIA process (Chap. 2, al. 2.4.1).

→ Public participation should ensure that women and children are actively involved since they are the major resource users and managers (Chap. 1, al. 1.3.6).

→ The Director of Environmental Affairs may [...] conduct his or her own public consultation to verify or extend the work of a developer (Chap. 2, al. 2.4.2).

→ Formal EIA documents are made available for public review and comment. Documents to which the public has access include Project Briefs, EIA terms-of-reference, draft and final EIA Reports (Chap. 2, al. 2.4.3).

Detailed guidance on public consultation objectives, methods and principles is given in Appendix G of these guidelines. Proposed consultation methods include interviews, questionnaires, community meetings, advisory committees and public hearings. It is also reminded that the stakeholder engagement programme should be flexible and adapted to the project’s complexity and social setting, that it needs to be started as early as possible in the project cycle, and that it should have its major elements timed to coincide with significant planning and decision-making activities in the project (EIA) cycle.

6.1.2 INTERNATIONAL REQUIREMENTS

6.1.2.1 WORLD BANK REQUIREMENTS

The World Bank’s Operational Policy 4.01 on Environmental Assessment requires that, during the EIA process, the project-affected groups and local NGOs are consulted about the project’s environmental aspects and their views are taken into account.
Stakeholder consultations should be initiated as early as possible and should occur at least twice: (a) shortly after environmental screening and before the terms of reference for the EIA are finalized; and (b) once a draft EIA report has been prepared.

For meaningful consultations, O.P. 4.01 emphasizes 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 consultations, it stipulates that a summary of the project’s objectives, description, and potential impacts will be disclosed. For consultations on the draft EIA report, stakeholders need to be provided with a summary of the EIA’s conclusions. In addition, the proponent is expected to make the draft EIA report available at a public place, accessible to project-affected groups and local NGOs.

6.1.2.2 AFRICAN DEVELOPMENT BANK

The African Development Bank’s requirements on public consultations and disclosure that apply to the EIA development process, are set forth by the Operational Safeguard (OS) 1 on Environmental and Social Assessments. Among its specific objectives, OS1 aims to “Provide for stakeholders’ participation during the consultation process so affected communities and stakeholders have timely access to information in suitable forms, about Bank operations, and are consulted meaningfully about issues that may affect them.”

The OS1 stipulates that it is the borrower or customer’s responsibility to carry out and provide evidence of meaningful consultations with communities potentially affected by the environmental and social impacts, and with local stakeholders. The borrower or customer must ensure broad community support, especially for projects involving the resettlement of over 200 people (Category 1 projects).

The OS1 also points out that the stakeholder consultations must be preceded by the disclosure of relevant environmental and social information, to ensure that participants are fully informed.

The “Handbook on Stakeholders Consultation and Participation in ADB Operations” (2001) provides clarification on the basic principles of stakeholder involvement, as well as on the central aspects of good practices in the domain. In addition, the “Framework for Enhanced Engagement with Civil Society Organizations” (2010) highlights the ADB’s desire to promote, through its actions, awareness, dialogue and partnerships with civil society organizations.

Finally, it should be noted that the development of ADB projects must comply with the World Bank Group’s Disclosure and Access to Information (“DAI Policy”) policy in place since February 2013. Collaboration with all stakeholders, transparency and accessibility of information are the core principles of this policy.

6.1.2.3 SOUTHERN AFRICAN POWER POOL

The Southern African Power Pool’s requirements on public consultations are presented in the official ESIA Guidelines published in 2010. These Guidelines consider stakeholder engagement and public consultations and participation to be essential as it leads to better and more acceptable decision-making. The objective is to give the affected parties and communities an opportunity to learn about the project, its potential impacts and the mitigation measures that will be implemented.

Moreover, it must be an occasion for individuals and groups to express their views (expectations and preoccupations) on the project, at both the Scoping and ESIA phases.

The SAPP Guidelines make specific reference to a Handbook of Public Participation in Environmental Assessment in Southern Africa developed by the Southern African Institute of Environmental Assessments (SAIEA, 2004) which can be consulted through the following internet link: http://www.saiea.com/calabash/handbook/index.html.
6.2 STAKEHOLDER ENGAGEMENT PROCESS

6.2.1 GENERAL OBJECTIVES

General stakeholder engagement objectives, for this study, were to:

→ Ensure prior and informed stakeholder consultations, at key stages of the EIA and RPF, in order to improve their results and increase the credibility of the process;
→ Ensure compliance with national and international requirements for stakeholder engagement and public consultations, during EIA studies, for major projects;
→ Ensure the EIA helps consolidate the efforts made by ESCOM in order to establish lasting relationships with affected communities and other stakeholders.

6.2.2 TARGET STAKEHOLDER GROUPS

Stakeholder groups that were engaged through the development of the EIA and RPF studies are briefly described in Table 6-1. A comprehensive list of the stakeholder organizations identified for this project is provided in Appendix 8.

<table>
<thead>
<tr>
<th>Stakeholder groups</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Ministries and National agencies</td>
<td>Regulatory bodies in charge of the environment, agriculture, land, physical planning, human rights, wildlife, forests and protected areas, civil aviation, roads and cultural heritage.</td>
</tr>
<tr>
<td>Government Regional services – Southern Region</td>
<td>Relevant regional offices and services: agriculture, forestry, land and physical planning, wildlife, gender, social affairs and roads.</td>
</tr>
<tr>
<td>District Councils</td>
<td>Local Government of the affected Districts (Mwanza, Neno and Balaka); District Commissioners and relevant technical officers (Land Valuer, Agriculture, Environment, Forestry, Water, Community Development, Gender, Child Protection, Social Welfare)</td>
</tr>
<tr>
<td>Traditional Authorities</td>
<td>Traditional authorities (TAs) are highly influential over land issues in the study area and are expected to play a key role in the resettlement process. Five TAs are affected by the line route: TA Kanduku, TA Nthache, TA Mlauli, TA Symon and Senior Traditional Authority (STA) Phalula.</td>
</tr>
<tr>
<td>Affected Communities</td>
<td>All the communities (villages) affected by the line route. These are represented by village headmen and group village’s headmen.</td>
</tr>
<tr>
<td>Displaced Households</td>
<td>Households having their houses or farm plots within the proposed right-of-way.</td>
</tr>
<tr>
<td>Commercial Stakeholders</td>
<td>Commercial organizations potentially affected by the line route. Only two of such organizations have been identified, namely the Nankudwe Estate, in Mwanza, and CLN (Vale’s railway manager).</td>
</tr>
<tr>
<td>NGOs</td>
<td>Relevant NGOs at national and local levels in the fields of conservation, environment, social development and Human Rights. These have included the following: Wildlife &amp; Environmental Society of Malawi (WESM); African Parks; Bats without Borders; National Steering Committee on Biodiversity; Women’s Legal Resources Centre (WORLEC); Partners in Health.</td>
</tr>
</tbody>
</table>

6.2.3 CONSULTATION ROUNDS

Three stakeholder information and consultation rounds were conducted through the development of the EIA and RPF studies. Those were planned according to key stages, or decision moments, throughout the study where the informed participation of stakeholders was likely to make the most significant contribution to the on-going analysis, namely the environmental and social scoping stage (1st round), the assessment of the preliminary line route and of PAPs’ needs and preferences (2nd round), and the assessment of the draft and final EIS and RPF (3rd round).
round) and the disclosure of the EIA, ESMP and RPF draft reports (3rd round). The next table outlines the stakeholder engagement process and shows, for each consultation round, the specific engagement objectives, target groups and implementation periods.

### Table 6-2 Objectives, Target Groups, Meeting Formats and Implementation Periods Specific to the Different Consultation Rounds

<table>
<thead>
<tr>
<th>Engagement Objectives</th>
<th>Target Groups</th>
<th>Consultation Formats and Tools</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consultations Round 1 - Scoping Phase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Introduce the Project and present the upcoming activities as part of the ESIA and RPF development process</td>
<td>Central Ministries and national agencies</td>
<td>Meetings with District Executive Committees, Workshops with regional services, Individual meetings with national authorities, NGOs and commercial stakeholders</td>
<td>Nov. 2016</td>
</tr>
<tr>
<td>• Identify key issues, concerns and expectations associated with the Project and resettlement process</td>
<td>Regional services, Districts Councils, Commercial stakeholders, NGOs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Involve stakeholders in the assessment of the proposed deviations to the study corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Expose, validate and enhance elements of the stakeholder engagement plan</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Consultations Round 2 - On Provisional Line Routing and PAPs’ Needs and Preferences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Disclose the preliminary line routing to communities</td>
<td>Traditional Authorities, Affected communities / Community leaders, Potentially-displaced households</td>
<td>Individual meetings with Traditional Authorities, Group discussions and field walks with community leaders, Public assemblies in villages, Group discussions with women, Interviews with heads of potentially-displaced households (through socio-economic survey)</td>
<td>Dec. 2016 and April. 2017</td>
</tr>
<tr>
<td>• Involve community leaders in the identification and assessment of sensitive elements within the preliminary wayleave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Allow communities to voice their preferences and concerns with regard to compensation options and resettlement assistance</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Consultations Round 3 – Disclosure of Draft ESIA and RPF Reports</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Publicize the final line routing</td>
<td>Central Ministries and national agencies, Regional services, Districts Councils, TAs and Community leaders, Commercial stakeholders, NGOs</td>
<td>Meetings with District Executive Committees, Workshop with regional services, Group meetings with TAs and Community leaders, Individual meetings with national authorities, NGOs and commercial stakeholders</td>
<td>July 2017</td>
</tr>
<tr>
<td>• Present, validate and enhance key elements of draft reports, including the assessment of impacts and proposed mitigation/compensation measures</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6.3 ACTIVITIES PERFORMED AND RESULTS ACHIEVED

The activities performed, the stakeholders reached and the results achieved for the different stakeholder consultation rounds are briefly described hereafter. Detailed consultation reports for each consultation round, including meeting minutes and registers of participants’ signatures, are appended to this report.
6.3.1 CONSULTATIONS ROUND 1

The first series of informative and consultative meetings with stakeholders was conducted from November 7th to 12th, 2016. This exercise was used to introduce the Project to the concerned authorities at the national, regional and district levels, as well as to identify the key issues, concerns and expectations raised by the Project.

A background information document providing an overview of the Project’s components, potential impacts and objectives of the ESIA process was distributed to participants two weeks prior to the meetings. This document, produced in English and Chichewa, is presented in Appendix 8. A press conference to inform the general public about the Project and the ESIA process was held in Blantyre on November 9th, with the regional and national media.

Stakeholder organizations, consulted during consultations round 1, are listed in Table 6-3, followed by a summary of the main issues and expectations raised by them. The detailed meeting minutes and the signatures of participants are presented in Appendix 8.

<table>
<thead>
<tr>
<th>Date (2016)</th>
<th>Location</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 7th</td>
<td>Lilongwe</td>
<td>Min. of Lands, Housing and Urban Planning</td>
</tr>
<tr>
<td>Nov. 7th</td>
<td>Lilongwe</td>
<td>Malawi Human Rights Commission</td>
</tr>
<tr>
<td>Nov. 7th</td>
<td>Lilongwe</td>
<td>Environmental Affairs Department (EAD – MNREM)</td>
</tr>
<tr>
<td>Nov. 8th</td>
<td>Lilongwe</td>
<td>Department of National Parks and Wildlife</td>
</tr>
<tr>
<td>Nov. 8th</td>
<td>Lilongwe</td>
<td>Department of Forestry (MNREM)</td>
</tr>
<tr>
<td>Nov. 8th</td>
<td>Lilongwe</td>
<td>Department of Civil Aviation</td>
</tr>
<tr>
<td>Nov. 9th</td>
<td>Blantyre</td>
<td>Workshop with regional services (South): Tourism; Physical Planning; Forestry; Roads; Agriculture; Lands; Parks and Wildlife; ESCOM.</td>
</tr>
<tr>
<td>Nov. 10th</td>
<td>Blantyre</td>
<td>Women’s Legal Resources Center (WOLREC)</td>
</tr>
<tr>
<td>Nov. 10th</td>
<td>Blantyre</td>
<td>Wildlife and Environment Society of Malawi</td>
</tr>
<tr>
<td>Nov. 10th</td>
<td>Blantyre</td>
<td>CLN (railway)</td>
</tr>
<tr>
<td>Nov. 10th</td>
<td>Balaka</td>
<td>Balaka District Office (District Commissioner, Water Officer; Social Welfare Officer)</td>
</tr>
<tr>
<td>Nov. 11th</td>
<td>Mwanza</td>
<td>Mwanza District Executive Committee – 38 participants, including District Technical Officers (Rural Housing, Gender, Immigration, Natural resources, Social, Agriculture, Youth, Lands, Education, Labour, HIV &amp; AIDS, Fisheries, Forestry, Community Development, Sports, Police) and NGOs (Save the Children, Red Cross)</td>
</tr>
<tr>
<td>Nov. 11th</td>
<td>Nthache</td>
<td>Dzaone Women Group</td>
</tr>
<tr>
<td>Nov. 11th</td>
<td>Neno</td>
<td>Neno District Executive Committee (Senior Chief; Community development officer; Forestry Officer; Agriculture Officer; Environment Officer; Lands Officer)</td>
</tr>
<tr>
<td>Nov. 12th</td>
<td>Mwanza</td>
<td>Nankudwe Estate</td>
</tr>
<tr>
<td>Nov. 17th</td>
<td>Lilongwe</td>
<td>Department of Antiquities (MITC)</td>
</tr>
</tbody>
</table>
6.3.1.1 CONCERNS OVER THE EIA PROCESS

→ A majority of stakeholders have stressed that they expect the project to conduct thorough public consultations and show, in the EIA report, how public concerns have been addressed.

→ District representatives have raised that the district technical services should participate in the field surveys, as they will contribute to the identification of sensitive sites, potential issues and solutions.

→ The Environmental Affairs Department and other stakeholders have recommended to involve local NGOs in the implementation of the project-related sensitization activities as well as in the monitoring of the resettlement process.

6.3.1.2 CONCERNS OVER TECHNICAL ASPECTS

→ Land reserves for roads need to be respected (no towers).

→ CLN is concerned about the potential for radio interferences created by the transmission line with its locomotive communication system. To mitigate this risk, specific technical requirements must be respected.
6.3.1.3 CONCERNS OVER BIOPHYSICAL ASPECTS

→ Regional and district forestry officers are concerned about the proximity of the proposed line route with the Thambani forest reserve. They consider the project could encourage illegal logging and charcoal production in the reserve if the line and associated access roads are located too close.

→ The Department of Forestry and district officers have pointed out that, outside of forest reserves, communities must be compensated for the loss of natural trees through reforestation projects.

→ The Department of Forestry has raised that cluster of mopane trees should be identified and avoided as much as possible by the transmission line. Certain species of mopane trees (hard wood) are targeted for exportation, often illegally, and are overexploited.

→ WESM has pointed out that the transmission line could cross migration paths used by vultures, in particular the white headed and the white back, to and from the Majete Game Reserve. This should be explored by the EIA, as the risk of collision of these birds with the transmission line could be significant.

→ WESM also raised that the Lisungwi escarpment, located a few kilometers away from the preliminary line route, is home to large communities of bats and parrots. The risk of collision with the transmission line for these animals, around Lisungwi, should be assessed.

→ In the project area, Zalewa and Balaka are known for their road-side sellers of birds, mice and other small mammals. Population influx during construction work could encourage this market fed by poachers. The project should integrate sensitization measures directed to workers on the impacts of the illegal bush meat market.

→ The Environmental Affairs Department expects the EIA to assess the potential health risks associated with the electromagnetic fields, considering that people tend to settle within the ROW, or close to it, even if this is forbidden.

6.3.1.4 CONCERNS OVER COMPENSATION AND RESETTLEMENT ASPECTS

→ Recent resettlement experiences in the project area for other projects have created very high expectations in local communities with regards to compensations. An important communication effort will be required to explain the official basis for land valuation and re-establish a balance between government and PAPs’ interests.

→ Arable lands are still generally considered available in the area and displaced farmers are not expected to face any significant difficulty in finding replacement lands. However, land-for-land compensation strategies are considered to be difficult to implement in Malawi because people expect money and prefer to look for replacement land themselves.

→ Municipal lands (managed by district authorities for public purposes) are likely to be affected. Compensations for such lands are expected to be provided to District Councils. Some have recommended to provide such compensation through public investment agreements, rather than in cash.

→ Representatives from the Ministry of Lands have pointed out that the resettlement process needs to consider the provisions of the new Land Bill 2016, including the use of the new land valuation basis, with the notion of “appropriate” value (i.e. market value).

→ The Ministry of Lands and district representatives have stressed that district land valuers should be involved in the surveys and RPF development processes.

→ District representatives have stressed that Traditional authorities (TAs and sub-TAs) are influential over land issues in the project area and should be involved in the RPF / RAP development processes.

→ It is generally expected that PAPs will prefer cash compensations, but will not necessarily use the money properly. It is recommended to provide assistance, sensitization and follow-ups with PAPs to make sure the money is actually used to replace what was lost.
The MHRC and representatives of women’s interests (WOLREC and Dzaone association) are concerned that men usually take control over compensation money, even when it is given to the women. To address this problem, it is recommended to empower women through information, sensitization and transparency. Compensation should be paid to “families”, rather than to the head of household.

6.3.1.5 CONCERNS OVER OTHER SOCIOECONOMIC ASPECTS

The access roads required for this project are seen as both an opportunity (for the development of the road network in the area) and a concern (for its potential impacts).

The use (and improvement) of existing roads should be preferred to the construction of new ones, where possible. Communities should be involved in the planning of the access roads.

Government, NGOs and district representatives have all emphasized on the need to integrate sensitization and prevention measures for HIV & AIDS, which is a major concern in Malawi during construction works. Child labor, sexual abuse of children, prostitution and unplanned pregnancies are other forms of social disturbances often associated with construction work and the presence of outside workers. The project should put a strong emphasis on civic awareness and sensitization, to prevent such problems.

Vulnerable groups to be considered include the physically and mentally challenged, people with HIV & AIDS, women and children. No marginalized ethnical groups are expected to be found in the study area. WOLREC has pointed out that a large ratio of women-headed households (around 33%) is to be expected in the project area and that these are to be considered as vulnerable groups in view of the resettlement process.

District representatives have emphasized that the affected communities must benefit from the project, either through job opportunities, access to electricity or community development assistance (education, water and sanitation).

According to the Department of Antiquities, the potential for archeological findings in the project area is considered to be high. There is also the potential of discovery of old graveyards and cultural sites. A Cultural Heritage Impact Assessment is required prior to construction activities.

6.3.2 CONSULTATIONS ROUND 2 – ON THE PROPOSED LINE ROUTE AND PAPS’ NEEDS AND PREFERENCES

The second stakeholder engagement round of information was focused on community-level consultations. Its main objectives were to expose the project and the proposed line route to the affected communities, the local leaders and the potentially displaced households, and document their respective concerns, expectations and recommendations. It included a series of meetings with Traditional Authorities, direct exchanges with community leaders and open public assemblies followed by focus group discussions with women and youth representatives. A description of the activities conducted and the stakeholders reached is provided hereafter, followed by a summary of the main issues and expectations raised. The detailed minutes of meetings and the signatures of participants are presented in Appendix 8.

It is to be noted that, in addition to the activities described below, the Household Survey Questionnaire has also been used as an important element of the stakeholder engagement process. A number of open and consultative questions were indeed added to this questionnaire, which was completed with the heads of all potentially displaced households, aiming to document their concerns, preferences and expectations with regard to the project and the resettlement process. Such inputs from the heads of affected households are documented in the RPF document.

6.3.2.1 ACTIVITIES PERFORMED AND STAKEHOLDERS REACHED

Meetings with Traditional Authorities: Informative and consultative meetings were first held with the Traditional Authorities and local customary chiefs affected by the proposed line route, namely the Traditional Authority (TA) Phalula, TA Symon, TA Mlauli, TA Nthache and TA Kanduku. These meetings, which took place from April 11th to 13th, 2017, have served to inform the regional customary
Chiefs about the project, the proposed alignment and the upcoming field activities (socioeconomic surveys and public assemblies) and document their concerns, expectations and recommendations, in particular, in relation to land and resettlement issues. A meeting request letter explaining the purposes of the meeting was channelled to the TAs through the District administrations, one week ahead. During the meetings, large maps of the proposed line route were displayed to assist the discussion. The Chiefs were involved in the selection of the villages where the public assemblies would be held and their support was requested to announce these events to the concerned villages.

Numerous copies of an updated version of the project background information document, in Chichewa, were handed to the Chiefs for distribution to the concerned local leaders and public postings in the villages selected for the public assemblies. Table 6-4 indicates the date, place and participants of these meetings.

Table 6-4 List of Meetings with Traditional Authorities

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Participants(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/04/2017</td>
<td>Balaka District Office</td>
<td>Sub-TA Phalula; District Administration Director</td>
</tr>
<tr>
<td>11/04/2017</td>
<td>Phalula Community Hall</td>
<td>GVH Phalula; VH Phalula; Everson William – Aide; GVH Njiragoma; GVH Nsenjere; GVH Kunyalani; VH Mbengo; VH Chizungu; VH Nthawitsa</td>
</tr>
<tr>
<td>12/04/2017</td>
<td>TA Symon’s Palace</td>
<td>TA Symon; VH Mwingitsa; Edson Likongwe – Aide; Chair of Area Development Committee; Two members of Village Development Committee</td>
</tr>
<tr>
<td>12/04/2017</td>
<td>TA Mlauli’s palace, Chifunga</td>
<td>TA Mlauli; GVH Msalawatha; GVH Daelo; GHV Chasesa; three members of Area Development Committee</td>
</tr>
<tr>
<td>13/04/2017</td>
<td>Mwanza District Commissioner’s Offices</td>
<td>TA Nthache</td>
</tr>
<tr>
<td>13/04/2017</td>
<td>TA Kanduku’s Office</td>
<td>TA Kanduku; Elisha Ngaiyaye – Aide</td>
</tr>
</tbody>
</table>

(1) TA: Traditional Authority; Sub-TA: Sub-Traditional Authority; GVH: Group of Villages Head; VH: Village Head.
Community Engagement through the Socioeconomic Survey: Open and consultative questions were added to the survey questionnaires used to collect socioeconomic data on the affected communities and households. The Community Survey has thus created a window for direct exchanges with each community’s leaders through which answers about the Project were answered and concerns, expectations or recommendations could be voiced. This took the format of an open and semi-directed discussion, supported by large maps showing local sections of the proposed line route, followed by a field walk with community leaders to locate the alignment and identify community assets or other elements of importance to communities likely to be impacted. Copies of the project background information document, in Chichewa, were handed out to participants. The day, locality and number of participants for these activities are given in Table 6-5.

Photo 6-2 Pictures of Meetings with the TAs
<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>District</th>
<th>TA</th>
<th>Locality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11/04/2017</td>
<td>Balaka</td>
<td>Phalula</td>
<td>Phombeya</td>
</tr>
<tr>
<td>2</td>
<td>12/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Kammwamba</td>
</tr>
<tr>
<td>3</td>
<td>12/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Chikapa</td>
</tr>
<tr>
<td>4</td>
<td>12/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Laja</td>
</tr>
<tr>
<td>5</td>
<td>12/04/2017</td>
<td>Balaka</td>
<td>Phalula</td>
<td>Yonam</td>
</tr>
<tr>
<td>6</td>
<td>13/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Kandoje</td>
</tr>
<tr>
<td>7</td>
<td>13/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Salafosi</td>
</tr>
<tr>
<td>8</td>
<td>13/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Chitsotsso</td>
</tr>
<tr>
<td>9</td>
<td>14/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Mtingara</td>
</tr>
<tr>
<td>10</td>
<td>14/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Mbemba</td>
</tr>
<tr>
<td>11</td>
<td>14/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Mkoka</td>
</tr>
<tr>
<td>12</td>
<td>14/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Liyenda</td>
</tr>
<tr>
<td>13</td>
<td>14/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Ngwenyama 3/phokoso</td>
</tr>
<tr>
<td>14</td>
<td>14/04/2017</td>
<td>Neno</td>
<td>Symon</td>
<td>Joseph</td>
</tr>
<tr>
<td>15</td>
<td>15/04/2017</td>
<td>Neno</td>
<td>Mlauli</td>
<td>Kazunga</td>
</tr>
<tr>
<td>16</td>
<td>15/04/2017</td>
<td>Neno</td>
<td>Mlauli</td>
<td>Nsalawatha</td>
</tr>
<tr>
<td>17</td>
<td>15/04/2017</td>
<td>Neno</td>
<td>Mlauli</td>
<td>Jonathan</td>
</tr>
<tr>
<td>18</td>
<td>15/04/2017</td>
<td>Neno</td>
<td>Mlauli</td>
<td>Dailo</td>
</tr>
<tr>
<td>19</td>
<td>16/04/2017</td>
<td>Neno</td>
<td>Mlauli</td>
<td>Chapita</td>
</tr>
<tr>
<td>20</td>
<td>16/04/2017</td>
<td>Neno</td>
<td>Mlauli</td>
<td>Chasesa</td>
</tr>
<tr>
<td>21</td>
<td>18/04/2017</td>
<td>Mwanza</td>
<td>Kanduku</td>
<td>Laundi</td>
</tr>
<tr>
<td>22</td>
<td>18/04/2017</td>
<td>Mwanza</td>
<td>Kanduku</td>
<td>Siledi</td>
</tr>
<tr>
<td>23</td>
<td>18/04/2017</td>
<td>Mwanza</td>
<td>Kanduku</td>
<td>Moffat</td>
</tr>
<tr>
<td>24</td>
<td>19/04/2017</td>
<td>Mwanza</td>
<td>Nthache</td>
<td>Dzilima</td>
</tr>
<tr>
<td>25</td>
<td>19/04/2017</td>
<td>Mwanza</td>
<td>Kanduku</td>
<td>Mulongolora</td>
</tr>
<tr>
<td>26</td>
<td>20/04/2017</td>
<td>Mwanza</td>
<td>thache</td>
<td>Gonamwake</td>
</tr>
<tr>
<td>27</td>
<td>20/04/2017</td>
<td>Mwanza</td>
<td>Kanduku</td>
<td>Chilimbira</td>
</tr>
<tr>
<td>28</td>
<td>21/04/2017</td>
<td>Mwanza</td>
<td>Nthache</td>
<td>Kagulo</td>
</tr>
<tr>
<td>29</td>
<td>21/04/2017</td>
<td>Mwanza</td>
<td>Nthache</td>
<td>Biriri</td>
</tr>
<tr>
<td>30</td>
<td>22/04/2017</td>
<td>Mwanza</td>
<td>Nthache</td>
<td>Kasapha</td>
</tr>
<tr>
<td>31</td>
<td>22/04/2017</td>
<td>Mwanza</td>
<td>Nthache</td>
<td>Mkulira</td>
</tr>
<tr>
<td>32</td>
<td>22/04/2017</td>
<td>Mwanza</td>
<td>Nthache</td>
<td>Golowa</td>
</tr>
</tbody>
</table>

**Public assemblies:** In the territory of each one of the five affected Traditional Authorities, a public assembly was held in a locality selected with the TA. These events were conducted upon completion of the socioeconomic survey, so that everyone in the community could benefit from an accurate understanding of where the line really passes. The assemblies were open to all community members, regardless of whether or not they are directly affected by the ROW. They were previously announced through the TAs and through the public posting of a background information document, in Chichewa. The publicizing periods ranged from four days (Nthache) to twelve days (Kanduku).

During the public assemblies, the consultant and ESCOM representatives provided a full project description, explained the ESIA and RPF development processes and exposed the proposed line route using large printed maps. After the presentation and a short question and answer period, the
attendees were separated into men and women distinct groups so as to facilitate the expression of the concerns, specific to each gender group.

In some cases, youth representatives also formed a separate discussion group. Copies of the project background information document in Chichewa were handed out to participants.

The day, locality and number of participants, of the public assemblies, are given in Table 6-6, and some pictures are provided in Photo 6-3.

**Table 6-6 Date, Location and Participants to Public Assemblies**

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Participants</th>
<th>Focus group discussions held following the assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/04/2017</td>
<td>Phalula</td>
<td>43 attendees, including TA Phalula, GVH Phalula, GVH Njiragoma, GVH Nsenjere GVH Kunyalani, VH Mbengo, VH Chizungu, VH Nthawitsa, VH Phombeya</td>
<td>Men; Women</td>
</tr>
<tr>
<td>18/04/2017</td>
<td>Kagonamwake Headquarters</td>
<td>111 attendees, including TA Nthache, GVH Chimlango GVH Chiwembu, GVH Silota, GVH Gonankhonde, GVH Golowa, GVH Gowelo, GVH Kagonamwake</td>
<td>Men; Women; Youth (both genders); Elders</td>
</tr>
<tr>
<td>19/04/2017</td>
<td>Chifunga School Ground</td>
<td>69 attendees, including TA Mlauli, GVH Msalawatha, VH Chasesa, VH Dealo, VH Chapita</td>
<td>Men; Women</td>
</tr>
<tr>
<td>20/04/2017</td>
<td>Kammwamba</td>
<td>138 attendees, including TA Symon, GVH Samisoni, GVH Ngwenyama, GVH Kasamba, VH Mwingitsa</td>
<td>Men; Women; Youth (both genders); Elders</td>
</tr>
<tr>
<td>25/04/2017</td>
<td>Mulongolola Village Ground</td>
<td>39 attendees, including GVH Mulongolola, VH Mulolongolola, VH Chilimbira</td>
<td>Men; Women; Elders</td>
</tr>
</tbody>
</table>

(1) TA: Traditional Authority; Sub-TA: Sub-Traditional Authority; GVH: Group of Villages Head; VH: Village Head.
6.3.2.2 CONCERNS AND EXPECTATIONS RAISED

Overall, the inputs from community-level stakeholders, collected during consultations Round 2, indicate the Project is broadly welcome and raises important expectations for job creations and community investments, including access to electricity. Most of the concerns and recommendations expressed relate to the compensation process for the affected households, a process which is perceived by the different groups as very likely to be plagued with corruption, affecting more particularly the illiterates. The timely payment of compensation, as well as social disruptions anticipated with the presence of non-local workers, including marriage break-ups and the spread of HIV & AIDS and other STDs, are also amongst the key concerns that were the most frequently raised.

The concerns, expectations, requests and recommendations expressed by stakeholders during Consultations Round 2 are further detailed below, according to the different groups consulted, namely the Customary Authorities, Community Leaders, General Assemblies and Men, Women, Youth and Elders.

Customary Authorities (TAs, GVH and VH):

- The Project is welcome as long as it benefits the communities;
- All the chiefs have stressed the importance of creating job opportunities for the local people;
- The TAs have emphasized that compensation should be granted before the work commences, otherwise the people will be frustrated and will not co-operate;
- Avoid unfulfilled promises – based on past experiences, the chiefs have said to be suspicious of all the promises made by Projects, which are often not honored. They have said to be more and more aware and knowledgeable, and will no longer accept false promises;
- The project should ensure that the affected people are informed of the timeframe within which compensation will take place and that compensation amounts should be directly communicated to the people (as opposed to the DCs office informing them);
- Based on past experience in the region, the chiefs are doubtful about the Project’s capacity to deliver compensations in a timely manner. Delays in compensation payment should be avoided so as to reduce the potential for tension and conflicts;
- Avoid discrepancies in compensation – in past experiences, some people received more than the value of their property while others received less than the value of their parcels;
- Some of the affected households may have only one parcel for subsistence. Those need to be assisted and provided with access to new agricultural land;
- The Chiefs consider it essential to educate the PAPs on how to handle compensation money prior to delivery in order to mitigate the risk of ignorance-based abuses of all kinds;
Chiefs from TA Mlauli have recommended compensation should mainly go to women as traditionally, they are the custodians of family and land;

Compensation to PAPs should be delivered in the presence of a representative from the DC’s office;

In some instances, projects such as these encourage marriage break-ups because the contractors have a lot of money;

Contractors and people from outside of the local areas tend to bring in bad behaviour to the villages.

Group discussions with village leaders, through the Community Survey:

The Project was generally welcomed;

Local leaders expect to be consulted and involved in compensation delivery procedures;

Lost houses and structures have to be rebuilt in a timely manner, without delay;

Village-level sensitization is required at least 2 days before carrying out any kind of work in the villages;

The Project is expected to contribute to community development and access to electricity;

A graveyard was reported to be located right in the wayleave, in Liyenda village (TA Symon), which the community cannot accept to relocate;

A borehole (Gonamwake) and a church (Biriwiri) are reported to be located inside the wayleave, while some other graveyards, churches and boreholes are located just on the edge;

Chipindi primary school is planning to expand very close to the wayleave.

General Assemblies and Men discussion groups:

Job creation for local people;

Justice, equality and fairness at work;

Health and Safety matters to be observed and strongly adhered to. In previous projects, people were not provided with proper safety wear and equipment;

In previous projects, compensations were paid out in cash, in lump sums, and this was generally appreciated by the population;

The calculation of compensation should be based on the returns from the lost property, as opposed to the value of the land;

Vulnerability, in the compensation process, of the illiterate villagers who are usually short-changed, duped and generally treated unfairly. Civic education must be provided before compensation is paid out;

Compensation should be paid directly to the owner of property, to reduce potential for corruption;

Assistance should be provided to households left with just a tiny part of their plot after land takes;

Replacement houses must be constructed in a timely fashion;

A number of villagers have said that the proposed ROW is passing through flat areas of their lands where they have plans for future buildings for their children;

In Mulongolola (TA Kanduku), concerns were raised over potentially affected graveyards;

In Kammwamba (TA Symon), some participants complained that surveyors had not surveyed all the land and some affected areas were left out. It was agreed the surveyors will be asked to visit the areas again, accompanied by a village representative;
→ Concerns were raised over social disruptions likely to be associated with development work, mostly marriage break-ups and potential spread of HIV & AIDS and other STDs;

→ The Project is expected to contribute to community development through the construction of health centers, tarmac roads, schools, markets, boreholes and many other community equipment;

→ Funding and seedlings for reforestation, to compensate for vegetation losses;

→ Assemblies have generally asked for more informative and consultative meetings with affected populations and local leaders. They have also asked for feedback to their queries and concerns before the project commences.

Women discussion groups:

→ Job opportunities should also be created for women, at fair wages/salaries. Women should form part of the hiring team;

→ Other recent projects have been plagued with nepotism (chiefs favor their families) at community-levels, in particular when it comes to hiring, further, the contractors’ hiring officers tend to favour people from their region/tribe/ethnic groups;

→ Transportation should be provided to and from the work sites;

→ Food (lunch) should be provided at work;

→ When a person is injured on the job, transportation and medical treatment should be taken care of as well as compensated for;

→ If an employee dies, the project takes care of coffin and other funeral expenses;

→ Contact numbers for people responsible for salaries/wages should be made readily available to avoid tricks by the paying officers;

→ Don’t take too long to hire people as this causes anxiety;

→ Some hiring officers have been asking for sex or bribes in exchange for consideration for employment;

→ Concerns over social disruptions sometimes associated with development works, mostly marriages disruption and break-ups;

→ Compensations should be done before construction commences, otherwise no cooperation;

→ Lost vegetation and trees must be replaced (reforestation);

→ Many requests for investment in community equipment such as boreholes, a clinic with maternity wing, bridges, roads, schools, a police unit and markets.

Elders’ discussion groups:

→ Creation of job opportunities for local population;

→ Provision of a step-down transformer in the area;

→ Elders are suspicious of the compensation process as previous projects in the area have not complied with their promises. Compensation payments were delayed (up to two years after resettlement) and compensation figures came out different from what was announced;

→ Community leaders should be compensated for the assistance they bring to project implementation;

→ HIV & AIDS awareness;

→ Compensation to be paid directly to the affected people;

→ When the compensation packages are channelled through other systems, e.g. the DC’s Offices, we get cheated/shortchanged. The affected persons must know how much is due to them and not through a third party like the DC’s office;

→ Environmental conservation/reforestation;
Many requests for investment in community equipment such as health centers, paved roads, bridges, boreholes in affected villages, community halls, schools and school equipment;

The project should expect a lot of problems if communities’ requests are not taken into account.

Youth discussion groups:

- As youth (both male and female) we would like to be considered for employment;
- Corrupt hiring practices are rampant. Hiring officers ask for bribes. Please look into this matter critically;
- Adequate and fair compensations;
- Access to electricity to support local business development;
- Vocational Skills Development Centre;
- Investments in community equipment such as sport grounds, infrastructures and activities (football tournament), schools and tertiary colleges, health centers, boreholes, paved roads, bridges next to schools and markets.

### 6.3.3 CONSULTATIONS ROUND 3 – ON THE DRAFT EIA AND RPF REPORTS

This last round of stakeholder information and consultations served to expose the main findings and recommendations contained in the preliminary EIA and RPF reports in order to pre-validate these elements and obtain feedback and suggestions from stakeholders to improve them. The activities carried out, the organizations reached and the results obtained are summarized below.

#### 6.3.3.1 ACTIVITIES PERFORMED AND STAKEHOLDERS REACHED

Three public assemblies (one in each of the three affected districts) were conducted as part of Consultation Round 3, along with a technical workshop held in Blantyre with representatives from directly concerned government agencies. The assemblies were previously advertised in the local newspaper (The Daily Times of August 7th, 2017) (see Appendix 8). A summary of the ESIA report and maps were deposited for public consultation, one week prior to the assemblies, at the District Office of each one of the three districts concerned. Copies of a summary project information document were distributed to participants during the events (see Appendix 8).

The day, locality and description of participants to the public assemblies and technical workshop are given in Table 6-7, and some pictures are provided in Photo 6-4.

**Table 6-7 Date, Location and Participants to Consultative Meetings**

<table>
<thead>
<tr>
<th>DATE</th>
<th>EVENT</th>
<th>VENUE</th>
<th>PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/08/2017</td>
<td>Technical Workshop</td>
<td>MPC Conference Centre, Blantyre</td>
<td>Representatives from the following services for Southern Region: Tourism, Physical Planning, Land Valuation.</td>
</tr>
<tr>
<td>10/08/2017</td>
<td>Public Assembly – Neno District</td>
<td>TA Symon’s court, Kammwamba</td>
<td>Total number present – 51; Traditional Leaders – 9; Political leader – 1; Consultant Staff – 2; ESCOM Representative – 1; and Community Members – 38</td>
</tr>
<tr>
<td>10/08/2017</td>
<td>Public Assembly – Balaka District</td>
<td>STA Phalula’s Court, Phalula</td>
<td>Total number present – 330; Traditional Leaders -15; Political leader (Ward Councillor) – 1; Consultant Staff – 2; ESCOM Representative – 1; and Community Members – 311</td>
</tr>
<tr>
<td>11/08/2017</td>
<td>Public Assembly – Mwanza District</td>
<td>TA Nthache’s Court, Mwanza</td>
<td>Total number present – 148; Traditional Leaders – 13; Consultant Staff – 2; ESCOM Representative – 1; and Community Members - 132</td>
</tr>
</tbody>
</table>
6.3.3.2 CONCERNS AND RECOMMENDATIONS EXPRESSED BY STAKEHOLDERS

Table 6-8 below summarizes the main concerns and recommendations raised by participants following the disclosure of the draft ESIA and RPF reports. Adjustments made to final reports in response to such comments and recommendations are also indicated. Detailed minutes of the consultative meetings held as part of Consultation Round 3 can be consulted at Appendix 8.
### Table 6-8 Concerns and Recommendations on Elements of the Draft Reports

<table>
<thead>
<tr>
<th>Comments / recommendations</th>
<th>Adjustments made to final ESIA and RPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remaining concerns over the magnitude of potential tree losses induced by the clearance of the right-of-way.</td>
<td>Mitigation measures presented in section 7.3.3.1 are aimed at protecting existing vegetation and at ensuring revegetation of areas freed after construction. Furthermore, the environmental and social management plan (ESMP) identifies the need for and describes the requirements that must be developed for a revegetation plan (see section 8.1.2.2).</td>
</tr>
<tr>
<td>Farmers need to know well in advance when works will begin so that they can plan their agricultural activities accordingly.</td>
<td>Current high-level planning does not foresee any construction work before 2019. It is also mentioned in the RPF to try and wait to initiate construction until after harvesting activities are completed.</td>
</tr>
<tr>
<td>Communities and local authorities expect the Project to invest in Corporate Social Responsibility activities.</td>
<td>Section 8.2.8.2 of the RPF recommends the creation of a Community Compensation Fund equivalent to 1% of the project’s total value for the development of community and social responsibility projects.</td>
</tr>
<tr>
<td>District authorities and officers want to be reassured that they will be continuously involved throughout project development.</td>
<td>The ESMP identifies the need for and describes the requirements that must be developed for a communication plan (see section 8.1.2.5). Furthermore, the same ESMP describes the environmental and social management system (ESMS) that will have to be implemented prior to initiating construction activities (See section 8.3). The ESMS will include a stakeholder engagement plan for the construction and operation activities. Finally, the proposed institutional arrangement for the implementation of the RPF (See section 9 of the RPF) confirms that the District authorities will have a central role in the planning of resettlement and in its implementation.</td>
</tr>
<tr>
<td>Communities have generally requested that compensations should be paid through banks and that bank account opening assistance must be provided to PAPs.</td>
<td>The preference for payment of compensation through banks and for an assistance in opening a bank account was already mentioned in the RPF but only for vulnerable members of the community. A more general mention of this preference was added as an introductory note of section 7.4 (related to compensation aspects) of the RPF. The requirement for civic education and sensitization was also added in the same section.</td>
</tr>
<tr>
<td>It was recommended to enhance the civic education and sensitization efforts directed to PAPs receiving cash compensation, as many social disturbances induced by cash compensation were reported on other recent projects.</td>
<td>This specific concern was covered under section 8.2.1 of the RPF report where it is mentioned that the PAPs find their alternative parcels themselves, but liaise with the Project Implementation Unit (PIU) which will ensure that PAPs do not illegally resettle in Thambani Forest Reserve.</td>
</tr>
<tr>
<td>Forestry officers have reiterate their concern that some of the displaced households could illegally resettled within the limits of the Thambani Forest Reserve after receiving compensations for their houses.</td>
<td></td>
</tr>
</tbody>
</table>
7 IMPACT ASSESSMENT

The following sections present the impacts that can be anticipated at the pre-construction, construction and operation phases, of the transmission line project.

The identification of the direct/indirect, positive/negative, trans-regional, social/economic and physical/ecological impacts will be established by an “environmental matrix” opposing, on one hand, the potential sources of impacts tied to the transmission line’s pre-construction, construction and operation, and, on the other hand, all of the biophysical and socioeconomic components of the project. This will be based on the following information:

- **Technical characteristics of the project**: enables the identification of potential sources of impact based on the technical characteristics of the infrastructures to be built, as well as construction activities, methods and schedule. The project is described in detail in chapter 3.

- **Environmental and socio-economic baseline data**: allows the understanding of the ecological and social contexts in which the project is implemented and to identify, if applicable, issues that should be considered. The environmental components are described in chapter 5.

- **Issues and concerns raised by PAPs and other stakeholders**: allows the identification of the main issues related to the project. Public issues and concerns are discussed in chapter 6.

### 7.1 IDENTIFICATION OF POTENTIAL INTERACTIONS

#### 7.1.1 SOURCES OF IMPACT

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. The following table summarizes these sources of impacts (Table 7-1). The detailed descriptions of the sources of impacts are presented in section 3.5 of this report.

It should be noted that impacts resulting from the project’s decommissioning phase were neither identified nor assessed in the present report. Indeed, it is anticipated that the power line and associated substations will be continuously maintained and operated for several decades. This very long useable life makes it very difficult and potentially counter-productive to predict, at this stage, the circumstances under which the project’s installations might ultimately be decommissioned. However, it is recommended to conduct the full assessment of the decommissioning phase’s impacts when enough information becomes available.

#### 7.1.2 VALUABLE ENVIRONMENTAL AND SOCIAL COMPONENTS

Determining valuable environmental and social components (VESC) consists in identifying, based on available data, all elements of the physical, biological and socioeconomic environments that are likely to be affected by one or more sources of impact. The VESCs identified for the project are listed in Table 7-2. The ESIA process will focus only on these components.
<table>
<thead>
<tr>
<th>Sources of Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Construction</strong></td>
<td></td>
</tr>
<tr>
<td>Land acquisition</td>
<td>Procedures relating to agreements with landowners.</td>
</tr>
<tr>
<td>Resettlement</td>
<td>Resettlement process of the people affected by the project.</td>
</tr>
<tr>
<td>Displacement of economic activities</td>
<td>Resettlement of economic activities affected by the project.</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td></td>
</tr>
<tr>
<td>Site preparation</td>
<td>Site preparation activities, including establishment of equipment storage yards and worker camps, vegetation clearing, removal of topsoil, excavation, earthworks and construction of access roads.</td>
</tr>
<tr>
<td>Transportation and circulation</td>
<td>Road transportation of materials, equipment and workers to and from the site, including fueling and maintenance of vehicles and machinery.</td>
</tr>
<tr>
<td>Construction activities</td>
<td>Construction of the power transmission line and substations, including temporary facilities used during the work phase, such as borrow pits.</td>
</tr>
<tr>
<td>Waste and hazardous materials management</td>
<td>Management and storage of waste, hazardous substances and other materials to be removed, including hydrocarbons.</td>
</tr>
<tr>
<td>Purchase of materials, goods and services</td>
<td>Purchases required for the construction of the power transmission line and substations.</td>
</tr>
<tr>
<td>Presence of workers</td>
<td>Workers present along the ROW and substation sites.</td>
</tr>
<tr>
<td>Worksites’ restoration</td>
<td>Restoration of worksites.</td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td></td>
</tr>
<tr>
<td>Presence and operations of line, substations and access roads</td>
<td>Presence and operations of facilities.</td>
</tr>
<tr>
<td>Transportation and circulation</td>
<td>Road transportation of materials and equipment, including vehicle fueling and maintenance.</td>
</tr>
<tr>
<td>Maintenance and repairs</td>
<td>Inspection, maintenance and repairs of conductors, towers and structures in substations as well as ROW maintenance.</td>
</tr>
<tr>
<td>Waste and hazardous materials management</td>
<td>Handling operations and storage of hazardous waste used during the operation, including oil used in transformers at substations.</td>
</tr>
<tr>
<td>Purchase of materials, goods and services</td>
<td>Purchases required for the operation of the substations and the transmission line.</td>
</tr>
<tr>
<td>Presence of workers</td>
<td>Employees operating substations and during maintenance along the line.</td>
</tr>
</tbody>
</table>
### Table 7-2 Environmental and Social Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>Physico-chemical characteristics of the surface deposits, including vulnerability to erosion.</td>
</tr>
<tr>
<td>Water resources</td>
<td>Physico-chemical characteristics of the surface water, sediments and groundwater.</td>
</tr>
<tr>
<td>Air quality</td>
<td>Physico-chemical characteristics of the air.</td>
</tr>
<tr>
<td>Noise, vibrations and electromagnetic fields</td>
<td>Noise, vibrations and EMF levels.</td>
</tr>
<tr>
<td>Terrestrial flora</td>
<td>Terrestrial plant communities, including special-status species.</td>
</tr>
<tr>
<td>Terrestrial fauna</td>
<td>Terrestrial and semi-aquatic animal species and their habitats, including special-status species.</td>
</tr>
<tr>
<td>Avifauna</td>
<td>Bird species and their habitats, including special-status species.</td>
</tr>
<tr>
<td>Aquatic habitats and associated fauna</td>
<td>Riparian and aquatic plant communities and marshlands, with associated species, including special-status species.</td>
</tr>
<tr>
<td>Employment and economic development</td>
<td>Local and regional economic developments, employment.</td>
</tr>
<tr>
<td>Land use</td>
<td>Land uses: agriculture, livestock rearing, fishing, tourism, mining, forestry, urban, etc.</td>
</tr>
<tr>
<td>Built environment</td>
<td>Impacts on existing buildings present in the project area (commercial, residential, industrial, institutional, etc.).</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Electricity and telecommunication networks, public services (health, education), regional and local road network, railroads, etc.</td>
</tr>
<tr>
<td>Gender aspects</td>
<td>Women living conditions, including women’s economic opportunities and gender equity within the communities.</td>
</tr>
<tr>
<td>Communities and social cohesion</td>
<td>Traditional knowledge, social cohesion and vulnerable groups (the poor, youth, women, elderly), as well as post-conflict issues.</td>
</tr>
<tr>
<td>Cultural and archaeological heritage</td>
<td>Religious, cultural or historical sites and structures.</td>
</tr>
<tr>
<td>Landscape</td>
<td>Integrity of landscape features (landmarks, etc.).</td>
</tr>
<tr>
<td>Safety and public health</td>
<td>Population well-being and health, including HIV/AIDS issues.</td>
</tr>
<tr>
<td>Workers’ health and safety</td>
<td>Health and safety issues including labor issues and child protection.</td>
</tr>
</tbody>
</table>

#### 7.1.3 INTERACTIONS BETWEEN ENVIRONMENTAL AND SOCIAL COMPONENTS AND PROJECT ACTIVITIES

As mentioned previously, the identification of the direct/indirect, positive/negative, trans-regional, social/economic and physical/ecological impacts is established by an “impacts identification matrix”, where on one axis the project’s sources of impacts are identified, and, on another, all of the biophysical and socioeconomic components of the project. Table 7-3 presents these interactions and will be the basis for the impact evaluation.

#### 7.2 METHOD FOR IMPACT ASSESSMENT

Following the identification of the potential and significant interactions, the positive and negative impacts of each project activity, on each of the valuable environmental and social components, will be qualitatively and/or quantitatively assessed.

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2 Worker’s health and safety is not described in the socio-economic environment baseline (section 5.3). However, since there are national regulations, it has been added as a pertinent social component.
The magnitude of the impact will be determined by an overall assessment of how one or several sources of impact affect an environmental component.

This assessment takes into account the measures already applied in the project’s design phase to optimize the transmission line’s alignment and evaluate the impact’s magnitude based on three criteria (intensity, extent and duration) and on the implementation of the proposed mitigation measures. Impact magnitude is determined to be major, moderate, or minor in nature (Table 7-4).

The assessment criteria are hereafter defined while the proposed mitigation measures are listed in table 8-1 of the ESMP chapter.

7.2.1 INTENSITY

The intensity of the impacts on environmental and social receptors indicates the degree to which the assessed component is disturbed.

The analysis considers the receptor’s properties and particularly its sensitivity and its capacity to accommodate to changes, as well as its estimated value. Impact intensity is divided into three levels:

- **High**: the impact damages the concerned receptor permanently, jeopardizes significantly its integrity, or changes substantially or irreversibly its environmental distribution or role.
- **Medium**: the impact alters the receptor’s quality and its environmental distribution or role, without damaging its integrity.
- **Low**: the impact slightly alters the concerned receptor without changing substantially its quality, and environmental distribution or role.

7.2.2 EXTENT

The extent of the impact refers to the range of the modified natural and human environments. The extent is a function of the project’s footprint, area of influence or portion of the population affected by it. It could be regional, local or limited:

- **Regional**: the impact has regional effects (or an area wider than the study area) or affects the majority of the population in surrounding districts;
- **Local**: the impact affects mainly the direct area of influence or bordering population groups;
- **Limited**: the impact affects only a limited area or some individuals in the direct area of influence.

7.2.3 DURATION

The duration of the impact refers to the period of time during which the effects of the project will be felt. This parameter reflects the intermittent nature of the impact. An impact could be long-term, medium-term, or short-term:

- **Long-term**: the impact is felt continuously or intermittently throughout the project’s lifetime. The impact is often permanent or irreversible;
- **Medium-term**: the impact is felt temporarily, continuously or intermittently, during the construction phase;
- **Short term**: the impact is felt temporarily, continuously or intermittently, for a limited period of time during the project’s construction and/or decommissioning phases.

Public consultation activities will help to identify and confirm the impact assessments on given components representing issues of the affected communities.
### Table 7-3 Impact Identification Matrix

<table>
<thead>
<tr>
<th>Environmental Component</th>
<th>Physical Environment</th>
<th>Biological Environment</th>
<th>Socio-Economic Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soils</td>
<td>Water resources</td>
<td>Air quality</td>
</tr>
<tr>
<td>Pre-Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land acquisition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettlement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement of economic activities</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site preparation</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Transportation and circulation</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Construction activities</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Waste and hazardous materials management</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of materials, goods and services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of workers</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Worksites' restoration</td>
<td>N</td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence and operations of line, substations and access roads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation and circulation</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Maintenance and repairs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste and hazardous materials management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of materials, goods and services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of workers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:  N = negative impact  P = positive impact  N/P = both negative and positive impacts
### Table 7-4 Impact Magnitude Matrix

<table>
<thead>
<tr>
<th>Analysis criteria</th>
<th>Magnitude</th>
<th>Intensity</th>
<th>Extent</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regional</td>
<td></td>
<td>Long-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Medium-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local</td>
<td></td>
<td>Long-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Medium-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited</td>
<td></td>
<td>Long-term</td>
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<tr>
<td></td>
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<td></td>
<td>Medium-term</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td></td>
<td>Long-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regional</td>
<td></td>
<td>Medium-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local</td>
<td></td>
<td>Medium-term</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited</td>
<td></td>
<td>Long-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Medium-term</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td></td>
<td>Long-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regional</td>
<td></td>
<td>Medium-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local</td>
<td></td>
<td>Long-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Medium-term</td>
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<td>Short-term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited</td>
<td></td>
<td>Long-term</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Medium-term</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term</td>
</tr>
</tbody>
</table>

#### 7.2.4 Probability of Occurrence

The impact assessment also examines the probability of occurrence, i.e. the likelihood that an impact will affect a component. The probability may be:

- **High probability**: the impact will probably manifest itself;
- **Moderate probability**: the impact might occur, without any certainty;
- **Low probability**: it is unlikely that the impact occurs or it could occur only in the event of an accident.

Note that the analysis of the impact’s probability of occurrence is conducted separately from that of the importance, since they are two independent criteria that do not influence each other. Thus, this criterion is not included in the impact assessment matrix. However, the evaluation of these two criteria is presented together in the following sections.
7.3 IMPACTS ASSOCIATED WITH THE PROJECT

7.3.1 POSITIVE IMPACTS

7.3.1.1 EMPLOYMENT AND ECONOMIC DEVELOPMENT

Positive opportunities for PAPs and communities can be in the form of temporary employment and business opportunities during the construction and operation phases, including revenues from the sale of food and other consumable goods to workers from other parts of the country and abroad.

It is expected that some jobs be available during construction of the transmission line for the local population, mainly as casual workers. However, these employment opportunities are expected to be temporary and benefit the community in the short-term only. This would result in a minimal positive impact on employment, since few local people are likely to be employed. To maximize the project’s positive impacts on the creation of jobs, the following enhancement measures are recommended:

- Apply human resource policies favoring local labor;
- Implement training programs to build local capacity;
- Disclose information on newly created business opportunities.

7.3.1.2 INFRASTRUCTURE

There is currently a lack of electricity in areas crossed by the project and one of the most important anticipated benefits to the population would be increased electricity supply to communities and households. Many significant long-term positive indirect impacts could arise with the foreseen rural electrification projects. With the additional energy supply, community institutions and trading centers could improve services, increase economic activity and accelerate their development in their areas of expertise. Furthermore, the existing electricity grid is likely to become more stable with the interconnection.

The following section provides project integration avenues that could be considered in order to maximize positive impacts.

REDUCING DEFORESTATION

An additional potential co-benefit of rural electrification is the possibility to provide rural households with the opportunity to use electricity for their energy needs as an alternative to firewood and charcoal. Firewood harvesting is responsible for deforestation. The project could help reduce the deforestation rate in the project area.

AGRICULTURAL INFRASTRUCTURE

Improved availability and reliability of energy can also improve storage and processing of agricultural products, increasing their market value and/or extending their preservation periods. Storage with refrigerators can preserve dairy products, fruits and vegetables that can be sold or consumed during the following days. Grain mills can be built in the villages instead of bringing products to "mill towns", thereby reducing transportation costs and time loss. These improvements could result in higher values for agricultural products and better incomes for farmers in the long term.

POVERTY REDUCTION

Rural electrification is at the center of poverty reduction programs and could support rural economic development through the provision of energy to power water pumps and grain mills, as well as favour the development of tourism, local industries, etc.
WELL-BEING OF WOMEN

Local electrification has the potential to significantly reduce women’s workloads through the usage of water pumps and electricity, thus eliminating the arduous and time consuming daily responsibilities of collecting water and firewood. This improvement could also have a significant indirect positive impact on the environment, through reduction of deforestation and of soil erosion.

EDUCATION AND HEALTH

Electrification could support investments in education and strengthen capacity building efforts to overcome critical constraints in the implementation of development programs. Power supply to health facilities, cold storage for transport and storage of vaccines and other essential medicines could be significant improvements to health services in the project area.

SECURITY

The assessment of the current situation related to Un Exploded Ordinance (UXO) in the border areas of both countries crossed by the project will increase the security of the area. As needed all UXO present in the area will be removed as per the current safety protocol and procedure and disposed of in a secure way. (See 8.1.2 for measures).

7.3.2 NEGATIVE IMPACTS TO THE PHYSICAL ENVIRONMENT

There are no impacts on any physical components during the pre-construction phase as the associated impact sources essentially affect socioeconomic components.

7.3.2.1 SOILS

DESIGN MEASURES

At the design stage, the nature of the soils in the general study area was verified so as to ensure towers will be installed on stable ground. At an advanced stage, the geotechnical study will assess the soil conditions at the location of the towers. Adjustments will be made in either location or design if conditions are deemed unstable.

CONSTRUCTION PHASE

POTENTIAL IMPACTS

→ Soil erosion in erosion-prone areas;
→ Soil compaction in work areas;
→ Loss of organic layer in areas where excavation and backfilling activities are held;
→ Changes in soil chemical properties and risk of soil contamination.

SOURCES OF IMPACT

→ Site preparation;
→ Construction activities;
→ Waste and hazardous materials management;
→ Transportation and circulation.
**MITIGATION MEASURES**

- Contractor to develop and implement a construction worksite ESMP which will translate chapter 8’s requirements into detailed actions to be carried out during construction works, including implementation of mitigation measures and environmental & social monitoring. Worksite ESMP to cover all elements under the contractor’s control (i.e. construction works), and consider detailed specifications of activities to be conducted during construction and specific locations where they will be conducted.
- Implement the Waste Management Plan (see Chapter 8 – Environmental and Social Management Plan);
- Develop and implement an Emergency Measures Plan (to be prepared by the contractor as stipulated in Chapter 8);
- Restrict transportation to the identified access by clearly marking out the limit of the ROW and access roads;
- Restrict construction activities, materials and manpower movements to existing roads/tracks and ROW limits;
- Operate machinery on land in a way that minimizes disturbance to the banks of watercourses and marshlands;
- Prepare and implement erosion and sediment control plans, particularly in areas identified as having high erosion potential such as near Thambani Forest Reserve;
- Avoid construction activities in areas where soils are highly saturated;
- Construct a designated, signposted, concrete wash down bay that is fully contained for all excess concrete and concrete wash down (e.g. plastic lined);
- Regularly maintain the concrete washout bay, by treating any water prior to release to natural systems;
- De-compact soils following construction with appropriate equipment;
- Segregate the organic layer of soils and store separately from the non-organic layers. Re-use the organic soils for revegetation work or offer them to local farmers to improve their agricultural lots;
- Revegetate areas of bare and disturbed soils as soon as possible.

**DETAILED IMPACT DESCRIPTION**

Even prior to the construction phase, one of the Contractor’s main obligations will be to translate the ESMP into a detailed Worksite ESMP. This Worksite ESMP will consider detailed specifications of construction activities (such as Workers’ Camp/ Equipment Yard/Workshop, Borrow pits, presence of workers, etc.) and indicate how and when the ESMP’s mitigation measures and monitoring requirements will be implemented.

The Worksite ESMP is not limited to impacts on soils and will cover all environmental and social components analyzed herewith. This obligation will ensure that environmental and social impact mitigations will be fully adapted to detailed construction activities and equipment specifications which are currently unknown.

During the construction phase, the construction of access roads as well as the vegetation removal and excavation required to install the foundations for the towers are the main activities likely to affect soil structure and quality. Foundations will be dug up to variable depths depending on the tower type and soil characteristics. At the tower sites, all vegetation within the footprint of the tower base, and for a distance to be determined beyond the base, will be cleared to ground level in all directions.

Excavation and removal of vegetation, especially on steep slopes, will render soils unstable and more vulnerable to erosion. The line’s ROW is mostly composed of two types of soils, that is, chromic luvisols from the border to Mwanza and eutric cambisols, from Mwanza to the Phombeya substation. The chromic luvisols are red to yellow clayey soils with a low to medium erosion risk. The eutric...
cambisols are known as lithosols. Lithosols include regosol soils which are sandy soils, of low fertility and susceptible to erosion. As a vegetation cover stabilises the soils and ensures resistance to erosion, the removal of vegetation will be restricted to a minimum.

The construction of access roads and vehicle movement along the project area can lead to soil compaction in those areas where soils are clayey or highly saturated.

In the project area, the following soil types are likely to be vulnerable to soil compaction: mineral hydromorphic soils and vertisols. These soils however, cover only 1.9% and 2.6% of the extended study area, respectively. Application of the mitigation measures outlined above, such as the de-compaction of soils following construction, as well as the postponing of construction activities during times when soils are saturated, will help reduce adverse effects resulting from soil compaction.

Excavation and backfilling work associated with the construction of the towers and access roads, could result in the loss of the organic layer of the soils through mixing with other layers. The agricultural potential in the study area is generally recognized as being poor, so any existing layer of organic soil should be preserved. By initially removing the first inches of soil (exact depth to be determined on-site) and storing those separately from the rest of the excavated soils, will allow for their reuse.

In addition, soil contamination may also result from unsound waste management practices. Hazardous waste can be easily ignited, corrosive, reactive, or toxic. They can also have other physical, chemical, or biological characteristics that pose a potential risk to human health or the environment, if improperly managed. Contractors and sub-contractors will be required to develop and implement waste management plans that comply with relevant WB/IFC waste management guidelines to ensure that various types of waste produced during the construction phase (sanitary, non-hazardous and hazardous) are adequately recovered, stored and disposed of.

Finally, soils can be contaminated during the construction phase by soil mixing during the excavation of foundation pits or by accidental oil/fuel spills from heavy machinery either at storage yards or work sites. With respect to soil mixing, excavated soils will be segregated and stockpiled in authorized sites during the construction phase, in order to prevent soil mixing. In the case of accidental spills from heavy machinery, the extent of soil contamination will depend on the magnitude of these accidental events. However, the establishment of equipment storage yards and maintenance areas on adapted surfaces and the implementation of the Emergency Response Plan will help manage accidental spills correctly.

**IMPACT ASSESSMENT**

The intensity of the impact is low since the potential for soil erosion in the study area is low and the application of general mitigation measures will reduce erosion or compaction soil vulnerability, loss of organic layers as well as possible soil contamination from soil mixing or accidental spills. The extent of the impact is local since soil erosion, compaction, organic layer losses or contamination are likely to occur in a well-defined area within the ROW. The duration of the impact is medium since soil erosion, compaction, organic layer losses and contamination could occur throughout the entire construction phase. The impact on soils during the construction phase is thus considered of minor importance. The probability of occurrence is low after the application of mitigation measures.

<table>
<thead>
<tr>
<th>Impact on soils during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Medium</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: Low</td>
</tr>
</tbody>
</table>
OPERATION PHASE

POTENTIAL IMPACTS

→ Changes in soil chemical properties and risk of soil contamination.

SOURCES OF IMPACT

→ Presence and operations of lines, substations and access roads;
→ Maintenance and repair.

MITIGATION MEASURES

→ Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease;
→ Regularly inspect all equipment at the substations that may contain contaminants, such as transformers;
→ Implement ESCOM’s Emergency Measures Plan.

DETAILED IMPACT DESCRIPTION

During the operation phase, oil spills could result from equipment breakdowns at the substation sites and lead to soil contamination in proportion with the magnitude of these accidental events. As during the construction phase, the risk of soil contamination from accidental oil spills from maintenance vehicles and machinery, cannot be completely discarded. However, the application of general mitigation measures will help reduce this risk, significantly.

IMPACT ASSESSMENT

The intensity of the impact is low, since immediate response to accidental spills and decontamination would be possible. The extent of the impact is local since any spill or inappropriate management is likely to occur in a well-defined area within the ROW and substation site. Moreover, the duration of the impact is short, given that any accidental spill will be contained and cleaned-up immediately. The impact on soils during the operation phase is thus considered of minor importance. The probability of occurrence is low after the application of mitigation measures.

<table>
<thead>
<tr>
<th>Impact on soils during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: Low</td>
</tr>
</tbody>
</table>

7.3.2.2 WATER RESOURCES

DESIGN MEASURES

As a general measure, existing access roads, including those recently opened for the construction of the Nacala railway corridor, will be used whenever possible to minimize the need for new ones. This will help reduce the number of waterbody crossings. Additionally, the watercourses will be perpendicular to the line, therefore reducing the length of said crossing. When possible, the crossings will be located in the narrowest sections of waterbodies. The positioning of the towers will be located outside of waterbodies and floodplains, whenever possible.
CONSTRUCTION PHASE

POTENTIAL IMPACTS

→ Changes in hydrology.
→ Modifications of surface water quality with a risk of contamination.
→ Modifications of groundwater quality with a risk of contamination.

SOURCES OF IMPACT

→ Site preparation.
→ Construction activities.
→ Waste and hazardous materials management.
→ Transportation and circulation.

MITIGATION MEASURES

The following specific mitigation measures should also be applied:

→ Implement the Waste Management Plan (see Chapter 8 – Environmental and Social Management Plan);
→ Develop and implement an Emergency Measures Plan (to be prepared by the contractor as stipulated in Chapter 8);
→ Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalysts and clean (power washed), free of leaks, excess oil and grease;
→ Operate machinery on land in a way that minimizes disturbance to the banks of watercourses and marshlands;
→ Prepare and implement erosion and sediment control plans, particularly in areas identified as having high erosion potential such as near Thambani Forest Reserve;
→ Construct a designated, signposted, concrete wash down bay that is fully contained for all excess concrete and concrete wash down (e.g. plastic lined);
→ Regularly maintain the concrete washout bay, by treating any water prior to release to natural systems;
→ Always maintain hydrologic connectivity upstream/downstream in work areas. When stream crossings are unavoidable, construct suitable culvert that allows for a sufficient water supply to maintain a viable fish habitat;
→ Avoid material piling, equipment and vehicle movements in rivers, floodplains and marshland areas. If unavoidable, reduce access to a minimum;
→ Properly delineate marshlands and floodplain areas, while working within marshlands, restrict all equipment movements to access roads;
→ Limit activities in watercourses or marshlands to the extent possible but if necessary, set and implement strict procedures for in-water work, if required;
→ Conduct activities during the dry season to minimize disturbance of sensitive shoreline and marshland areas;
→ Install silt barriers (e.g., fencing) when working in steep riparian areas and along marshlands to minimize potential sediment transport to aquatic habitats.

DETAILED IMPACT DESCRIPTION

The proposed transmission line route crosses watercourses, including the Mwanza and the Lisungwi Rivers.
Sources of impact to watercourses are the removal of vegetation, the construction of access roads, vehicle movement along the ROW, construction sites and excavation required for tower installations.

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

Construction of access roads as well as vehicle movements along the construction sites can result into changes in hydrology by modifying the water flow dynamics, causing a reduction in the water flow velocity. This impact will be minimized by prohibiting permanent access roads in marshland areas, minimizing construction of access roads in such areas to what is strictly essential to the project’s construction and decommissioning of all construction access roads in marshland areas as soon as they have fulfilled their purpose.

Moreover, the excavation of pits for the towers’ foundations could cause groundwater contamination. Any groundwater encountered during the excavation works can potentially be contaminated by spills or leaks of contaminants modifying the quality of water pumped at nearby boreholes. Thus, any groundwater encountered during excavation should be pumped out of the pits.

In addition, the development and implementation of both a waste management and an emergency response plan, by the contractor and sub-contractors, will mitigate the risks occurring from unsound waste management practices and potential spills that could result in both surface water and groundwater contaminations.

**IMPACT ASSESSMENT**

The intensity of the impact is low since all impacts can be efficiently mitigated or eliminated through efficient application of proposed mitigation measures. The extent is limited since any modification or disruption will be experienced in a specific area and will be controlled with the application of specific management measures. The duration is medium since contamination of water resources will be addressed immediately with the Emergency Response Plan and changes in hydrology will be mitigated. The impact on water resources during the construction phase is thus considered of minor importance. The probability of occurrence is low after the application of mitigation measures.

| Impact on water resources during the construction phase |
|---------------------------------|----------------|
| Intensity: Low                  | Importance: Minor |
| Extent: Limited                 |                   |
| Duration: Medium                |                   |
| Probability of occurrence: Low |

**OPERATION PHASE**

**POTENTIAL IMPACTS**

→ Modifications of surface water quality with a risk of contamination.

**MODIFICATIONS OF GROUNDWATER QUALITY WITH A RISK OF CONTAMINATION**

**SOURCES OF IMPACT**

→ Waste and hazardous materials management.

→ Maintenance and repair.

→ Transportation and circulation.
MITIGATION MEASURES

→ Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease.
→ Implement ESCOM’s Emergency Measures Plan.
→ Regularly inspect all equipment at the substations that may contain contaminants, such as transformers.

DETAILED IMPACT DESCRIPTION

During the operation phase, oil spills could result from equipment breakdown at the substation sites and lead to ground and surface water contamination in proportion with the magnitude of these accidental events.

Additionally, the movement of machinery required for maintenance work near marshland areas could be the cause for water quality alterations through leaks of contaminants. These impacts will be mitigated by applying proposed mitigation measures and favoring manual maintenance in their vicinity.

IMPACT ASSESSMENT

The intensity of the impact is low, since immediate response to accidental spills would be possible and circulation in existing marshlands can be avoided. The extent of the impact is limited since any spill or inappropriate management is likely to occur in a well-defined area within the ROW and substation sites. Moreover, the duration of the impact is short, given that any accidental spill will be contained and cleaned-up immediately. The impact on water resources during the operation phase is thus considered of minor importance. The probability of occurrence is low after the application of mitigation measures.

<table>
<thead>
<tr>
<th>Impact on water resources during the operation phase</th>
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</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
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<tr>
<td>Extent: Limited</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: Low</td>
</tr>
</tbody>
</table>

7.3.2.3   AIR QUALITY

DESIGN MEASURES

No specific design measures were implemented for this component.

CONSTRUCTION PHASE

POTENTIAL IMPACTS

→ Temporary air quality deterioration and generation of greenhouse gases.

SOURCES OF IMPACT

→ Site preparation.
→ Construction activities.
→ Transportation and circulation.
→ Worksite restoration.
MITIGATION MEASURES

Moreover, the following specific measures should be put in place:

- Implement the Waste Management Plan (see Chapter 8 – Environmental and Social Management Plan), namely prohibiting the burning of waste along the ROW and other work areas;
- Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalysts and clean (power washed), free of leaks, excess oil and grease;
- Prohibit idling of vehicles on site. Generators and machinery will be shut down when not in use;
- Stockpiles of fine materials will be covered during periods of high winds;
- Cover excavated materials and loads of brittle material during transport with erosion control blankets to avoid dust generation;
- Use water for dust suppression on stockpiles, exposed soils and roads if dust generation is visible;
- Revegetate areas with exposed and disturbed soils with native species as soon as possible;
- Undertake a selective cutting of the vegetation in order to keep low scrubby and herbaceous species that do not represent a risk for the powerline;
- Prohibit the burning of wastes;
- Restrict speed on loose surface roads to 20 km/h during dry or dusty conditions and install signposts and road humps where relevant.

DETAILED IMPACT DESCRIPTION

During the construction phase, several construction activities will be conducted at separate locations around the work sites (e.g.: excavations, off-road equipment operation, traffic along the ROW and on unpaved roads, etc.). These activities will generate dust and exhaust emissions, which will lead to temporary air quality deterioration and disturbances to neighboring populations.

Considering that work will be carried out in close proximity to two of the National Roads (M1 and M6), that during the dry season large amounts of air pollutants are generated by dust generation and fires and that typical agricultural practices and wood coal production activities also affect local air quality, the project’s contribution should be negligible to low, as it will consist of local activities of short duration.

IMPACT ASSESSMENT

The intensity of the impact is low since the application of mitigation measures will significantly help reduce dust and exhaust emissions. The extent is local since dust and exhaust emissions are likely to be generated along the local road network and within the ROW and construction sites. The duration of the impact is short since air quality deterioration will occur sporadically throughout the construction phase.

The impact on air quality during the construction phase is thus considered of minor importance. The probability of occurrence is high since dust and exhaust emissions are commonly associated to construction activities.

<table>
<thead>
<tr>
<th>Impact on air quality during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>
OPERATION PHASE

POTENTIAL IMPACTS

→ Temporary air quality deterioration.

SOURCES OF IMPACT

→ Maintenance and repairs.
→ Transportation and circulation.

MITIGATION MEASURES

→ Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease.
→ Prohibit idling of vehicles on site. Generators and machinery will be shut down when not in use.
→ Restrict speed on loose surface roads to 20 km/h during dry or dusty conditions and install signposts and road humps where relevant.
→ Use water for dust suppression on stockpiles, exposed soils and roads if dust generation is visible.

DETAILED IMPACT DESCRIPTION

During the operation phase, occasional maintenance activities will be conducted along the line such as ROW or access road maintenance. These activities will generate dust and exhaust emissions, which will lead to temporary air quality deterioration and disturbances to neighboring populations.

IMPACT ASSESSMENT

The intensity of the impact is low since the application of mitigation measures will help reduce dust and exhaust emissions. The extent is local since dust and exhaust emissions are likely to be generated along the local road network and within the ROW. The duration of the impact is short since air quality deterioration will occur sporadically during the operation phase. The impact on air quality during the construction phase is thus considered of minor importance. The probability of occurrence is high since dust and exhaust emissions are commonly associated with maintenance activities.

<table>
<thead>
<tr>
<th>Impact on air quality during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
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<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

7.3.2.4 NOISE AND VIBRATIONS

DESIGN MEASURES

No specific design measures were implemented for this component.

CONSTRUCTION PHASE

POTENTIAL IMPACTS

→ Increase in noise and vibration levels.
SOURCES OF IMPACT

- Site preparation.
- Construction activities.
- Transportation and circulation.
- Worksite restoration.

MITIGATION MEASURES

- Locate access roads and lay down areas away from residences to the extent possible.
- Implement a worker training program on noise reductions near sensitive receptors (see Appendix 5).
- Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease.
- Prohibit idling of vehicles on site or near sensitive receptors. Generators and machinery will be shut down when not in use.
- Respect noise limits in residential, institutional and educational areas to 55 dB(A) during the day (7:00 to 22:00) and 45 dB(A) at night (22:00 to 7:00).
- Restrict speed on loose surface roads to 20 km/h during dry or dusty conditions and install signposts and road humps where relevant.
- If blasting is required for a tower’s installation, the local population will be advised in advance to prevent nuisances.

DETAILED IMPACT DESCRIPTION

Noise and vibrations will occur during site preparation activities, tower installation and construction of access roads. In some locations, work will be done in close proximity to residences, farms or businesses located along the ROW or near substations. Traffic, as well as the use of construction equipment and machinery, will lead to temporary noise that may disturb the neighbouring communities and the local fauna.

Noise and nuisance levels resulting from the construction work will be limited in time and will be significantly reduced with the implementation of the mitigation measures outlined above.

These measures include maintaining machinery and equipment in good running condition and restricting noise-generating activities to daytime hours. Additionally, noise from construction activities will contribute to the workers’ health and safety by keeping large, dangerous animals away during construction activities.

IMPACT ASSESSMENT

The application of the proposed mitigation measures will help keep a low intensity for the impact. The extent of the impact is local since noise and vibration levels will most likely increase in the work sites and the immediately surrounding areas. The duration of the impact is considered short since it will occur sporadically during the construction phase.

The impact of noise and vibrations during the construction phase is thus considered of minor importance. The probability of occurrence is high because noise and vibrations are part of construction activities.

<table>
<thead>
<tr>
<th>Impact of noise and vibrations during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>
OPERATION PHASE

POTENTIAL IMPACTS
Increase in noise and vibration levels.

SOURCES OF IMPACT
- Maintenance and repairs.
- Transportation and circulation.

MITIGATION MEASURES
- Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease.
- Prohibit idling of vehicles on site or near sensitive receptors. Generators and machinery will be shut down when not in use.
- Restrict speed on loose surface roads to 20 km/h during dry or dusty conditions and install signposts and road humps where relevant.
- Implement an operator training program on noise reduction near sensitive receptors (see Appendix 5).

DETAILED IMPACT DESCRIPTION
The activities associated with the ROW and access road maintenance are likely to cause grievances. This nuisance will be limited in time and will be significantly reduced with the implementation of the mitigation measures outlined above.

IMPACT ASSESSMENT
The intensity of the impact is low, since the application of the mitigation measures will significantly reduce noise and vibrations levels. The extent of the impact is local as noise and vibrations will be generated all along the transmission line during maintenance work. The duration of the impact is short since work is expected to be occasional along the transmission line.

The impact during the operation phase is thus considered of minor importance. The probability of occurrence is high since maintenance work will be needed to ensure the transmission line’s operation.

<table>
<thead>
<tr>
<th>Impact of noise and vibrations during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensity:</strong> Low</td>
</tr>
<tr>
<td><strong>Extent:</strong> Local</td>
</tr>
<tr>
<td><strong>Duration:</strong> Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

7.3.3 NEGATIVE IMPACTS TO THE BIOLOGICAL ENVIRONMENT
There are no impacts on any biological components during the pre-construction phase.
7.3.3.1 TERRESTRIAL FLORA

DESIGN MEASURES

At the scoping phase, the line’s corridor was relocated so as to avoid ecological sensitive areas such as the Nankudwe estate and the Thambani Forest Reserve. Thus, no protected areas are crossed by the line.

CONSTRUCTION PHASE

POTENTIAL IMPACTS

➔ Permanent loss of natural habitat area and of its associated flora.
➔ Modification of species composition in flora communities present in the project area.
➔ Potential impacts on vulnerable species communities, such as *Pterocarpus angolensis*, *Dalbergia melanoxylon* and *Afzelia quanzensis*.
➔ Loss of ecosystem services.
➔ Increased pressure on natural resources in some areas. Loss of individuals from species of use-value.
➔ Potential invasive species introduction and risk of spread.

SOURCES OF IMPACT

➔ Site preparation.
➔ Transportation and circulation.
➔ Presence of workers.

MITIGATION MEASURES

The following specific mitigation measures should be applied:

➔ Restrict construction activities, materials and manpower movements to existing roads/tracks and ROW limits.
➔ Minimize the construction of new access roads. Promote the use of existing access roads for machinery and vehicle movements, increasing their width as necessary.
➔ Clearly mark the extent of the ROW with stakes at intervals of 50 m or less. Identify and mark the vegetation to be preserved along sections of the ROW.
➔ Undertake a selective cutting of the vegetation in order to keep low scrubby and herbaceous species that do not represent a risk for the powerline; Conserve all the vegetation (trees, shrubs, herbaceous plants, crops) present at the edge of watercourses and on steep slopes.
➔ Establish a Revegetation Plan for the loss of natural habitats. Promote the use of native species and include the plantation of *Pterocarpus angolensis*, *Dalbergia melanoxylon* and *Afzelia quanzensis* and any other species of conservation concern that could be found inside the project footprint. Collaborate with communities to identify native species with higher use-value and integrate them also to Revegetation Plan.
➔ Make chopped woody resources and residues available to local population in order to reduce additional pressures on natural resources; Undertake ROW vegetation cutting with the supervision of a botanist in order to identify and relocate, if possible, species of conservation concern as well as protect vegetation that does not represent a risk for the powerline. Any species of conservation concern that needs to be cut will be located and its habitat will be fully described. This information will be integrated in the planning of a reforestation program. If possible, collect seeds from species of conservation concern; If possible, collect seeds from *Pterocarpus angolensis*, *Dalbergia melanoxylon* and *Afzelia quanzensis* mature specimens; Inspect and clean
construction equipment properly after working in areas known to be infested with flora invasive alien species.

→ Rehabilitate and revegetate temporary access roads and work areas as soon as possible using vegetation species that will be useful to local fauna.

→ Revegetate areas of bare and disturbed soils as soon as possible with native species.

→ Promote the selection of areas with less of a need for tree cutting for temporary work and storage areas.

**DETAILED IMPACT DESCRIPTION**

During the construction phase, local vegetation will be cut for the construction of access roads, under the ROW. Vegetation clearing will lead to a permanent loss of terrestrial habitats. However, a portion of these habitats, particularly between the border and the Mwanza River and between the crossing point with the M6 Road and the Phombeya Substation’s site, are already used for agriculture, reducing the loss and fragmentation of natural habitats. Moreover, the proposed line route mainly follows existing linear infrastructures, reducing the additional habitat fragmentation and loss.

The surface area loss for each vegetation types as well as their respective proportion inside the right of way are provided in the following table. The table also provides an estimated number of affected trees based on the tree density identified during baseline characterization. A total of 317,820 trees may be affected by vegetation clearing inside the right of way.

**Table 7-5 Vegetation types inside the right of way**

<table>
<thead>
<tr>
<th>Vegetation type</th>
<th>Surface area (ha)</th>
<th>Proportion (%)</th>
<th>Tree density/ha</th>
<th>Estimated number of affected trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Area</td>
<td>100.21</td>
<td>24%</td>
<td>48</td>
<td>4,810</td>
</tr>
<tr>
<td>Built Area</td>
<td>12.99</td>
<td>3%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dry Deciduous Brachystegia/Savannah Woodland</td>
<td>24.99</td>
<td>6%</td>
<td>1,190</td>
<td>29,738</td>
</tr>
<tr>
<td>Open Canopy Savannah Woodland of hills and scarps</td>
<td>41.61</td>
<td>10%</td>
<td>912</td>
<td>37,948</td>
</tr>
<tr>
<td>Open Semi-deciduous Savannah Woodland of Plateaux</td>
<td>229.21</td>
<td>54%</td>
<td>1,027</td>
<td>235,399</td>
</tr>
<tr>
<td>Riverine Vegetation</td>
<td>8.34</td>
<td>2%</td>
<td>1,190</td>
<td>9,925</td>
</tr>
<tr>
<td>Water</td>
<td>3.04</td>
<td>1%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>420.39</strong></td>
<td><strong>100%</strong></td>
<td><strong>1,190</strong></td>
<td><strong>317,820</strong></td>
</tr>
</tbody>
</table>

As a botanist will be part of the site preparation team, specimens of species of conservation concern will be collected, when possible. However, if the cut is necessary, GPS coordinates of each specimen and the description of their habitat will be noted. Each loss of specimens will need to be compensated and the success of their plantation will be followed. The application of the Revegetation Plan will ensure no net losses.

Vegetation clearing will also lead to destruction of species of value contributing to local ecosystem services. While many species are used as fuel wood, some specific species contribute to fodder, medicines, wild food products or construction and craft material. In order to allow communities to maintain the access to the ecosystem services contributing to their livelihood, the Revegetation Plan should be developed in partnership with communities to identify the species with higher use-value. The identification of these species should be made locally as the species may vary from place to place.

Extended vegetation clearings for the ROW, access roads and work areas could result in an increased likelihood of invasive alien species’ (IAS) establishment along the power line route, as these species often thrive in disturbed environments, especially inside marshland habitats. Habitats
providing food and cover for local wildlife may be altered or lost if these IAS out-compete existing native plants, resulting in a loss of plant and animal diversity.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures limits the intensity of the impact to medium. The extent of the impact on terrestrial flora is local since almost all vegetation inside the ROW will be eliminated during the construction phase. The duration of the impact is considered long as the vegetation will need to be cut and maintained at a given height. The impact on terrestrial flora is thus considered of medium importance. The probability of occurrence is high since, when the project is approved the construction work will happen.

<table>
<thead>
<tr>
<th>Impact on terrestrial flora during the construction phase</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Medium</td>
<td>Importance: <strong>Moderate</strong></td>
</tr>
<tr>
<td>Extent: Local</td>
<td></td>
</tr>
<tr>
<td>Duration: Long</td>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

**OPERATION PHASE**

**POTENTIAL IMPACTS**

- Impairment of natural habitats and associated flora communities.
- Increased pressure on natural resources in some areas.
- Potential introduction of invasive alien species (IAS).

**SOURCES OF IMPACT**

- Maintenance and repairs.
- Presence and operations of line, substations and access roads.
- Transportation and circulation.

**MITIGATION MEASURES**

- Maintain all work inside the access road and ROW footprints to reduce encroachment on natural habitats.
- Clearly mark the extent of vegetation control in the ROW. Identify and mark the vegetation to be preserved along sections of the ROW.
- Undertake selective control of the vegetation in order to keep low (<5m) scrubby and herbaceous species that do not represent a risk for the powerline (species that cannot grow more than 4m in height).
- Use mechanical method for vegetation control inside the ROW. Forbid use of chemical pesticides to control vegetation in the ROW.
- Dispose of organic material removed from the ROW properly and in collaboration with local communities; Undertake ROW vegetation cutting with the supervision of a botanist in order to identify and relocate, if possible, species of conservation concern as well as protect vegetation that does not represent a risk for the powerline. Any species of conservation concern that need to be cut will be located and its habitat will be fully described.
- Implement an IAS monitoring program following project construction and site revegetation in sensitive areas, forests reserves, and forest stands. Consider conduction along with ROW management.
DETAILED IMPACT DESCRIPTION

During the operation phase, the ROW’s 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 5 m 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 the rarity of specialized species. The presence of access roads in previously inaccessible areas could lead to an increase in natural resource exploitation and a reduction of species communities with a higher use value.

Moreover, periodic ROW maintenance activities can also lead to IAS proliferation, especially if these activities include moving and clearing of vegetation. Once introduced, IAS will likely spread and impact adjacent areas with habitats that correspond to their ecological requirements.

Concerns were expressed by regional and district forest officers during consultations on potential impacts of the transmission line and access road on illegal logging and charcoal production in the Thambani forest reserve. After analysis, this potential impact is deemed to be negligible since the wayleave will not provide additional access to the forest reserve. Indeed, efforts were made at scoping stage to avoid the Thambani forest reserve and, although it follows it to the North, it never enters the said reserve. The project impact will therefore be negligible compared to the existing road that provides easy access to its entire Northwest section and even includes two bridges and other stream crossings.

IMPACT ASSESSMENT

The application of the proposed mitigation measures, limits the intensity of the impact to low since the vegetation will need to cut above at a certain height to ensure the line’s proper operation. The extent of the impact on terrestrial flora is local, as maintenance work will be needed all along the ROW. The duration of the impact is considered long as the impact will be effective during all the operation phase because of the continuous need for ROW maintenance. The impact on terrestrial flora is thus considered of moderate importance. The probability of occurrence is medium as the maintenance work will just be undertaken in the case there is regeneration of ligneous vegetation inside the ROW.

<table>
<thead>
<tr>
<th>Impact on terrestrial flora during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
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<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Long</td>
</tr>
<tr>
<td>Importance: Moderate</td>
</tr>
<tr>
<td>Probability of occurrence: Medium</td>
</tr>
</tbody>
</table>

7.3.3.2 TERRESTRIAL FAUNA AND ASSOCIATED HABITATS

DESIGN MEASURES

At the scoping phase, the line’s corridor was relocated so as to avoid ecological sensitive areas such as the Nankudwe estate and the Thambani Forest Reserve. Thus, no protected areas are crossed by the line.

CONSTRUCTION PHASE

POSSIBLE IMPACTS

- Terrestrial habitat fragmentation and degradation over small areas at the project site.
- Modification in habitat composition through introduction of flora invasive alien species.
- Modification of species composition in fauna communities present in the project area.
- Local reduction of fauna density for species of higher use value.
SOURCES OF IMPACT

→ Site preparation.
→ Transportation and circulation.
→ Construction activities.
→ Presence of workers.

MITIGATION MEASURES

→ Restrict construction activities, materials and manpower movements to existing roads/tracks and ROW limits.
→ Establish a Revegetation Plan for the loss of natural habitats. Promote the use of native species and include the plantation of *Pterocarpus angolensis*, *Dalbergia melanoxylon* and *Afzelia quanzensis* and any other species of conservation concern that could be found inside the project area.
→ Clearly mark the extent of the ROW with stakes at intervals of 50 m or less. Identify and mark the vegetation to be preserved along sections of the ROW.
→ Undertake ROW vegetation cutting with the supervision of a botanist in order to identify and relocate, if possible, species of conservation concern as well as protect vegetation that does not represent a risk for the powerline. Any species of conservation concern that need to be cut will be located and its habitat will be fully described. This information will be integrated in the planning of reforestation program. If possible, collect seeds from species of conservation concern.
→ Undertake a selective cutting of the vegetation in order to keep low scrubby and herbaceous species that do not represent a risk for the powerline.
→ Conserve all the vegetation (trees, shrubs, herbaceous plants, crops) present at the edge of watercourses and on steep slopes.
→ Inspect and clean construction equipment properly after working in areas known to be infested with flora invasive alien species.
→ Burn residues of flora invasive alien species to reduce the risk of propagation to other areas.
→ Rehabilitate and revegetate temporary access roads and work areas as soon as possible using vegetation species that will be useful to local fauna.
→ Promote the selection of areas with less of a need for tree cutting for temporary work and storage areas.
→ Implement a biodiversity protection awareness program with workers. Prohibit workers from owning firearms and other hunting gear, and raise awareness about the prohibition to engage in any kind of poaching.
→ Inform the Contractor’s Environmental & Social specialist when endangered fauna species are observed in or close to project sites.

DETAILED IMPACT DESCRIPTION

Heavy duty machinery movements and increase in traffic during construction could lead to mortality of small mammals, reptiles and amphibians.

During the construction phase, site preparation for access roads and the power line construction will lead to a loss of habitats for some terrestrial fauna species. Removal of vegetation all along the powerline can also increase habitat fragmentation in the study area. A portion of the project area has already been converted to agriculture and settlements and can be considered as already disturbed by human activities, that is when the alignment crosses the area between the border and Road D311 in the Mwanza area and the area between the M6 Road and the Phombeya Substation’s location. The mitigation measures proposed will contribute to minimize habitat losses. Construction activities could favor the spread of invasive alien species which can reduce the suitability of the habitats for some...
native fauna species. Proper cleaning of equipment and monitoring will be implemented to reduce the risks of spreading.

Construction activities can also cause increased noise which may disturb species present in the area. These impacts are temporary and terrestrial fauna species are likely to migrate to similar but quieter habitats in the vicinity of construction areas. Waste generation has the potential to cause a local increase of pest fauna if waste is not managed properly.

In addition, an awareness program should be implemented for biodiversity protection with workers including a prohibition to own firearms and other hunting equipment, sensitization about prohibition to engage in poaching and sensitization about animal behavior and handling.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures limits the intensity of the impact to low. The extent of the impact on terrestrial fauna is local as most of their habitat has already been modified by human presence. The duration of the impact is considered long, as the habitat will be modified on a long term. The impact on terrestrial fauna is thus considered of moderate importance. The probability of occurrence is high because the ROW needs to be prepared prior to construction work and will then generate habitat loss and fragmentation.

<table>
<thead>
<tr>
<th>Impact on terrestrial fauna during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Long</td>
</tr>
<tr>
<td>Importance: <strong>Moderate</strong></td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

**OPERATION PHASE**

**POTENTIAL IMPACTS**

- Risk of bat collisions.
- Modification and alteration of terrestrial fauna habitats, with associated modifications in fauna communities.

**SOURCES OF IMPACT**

- Presence and operation of line, substations and access roads.
- Maintenance and repairs.

**MITIGATION MEASURES**

- Implement a bat mortality monitoring program in partnership with local communities.
- Develop specific mitigation measures for species that are involved in mortality.

**DETAILED IMPACT DESCRIPTION**

During the operational phase, vegetation clearing and maintenance of the ROW will lead to a loss of habitats for some terrestrial fauna species and the presence of flora species in earlier stages of development. It could lead to a local adaptation of wildlife communities with higher representation of common species. Vegetation clearing will be minimized to limit habitat destruction. Vegetation maintenance activities could favor the spread of invasive species which can reduce the suitability of the habitats for some fauna species. Proper cleaning of equipment and monitoring will be implemented to reduce the risks of spread and associated impacts on wildlife.
Powerlines are susceptible to impacting bat populations during the operational phase because there is a risk of collision and electrocution with flying mammals. Electrocution is only possible when bats get in contact with two live wires at the same time. Considering the powerline is designed with single conductors, the electrocution risk is considered nil. There is still a risk of collision but it involves only frugivorous species. A monitoring program will be implemented in order to follow up the number of mortality and species involved. Species specific mitigation measures will be proposed consequently to monitor results.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures helps limit the intensity of the impact to low. Even if most of the significant effects on wildlife habitats will happen during the construction phase, risks of mortality for bats and habitat modifications will occur during all the operation phase. The duration is considered long since the line will become a permanent feature in the receiving environment. The extent of the impact is local since effects will be felt all along the line corridor. The probability of occurrence is medium considering the potential impacts on bat communities.

| Impact on terrestrial fauna during the operation phase |
|-------------------|----------------|
| Intensity: Low    | Importance: Minor |
| Extent: Limited   |                  |
| Duration: Long    |                  |

**7.3.3.3 AVIFAUNA**

**DESIGN MEASURES**

Bird diverters will be installed on transmission lines during the construction phase along ecologically sensitive areas, where birds are present. For the current project, it is proposed to place bird diverters while the line crosses the Mwanza River along a 4 km stretch (2 km each side of a central axis represented by the river). Theses diverters will be positioned on the top wire to make the line more visible.

**CONSTRUCTION PHASE**

**POTENTIAL IMPACTS**

- Modification and degradation of bird habitat.
- Disturbances and modifications of local communities.
- Potential habitat losses or degradation for the threatened *Apalis flavida* (Yellow-breasted Apalis).

**SOURCES OF IMPACT**

- Site preparation.
- Construction activities.
- Presence of workers.

**MITIGATION MEASURES**

- Establish a Revegetation Plan for the loss of natural habitats. Promote the use of native species and include the plantation of *Pterocarpus angolensis*, *Dalbergia melanoxylon* and *Afzelia quanzensis* and any other species of conservation concern that could be found inside the project area.
→ Compensate any loss of breeding/nesting sites, particularly for the Yellow-breasted Apalis, by the creation of suitable habitats elsewhere, notably from enhancement of degraded habitats.
→ If a Yellow-breasted Apalis nest is identified, clearly describe the habitats and support for the nest.
→ Place bird diverters on the top wire to make the line more visible to birds, near ecologically sensitive areas.
→ Installation of indicator lights at night for high towers.
→ Complete tree and/or brush cutting prior to or after the core nesting season.

DETAILED IMPACT DESCRIPTION

Construction activities will lead to habitat losses, modifications and fragmentation for some terrestrial and waterbirds. However, vegetation clearing will be minimized as much as possible to limit habitat destruction. The habitat loss could impair habitats for birds, like breeding or nesting sites. Impacts could be higher for the nationally threatened species, Yellow-breasted Apalis. This species has however a wide range of habitats. To reduce potential impacts on this species, moreover its reproductive success, rainy season should be avoided for vegetation clearing as some nests could be destroyed.

Construction activities will also lead to increased noise which may disturb the bird species present in the area. However, as for the terrestrial fauna, the avifauna is likely to migrate to similar but quieter habitats located in the vicinity of construction areas. This phenomenon could cause a short-term increase in habitat competition as the bird communities may concentrate in these adjacent habitats.

IMPACT ASSESSMENT

The application of the proposed mitigation measures limits the intensity of the impact on avifauna to medium. The extent of the impact on the avifauna is local since vegetation clearing will be realized all along the ROW. The duration of the impact is considered long, as the habitat will be modified permanently. The impact on avifauna is thus considered of moderate importance. The probability of occurrence is high because the ROW needs to be prepared prior to construction work and will then generate habitat loss and fragmentation.

<table>
<thead>
<tr>
<th>Impact on avifauna during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Medium</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Long</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

OPERATION PHASE

POTENTIAL IMPACTS
→ Bird collisions.
→ Modifications and alteration of bird habitats, with associated modifications in fauna communities.

SOURCES OF IMPACT
→ Presence of lines, substations and access roads.
→ ROW management.
→ Waste and hazardous materials management.
→ Transportation and circulation.
MITIGATION MEASURES

- Implement a bird mortality monitoring program in partnership with local communities that will review mitigation measures according to their efficiency and develop specific mitigation measures for species that are involved in bird mortality.
- Schedule ROW management activities to avoid breeding and nesting seasons of bird species with special status.

DETAILED IMPACT DESCRIPTION

The presence of the powerline is likely to affect bird communities, especially when located in open air space habitats. The presence of the powerline can affect birds mainly through collisions with powerlines or towers and displacement along migration route.

The environmental characteristics and location of the powerline can greatly influence collision probabilities. Collision rates between birds and the proposed powerline could be highly variable both temporally and spatially. There are many factors that can contribute to species’ vulnerability to collisions with powerlines, such as flocking behavior, rapid flight, high wing loading, nocturnal migrants, and species with poor vision. Collision risks are higher for species with small binocular fields of vision and large blind areas, as *Ardea cinerea* surveyed inside the study area.

The project design significantly reduces collision risks. Indeed, at the scoping stage the Wildlife and Environmental Society of Malawi (WESM) pointed out that collision risks could exist for vultures, in particular the white headed and the white back [vultures], to and from the Majete Game Reserve. Additionally, WESM also raised concerns about the Lisungwi escarpment, which is home to large communities of bats and parrots. Accordingly, the transmission line routing to pass away from the Majete Game reserve (>15 km) and the Lisungwi escarpment (> 5 km), significantly reducing collision risks.

Additional proposed mitigation measures should help reduce the risk of collision and the project design reduces significantly any risk of electrocution. Among others, installation of bird diverters as explained above (see section 7.3.3.3, Construction phase) could have material importance. However, success of those mitigation measures could be highly variable depending on the species. To manage this uncertainty, a proper bird mortality monitoring program will be developed and implemented to identify areas and species that are more impacted. Based on the monitoring program results, other measures could be proposed. It should also be noted that additional bird diverters could be installed on any line segment identified following the bird mortality survey results, an activity identified in the ESMP and detailed in the following chapter.

IMPACT ASSESSMENT

The implementation of the proposed mitigation measures will help reduce the impacts on avifauna to a low intensity. The extent of the impact on avifauna is local as it could happen on any given portion of the line. The duration of the impact is considered long as it is likely to occur throughout the operation phase. The impact on avifauna is thus considered of moderate importance. The probability of occurrence is high.

<table>
<thead>
<tr>
<th>Impact on avifauna during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Long</td>
</tr>
<tr>
<td>Importance: Moderate</td>
</tr>
</tbody>
</table>

Probability of occurrence: High
7.3.3.4 AQUATIC HABITATS AND ASSOCIATED FAUNA

**DESIGN MEASURES**

At the design stage, towers were positioned so as to be outside of the floodplain, watercourses and permanent marshlands, whenever possible. Watercourses might be crossed by access roads at a 90-degree angle and when possible in the narrowest section of the waterbody.

**CONSTRUCTION PHASE**

**POTENTIAL IMPACTS**

- Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.
- Impairment of hydrological dynamics leading to disturbances and alteration of aquatic habitats.

**SOURCES OF IMPACT**

- Site preparation.
- Construction activities.
- Waste and hazardous materials management.
- Transportation and circulation.
- Presence of workers.

**MITIGATION MEASURES**

- Develop and implement an Emergency Measures Plan (to be prepared by the contractor as stipulated in Chapter 8).
- Always maintain hydrologic connectivity upstream/downstream in work areas. When stream crossings are unavoidable, construct a suitable culvert to ensure sufficient water supply to maintain a viable fish habitat.
- Avoid material piling, equipment and vehicle movements in river, floodplain and marshland areas. If unavoidable, reduce access to a minimum.
- Avoid any water-works and movement of vehicles in tributaries during rainy season to avoid impacts on threatened fish species.
- Set and implement strict procedures for in-water works, if required.
- Conserve all the vegetation (trees, shrubs, herbaceous plants, crops) present at the edge of watercourses and on steep slopes.
- Avoid construction of temporary access roads along river banks or in areas where soils are saturated, to the extent possible.
- Maintain fish access when road crossings of watercourse are unavoidable by utilizing clear span bridges or open-bottom culverts. Install diversion structures (canals, dikes, cofferdams) that neither obstruct fish movements nor diminish habitat width to less than 2/3 of the current water bodies, including rivers, marshlands, etc.
- Maintain vegetated buffer zones within and around marshlands and along both sides of watercourse crossings. Restore as soon as possible any disturbed areas in the riparian buffer zone.
- Do not allow any temporary access roads to be built during the construction phase in marshland areas.
- Avoid equipment and vehicle movements in river, floodplain and marshland areas. If unavoidable, reduce access to a minimum length in marshlands and floodplains and select the most optimized site for the access considering human uses and areas of higher ecological integrity.
Conduct activities during the dry season to minimize disturbance of sensitive shoreline and marshland areas.

Do not operate heavy machinery in marshland areas with standing water.

After termination of construction work, restore natural river bed conditions (minor bed, natural obstacles, etc.).

Use marshland mat or bridge for vehicle and machinery movement inside permanent marshland to avoid the need for building a road.

**DETAILED IMPACT DESCRIPTION**

The construction of access roads and towers and vegetation clearing in the ROW may lead to impacts on marshland and riparian areas. The construction of access roads can change the quantity or direction of water flow, causing permanent changes to hydrological conditions sustaining marshland dynamics and habitats. If flowing water is stopped by structures, a lentic habitat could replace the existing lotic ones. Flora communities would consequently switch and be replaced by adapted vegetation. Construction of access roads will necessitate the implementation of water crossings which have the potential to cause modifications to water dynamics and consequently deterioration, destruction or disturbance of marshlands and watercourses, comprising habitats for fish and other aquatic organisms. Moreover, they have the potential to become obstacles for aquatic fauna movements, leading to restricted access to specific habitats for a variety of species. This will be minimized by the implementation of the design measure the need for new access roads will be reduced to a minimum and where access roads will be kept away from riparian land except when strictly necessary. Installation of culverts sized according to water flows and the application of preventive mitigation measures on the remaining access road can limit this loss of habitat further by avoiding the barrier effect that these works can have on aquatic habitats and associated fauna.

Construction activities could result in an increase in suspended solids leading to the siltation of spawning and feeding sites for aquatic and semi-aquatic species. This may affect some threatened species. *Labeo mesops*, *Oreochromis lidole* and *Oreochromis shiranus chirwae* are three endangered species that have been surveyed inside the study area. *Oreochromis lidole* is not likely to be impacted as it is a benthopelagic species, occupying more deep-water areas concentrated in lakes Malawi, Kingiri and Chungiuru (FishBase, 2017). Impacts are more susceptible to occur for *Labeo mesops* and *Oreochromis shiranus chirwae* as both species are found in shallow water and spawn on muddy areas on the vicinity of rooted aquatic vegetation or not (FishBase, 2017).

The implementation of the mitigation measures listed above will help prevent these impacts. However, environmental surveillance should allow to identify if the project has led to such impacts and management measures should be implemented to avoid them.

Additionally, water could also be contaminated through accidental spills of reactants, chemical products, hydrocarbons, and wastewater resulting from poor environmental management. Contamination in lentic environment with shallow water will exacerbate the impacts as the contaminants could be locally concentrated. Environmental contamination could affect the aquatic and semi-aquatic fauna, among which amphibians and fish which are sensitive to the presence of contaminants in their habitats. This contamination has the potential to affect the entire food chain and to bio accumulate. The implementation of the Emergency Response Plan and the appropriate mitigation measures will minimize this impact.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures limits the intensity of the impact to low. The extent of the impact on aquatic habitats and associated fauna is limited since the aquatic habitats are punctual along the proposed transmission line and the impact could be restricted to permanent marshlands and watercourses if the construction work schedule is well planned. The duration of the impact is considered medium as, with the application of the proposed mitigation measures, the permanent water crossings will be built so as to maintain the watercourse’s integrity. The impact on
aquatic habitats and associated fauna is thus considered of minor importance. The probability of occurrence is high since water crossings will be necessary if the project is approved.

<table>
<thead>
<tr>
<th>Impact on aquatic habitats and associated fauna during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Limited</td>
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<tr>
<td>Duration: Medium</td>
</tr>
</tbody>
</table>

Probability of occurrence: High

OPERATION PHASE

POTENTIAL IMPACTS

→ Disturbances of the water’s physical and chemical characteristics causing modifications in aquatic habitats and its associated fauna.
→ Effects on marshland specialist species and species of conservation interest.
→ Increased pressure on natural resources, especially in areas where new accesses have been created.

SOURCES OF IMPACT

→ Maintenance and repairs.
→ Waste and hazardous materials management.

MITIGATION MEASURES

→ Implement an invasive alien species (IAS) monitoring program following project construction and site revegetation in sensitive areas, forest reserves, and forest stands. Consider conduction along with ROW management.
→ Forbid use of chemical pesticides to control vegetation in the ROW.
→ Avoid the destabilization of shores and sediments or other pollutant rejections in watercourses during road and wayleave maintenance.

DETAILED IMPACT DESCRIPTION

Possible changes in the hydrological conditions that could be related to the presence of access roads and pylons within a marshland or a watercourse’s flood zone could lead to modifications of ecological parameters and associated disturbances of the aquatic and semi-aquatic fauna. Maintenance of access roads and related ditches is essential in order to prevent the water crossings from becoming insurmountable obstacles for the aquatic fauna and for soil erosion to encroach spawning grounds or other critical ecological habitats.

As mentioned above, no permanent access roads shall be built in marshlands.

During the operation phase, the movement of people and vehicles along the ROW and access roads for ROW maintenance and for repair of transmission line can lead to the introduction IAS and accidental spills. Seeds and other propagating parts of IAS can be carried out into a marshland or watercourse inadvertently by equipment.

IMPACT ASSESSMENT

The application of the proposed mitigation measures limits the intensity of the impact. The extent of the impact on aquatic habitats and associated fauna is limited since the aquatic habitats are punctual along the proposed power line. The duration of the impact is considered short, since maintenance
work will be needed occasionally during the operation phase. The impact on aquatic habitats and associated fauna is thus considered of minor importance. The probability of occurrence is medium as it is related to a good maintenance of ditches and access roads.

<table>
<thead>
<tr>
<th>Impact on aquatic habitats and associated fauna during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
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<tr>
<td>Extent: Limited</td>
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<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
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<tr>
<td>Probability of occurrence: Medium</td>
</tr>
</tbody>
</table>

7.3.4 NEGATIVE IMPACTS TO THE SOCIOECONOMIC ENVIRONMENT

7.3.4.1 EMPLOYMENT AND ECONOMIC DEVELOPMENT

DESIGN MEASURES

At the scoping stage, the line alignment was chosen so as to avoid areas where settlements, businesses or industries were located. This measure helped decrease the project’s potential impacts as entire areas were deemed unavailable and therefore avoided.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

→ Disruption of farming activities by construction work.
→ Loss of arable, grazing and pastoral lands.
→ Inflation risk.
→ Increase in pressure on resources.

SOURCES OF IMPACT

→ Construction activities.
→ Displacement of economic activities.
→ Transportation and circulation.
→ Presence of workers.

MITIGATION MEASURES

→ Provide compensation measures and resettlement assistance to affected households and landowners.
→ Adopt procurement and labour policies promoting local products and services, when available.
→ Clearing of plantations or cutting of trees in the ROW will only be done when consent of each owner has been obtained.
→ Restrict transportation to the identified access by clearly marking out the limit of the ROW and access roads
→ Carefully select the landing area of falling trees to minimize damage to crops.

DETAILED IMPACT DESCRIPTION

There are no strong adverse impacts on the local and regional economy at the pre-construction and construction stages. Some speculations could happen before the beginning of construction which could act as an upward pressure on commodity prices.
During the construction phase, the upward pressures on commodity prices in areas where construction will happen (because of increased demand by workers or by contractors) could temporarily cause some slight market distortions. It is however expected that the local markets will react accordingly by increasing local supplies of key merchandise. The increased supply should in turn drive prices down to their former level. Furthermore, contractors could state that local commodities and services will not be purchased over a certain price in order to reduce the risk of inflation.

The dissemination of reliable information is essential to maintain a swift and efficient market for the goods and services required by contractors and workers. Therefore, it will be essential that local and regional populations be informed, well in advance, of the onset and duration of construction work to allow them to adjust their supplies accordingly and avoid bottlenecks resulting in steep price increases.

As for agricultural activities, adequate compensation measures should offset the temporary loss in crops.

However, the compensation package should ideally be adjusted as to replicate the normal revenue stream of farmers (i.e. more than one instalment), if judged convenient by both authorities and communities. Experience has shown that dividing a compensation package into several instalments tends to reduce inequalities in households and preserve more efficiently social organization. The separate RPF report provides the necessary details on the compensation measures and mechanisms.

Impacts on local economies can also be offset by hiring local workers in priority, especially for unspecialized jobs.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures limits the intensity of the impact to low as some economical activities and inflation could be seen in construction due to the increase in economic activity in the vicinity of construction areas. The extent of the impact is local since, if the impact occurs, it will be felt mostly around construction sites. The duration of the impact is considered medium because inflation could be felt over a period of time corresponding to the extent of the construction period. The impact is thus considered of minor importance. The probability of occurrence of the impact is medium because inflation may occur.

| Impact on employment and economic development during the pre-construction and construction phases |
|---|---|---|
| **Intensity**: Low | **Importance**: Minor |
| **Extent**: Local | **Duration**: Medium |
| **Probability of occurrence**: Medium |

**OPERATION PHASE**

No adverse impacts on employment and economic development are expected during the operation phase.

**7.3.4.2 LAND USE**

**DESIGN MEASURES**

At the scoping stage, the line alignment was chosen so as to avoid areas where local populations, businesses or industries were located. This measure helped decrease the project’s potential impacts as entire areas were deemed unavailable and therefore avoided. The proposed line route was modified so as to avoid private estates where there is a higher concentration of agricultural activities such as the Nankudwe estate.
PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

- Restriction to land uses within the line’s ROW.
- Loss of arable, grazing and pastoral lands.
- Disruption of farming activities by construction work.

SOURCES OF IMPACT

- Land acquisition.
- Construction activities.
- Transportation and circulation.

MITIGATION MEASURES

- Implement the RPF.
- Restrict transportation to the identified access by clearly marking out the limit of the ROW and access roads.
- Restrict construction activities, materials and manpower movements to existing roads/tracks and ROW limits.
- Validate with local leaders the temporary areas to be used during construction activities.

DETAILED IMPACT DESCRIPTION

Agricultural activities and livestock are likely to be affected during the work due to the loss of arable lands, restrictions imposed on the movement of livestock, potential breakage to fences and drainage channels. Adequate compensation and/or reestablishment measures (de-compaction of land, reconstruction of fences, etc.) will be proposed to affected landowners.

Crops in the wayleave area will be destroyed or delayed during the construction period. It is however difficult to assess the precise impact on the annual harvest since the exact period and duration of construction in each locality are not known at this stage. It is important to mention that crops will be allowed in the wayleave, but not under the pylons. All these aspects will be detailed in the RPF. In addition, crops that may be removed temporarily for construction purposes (camp, access road) will also have to be compensated.

The power transmission line crosses mostly small-scale agricultural land, as well as some land that might be used for grazing.

IMPACT ASSESSMENT

The intensity of the impact on land use is medium since compensation and resettlement assistance will be provided to affected households and the ROW use is tolerated for small cultivators. The extent of the impact on land use is local since land use will mainly be altered along the transmission line and new access roads. The duration of the impact is considered long since land use will be altered beyond construction. The impact on land use during the pre-construction and construction phases is thus considered of moderate importance. The probability of occurrence is high since land used will certainly be altered in the ROW.

<table>
<thead>
<tr>
<th>Impact on land use during the pre-construction and construction phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Medium</td>
</tr>
<tr>
<td>Extent: Limited</td>
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<tr>
<td>Duration: Long</td>
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<tr>
<td>Importance: Moderate</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>
OPERATION PHASE

POTENTIAL IMPACTS

→ Land use restriction in the ROW and substations.
→ Occasional infringement of machinery on crops for maintenance purposes.

SOURCE OF IMPACT

→ Presence and operation of line, substations and access roads.
→ Maintenance and repairs.

MITIGATION MEASURES

→ Allow grazing cultivation in the ROW, provided that plantations do not exceed 5 m in height.
→ Plan for maintenance activities to be conducted outside of the growing and grazing seasons.
→ Compensate PAPs for any damaged crops during maintenance work.
→ Carefully select the landing area of falling trees to minimize damage to crops.

DETAILED IMPACT DESCRIPTION

During the operation phase, impacts on land use consist of land use restrictions in the ROW and infringement by machinery on crops during ROW maintenance. Effects on land use should not be significant since grazing should be tolerated within the ROW, provided that plantations do not exceed 5 m in height. Moreover, infringement on crops by machinery during ROW maintenance will be prevented by conducting maintenance activities outside the growing and grazing seasons.

However, certain farmers could choose to cultivate the land in the ROW without regard to the land use restrictions. In the event of maintenance work, the removal of these crops would not be compensated.

IMPACT ASSESSMENT

The intensity of the impact is considered moderate since maintenance work will be required along the ROW sporadically requiring land clearings. The extent of the impact on land use is limited since it will be felt by a small portion of the population within the project area. The duration of the impact is considered medium since land use will be altered during maintenance work. The impact on land use during the operation phase is thus considered of minor importance. The probability of occurrence of the impact is medium because land use will be restricted within the ROW.

<table>
<thead>
<tr>
<th>Impact on land use during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Limited</td>
</tr>
<tr>
<td>Duration: Medium</td>
</tr>
<tr>
<td>Importance: Moderate</td>
</tr>
</tbody>
</table>

Probability of occurrence: Medium

7.3.4.3 BUILT ENVIRONMENT

DESIGN MEASURES

Generally, the line alignment was chosen so as to avoid residential housing. This measure helped decrease the project’s potential impacts as dense urban areas were circumvented. As well, areas known to be occupied by individuals that have already been resettled in previous projects were also avoided.
PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS
→ Houses and other buildings located within the ROW will need to be relocated to clear the ROW.

SOURCES OF IMPACT
→ Land acquisition.
→ Resettlement.

MITIGATION MEASURES
→ Provide compensation measures and resettlement assistance to affected households and landowners.

DETAILED IMPACT DESCRIPTION
A number of houses (45), secondary structures (39) and/or community buildings (1) that are located within the ROW will be demolished or moved. The RPF report details the procedures and compensation measures that will alleviate some of the impacts associated with land acquisitions and resettlement. The impact of the project on these households will be minimized but still be potentially significant. Sufficient time and care to assist communities and households is crucial to minimize the impact on these resettlements. It should however be noted that the definitive number of households likely to be displaced will be established during the final property and asset inventories.

IMPACT ASSESSMENT
The intensity of the impact is moderate since the built environment within the ROW will not simply be removed or destroyed; it will be either relocated or compensated according to the agreement reached with the owner. The extent of the impact is local since it will occur within the whole ROW. The duration of the impact is considered long since houses and buildings will be relocated for the lifetime of the transmission line. The impact is thus considered of moderate importance. The probability of occurrence of the impact is high because a portion of the built environment and habitations within the project area will certainly be displaced due to construction activities.

<table>
<thead>
<tr>
<th>Impact on built environment and habitations during the pre-construction and construction phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity:</td>
</tr>
<tr>
<td>Extent:</td>
</tr>
<tr>
<td>Duration:</td>
</tr>
<tr>
<td>Importance:</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

OPERATION PHASE

POTENTIAL IMPACTS
→ Houses and other buildings constructed within the ROW after beginning of the line’s operation will need to be relocated to clear the ROW when maintenance work will be required.

SOURCE OF IMPACT
→ Maintenance and repairs.

MITIGATION MEASURES
→ Announce in advance any maintenance or repair work so illegal occupant can move the structures they have built in the ROW.
→ Try to plan work in such a way as to avoid having to remove the structures present.
DETAILED IMPACT DESCRIPTION

During the operation phase, and although it will have been advertised that no structures should be built within the line’s ROW, some people may build primary or secondary structures within this ROW. During maintenance or repair activities, it may be required to remove these structures to allow for the required work. Some of these structures may be easily relocated outside the ROW but others will have to be demolished.

IMPACT ASSESSMENT

The intensity of the impact is considered moderate since the structure present within the ROW that will have to be removed will be illegally present. The extent of the impact is limited since it will be felt by a small portion of the population within the project area. The duration of the impact is considered long the structures will be demolished prior to maintenance work. The impact on built environment during the operation phase is thus considered of moderate importance. The probability of occurrence of the impact is low because building structures will be restricted within the ROW.

<table>
<thead>
<tr>
<th>Impact on built environment and habitations during the pre-construction and construction phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Moderate</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Long</td>
</tr>
</tbody>
</table>

7.3.4.4 INFRASTRUCTURE

DESIGN MEASURES

General design parameters were followed for road and railway infrastructure crossing. Towers were located at least 30 m from existing roads and whenever possible crossings were designed at 90-degree angles. As for railway infrastructure, the railway’s ROW of 120 m was respected. The towers were implemented to follow the minimal 15 m height for the line cables passing over the railway.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

- Need for relocation of existing infrastructure.
- Increased traffic and disturbance of traffic flow.
- Damage to existing infrastructure.

SOURCES OF IMPACT

- Site preparation.
- Construction activities.
- Transportation and circulation.

MITIGATION MEASURES

- Travel to and from the construction sites should be done during low traffic periods.
- Coordinate with the railway companies to ensure that the line’s installation work will be done without interrupting the rail schedule, namely with those managing the Nacala Railways.
- Design pylons to respect security standards.
- Rehabilitate any damaged infrastructure after the construction.
DETAILED IMPACT DESCRIPTION

Roads, electricity, railways and telecommunications infrastructure were surveyed. On main roads, the presence of construction vehicles and equipment may lead to increased traffic and affect traffic flow. The project’s equipment could potentially damage some existing infrastructure. Also, several existing secondary roads will be used as access roads to the ROW, and new access roads will be constructed. However, all affected infrastructure will have to be rehabilitated after the construction phase if they have been damaged. Some secondary roads may also be dismantled. Proper signaling will also be key in indicating the presence of machinery traffic. An increase in road traffic as well as a temporary road blocks could lead to difficulties with regards to water access for some communities.

Also, the project will cross railways at some points. To ensure that work is performed safely without interfering with railway operations, coordination will be required between the contractor and the relevant authorities. Construction work should not create any impacts on the operation of nearby existing telecommunication antennas, except by temporarily limiting their access. No High or Medium voltage electrical lines are crossed.

IMPACT ASSESSMENT

The intensity of the impact is low since the application of the proposed mitigation measures will offset the impact of the construction activities on infrastructure within the project area. The extent of the impact is local since the impact on infrastructure, if any, will be felt mainly by the population living in proximity with the line and access roads. The duration of the impact is considered medium since the negative effect on infrastructure will be felt continuously throughout the construction phase. The impact on infrastructure is thus considered of minor importance. The probability of occurrence of the impact is low because the project construction is not likely to damage or cause the relocation of existing infrastructures.

| Impact on infrastructures during the pre-construction and construction phases |
|-------------------------------|---------------------------------|
| Intensity: Low                | Importance: Minor               |
| Extent: Local                 |                                 |
| Duration: Medium              | Probability of occurrence: Low |

OPERATION PHASE

POTENTIAL IMPACTS

→ Radio and television signal interruption.
→ Interference with train operating systems.
→ Collisions between line and towers with air traffic.

SOURCE OF IMPACT

→ Presence of line, substations and access roads.

MITIGATION MEASURES

No specific mitigation measures apply to this component.

DETAILED IMPACT DESCRIPTION

Transmission lines do not usually interfere with normal television and radio reception. In some cases, interference can occur very close to the wayleave due to weak broadcast signals or poor receiving equipment. Furthermore, the presence of indicator lights on top of high towers will reduce the risk of
collisions between air vehicles and lines or towers. As well, the line could interfere with the train operating systems where it runs parallel to the tracks, however the railway guidelines were followed at the design stage which should prevent this impact.

**IMPACT ASSESSMENT**

The intensity of the impact is low as infrastructure within the project area will be minimally affected by operation activities. The extent of the impact is local since the impact will be felt mainly by the population living very close to the wayleave. The duration of the impact is considered short since a negative effect could be felt sporadically over a short period of time. The impact is thus considered of minor importance. The probability of occurrence of the impact is low because the transmission line is unlikely to cause the interruption of radio and/or television signals or air collisions.

| Impact on infrastructures during the operation phase |
|---------------------------------|-----------------|
| Intensity: Low                  | Importance: Minor |
| Extent: Local                   |                  |
| Duration: Short                 | Probability of occurrence: Low |

7.3.4.5 **GENDER ASPECTS AND VULNERABLE GROUPS**

**DESIGN MEASURES**

No specific design measures.

**PRE-CONSTRUCTION AND CONSTRUCTION PHASES**

**POTENTIAL IMPACTS**

→ Risk of sexual abuse by workers, especially child abuse.
→ Women being sidetracked from the compensation and decision-making processes.
→ Disturbance of women’s subsistence activities.
→ Marginalization of women during the employment process.
→ Increased marginalization of vulnerable groups.

**SOURCES OF IMPACT**

→ Land acquisition.
→ Resettlement.
→ Presence of workers.
→ Construction activities.

**MITIGATION MEASURES**

→ Favour the employment of local workers to reduce the risk of sexual harassment and violence caused by foreigners.
→ Locate worker camps at a minimum distance of 2 km from towns and villages in order to limit worker – community interactions.
→ Implement and follow-up on grievance redress mechanisms.
→ Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).
It is the Lead Contractor’s responsibility to take necessary measures so his employees and subcontractors’ employees do not commit acts of sexual abuse and/or underage sex.

- Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place.

- Immediately report any suspected case of sexual abuse or underage sex to the supervising engineer and ESCOM. Management of such cases should be based around the following principles:
  - Immediate suspension of employment for accused worker;
  - Trigger grievance redress mechanism processes if not already done and invite an impartial observer to follow the process.

- If accusations are found to be justified, the Lead Contractor shall:
  - Immediately cease employment of the accused worker and report criminal offences to appropriate authorities for prosecution;
  - Compensate the affected person and community according to an agreement to be negotiated using a grievance redress mechanism. These compensations may not take a monetary form, and shall be validated as fair by the impartial observer mentioned above as well as the World Bank Project’s social specialist.

- If accusations are found not to be justified, the Lead Contractor shall reinstate the worker in its regular tasks with compensation for lost income during suspension.

- The first sexual abuse and/or underage sex complaint or event treated in front of a grievance committee (which may involve one or more workers) where accusations of sexual abuse and/or underage sex are found to be justified shall entice the following consequences for the Lead Contractor, in addition to those listed above:
  - Warning from ESCOM about consequences of any additional cases;
  - Obligation to submit a remedial plan to be approved by ESCOM and World Bank Social specialist.

- The second instance where a sexual abuse and/or underage sex complaint treated in front of a grievance committee finds accusations to be justified shall trigger immediate suspension of all construction work. The World Bank Inspection Panel shall be called in to conduct an inquiry and provide guidance on the way forward.

- Encourage the recruitment of female workers, with equal payment for male and female workers, for equivalent jobs.

- Provide opportunities to women in income generating activities during construction, e.g. provision of catering services, selling local products, etc., with price limits in order not to cause inflation.

- Proper consideration of gender issues in decision making process and the attribution – and distribution – of compensation packages.

DETAILED IMPACT DESCRIPTION

According to the socioeconomic surveys, 53.7% of the members of the households affected by the project are women and 46.3% are men. However, the heads of households affected by the project are predominantly men (72.2%), while 27.2% of heads of households are women.

Close interactions between workers and communities may result in cases where some workers commit sexual abuse or have sexual intercourse with underage community members. These impacts of labour influx and presence of foreign workers is further discussed in section 7.3.4.5.

During the pre-construction phase, attention should be paid to the treatment of women in the surveying of propriety/land titles and their registration. It is primordial that the project ensures women are not sidetracked from the process. This will be particularly important for the attribution of compensation packages for agricultural losses. During the construction phase, impacts of the project on gender aspects are mostly related to employment opportunities and land use by women.
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. At the very least, such impacts should be kept to a minimum by actively making sure that women with proper qualifications (technical work or administrative work, generally) are hired for various jobs (surveying, signaling, etc.). There should also not be any gender inequalities in terms of wages for equivalent jobs.

Also, land loss and subsequent loss of crops (annual and perennial) due to the project could affect women more than men. In fact, women are usually in charge of subsistence activities and struggle to provide for the household when crops are limited. Proper consideration of this dynamic in the attribution and distribution of compensation packages is recommended. To reduce this inequality, women should be provided with adequate information at all phases of the compensation process. Moreover, a scaling formula of payments and joint bank accounts should be used to reduce the misuse of funds by husbands or relatives.

In addition to women, the compensation distribution can make some people more vulnerable (disabled or elderly persons, for example) to social and family pressures that would reduce their ability to use the funds. The negative impacts can be mitigated by assuring the collaboration of legitimate leaders and an adequate follow-up with the PAPs regarding compensation distribution and management.

Moreover, the impacts on livelihood benefits of vulnerable groups can be more severe, as these groups generally have less resources and have trouble using the services available for their condition. It is essential to prioritize vulnerable households and people in terms of access to various social measures and programs that are offered, especially in the RAP.

These PAPs will also receive special assistance in organizing transportation to the relocation site and for the construction of their new structures, if necessary. The details related to vulnerable PAPs are provided in the RPF. According to the socioeconomic surveys, 75 affected households have a sick or handicapped member (whom can be the head of household), 74 affected households are headed by woman and 105 affected households own only one (1) land parcel that is likely to be impacted by the project. The main cause of disease or handicap identified by households is malaria (87.6% of households included in the category). There are actually no children head of households impacted by the project. The vast majority of heads of households that are widowed are also women (90.4%).

**IMPACT ASSESSMENT**

With the adoption of adequate mitigation measures, the intensity of the impact is considered high because the project could negatively impact women within the project area. The extent is considered local as only a portion of women within the project area will be affected. The impact duration is estimated medium as the negative impacts will be felt during the construction phase. The importance of the impact on gender relations is considered moderate. The probability of the occurrence of this impact is medium because there is a slight probability that women will not be impacted by the project.

<table>
<thead>
<tr>
<th>Impact on gender aspects during the pre-construction and construction phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Medium</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Medium</td>
</tr>
</tbody>
</table>

Probability of occurrence: Medium
OPERATION PHASE

POTENTIAL IMPACTS

→ Effects on women due to crop loss.

SOURCES OF IMPACT

→ Maintenance and repairs.
→ ROW management.
→ Presence of workers.

MITIGATION MEASURES

→ Encourage the recruitment of female workers.
→ Compensate PAPs for any damaged crops during maintenance work.
→ Plan for maintenance activities to be conducted outside of the growing and grazing seasons.

DETAILED IMPACT DESCRIPTION

Although the impacts on gender are likely to be mostly felt during the construction phase, they are also likely, to a lesser degree, during maintenance activities. Loss of crops (annual and perennial) due to maintenance activities may affect women more than men.

In fact, women are usually in charge of subsistence activities and struggle to provide for the household when crops are limited. Proper consideration of this dynamic in the attribution and distribution of compensation packages is recommended.

Prompt and proper compensation needs to be provided for any crop loss due to maintenance activities. However, an effort should be made to schedule maintenance work after crops have been harvested to avoid any losses that would affect women.

Close interactions between workers and communities may result in cases where some workers commit sexual abuse or have sexual intercourse with underage community members. This impacts of labour influx and Presence of foreign workers is further discussed in section 7.3.4.11.

IMPACT ASSESSMENT

The intensity of the impact is considered low because women will be minimally affected by the project during the operation phase. The extent is considered local as only a portion of women within the project area will be affected. The impact duration is estimated short as the negative impacts will be felt sporadically over the lifetime of the project, during maintenance operations. The importance of the impact on gender relations and equality is considered minor. The probability of the occurrence of this impact is low because it is unlikely that women will be impacted by the project during the operation phase.

<table>
<thead>
<tr>
<th>Impact on gender aspects during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: Low</td>
</tr>
</tbody>
</table>

WSP
Project No. 161-07023-00
May 2019

Electricity Supply Corporation of Malawi Limited
Mozambique-Malawi 400 kV Interconnection Project
Environmental and Social Impact Assessment Study
7.3.4.6  COMMUNITIES AND SOCIAL COHESION

DESIGN MEASURES

Generally, the line alignment was chosen to avoid residential housing and development. This measure helped decrease the project’s potential impacts as dense urban areas were circumvented. Furthermore, areas occupied by individuals that have already been resettled in previous projects were also avoided.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

- Land use and compensation disputes, reviving old quarrels (land resource and power conflict).
- Tension over the awarding of jobs and contracts.
- Tension with workers from outside.
- Increased marginalization of vulnerable groups
- Inadequate communication with communities and stakeholders.

SOURCES OF IMPACT

- Land acquisition.
- Resettlement.
- Displacement of economic activities.
- Presence of workers.

MITIGATION MEASURES

- Involve traditional leaders in the resettlement process.
- The Contractor will prepare a Community Engagement Plan with the following components:
  - Identification of Project Stakeholders using the present ESIA, the RPF and future RAP, information from RAP implementation as well as any other relevant information;
  - Analysis of stakeholder engagement to date;
  - Identification of methods of communication and information disclosure;
  - Action plan for stakeholder information and engagement during project construction;
  - Roles and responsibilities
- Communicate with communities effectively and involve their representatives.
- Encourage the recruitment of local workers.
- Encourage the recruitment of female workers.
- If blasting is required for a tower’s installation, the local population will be advised in advance to prevent nuisances.

DETAILED IMPACT DESCRIPTION

The steps leading to final arrangements prior to the construction could stress some communities, reviving old quarrels. Moreover, the distribution of compensations among claimants (e.g. landlords, tenants, and family members) can create tension inside and outside the impacted households.

Recommended solutions to both conflict-related and “regular” land conflicts during resettlement converge towards proper communication of compensation rules and procedures to all interested parties and implementation of mechanisms involving all parties to the conflict including local...
representatives in discussions aiming towards mediation and peaceful conflict resolution. Therefore, the grievance redress mechanism to be implemented through the RPF will define how to deal with conflicts that may arise.

Furthermore, outsiders going to remote locations for the preparation of work may disturb some communities and disrupt their traditional habits and schedules. The impacts of influx of foreign workers is further discussed in section 7.3.4.11.

Impacts on livelihoods of vulnerable groups (such as the elderly people, the disabled, the landless and women-headed households), may be more severe, since these groups usually have less resources and experience difficulty in using available services due to their condition.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures establishes the intensity of the impact at low. The extent of the impact is considered local as only a portion of the population in affected communities will be affected. The impact duration is medium as it will be felt continuously during the construction phase. The importance of the impact on communities and social cohesion is thus considered moderate.

The probability of the occurrence of this impact is high because land and compensation disputes and the increase in marginalization of vulnerable groups will most likely occur during the pre-construction and construction phases.

<table>
<thead>
<tr>
<th>Impact on communities and social cohesion during the pre-construction and construction phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Medium</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
</tr>
</tbody>
</table>

**OPERATION PHASE**

**POTENTIAL IMPACTS**

- Tension between local population and outside workers.
- Land use disputes, reviving old quarrels (land resource and power conflicts).

**SOURCES OF IMPACT**

- Presence of workers.

**MITIGATION MEASURES**

- Communicate with communities effectively and involve their leaders.
- Restrict project land use during the operation phase to the line’s ROW to avoid project developer conflict with local communities.

**DETAILED IMPACT DESCRIPTION**

Although the impacts on communities and social cohesion are likely to be mostly felt during the construction phase, they could also be felt, to a lesser degree, during the operation phase due to the presence of workers for maintenance activities.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measure limits the intensity of the impact to low because the size of the workforce to be employed during the operations will be very limited. The extent of the impact is considered local as only a portion of the population in affected communities will be affected.
The impact duration is short as it will be felt sporadically over the maintenance phase. The importance of the impact on communities and social cohesion is thus considered minor. The probability of the occurrence of this impact is low because tension between the local population and maintenance workers is not very likely to occur during the operation phase.

<table>
<thead>
<tr>
<th>Impact on communities and social cohesion during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Short</td>
</tr>
<tr>
<td>Probability of occurrence: Low</td>
</tr>
</tbody>
</table>

### 7.3.4.7 CULTURAL AND ARCHEOLOGICAL HERITAGE

**DESIGN MEASURES**

As a general measure, where possible, project components were designed and re-designed as to avoid or minimize impacts to known physical cultural heritage resources based on input from cultural heritage specialists. In some instances, towers and the line alignment were adjusted to avoid cultural and archaeological sites.

**PRE-CONSTRUCTION AND CONSTRUCTION PHASES**

**POTENTIAL IMPACTS**

- Potential disturbance or destruction of archaeological sites and/or artifacts.
- Destruction or potential disturbance of burials and/or sacred sites.

**SOURCES OF IMPACT**

- Site preparation.
- Construction activities.

**MITIGATION MEASURES**

- Implement the Cultural and Archaeological Heritage Management Plan.

**DETAILED IMPACT DESCRIPTION**

The socio-economic surveys and consultations with district officials and communities did not identify the presence of any site or resource linked to the cultural heritage in the ROW.

The project’s chance findings procedure should be updated prior to construction to include information on relevant contact persons in case of a chance find. During construction activities, unknown archaeological sites or artifacts can be discovered and partially damaged by the machinery. An archaeologist should accompany the construction team during excavation work and should make some sporadic checks at the pylon locations. Should any archaeological or historic remnants be encountered, construction work will immediately stop along that section, and the proper authorities will be informed.

**IMPACT ASSESSMENT**

The application of the proposed mitigation measures listed above limits the intensity of the impact to low as on-going surveillance of work sites should avoid any disruption of cultural heritage sites. The extent is limited because the risk of disturbance is confined to a limited space, that of the facilities where the ground needs to be disturbed during the construction. The impact duration is estimated long, if integrity is lost or an archaeological site or artifact is destroyed. Indeed, the nature of such loss or destruction could be permanent and irreversible. The importance of the impact on archaeology and heritage is considered moderate. The probability of the occurrence of this impact is minor since it is possible that cultural and/or archaeological sites will be accidentally damaged along the project line route.
Impact on cultural and archaeological heritage during the pre-construction and construction phases

<table>
<thead>
<tr>
<th>Intensity: Low</th>
<th>Importance: Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent: Limited</td>
<td></td>
</tr>
<tr>
<td>Duration: Long</td>
<td></td>
</tr>
<tr>
<td>Probability of occurrence: Medium</td>
<td></td>
</tr>
</tbody>
</table>

OPERATION PHASE

No adverse impacts on cultural and archaeological heritage are expected during the operation phase.

7.3.4.8 LANDSCAPE

DESIGN MEASURES

No specific design measures were implemented for this component.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

→ Temporary degradation of landscape at worksite.

SOURCES OF IMPACT

→ Site preparation.
→ Construction activities.

MITIGATION MEASURES

→ Obtain authorizations prior to harvesting the trees, clearly delineate areas to be deforested and vegetation to be cut and minimize vegetation clearing around work areas.
→ Maximise use of existing access roads.
→ Revegetate areas of bare and disturbed soils as soon as possible.
→ Rehabilitate and revegetate temporary access roads and work areas as soon as possible.
→ Promote the selection of areas with less of a need for tree cutting for temporary work and storage areas.

DETAILED IMPACT DESCRIPTION

Aesthetic impacts during the construction phase will be limited to the work areas. Deforestation of the ROW will alter the landscape. Moreover, to minimize the impacts of construction activities on the landscape, existing access roads will be used as much as possible. Finally, all temporary access roads and work areas will be restored upon completion.

IMPACT ASSESSMENT

The application of the proposed mitigation measures limits the intensity of the impact on the landscape during the pre-construction and construction phases to low. The extent of the impact is local as the impact will only be felt along the ROW and access roads. The impact duration is medium as it will be felt continuously over a period of time equivalent to the construction phase.

The importance of the impact on the landscape during the pre-construction and construction phases is thus considered minor. The probability of the occurrence of this impact is high because the landscape will certainly be disrupted at the work sites and potentially at scenic areas.
Impact on landscape during the pre-construction and construction phases

<table>
<thead>
<tr>
<th>Intensity: Low</th>
<th>Importance: Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent: Local</td>
<td></td>
</tr>
<tr>
<td>Duration: Medium</td>
<td></td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
<td></td>
</tr>
</tbody>
</table>

OPERATION PHASE

POTENTIAL IMPACTS

→ Permanent alteration to the landscape.
→ Potential degradation of sensitive scenic areas.

SOURCES OF IMPACT

→ Presence of lines, substations and access roads.

MITIGATION MEASURES

→ Use existing access roads optimally so as to reduce the need for new deforestation.
→ Minimize the number of permanent access roads to and in the ROW, when possible, proceed to early closing and rehabilitation of access roads near sensitive scenic areas.
→ Allow tree and shrub species whose height is limited to 5 m to grow within the ROW.
→ Create visual barriers to reduce line visibility in sensitive areas, when possible.

DETAILED IMPACT DESCRIPTION

The overall aesthetic effect of a transmission line is likely to be negative to most people, especially where proposed lines would cross natural landscapes. The tall steel structures may seem out of proportion and not compatible with agricultural landscapes, vast plains or luxuriant hills. Substations will generally have a subtler impact on the landscape as they will blend better with the urban or peri-urban areas in which they will be installed.

Research and experience shows that reaction to aesthetic of transmission lines vary. Some residents do not notice them or find them objectionable from an aesthetic perspective. To some, the power transmission lines or other utilities may be viewed as part of the infrastructure necessary to sustain everyday lives and activities and are therefore acceptable. To others, new transmission lines may be viewed in a positive way as they are associated with economic development. During the community and household consultations, the aesthetic impact of the project was never mentioned, which indicates that it is not a major concern for the impacted populations.

To reduce the visual impact, visual barriers (trees, shrubs) should be installed, where possible, to reduce the visibility of the line. Finally, during maintenance activities, existing access roads will be used as much as possible to avoid new landscape disturbance.

IMPACT ASSESSMENT

The application of the proposed mitigation measures limits the impact on the landscape during the operation phase to a low intensity. The extent of the impact is local as the impact will be felt along the entire length of the transmission line. The impact duration is long as it will be felt continuously for the lifetime of the transmission line. The importance of the impact on the landscape during the operation phase is thus considered moderate. The probability of the occurrence of this impact is high because the landscape will certainly be disrupted, potentially at scenic areas.
Impact on landscape during the operation phase

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent</td>
<td>Local</td>
</tr>
<tr>
<td>Duration</td>
<td>Local</td>
</tr>
<tr>
<td>Importance</td>
<td>Moderate</td>
</tr>
<tr>
<td>Probability</td>
<td>High</td>
</tr>
</tbody>
</table>

7.3.4.9 SAFETY AND PUBLIC HEALTH

DESIGN MEASURES

No specific design measures were implemented for this component.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

- Risk of increased incidences of STDs and HIV/AIDS.
- Risk of sexual abuse by workers and especially child abuse.
- Risk of abuse by contractors hiring underage workers (child labor).
- Increased pressure on community health services.
- Accidents and physical injuries involving local residents.
- Risk of accidents due to project related traffic.
- Increased stress related to nuisances (noise, dust, air pollution).

SOURCES OF IMPACT

- Site preparation.
- Construction activities.
- Waste and hazardous materials management.
- Transportation and circulation.
- Presence of workers.

MITIGATION MEASURES

- Locate worker camps at a minimum distance of 2 km from towns and villages in order to limit worker – community interactions.
- Maintain construction camps in clean and healthy condition as prescribed by international worker health standards.
- Require all contractors and sub-contractors to comply with relevant WB health and safety requirements and ESCOM’s corporate policy.
- Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.).
- Implement and follow-up on grievance redress mechanisms described in section 8.4 of this study and in chapter 10 of the RPF report.
- Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex). It is the Lead Contractor’s responsibility to take necessary measures so his employees and subcontractors’ employees do not commit acts of sexual abuse and/or underage sex.
Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place;

Immediately report any suspected case of sexual abuse or underage sex to the supervising engineer and ESCOM. Management of such cases should be based around the following principles:

- Immediate suspension of employment for accused worker;
- Trigger grievance redress mechanism processes if not done already and invite an impartial observer to follow the process.

If accusations are found to be justified, the Lead Contractor shall:

- Immediately cease employment of the accused worker and report criminal offences to appropriate authorities for prosecution;
- Compensate the affected person and community according to an agreement to be negotiated using the grievance redress mechanism. These compensations may not take a monetary form, and shall be validated as fair by the impartial observer mentioned above as well as the World Bank Project’s social specialist.

If accusations are found not to be justified, the Lead Contractor shall reinstate the worker in its regular tasks with compensation for lost income during suspension.

The first sexual abuse and/or underage sex complaint or event treated in front of a grievance committee (which may involve one or more workers) where accusations of sexual abuse and/or underage sex are found to be justified shall entice the following consequences for the Lead Contractor, in addition to those listed above:

- Warning from ESCOM about consequences of any additional cases;
- Obligation to submit a remedial plan to be approved by ESCOM and World Bank Project’s Task Team Leader and Social specialist.

The second instance where a sexual abuse and/or underage sex complaint treated in front of a grievance committee finds accusations to be justified shall trigger immediate suspension of all construction work. The World Bank Inspection Panel shall be called in to conduct an inquiry and provide guidance on the way forward.

Strictly prohibit child labour. It is the Lead Contractor’s responsibility to take necessary measures so his employees and subcontractors’ employees are all 18 years of age or more. All child labour cases should be immediately reported to ESCOM by the supervising engineer.

The first child labour case discovered (which may involve one or more child-labourers) shall entice the following consequences for the Lead Contractor:

- Warning from ESCOM about consequences of any additional cases;
- Obligation to submit a remedial plan to be approved by ESCOM and World Bank Project’s Task Team Leader and Social specialist.

Any additional case(s) of child labour shall trigger immediate suspension of all construction work. The World Bank Inspection Panel shall be called in to conduct an inquiry and provide guidance on the way forward.

Education programs on community risks for workers and drivers.

Secure equipment and demarcate any excavation work areas.

Sign and fence construction areas where necessary.

Locate access roads and lay down areas away from residences to the extent possible.

Reduce nuisances especially near settled areas with adequate noise, dust and air pollution reduction measures.

Educational programmes in schools and communities on hazards and safe behaviours near high voltage transmission lines.
CREATE AN EMERGENCY RESPONSE PLAN TO RESPOND TO ACCIDENTAL SPILLS OR ENVIRONMENTAL EMERGENCIES.

NOTIFY LANDOWNERS ALONG THE LINE ROUTE AND THE MAIN PUBLIC TRANSPORTATION ROUTES ABOUT THE CONSTRUCTION SCHEDULE AND ACTIVITIES.

CONFINE CONSTRUCTION PERIOD TO NORMAL WORKING HOURS 7AM TO 7PM.

SCREEN HEALTH OF POTENTIAL EMPLOYEES AS PART OF THE RECRUITMENT PROCESS.

IF BLASTING IS REQUIRED FOR A TOWER’S INSTALLATION, THE LOCAL POPULATION WILL BE ADVISED IN ADVANCE, TO PREVENT NUISANCES.

DETAILED IMPACT DESCRIPTION

The influx of foreign workers may cause significant health and safety impacts on local communities. These impacts are discussed in detail in section 7.4.3.11. Moreover, accidents are likely to happen during construction works. In fact, construction sites pose potential hazards to nearby communities because they may raise curiosity, especially among children. In order to prevent any accidents, the contractor will secure equipment and demarcate any excavations when construction is not in progress, such as with temporary fences. Non-authorized persons will also be kept away from any construction sites. In addition, warning signs will be posted for public safety.

Increased traffic in the villages could be a source of accidents. The contractor will have to develop appropriate strategies to manage transportation of supplies. The contractor will have to ensure its compliance with all applicable laws and regulations, such as maximum load restriction and speed limits. These measures will minimise the risk of accidents due to project related traffic.

With regards to overall quality of life, nuisances (noise, dust, air pollution and accident risks) will create stress especially in usually calm rural areas. Proper mitigation measures and confinement of construction activities during normal working hours will reduce these inconveniences to the local population.

Finally, this project may create an “induced development” effect, i.e. an influx of population in the area that can increase the pressure on public services. This risk is low due to the moving nature of the construction site.

IMPACT ASSESSMENT

With the adoption of proposed mitigation measures, the intensity of the impact on safety and public health is considered medium. The extent of the impact is considered local as only a portion of the population will be affected within the project area. The impact duration is medium as it will be felt continuously during pre-construction and construction phases but not throughout the lifetime of the project. The importance of the impact on safety and public health is thus considered moderate. The probability of the occurrence of this impact is high because some of the potential impacts listed above will manifest themselves.

<table>
<thead>
<tr>
<th>Impact on communities’ health and security during the pre-construction and construction phases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensity:</strong> Medium</td>
</tr>
<tr>
<td><strong>Extent:</strong> Local</td>
</tr>
<tr>
<td><strong>Duration:</strong> Medium</td>
</tr>
<tr>
<td><strong>Importance:</strong> Moderate</td>
</tr>
<tr>
<td><strong>Probability of occurrence:</strong> High</td>
</tr>
</tbody>
</table>

WSP Electricity Supply Corporation of Malawi Limited
Project No. 161-07023-00 Mozambique-Malawi 400 kV Interconnection Project
May 2019

Environmental and Social Impact Assessment Study
OPERATION PHASE

POTENTIAL IMPACTS

- Risk of electrocution caused by equipment breakdowns, illegal connections, steel thefts and all other forms of unsafe contacts.
- Accidents and physical injuries involving workers or local residents.
- Increased stress related to nuisances.
- Risk of accidents due to project related traffic.

SOURCES OF IMPACT

- Waste and hazardous materials management.
- Transportation and circulation.
- Presence of line, substations and access roads.

MITIGATION MEASURES

- Implement ESCOM’s Emergency Measures Plan.
- Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease.
- Maintain a minimum working distance of 2.5 m to the energized components during maintenance work.
- Educate local populations on safe behavior in the presence of a high voltage powerline such as bushfire, slash and burn practices under and close to the powerline.
- Install warning signs and anti-climbing devices on pylons.
- Ensure the development of local and regional emergency plans in case of infrastructure breakdowns, especially near roads or residential areas.
- Monitor and control illegal connections.

DETAILED IMPACT DESCRIPTION

The presence of electric powerlines constitutes potential risks and safety for the population living nearby, where people sometimes try to make illegal connections. Steel thefts on pylons can also pose significant safety risks and cause tower collapses.

However, towers are designed according to the best practices and applicable norms and standards. The land use restrictions within the wayleave will prevent contact with the energized conductors and minimize risks to public safety in the event of a tower collapse.

IMPACT ASSESSMENT

With the adoption of the proposed mitigation measures, the intensity of the impact on safety and public health during the operation phase is considered low. The extent of the impact is local as the impact associated with electrocution is possible all along the transmission line. The impact duration is long as it will be felt continuously for the lifetime of the transmission line. The importance of the impact on safety and public health during the operation phase is thus considered moderate. The probability of the occurrence of this impact is medium because potential impacts listed above might occur without any certainty.
7.3.4.10 WORKERS’ HEALTH & SAFETY

DESIGN MEASURES

No specific design measures were implemented for this component.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL RISKS

→ Absence of adherence to labor standards and well-being of construction workers.
→ Work related injury or health effects.

SOURCES OF IMPACT

→ Site preparation.
→ Construction activities.
→ Waste and hazardous materials management.
→ Transportation and circulation.

PRESENCE OF WORKER MITIGATION MEASURES

→ Develop and implement an Emergency Measures Plan (to be prepared by the contractor as stipulated in Chapter 8).
→ Require all contractors and sub-contractors to comply with relevant WB health and safety requirements and ESCOM's corporate policy.
→ Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers.
→ Require all contractors to adopt and comply with policies and procedures that comply with national legislation and address all aspects of labour standards relevant to the project as specified by WB/IFC health & safety guidelines for electric power transmission projects. Sub-contractors will be contractually required to comply with labour and health and safety legislation. Specific provisions must be included for:
  ▪ Supply drinking water and maintain its quality and, ensure sanitation at the construction sites;
  ▪ Provision of sanitation at camps, substations and tower erection points;
  ▪ Provision of separate accommodation and sanitation facilities in worker camps in order to satisfy both gender needs;
  ▪ Declaration of accidents through an accident reporting mechanism;
  ▪ Handling domestic and specialized waste, as well as dangerous goods;
  ▪ Procedures in case of injuries and accidents;
  ▪ Use of personal protective equipment (e.g.: helmets, fall protection equipment).
→ Secure equipment and demarcate any excavation works areas;
→ Sign and fence construction areas, where necessary; Maintain construction camps in a clean and healthy condition as prescribed by international worker health standards.

→ Implement a long-term training programme throughout the construction phase to ensure adequate training and qualification of all staff employed for the project. Specific training must be provided for:
  - Working around live powerlines;
  - Working at heights.

→ Provide medical facilities throughout the construction phase for the use of workers where required.

→ Ensure reasonable working hours, wages and other benefits.

→ Provide suitable and safe accommodation and sanitation facilities, including available drinking water and improved latrines.

→ Provide and ensure the use of personal protective equipment (PPE).

→ Establish a ‘grievance mechanism’ for workers and local residents.

DETAILED IMPACT DESCRIPTION

The project’s construction work will likely require hiring a large labour force, which leads to several issues in the absence of proper worker welfare. It must be ensured that the labour and working conditions are of an acceptable standard. Access to medical facilities is crucial with respect to accidents and illness either in the workplace or outside. Other working conditions such as reasonable working hours, wages and other benefits are considered good working practices and should be employed at all times. In addition, a large number of labourers may be housed temporarily near the work sites. Housing must be adequately designed with adequate lighting, adequate services (air conditioning, telephone, plumbing, etc.), adequate sanitary and safety facilities such as sufficient fire exits and fire suppression systems (fire detectors, fire alarms, fire extinguishers, fire suppressants); a fire break must be maintained outside the perimeter. Issues such as retrenchment policies must be clearly defined prior to work beginning.

Child labour is a risk during construction work that should be avoided at all costs. Child labour is described as having workers under 18 years of age. Therefore, child labour shall be strictly prohibited and any case thereof should be reported to ESCOM by the individuals responsible for surveillance. The ultimate responsibility for preventing child labour lies with the contractor, the same grievance mechanisms as identified above for sexual assault will be followed for child labor.

Moreover, activities planned during the construction phase could be a source of accidents. The main common causes of accidents in construction are:

→ Falls from working in height;
→ Crush injuries in excavation work;
→ Slips and trips;
→ Being struck by falling objects;
→ Moving heavy loads;
→ Bad working positions, often in confined spaces;
→ Drowning;
→ Encounters with dangerous fauna;
→ Electrocution.

All workers could be exposed to accidents at the worksite. However, implementation of suitable health & safety procedures should help prevent or reduce the probability of accidents from occurring. Also, the application of all aforementioned mitigation measures should help prevent or reduce the risk of accidents on-site.
IMPACT ASSESSMENT

The intensity of the impact on workers would be low, provided that proper management measures are applied as to ensure the workers’ health & safety as well as proper worker welfare. The extent of the impact is local since workers would be affected all along the construction of the transmission line. The impact duration is considered to be medium given that it will last over the entire construction phase. The importance of the impact on workers’ health & safety during the construction phase is thus considered minor. The probability of the occurrence of this impact is medium.

<table>
<thead>
<tr>
<th>Impact on workers’ health &amp; safety during the construction phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity: Low</td>
</tr>
<tr>
<td>Extent: Local</td>
</tr>
<tr>
<td>Duration: Medium</td>
</tr>
<tr>
<td>Importance: Minor</td>
</tr>
<tr>
<td>Probability of occurrence: Medium</td>
</tr>
</tbody>
</table>

OPERATION PHASE

POTENTIAL RISKS

→ Absence of adherence to labor standards and well-being of construction workers.
→ Risk of accidents and physical injuries involving local workers.

SOURCES OF IMPACT

→ Maintenance and repairs.
→ Waste and hazardous materials management.
→ Transportation and circulation.
→ Presence of workers.

MITIGATION MEASURES

→ Implement ESCOM’s Emergency Measures Plan
→ Maintain a minimum working distance of 2.5 m to the energized components during maintenance work.

DETAILED IMPACT DESCRIPTION

All workers could be exposed to accidents at the worksite. However, implementation of suitable health & safety procedures and mitigation measures should help prevent or reduce the probability of accidents from occurring. The implementation of the Emergency Measures Plan will reduce environmental risks and hazards associated to the manipulation of hazardous materials. The activities accomplished during maintenance and repair activities could be a source of accidents, the most common being:

→ Falls from working in height;
→ Slips and trips;
→ Being struck by falling objects;
→ Bad working positions, often in confined spaces;
→ Encounters with dangerous fauna;
→ Electrocution.
IMPACT ASSESSMENT

The intensity of the impact on workers will be low, provided that proper management measures are applied as to ensure the workers’ health & safety as well as proper worker welfare. The extent of the impact is local since workers could be affected during maintenance work all along the transmission line.

The impact duration is considered medium given that it will occur during maintenance operations. The importance of the impact on workers’ health & safety during the operation phase is thus considered minor. The probability of the occurrence of this impact is low.

<table>
<thead>
<tr>
<th>Impact on workers’ health &amp; safety during the operation phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensity:</strong> Low</td>
</tr>
<tr>
<td><strong>Extent:</strong> Local</td>
</tr>
<tr>
<td><strong>Duration:</strong> Medium</td>
</tr>
<tr>
<td><strong>Importance:</strong> Minor</td>
</tr>
<tr>
<td><strong>Probability of occurrence:</strong> Low</td>
</tr>
</tbody>
</table>

7.3.4.11 LABOUR INFLUX AND PRESENCE OF FOREIGN WORKERS

DESIGN MEASURES

No specific design measures.

PRE-CONSTRUCTION AND CONSTRUCTION PHASES

POTENTIAL IMPACTS

- Risk of sexual abuse by workers, especially child abuse.
- Tension over the awarding of jobs and contracts.
- Tension with workers from outside.
- Risk of increased incidences of STDs and HIV/AIDS.
- Risk of sexual abuse by workers and especially child abuse.
- Risk of abuse by contractors hiring underage workers (child labor).
- Increased pressure on community health services.

SOURCES OF IMPACT

- Presence of workers.

MITIGATION MEASURES

- Favour the employment of local workers to reduce the risk of sexual harassment and violence caused by foreigners and avoid tensions with local communities.
- Locate worker camps at a minimum distance of 2 km from towns and villages in order to limit worker – community interactions.
- Maintain construction camps in clean and healthy condition as prescribed by international worker health standards.
- Require all contractors and sub-contractors to comply with relevant WB health and safety requirements and ESCOM’s corporate policy.
- Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.).
Implement and follow-up on grievance redress mechanisms.

Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex). It is the Lead Contractor’s responsibility to take necessary measures so his employees and subcontractors’ employees do not commit acts of sexual abuse and/or underage sex;

Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place.

Immediately report any suspected case of sexual abuse or underage sex to the supervising engineer and ESCOM. Management of such cases should be based around the following principles:
- Immediate suspension of employment for accused worker;
- Trigger grievance redress mechanism processes if not already done and invite an impartial observer to follow the process.

If accusations are found to be justified, the Lead Contractor shall:
- Immediately cease employment of the accused worker and report criminal offences to appropriate authorities for prosecution;
- Compensate the affected person and community according to an agreement to be negotiated using a grievance redress mechanism. These compensations may not take a monetary form, and shall be validated as fair by the impartial observer mentioned above as well as the World Bank Project’s social specialist.

If accusations are found not to be justified, the Lead Contractor shall reinstate the worker in its regular tasks with compensation for lost income during suspension.

The first sexual abuse and/or underage sex complaint or event treated in front of a grievance committee (which may involve one or more workers) where accusations of sexual abuse and/or underage sex are found to be justified shall entice the following consequences for the Lead Contractor, in addition to those listed above:
- Warning from ESCOM about consequences of any additional cases;
- Obligation to submit a remedial plan to be approved by ESCOM and World Bank Social specialist.

The second instance where a sexual abuse and/or underage sex complaint treated in front of a grievance committee finds accusations to be justified shall trigger immediate suspension of all construction work. The World Bank Inspection Panel shall be called in to conduct an inquiry and provide guidance on the way forward.

Strictly prohibit child labour. It is the Lead Contractor’s responsibility to take necessary measures so his employees and subcontractors’ employees are all 18 years of age or more. All child labour cases should be immediately reported to ESCOM by the supervising engineer.

The first child labour case discovered (which may involve one or more child-labourers) shall entice the following consequences for the Lead Contractor:
- Warning from ESCOM about consequences of any additional cases;
- Obligation to submit a remedial plan to be approved by ESCOM and World Bank Project’s Task Team Leader and Social specialist.

Any additional case(s) of child labour shall trigger immediate suspension of all construction work. The World Bank Inspection Panel shall be called in to conduct an inquiry and provide guidance on the way forward.

DETAILED IMPACT DESCRIPTION

The influx of foreign workers may cause significant health and safety impacts on local communities. First and foremost, interactions between workers and female community members increase the risk of communicable disease transmissions such as HIV/AIDS and other STDs. To prevent this impact,
worker camps should be located away from towns and villages. The contractor responsible for the construction work will also undertake a prevention program for STDs and HIV/AIDS among his workers and the local communities.

Close interactions between workers and communities may also result in cases where some workers commit acts of sexual abuse and/or have sexual intercourse with underage community members. Such serious offence should be strictly forbidden and, in case of violation, determined actions should be automatic. The procedure to be applied in such an event, as provided in the mitigation actions listed above, is the immediate suspension of involved workers. The contractor will need to collaborate with communities through the grievance resolution mechanism to determine whether accusations are justified, dismiss the workers at fault and report them to public authorities if accusations are indeed justified. They will also be responsible for victim and community compensations through non-monetary mechanisms to be determined by common agreement.

It should be noted that the ultimate responsibility for women and children’s safety from sexual abuse lies with the contractor. The first sexual abuse / under age sex event (where accusations are found justified) shall result in a warning and an obligation for the contractor to prepare a remedial plan that will need to be approved by ESCOM. Any further event of sexual abuse / under age sex shall result in immediate suspension of all construction work and calling in the World Bank Inspection Panel to inquire and provide guidance.

Child labour is another risk during construction work that should be avoided at all costs. For purposes of the present ESMP, child labour is described as having workers under 18 years of age. Therefore, child labour shall be strictly prohibited and any case thereof should be reported to ESCOM by the supervising engineer.

Ultimate responsibility for preventing child labour lies with the Lead Contractor. The first child labour case that is discovered shall result in a warning and an obligation for the Lead Contractor to prepare a remedial plan that will need to be approved by ESCOM and the WB project’s TTL and Social specialist. Any additional cases shall result in immediate suspension of all construction work and calling in the World Bank Inspection Panel to inquire and provide guidance on the way forward.

Furthermore, outsiders going to remote locations for the preparation of work may disturb some communities and disrupt their traditional habits and schedules. The construction phase will mainly impact communities and social cohesion due to the presence of workers, sometimes from outside of the region, and dispersed throughout the different sections of the line. 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 tension, conflicts with local and traditional authorities, as well as draw cleavages between different groups.

Finally, during project construction, the population of the project area may increase temporarily, increasing the pressure on local health systems.

Impacts on livelihoods of vulnerable groups (such as the elderly people, the disabled, the landless and women-headed households), may be more severe, since these groups usually have less resources and have trouble using available services due to their condition.

**IMPACT ASSESSMENT**

With the adoption of proposed mitigation measures, the intensity of the impact of labour influx and presence of foreign workers is considered medium. The extent of the impact is considered local as only a portion of the population will be affected within the project area. The impact duration is medium as it will be felt continuously during pre-construction and construction phases but not throughout the lifetime of the project. The importance of the impact on safety and public health is thus considered moderate. The probability of the occurrence of this impact is high because labour needs are undeniable and some of the potential impacts listed above will likely manifest themselves.
Impact on communities’ health and security during the pre-construction and construction phases

<table>
<thead>
<tr>
<th>Intensity: Medium</th>
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</thead>
<tbody>
<tr>
<td>Extent: Local</td>
<td></td>
</tr>
<tr>
<td>Duration: Medium</td>
<td></td>
</tr>
<tr>
<td>Importance: Moderate</td>
<td></td>
</tr>
<tr>
<td>Probability of occurrence: High</td>
<td></td>
</tr>
</tbody>
</table>

OPERATION PHASE

POTENTIAL IMPACTS

→ Risk of sexual abuse by workers, especially child abuse.

→ Tension between local population and outside workers.

→ Tension over the awarding of jobs and contracts.

→ Tension with workers from outside.

→ Risk of increased incidences of STDs and HIV/AIDS.

→ Risk of sexual abuse by workers and especially child abuse.

→ Risk of abuse by contractors hiring underage workers (child labor).

→ Increased pressure on community health services.

SOURCES OF IMPACT

→ Presence of workers.

MITIGATION MEASURES

→ Restrict project land use during the operation phase to the line’s ROW to avoid project developer conflict with local communities.

DETAILED IMPACT DESCRIPTION

As in the construction phase, workers will travel along the corridor to realize maintenance operations. This could result in cases where some workers commit sexual abuse or have sexual intercourse with underage community members.

Although the impacts on communities and social cohesion are likely to be mostly felt during the construction phase, they could also be felt, to a lesser degree, during the operation phase due to the presence of workers for maintenance activities.

IMPACT ASSESSMENT

With the adoption of the proposed mitigation measures, the intensity of the impact the impact of labour influx and presence of foreign workers during the operation phase is considered low. Labour needs will be much lower then during the construction phase. The extent of the impact is local as the impact associated presence of workers is possible all along the transmission line. The impact duration is long as it will be felt continuously for the lifetime of the transmission line. The importance of the impact during the operation phase is thus considered moderate. The probability of the occurrence of this impact is medium because potential impacts listed above might occur without any certainty.

Impact on community and health security during the operation phase

<table>
<thead>
<tr>
<th>Intensity: Low</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent: Local</td>
<td></td>
</tr>
<tr>
<td>Duration: Long</td>
<td></td>
</tr>
<tr>
<td>Importance: Moderate</td>
<td></td>
</tr>
<tr>
<td>Probability of occurrence: Medium</td>
<td></td>
</tr>
</tbody>
</table>
### 7.3.5 SUMMARY OF IMPACTS

The following tables summarize the project’s residual impacts by phase.

**Table 7-6  Summary of Residual Impacts in Pre-Construction and Construction Phases**

<table>
<thead>
<tr>
<th>Component</th>
<th>Intensity</th>
<th>Extent</th>
<th>Duration</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Water resources</td>
<td>Low</td>
<td>Limited</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Air quality</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Noise, vibrations and EMFs</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Terrestrial flora</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Terrestrial fauna</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Avifauna</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Aquatic habitats and associated fauna</td>
<td>Low</td>
<td>Limited</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Employment and economic development</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Land use</td>
<td>Medium</td>
<td>Limited</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Built environment</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Gender aspects</td>
<td>Medium</td>
<td>Local</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Communities and social cohesion</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Cultural and archaeological heritage</td>
<td>Low</td>
<td>Limited</td>
<td>Long</td>
<td>Minor</td>
</tr>
<tr>
<td>Landscape</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Safety and public health</td>
<td>Medium</td>
<td>Local</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Worker’s health and safety</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>Medium</td>
<td>Local</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

3 The evaluation is undertaken after the application of mitigation measures and therefore represents the project’s residual impact on the environmental or social component.
### Table 7-7  Summary of Residual Impacts in Operation Phase

<table>
<thead>
<tr>
<th>Component</th>
<th>Intensity</th>
<th>Extent</th>
<th>Duration</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Water resources</td>
<td>Low</td>
<td>Limited</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Air quality</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Noise, vibrations and EMFs</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Terrestrial flora</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Terrestrial fauna</td>
<td>Low</td>
<td>Limited</td>
<td>Long</td>
<td>Minor</td>
</tr>
<tr>
<td>Avifauna</td>
<td>Medium</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Aquatic habitats and associated fauna</td>
<td>Low</td>
<td>Limited</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Employment and economic development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Land use</td>
<td>Medium</td>
<td>Limited</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Built environment</td>
<td>Medium</td>
<td>Limited</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Gender aspects</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Communities and social cohesion</td>
<td>Low</td>
<td>Local</td>
<td>Short</td>
<td>Minor</td>
</tr>
<tr>
<td>Cultural and archaeological heritage</td>
<td>-</td>
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</tr>
<tr>
<td>Landscape</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
</tr>
<tr>
<td>Safety and public health</td>
<td>Low</td>
<td>Local</td>
<td>Long</td>
<td>Moderate</td>
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<tr>
<td>Worker’s health and safety</td>
<td>Low</td>
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<td>Medium</td>
<td>Minor</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

#### 7.4 CUMULATIVE IMPACTS

#### 7.4.1 POTENTIAL CUMULATIVE IMPACTS ON VALUED ENVIRONMENTAL AND SOCIAL COMPONENTS

Cumulative impacts are the result of the combination, or even of the synergic effect, of various past, present or future projects or activities. The Project's cumulative impact assessment will help consider its possible interactions with other activities and projects, which might affect the valued environmental and social components located inside a determined study area. As the cumulative and synergetic effects of the Mozambique-Malawi Interconnection Project with other projects and activities are under study, the assessment mainly focused on valued environmental and social components located inside the project’s indirect area of influence corresponding to the territory of the affected Districts.

Inside this area, past, present or future projects or activities that may lead to cumulative impacts with the Project are the following:

- Nacala railway corridor crossing the Malawi territory from the western border with Mozambique (Mwanza area) to the eastern border with Mozambique (Nayuchi area along the northern shore of the Chilwa Lake);
- Phombeya substation 132/400 kV;
- Phombeya to Nkhoma 400 kV transmission powerline;

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4 The evaluation is undertaken after the application of mitigation measures and therefore represents the project’s residual impact on the environmental or social component.
Nacala railway;
M6 and M1 National roads and associated road systems;
Slash and burn agricultural practices that occur throughout the concerned districts but mostly in the Moatize District;
Urban and village sprawl;
planned Kammwamba coal fired plant (electricity generation).

7.4.2 EVALUATION OF CUMULATIVE EFFECTS ON VESC

Evaluation of cumulative effects takes into consideration the potential impacts that could be generated by the 400 kV Matambo-Phombeya Transmission line and adds those generated by past, existing and future projects. The main cumulative impacts resulting from those interactions on the VESCs of the physical, biological and human environments are presented in the sections below.

7.4.2.1 PHYSICAL ENVIRONMENT

Transportation activities and machinery will generate GHG emissions and various air emissions that can reduce air quality. Cumulative impacts are anticipated mainly with the road systems as well as with the slash and burn practices, particularly during dryer periods. These impacts are short term during the project’s construction phase. In addition, continuous land conversion could lead to changes in air quality through wind erosion and also to carbon emissions that were once buried in the soil or captured by natural vegetation.

Construction activities and transport on roads and railways generate some noise; this impact will be amplified if sources of noise are simultaneous in specific areas. Intensity of the impact will vary according to noise sources.

Hazardous product spills on ground or in surface water, atmospheric emissions and industrial activities might modify soils and water’s physico-chemical properties and eventually contaminate the environment. These risks are even greater in situations of poor management of hazardous materials.

Changes in land use, excavation and backfilling work, and the construction of different infrastructures will alter the soil profiles and could even affect drainage patterns. These impacts will be amplified where construction is concentrated.

Poor management of erosive actions and of atmospheric emissions could modify surface water and soil’s physico-chemical properties.

7.4.2.2 BIOLOGICAL ENVIRONMENT

The various developments and urban or village sprawl will reduce the supericies of natural habitats, in particular along new transportation axis. Regarding slash and burn practices, most of the areas crossed by the Transmission line are either in very low density populated areas as the land offers little agricultural value or in areas that have been cultivated for some time. The resulting residual effect will thus remain moderate. However, the associated losses will be detrimental to associated species.

The eventual transformation of the physico-chemical parameters (air, soil, water) could lead to current natural environment degradation. Such changes reflect on the composition of flora and fauna populations with potential proliferation of most resistant species.

The different infrastructures inside the study area could lead to the modification of the runoff water patterns resulting in a loss or modification of the various types of riparian, wetland habitats, as well as their associated species communities.
7.4.2.3 SOCIAL ENVIRONMENT

- The implementation of infrastructures inside the territory will transform the current land use. Development activities and the demographic growth contribute to the densification of human presence and to the apparition of new land uses within the study area.

- Studied projects affect the electrification and improvement of means of transport, both of which having the potential to promote economic development. Rapid economic development could accelerate the change in the lifestyles of the communities which are beneficiaries. There are strong inequalities that can be accentuated in the absence of measures to distribute wealth and improve social mobility. These persistent inequalities can lead to high vulnerability to poverty for part of the population and conflicts.

- The supply of electricity to urban centers and the establishment of the transport networks increase the interest of urban centers, which are better served, to the detriment of rural centers. This phenomenon increases the urban density and conflicts of land-use, especially in peri-urban areas, where the urban area could replace areas devoted to agricultural activities.
8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This chapter presents the project’s Environmental and Social Management Plan (ESMP). The ESMP aims at defining and structuring the measures to be implemented in order to mitigate or optimize the project’s potential impacts identified in Chapter 7. For each measure, responsibilities and costs are presented.

On a larger scale, the ESMP establishes responsibilities for the implementation and oversight of the proposed environmental and social management measures. Responsibilities are to be shared among several stakeholders, including relevant ministerial authorities, contractors and coordinating units.

The ESMP also provides guidelines for a comprehensive monitoring plan which shall ensure, on an ongoing basis, the adequate implementation of the proposed environmental and social management measures. This Monitoring Plan will be based on a set of performance indicators and a clear formulation of expected results to be achieved or maintained. Thus, the Plan will facilitate ongoing adjustments to initial mitigation/optimization measures, within an adaptive management approach.

Finally, the ESMP provides orientations on training and capacity building requirements for its successful implementation.

8.1 ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

8.1.1 PRE-CONSTRUCTION

The main source of impact at the pre-construction phase is the resettlement of the PAPs. The execution of this resettlement is outlined in a separate RPF report. This report documents any concerns by the PAPs as well as all the information provided during the project’s consultations, the socio-economic survey results and how the proposed resettlement is to be realized. The RPF’s objectives are listed below:

→ At the design stage, minimize involuntary resettlement through the optimization of the line route in collaboration with the environmental and technical specialists and relevant stakeholders;
→ During the preparation of the RPF, address social issues related to land acquisition and livelihood restoration, associated to the construction activities, as well as optimize the compensation measures to all stakeholders, through their identification and consultations;
→ During the preparation of the RPF, prepare cost estimates for resettlement/compensation by determining the affected assets and socio-economic status of the PAPs, identifying vulnerable PAPs and households, and assessing compensation and mitigation measures;
→ During the preparation of the RPF, assess opportunities for affected communities and PAPs to have them benefit from the project’s positive impacts;
→ Provide baseline information so post-project phase comparisons can be made to assess whether the PAP’s socio-economic situation, as a result of the project, has positively changed or has maintained a status quo;
→ Integrate the best practices for resettlement, during the project’s implementation, in order to comply with guidelines of funding agencies, therefore facilitating international funding;
→ Outline the institutional arrangements necessary for the RPF’s execution such as procedures and responsibilities, grievance mechanisms, monitoring and evaluation.

Land acquisition, resettlement and the displacement of economic activities are the main sources of impact at the pre-construction phase. The implementation of the RPF is the mitigation measure for the pre-construction phase. As mentioned previously, the RPF is presented in a distinct report where related mitigation measures will be found.

At this stage, the Project is not required to prepare a Resettlement Action Plan. However, a Resettlement Policy Framework (RPF) must be prepared, to be disclosed as a separate and stand-alone document from the ESIA. The RPF establishes the resettlement and compensation principles, organizational arrangements and design criteria to be applied to meet the needs of the people who may be affected by the project. The RPF is prepared to the standards of the Government's own policy on resettlement and compensation and to those of the World Bank, OP 4.12. Prior to initiating construction of the new 400 kV Transmission line a detailed Resettlement Action Plan will need to be prepared in compliance with this policy framework and submitted to the Bank for approval before any land acquisition, compensation, resettlement, or any other impact on livelihood occurs.

8.1.2 CONSTRUCTION

Table 8-1 shows the mitigation measures that will allow the avoidance, mitigation, compensation or enhancement of potential impacts that were identified in the previous chapter and are the basis of the ESMP. When selected, the contractor will compile these best practices into a work plan. This work plan will locate all project specific infrastructure (such as workers’ camp, equipment yard, workshop, borrow pits, etc.) and indicate how and when the mitigation measures outlined hereinafter will be implemented. This will ensure that environmental and social impact mitigation measures will be fully adapted to detailed construction activities.

There are, however, a few major measures that will necessitate their own plans, to be developed by the Contractor. They are:

- Waste Management Plan;
- Revegetation Plan;
- Erosion and Sediment Control Plan
- Cultural and Archaeological Heritage Management Plan;
- Emergency Response Plan;
- Communication Plan;
- Worker Health & Safety Management Plan;
- Traffic Management Plan;
- UXO assessment protocol and if needed a management program to remove all UXO

The following sections outline the main components of such plans as well as some of the best practices that will need to be included into these documents.
<table>
<thead>
<tr>
<th>Management measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and implement the Waste Management Plan.</td>
<td>Air quality, Soils, Hydrography and water resources</td>
<td>Temporary air quality deterioration, Changes in soil chemical properties and risk of soil contamination, Surface water contamination, Groundwater contamination</td>
<td>Site preparation, Construction activities, Waste and hazardous materials management</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Develop and implement the Cultural and Archaeological Heritage Management Plan.</td>
<td>Cultural and archaeological heritage</td>
<td>Potential disturbance or destruction of archaeological sites and/or objects, Destruction or potential disturbance of burials and/or sacred sites.</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Develop and implement an Emergency Response Plan.</td>
<td>Soils, Hydrography and water resources, Aquatic habitats and associated fauna, Safety and public health, Workers' health and safety</td>
<td>Changes in soil chemical properties and risk of soil contamination, Surface water contamination, Groundwater contamination, Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances, Risk of accidents and physical injuries involving local workers and residents</td>
<td>Site preparation; Construction activities; Waste and hazardous materials management</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Restrict transportation to the identified access by clearly marking out the limit of the ROW and access roads.</td>
<td>Soils, Land use, Employment and economic development</td>
<td>Soil erosion in erosion-prone areas, Soil compaction in work areas, Restriction to land uses within the line’s ROW, Temporary disruption of socioeconomic activities</td>
<td>Construction activities, Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Restrict construction activities, materials and manpower movements to existing roads/tracks and ROW limits.</td>
<td>Soils, Land use, Terrestrial flora</td>
<td>Soil erosion in erosion-prone areas, Soil compaction in work areas, Restriction to land uses within the line’s ROW, Permanent loss of natural habitat area and of its associated flora, Terrestrial habitat fragmentation and degradation over small areas at the project site; Modification of species composition in flora and fauna communities present in the project area; Changes in protected and IUCN-designated threatened species populations, Temporary disruption of socioeconomic activities</td>
<td>Construction activities, Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Minimize the construction of new access roads and camp sites. Promote the use of existing access roads for machinery and vehicle movements, increasing their width as necessary.</td>
<td>Flora and fauna habitats</td>
<td>Terrestrial habitat fragmentation and degradation over small areas at the project site</td>
<td>Site preparation, Construction activities, Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalyzers and clean (power washed), free of leaks, excess oil and grease.</td>
<td>Air quality, Noise and vibrations, Hydrography and water resources, Safety and public health</td>
<td>Temporary air quality deterioration, Increase in noise and vibration levels, Surface water contamination, Groundwater contamination, Increased stress related to nuisances</td>
<td>Site preparation, Construction activities, Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Prohibit idling of vehicles on site or near sensitive receptors (see Appendix 5). Generators and machinery will be shut down when not in use; Stockpiles of fine materials should be covered during period of high winds. Cover excavated materials with erosion control blankets and loads of brittle material during transport. Use water for dust suppression on stockpiles, exposed soils and roads if dust generation is visible. Prohibit the burning of wastes. Restrict speed on loose surface roads to 20 km/h during dry or dusty conditions and install signposts and road humps where relevant.</td>
<td>Air quality, Noise and vibrations, Safety and public health</td>
<td>Temporary air quality deterioration, Increase in noise and vibration levels, Increased stress related to nuisances</td>
<td>Site preparation, Construction activities, Transportation and circulation, Worksites’ restoration</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
</tbody>
</table>
Table 8-1  Management Measures to be Implemented during the Construction Phase (cont’d)

<table>
<thead>
<tr>
<th>Management measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement a worker training program on noise reductions near sensitive receptors</td>
<td></td>
<td>Increase in noise and vibration levels; Increased stress related to nuisances</td>
<td>Site preparation; Construction activities; Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
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<tr>
<td>(see Appendix 5);</td>
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<tr>
<td>Restrict noise and vibration generating activities near residential or institutional</td>
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<tr>
<td>sensitive receptors (Appendix 5) to the period considered as daytime (between 8 am</td>
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<tr>
<td>and 5 pm) by national and WHO noise standards.</td>
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<tr>
<td>Impact of noise and vibration generation, above a threshold</td>
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<tr>
<td>on the following locations:</td>
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</tr>
<tr>
<td>Noise and vibrations</td>
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</tr>
<tr>
<td>Safety and public health</td>
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</tr>
<tr>
<td>Operate machinery on land in a way that minimizes disturbance to the banks of</td>
<td>Hydrography and water resources</td>
<td>Soil erosion in erosion-prone areas; Changes in soil chemical properties and risk of soil contamination</td>
<td>Site preparation; Construction activities; Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>watercourses.</td>
<td></td>
<td>Groundwater contamination</td>
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<tr>
<td>Prepare and implement erosion and sediment control plans, particularly in areas</td>
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<tr>
<td>identified as having high erosion potential such as near Thambani Forest Reserve.</td>
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<tr>
<td>Avoid construction activities in areas where soils are highly saturated.</td>
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<tr>
<td>Construct a designated, signposted, concrete wash down bay that is fully contained</td>
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<td>for all excess concrete and concrete wash down (e.g. plastic lined).</td>
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<tr>
<td>Regularly maintain the concrete washout bay, by treating any water prior to release</td>
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<tr>
<td>to natural systems.</td>
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<tr>
<td>Soils Hydrography and water resources</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>De-compact soils following construction with appropriate</td>
<td>Soils</td>
<td>Soil compaction in work areas; Loss of organic layer in areas where excavation and backfilling activities are held; Changes in soil chemical properties and risk of soil contamination</td>
<td>Site preparation; Construction activities; Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>equipment.</td>
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<tr>
<td>Segregate the organic layer of soils and store separately from the non-organic</td>
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<td>layers. Re-use the organic soils for revegetation work or offer them to local</td>
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<td>farmers to improve their agricultural lots.</td>
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<td>When feasible, temporarily store excavated non-organic soils in order to use it as</td>
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<td>backfill when needed.</td>
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<tr>
<td>Regulate the application of soil amendments</td>
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<tr>
<td>Revegetate areas of bare and disturbed soils as soon as possible with site</td>
<td>Soils</td>
<td>Soil erosion in erosion-prone areas; Impairment of flora communities; Temporary degradation of the landscape at worksite</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
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<tr>
<td>adoptative native species.</td>
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<tr>
<td>When stream crossings are unavoidable, construct suitable culvert that allows for</td>
<td>Hydrography and water resources</td>
<td>Changes in hydrology; Impairment of hydrological dynamics leading to disturbances and alteration: Surface water contamination; Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
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<tr>
<td>a sufficient water supply to maintain a viable fish habitat.</td>
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<tr>
<td>Always maintain hydrologic connectivity</td>
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<td>Various crossings are unavoidable, construct a suitable culvert to ensure</td>
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<tr>
<td>sufficient water supply to maintain a viable fish habitat</td>
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<tr>
<td>Properly delineate marshlands and floodplain areas, while working within</td>
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<td>marshlands, restrict all equipment movements to access roads;</td>
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</tr>
<tr>
<td>Limit activities in watercourses or marshlands to the extent possible but if</td>
<td></td>
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</tr>
<tr>
<td>necessary, set and implement strict procedures for in-water work, if required;</td>
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</tr>
<tr>
<td>Avoid material piling, equipment and vehicle movements in rivers, floodplains, and</td>
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<tr>
<td>wetland areas. If unavoidable, reduce access to a minimum.</td>
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<td></td>
</tr>
<tr>
<td>Set and implement strict procedures for in-water works, if</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>required.</td>
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</tr>
</tbody>
</table>
### Table 8-1 Management Measures to be Implemented during the Construction Phase (cont’d)

<table>
<thead>
<tr>
<th>Management measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct activities during the dry season to minimize disturbance of sensitive shoreline and wetland areas. Install silt barriers (e.g., fencing) when working in steep riparian areas and along wetlands to minimize potential sediment transport to aquatic habitats.</td>
<td>Hydrography and water resources Aquatic habitats and associated fauna</td>
<td>Changes in hydrology Surface water contamination Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Establish a Revegetation Plan for the loss of natural habitats. Promote the use of native species and include planting of Pterocarpus angolensis, Dalbergia melanoxylon and Afzelia quanzensis and any other species of conservation concern that could be found inside the project footprint. Collaborate with communities to identify native species with higher use-value and integrate them also to Rev egetation Plan. If possible, collect seeds from Pterocarpus angolensis, Dalbergia melanoxylon and Afzelia quanzensis mature specimens and raise them on designated nurseries for re-planting;</td>
<td>Terrestrial flora Terrestrial fauna Avifauna</td>
<td>Permanent loss of natural habitat area and of its associated flora Terrestrial habitat fragmentation and degradation over small areas at the project site Modification of species composition in flora and fauna communities present in the project area.</td>
<td>Site preparation Construction activities</td>
<td>ESCOM</td>
<td>$15,000</td>
</tr>
<tr>
<td>Clearly mark the extent of the ROW with sticks at intervals of 50 m or less. Identify and mark the vegetation to be preserved along sections of the ROW.</td>
<td>Terrestrial flora Terrestrial fauna Avifauna</td>
<td>Permanent loss of natural habitat area and of its associated flora Changes in protected and IUCN-designated threatened species populations.</td>
<td>Site preparation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Undertake ROW vegetation cutting with the supervision of a botanist in order to identify and relocate if possible species of conservation concern as well as protect vegetation that does not represent a risk for the powerline. Any species of conservation concern that need to be cut will be located and its habitat will be fully described. This information will be integrated in the planning of a reforestation program. If possible, collect seeds from species of conservation concern for propagation.</td>
<td>Terrestrial flora Terrestrial fauna Avifauna</td>
<td>Terrestrial habitat fragmentation and degradation over small areas at the project site Changes in protected and IUCN-designated threatened species populations.</td>
<td>Site preparation</td>
<td>Contractor</td>
<td>$10,000</td>
</tr>
<tr>
<td>Undertake a selective cutting of the vegetation in order to keep low scrubby and herbaceous species that do not represent a risk for the powerline.</td>
<td>Terrestrial flora Terrestrial fauna Avifauna</td>
<td>Terrestrial habitat fragmentation and degradation over small areas at the project site. Changes in protected and IUCN-designated threatened species populations.</td>
<td>Site preparation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>If a Yellow-breasted Apalis nest is identified, clearly describe the habitats and support for the nest.</td>
<td>Avifauna</td>
<td>Potential habitat loss or degradation for the threatened Yellow-breasted Apalis.</td>
<td>Site preparation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Conserve all the vegetation (trees, shrubs, herbaceous plants, crops) present at the edge of watercourses and on steep slopes.</td>
<td>Terrestrial flora Terrestrial fauna Aquatic habitats and associated fauna</td>
<td>Terrestrial habitat fragmentation and degradation over small areas at the project site. Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Inspect and clean construction equipment properly after working in areas known to be infested with flora invasive alien species. Prohibit workers from bringing in to the project areas any alien invasive species either for fuelwood or ornamental purposes.</td>
<td>Terrestrial flora Terrestrial fauna Terrestrial and aquatic habitats</td>
<td>Invasive species introduction and risk of spread. Modification of species composition in fauna communities present in the project area.</td>
<td>Construction activities Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Burn residues of flora invasive alien species to reduce the risk of propagation to other areas.</td>
<td>Terrestrial flora Terrestrial fauna Terrestrial and aquatic habitats</td>
<td>Invasive species introduction and risk of spread. Modification of species composition in fauna communities present in the project area.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Make chopped woody resources and residues available to local population in order to reduce additional pressures on natural resources.</td>
<td>Land use Terrestrial flora</td>
<td>Loss of land, crops, tree and pastoral zones in the ROW Loss of ecosystem services increased pressure on natural resources resources in some areas. Loss of individuals from species of use-value</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Rehabilitate and revegetate temporary access roads and work areas as soon as possible using vegetation species that will be useful to local fauna.</td>
<td>Terrestrial flora Terrestrial fauna Landscape</td>
<td>Permanent loss of natural habitat area and of its associated flora Temporary degradation of the landscape at worksite.</td>
<td>Site preparation Construction activities Worksites’ restoration</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
</tbody>
</table>
Table 8-1  Management Measures to be Implemented during the Construction Phase (cont’d)

<table>
<thead>
<tr>
<th>Management measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote the selection of areas with less of a need for tree cutting for construction of temporary worker’s campsites and storage facilities.</td>
<td>Terrestrial flora Terrestrial fauna Landscape</td>
<td>Terrestrial habitat fragmentation and degradation over small areas at the project site Modification of species composition in flora and fauna communities present in the project area Temporary degradation of the landscape at worksite.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Implement a biodiversity protection awareness program with workers. Prohibit workers from owning firearms and other hunting gear, and raise awareness about the prohibition to engage in any kind of poaching.</td>
<td>Terrestrial fauna</td>
<td>Terrestrial habitat fragmentation and degradation over small areas at the project site Modification of species composition in flora and fauna communities present in the project area Changes in protected and IUCN-designated threatened species populations.</td>
<td>Presence of workers Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Inform the Contractor’s E&amp;S specialist when endangered fauna species are observed in or close to project sites.</td>
<td>Avifauna</td>
<td>Modification and degradation of bird habitat Disturbance and modification of local communities</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in revegetation plan</td>
</tr>
<tr>
<td>Compensate any loss of breeding/nesting sites by the creation of suitable habitats elsewhere, notably from enhancement of degraded habitats.</td>
<td>Avifauna</td>
<td>Modification and degradation of bird habitat Disturbance and modification of local communities</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>$15,000</td>
</tr>
<tr>
<td>Place bird diverters on the top wire to make the line more visible to birds, near ecologically sensitive areas such as the Mwanza Wamkurumadzi Rivers (2 km on each side).</td>
<td>Avifauna Infrastructure</td>
<td>Modification and degradation of bird habitat Disturbance and modification of local communities</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Avoid clearing activities during the rainy season, specifically in between October and March, to reduce impact on nesting of the nationally Endangered Yellow-breasted Apalis (Apalis flavida).</td>
<td>Avifauna</td>
<td>Modification and degradation of bird habitat Disturbance and modification of local communities</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Avoid construction of temporary access roads and workers campsites along river banks or in areas where soils are saturated, to the extent possible.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Construct clear span bridges or open-bottom culverts to maintain fish access when road crossings of watercourse are unavoidable. Install diversion structures (canals, dikes, coffers) that neither obstruct fish movements nor diminish habitat width to less than 2/3 of the current water bodies, including rivers, wetlands, etc.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Maintain vegetated buffer zones within and around wetlands and along both sides of watercourse crossings. Restore as soon as possible any disturbed areas in the riparian buffer zone.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Do not allow any temporary access roads and workers campsites to be built during the construction phase in wetland areas.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Avoid equipment and vehicle movements in rivers, floodplains and wetland areas. If unavoidable, reduce access to a minimum length in wetlands and floodplains and select the most optimized site for the access considering human uses and areas of higher ecological integrity.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Do not operate heavy machinery in wetland areas with standing water. Use wetland mat or bridge for vehicle and machinery movement inside permanent wetland to avoid the need for building a road. After termination of construction work, restore natural river bed conditions (minor bed, natural obstacles, etc.). Avoid any water-works and movement of vehicles in tributaries during rainy season to avoid impacts on threatened fish species.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Validate with local leaders, temporary areas to be used during construction activities.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Local degradation of aquatic and semi-aquatic habitats and associated fauna and flora disturbances.</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Prepare and implement a Traffic Management Plan. Use a Traffic Management Plan for guidance in traffic management and safety.</td>
<td>Infrastructure Safety and public health Workers’ health and safety</td>
<td>Loss of land, crops, tree and pastoral zones in the ROW</td>
<td>Resettlement</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Travel to and from the construction sites should be done during low traffic periods.</td>
<td>Infrastructure</td>
<td>Increase in traffic and circulation perturbation</td>
<td>Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Rehabilitate any damaged infrastructure soon after the construction.</td>
<td>Infrastructure</td>
<td>Damage to existing infrastructure</td>
<td>Construction activities Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
</tbody>
</table>

Project No.: 161-07023-00 Mozambique-Malawi 400 kV Interconnection Project

May 2019

Electricity Supply Corporation of Malawi Limited
Mozambique-Malawi 400 kV Interconnection Project
Environmental and Social Impact Assessment Study
<table>
<thead>
<tr>
<th>Management measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopt procurement and labour policies promoting local products and services, when available.</td>
<td>Employment and economic development</td>
<td>Inflation risk</td>
<td>Purchase of materials, goods and services</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Clearing of plantations or cutting of trees in the ROW will only be done when consent of each owner has been obtained.</td>
<td>Employment and economic development</td>
<td>Permanent loss of crops</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Coordinate with the railway companies to ensure that the line’s installation work will be done without interrupting the rail schedule, namely with those managing the Nacala Corridor Railways.</td>
<td>Infrastructure</td>
<td>Increased traffic and disturbance of traffic flow</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Carefully select the landing area of falling trees to minimize damage to crops.</td>
<td>Employment and economic development</td>
<td>Permanent loss of crops</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>An accessible grievance mechanism for affected stakeholders and PAPs to address complaints at the local level needs to be implemented and coordinated by a grievance management committee.</td>
<td>Safety and public health</td>
<td>Increased stress-related disturbances (noise, dust, air pollution)</td>
<td>Site preparation Construction activities Transportation and circulation</td>
<td>PIU (E&amp;S Experts)</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Secure equipment and demarcate any excavation work areas.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of accidents and physical injuries involving local workers and residents</td>
<td>Site preparation Construction activities Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Place signs and fences around construction areas, where necessary.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Accidents and physical injuries involving local residents</td>
<td>Site preparation Construction activities Transportation and circulation</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Require all contractors and sub-contractors to comply with relevant WB health and safety requirements and ESCOM’s corporate policy. Assess UXO situation in border area where the Transmission Line crosses and implement a UXO management program if needed</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of accidents and physical injuries involving local workers and residents</td>
<td>Adherence to labor standards and well-being of construction workers Risk related to UXO</td>
<td>Construction activities PIU (E&amp;S Experts) &amp; Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Require all contractors to develop and implement an H&amp;S management plan that comply with national legislation and address all aspects of labour standards relevant to the project as specified by IFC EHS Guidelines. Sub-contractors will be contractually required to comply with labour and health and safety legislation. Those protections will apply to all workers involved in construction activities, including temporary workers (e.g. provision of personal protective equipment and relevant vaccines, etc.).</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of accidents and physical injuries involving local workers and residents</td>
<td>Site preparation Construction activities Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Require all contractors and sub-contractors to take out an insurance to cover worker and third party injuries from project activities</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of accidents and physical injuries involving local workers and residents</td>
<td>Site preparation Construction activities Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Develop and implement a labour force management plan including a worker code of conduct</td>
<td>Safety and public health Workers’ health and safety Communities and social cohesion Gender aspects and vulnerable groups</td>
<td>Tensions with outside workers Risk of increased incidence of STDs and HIV/AIDS Increased marginalization of vulnerable groups</td>
<td>Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Supply drinking water and maintain its quality and ensure sanitation at the construction sites.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of accidents and physical injuries involving local workers and residents</td>
<td>Site preparation Construction activities Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Distribute condoms to and ensure that condoms are always available to workers.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of increased incidence of STDs and HIV/AIDS</td>
<td>Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Screen health of potential employees as part of the recruitment process in compliance with National HIV &amp; AIDS policy.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of increased incidence of STDs and HIV/AIDS</td>
<td>Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Maintain construction camps in a clean and healthy condition as prescribed by international worker health standards.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Risk of accidents and physical injuries involving local workers and residents</td>
<td>Site preparation Construction activities Presence of workers</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Communicate with communities effectively and involve their representatives.</td>
<td>Safety and public health Workers’ health and safety</td>
<td>Tensions with outside workers</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Encourage the recruitment of female workers.</td>
<td>Communities and social cohesion Gender aspects and vulnerable groups</td>
<td>Disturbance of women subsistence activities Increased marginalization of vulnerable groups. Tensions over the awarding of jobs and contracts Tensions with workers from outside</td>
<td>PIU (E&amp;S Experts) &amp; Contractor</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>Encourage the recruitment of local workers.</td>
<td>Communities and social cohesion Gender aspects and vulnerable groups</td>
<td>Disturbance of women subsistence activities Increased marginalization of vulnerable groups. Tensions over the awarding of jobs and contracts Tensions with workers from outside</td>
<td>Site preparation Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
</tbody>
</table>
### Table 8-1: Management Measures to be Implemented during the Construction Phase (cont'd)

<table>
<thead>
<tr>
<th>Management measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>If blasting is required for a tower’s installation, the local population will be</td>
<td>Communities and social cohesionsafety and public health noise and vibrations</td>
<td>Inadequate communication with communities and stakeholders</td>
<td>Construction activities</td>
<td>Contractor</td>
<td>Included in the construction contract</td>
</tr>
<tr>
<td>advised in advance so as to prevent nuisances and injuries.</td>
<td></td>
<td>Accidents and physical injuries involving local residents</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>→ Favour the employment of local workers to reduce the risk of sexual harassment</td>
<td></td>
<td>Increase in noise and vibration levels</td>
<td></td>
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<tr>
<td>and violence caused by foreigners and avoid tensions with local communities;</td>
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<tr>
<td>→ Locate worker camps at a minimum distance of 2 km from towns and villages in</td>
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<tr>
<td>order to limit worker – community interactions;</td>
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<tr>
<td>→ Organize education campaigns for the workers and surrounding communities to</td>
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<tr>
<td>facilitate workers and communities interactions</td>
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<tr>
<td>→ Maintain construction camps in clean and healthy condition as prescribed by</td>
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<tr>
<td>international worker health standards;</td>
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</tr>
<tr>
<td>→ Require all contractors and sub-contractors to comply with their health and</td>
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<tr>
<td>safety policy and ensure that it complies with relevant WB health and safety</td>
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<tr>
<td>requirements and EDM's corporate policy;</td>
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<tr>
<td>→ Develop and implement an H&amp;S management plan to protect every worker involved</td>
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<tr>
<td>in construction activities, even temporary workers (e.g. vaccines, etc.);</td>
<td></td>
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</tr>
<tr>
<td>→ Implement and follow-up on grievance redress mechanisms;</td>
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</tr>
<tr>
<td>→ Prepare and implement an STD and HIV/AIDS prevention program including a strict</td>
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</tr>
<tr>
<td>prohibition of sexual abuse and sexual intercourse with partners younger than</td>
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</tr>
<tr>
<td>18 years of age (underage sex). It is the Lead Contractor’s responsibility to</td>
<td></td>
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</tr>
<tr>
<td>take necessary measures so his employees and subcontractors’ employees do not</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>commit acts of sexual abuse and/or underage sex;</td>
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<td>→ Sensitize all contractors, workers and communities on the STD and HIV/AIDS</td>
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<td>program, including explanations on risks posed by STDs, sanctions, etc. as well</td>
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<td>as on grievance mechanisms in place;</td>
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<td>→ Immediately report any suspected case of sexual abuse or underage sex to the</td>
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<td>supervising engineer and EDM. Management of such cases should be based around the</td>
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<td>following principles:</td>
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<td>→ If accusations are found to be justified, the Lead Contractor shall:</td>
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<td>→ Immediately cease employment of the accused worker and report criminal offences</td>
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<td>to appropriate authorities for prosecution;</td>
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<td>→ Compensate the affected person and community according to an agreement to be</td>
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<td>negotiated using a grievance redress mechanism. These compensations may not take</td>
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<td>a monetary form, and shall be validated as fair by the impartial observer</td>
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<td>mentioned above as well as the World Bank ESDP Project’s social specialist;</td>
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<td>→ If accusations are found not to be justified, the Lead Contractor shall</td>
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<td>→ Reinstate the worker in its regular tasks with compensation for lost income</td>
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<td>during suspension;</td>
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<td>→ The first sexual abuse and/or underage sex complaint or event treated in front</td>
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<td>of a grievance committee (which may involve one or more workers) where accusations</td>
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<td>of sexual abuse and/or underage sex are found to be justified shall entice the</td>
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<td>following consequences for the Lead Contractor, in addition to those listed above:</td>
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<td>→ Warning from EDM about consequences of any additional cases;</td>
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<tr>
<td>→ Obligation to submit a remedial plan to be approved by EDM and World Bank Project’s Task Team Leader and Social specialist.</td>
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<td>→ The second instance where a sexual abuse and/or underage sex complaint treated</td>
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<td>in front of a grievance committee finds accusations to be justified shall trigger</td>
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<td>immediate suspension of all construction work. The World Bank Inspection Panel</td>
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<td>shall be called in to conduct an inquiry and provide guidance on the way forward.</td>
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<td>→ Strictly prohibit child labour. It is the Lead Contractor’s responsibility to</td>
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<td>take necessary measures so his employees and subcontractors’ employees are all</td>
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<td>18 years of age or more. All child labour cases should be immediately reported to</td>
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<td>EDM by the supervising engineer;</td>
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<td>→ The first child labour case discovered (which may involve one or more child-</td>
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<td>labourers) shall entice the following consequences for the Lead Contractor:</td>
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<tr>
<td>→ Warning from EDM about consequences of any additional cases;</td>
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<tr>
<td>→ Obligation to submit a remedial plan to be approved by EDM and World Bank ESDP</td>
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<td>Project’s Task Team Leader and Social specialist.</td>
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<td>Any additional case(s) of child labour shall trigger immediate suspension of all</td>
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<tr>
<td>construction work. The World Bank Inspection Panel shall be called in to conduct</td>
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<td>an inquiry and provide guidance on the way forward.</td>
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8.1.2.1 WASTE MANAGEMENT PLAN

The construction of power transmission lines and substations are a significant source of waste both hazardous or not. The nature of the residual materials will principally consist in:

→ packaging material (wood, cardboard, plastic);
→ organic matter (food and vegetation residues);
→ used oil and fuel used in the maintenance of machinery.

Some of the non-hazardous materials, such as vegetation and packaging waste, could be reused by local communities. Organic matter could be put in composting trenches. Unused material must not stay on the site and should be appropriately managed. Any construction debris generated will be removed from the sites immediately after the construction activities are completed. Burning of solid wastes will not be permitted. Waste management activities will be under the responsibility of the contractor as specified in the environmental and social plans and specification clauses. The contractor will develop a construction waste management plan that will integrate the waste management method, the location of storage and landfill sites, as well as the sub-contractors who will handle the hazardous waste management. The waste management strategy should follow environmental best practices. Specific clauses will be added to detail how to avoid the discharge of debris and solid waste in aquatic habitats and how they will be removed if they are introduced accidentally into the environment.

Hazardous waste will be stored in barrels with the contents clearly marked. These barrels will be located in safe areas limiting risks for workers’ safety and risks of contamination in the environment. A registry will monitor material deposits and collections. The choice of the company responsible for the management of hazardous waste is important because it guarantees the protection of the environment and people. This choice should be primarily based on the company’s ability to properly manage hazardous waste, in compliance with best practices. Should accidental spills occur, the contaminated soils will be characterized, removed and disposed of at sites authorized by relevant authorities.

8.1.2.2 REVEGETATION PLAN

The transmission line’s construction will require vegetation clearing along its wayleave and for some additional areas required for material storage and work camps, amongst others. Vegetation clearing will lead to a permanent loss of woody species along the corridor. Additionally, this will lead to loss of breeding/nesting sites for birds. The loss of ligneous species will be compensated by planting the equivalent areas with native species for the permanently affected areas and by revegetating the work areas liberated once work is completed. The compensation program will not only mitigate the loss of vegetation but also recreate suitable habitats for fauna.

The revegetation plan will have various objectives:

→ restore the local forest by planting ligneous species in the same amount as those cut down during construction in compliance with local conservation strategies and land planning;
→ recreate suitable habitats for birds and other terrestrial fauna due to the losses that occurred during construction;
→ near populated areas, replant with agro-forestry trees to increase the availability of fodder or fruit trees so as to maximize the benefits for the local population;
→ create visual barriers to reduce the line’s visibility in sensitive areas.

The species chosen for restoration works, as well as the timing of the revegetation, should be validated by a botanical expert. When possible and in the presence of suitable habitats, a preference will be given to endangered species.

Furthermore, the program will try to minimize the project’s visual impact by planting trees or hedges that block the view in the ROW and that camouflage particularly visible towers.
All temporary construction sites, such as borrow pits and areas where materials will be stored, will be revegetated immediately following the completion of the construction activities.

8.1.2.3 EROSION AND SEDIMENT CONTROL PLAN

OBJECTIVES

The purpose of the ECRMP will be to ensure that:

- Erosion of land and soil resources resulting from the project activities is minimized;
- Revegetation is enhanced;
- Transport of sediments into surface waters is avoided and transport of sediment into land is managed.

This ECRMP will provide an overview of the strategy and controls implemented by the Contractor to manage erosion and sediment.

CONTRACTOR OBLIGATIONS

- The Contractor and its Subcontractor(s) shall maintain a high regard for environmental protection while performing the work related to erosion and revegetation management at the Project sites.
- The Contractor, its Subcontractor(s) and workers shall comply with all applicable Malawian laws and international standards and ensure that all necessary licenses, authorisations, certificates and permits have been obtained and can be provided to ESCOM upon request.
- The Contractor shall ensure that all workers use the necessary protective equipment, and take all measures and follow all procedures required to protect the environment.
- The Contractor shall ensure that all equipment is checked regularly to establish that it is in proper working condition to ensure the protection of the environment and that any defect is rectified before the equipment use is resumed.
- The Contractor shall promptly and suitably correct all environment-related deficiencies. All deficiencies and hazards shall be reported to the Supervising Engineer. The Contractor shall report promptly to the Supervising Engineer the reception of a notice from the ministry in charge of the environment.
- The Contractor shall make available to the Project Implementation Unit, upon demand, all erosion control and revegetation management related documentation for the Environmental Audit.

EROSION AND SEDIMENT SOURCES

There are numerous potential sources of erosion and sediment transport as part of the Project. The three key areas of concern include:

- Steep slopes present in some sections of the project alignment;
- Borrow areas to be used during construction;
- Access roads construction;
- Heavy rainfall events during the rainy season which can favour erosion and sedimentation in areas that did not have previously known erosion sensitivities.

Areas of heavy traffic and land disturbances caused by construction equipment can represent a source of soil displacement and compaction. With compaction, infiltration is reduced and surface water has a greater potential for erosion. Proper planning prior to heavy equipment use and conduction of the works can limit the disturbed footprint and mitigate erosion potential. During unusual heavy rain events, oversaturated soils can exacerbate erosion issues.
TEMPORARY EROSION CONTROL

Erosion control measures must be planned and implemented as part of project activities. The extent and duration of soil disturbances likely to cause erosion should also be limited.

Temporary erosion controls must be installed prior to initial soil disturbance and be properly maintained and reinstalled as necessary (such as during construction of access roads) until replaced by permanent erosion controls or restoration is complete.

Temporary Slope Breakers

Temporary slope breakers are intended to reduce runoff velocity and divert water off the project’s site right-of-way. Temporary slope breakers may be constructed of materials such as soil, silt fence, or sand bags.

Temporary slope breakers must be installed on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 % where the base of the slope is less than 50 feet from a waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary) (Table).

<table>
<thead>
<tr>
<th>SLOPE (%)</th>
<th>SPACING (METERS)</th>
</tr>
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<tbody>
<tr>
<td>5-15</td>
<td>100</td>
</tr>
<tr>
<td>&gt;15-30</td>
<td>60</td>
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<tr>
<td>&gt;30</td>
<td>30</td>
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</tbody>
</table>

Outfall of each temporary slope breaker must be directed to a stable, well vegetated area or to an energy-dissipating device constructed at the end of the slope breaker and off the project’s site right-of-way.

Outfall of each temporary slope breaker must be positioned to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources. They may be constructed of materials such as silt fence, compacted earth (e.g., driveable berms across travel ways), sand bags, or other appropriate materials.

At a minimum, sediment barriers must be installed and maintained temporarily across the entire length of a given work site at the base of slopes greater than 5 % where the base of the slope is less than 15 meters from a waterbody, wetland, or road crossing until revegetation is successful. Adequate room must be left between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

Where wetlands or waterbodies are adjacent to and downslope of work areas, sediment barriers, must be installed along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

Mulch

Mulch must be applied on all slopes concurrent with or immediately after seeding, where necessary to stabilise the soil surface and to reduce wind and water erosion. Mulch must be spread uniformly over the area to cover at least 75% of the ground surface at a rate of 2 tons/acre of straw or its equivalent.
Mulch can consist of weed-free straw or hay, wood fiber hydro mulch, erosion control fabric, or some functional equivalent.

Mulch all disturbed upland areas (except cultivated cropland) before seeding if:

→ Final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled; or
→ Restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

If mulching before seeding, increase mulch application on all slopes within 30 metres of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

Ensure that mulch is adequately anchored to minimise loss due to wind and water.

When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 30 metres of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate independent standards-setting organisation.

Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimise harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

CONTROL MEASURES

The multiple control methods outlined in this section provide options that can be tailored to the type of erosion and sedimentation to be prevented or reduced. On-site application of mitigation measures will be determined based on a variety of factors, and the most appropriate will be implemented.

Ditching

During heavy rainfall events during the rainy season, water movement on-site can be significant. Strategically placed ditches and runoff collection structures can help direct water movement by reducing the total amount of water and reducing its interaction with erosion prone sites.

For example, cut and fill slopes created during road construction leave long runs of exposed soils that are prone to erosion. Creating an intercepting ditch above the cut slope will catch water and direct it to less erosion prone areas, thereby reducing runoff over sensitive regions.

Ditching should be used where long-term infrastructure is predicted to divert natural water runoff which will require collection and possible treatment.

Sedimentation Ponds

Sedimentation ponds are typically temporary structures incorporated into the base of a decline to collect runoff from areas of high sedimentation. Water collected in the ponds can be allowed to settle. Depending on the situation, the water can naturally overflow to the surrounding environment, or be pumped to another area for further settling or, if necessary, treated prior to discharge. The size of a sedimentation pond is dependent on the predicted flow rate and volume of sediment laden water to be collected.

Revegetation

Establishing a vegetative layer is critical to sites where slopes are exposed and no further activity is planned. Once established, a vegetative layer eliminates the need for continual monitoring and maintenance by protecting the lighter, organic soil fractions from being displaced, retaining moisture, and preventing slope destabilisation. Establishing permanent areas of vegetation, or seeding hardy, fast growing species temporarily, can offer short or long-term erosion control.
The choice of species will depend on many factors, such as availability and hardiness. Two important factors in choosing vegetation well suited specifically for erosion control are; those that provide roughness on the site surface, and have extensive rooting systems that will break up the top layer of soil. Both of these factors will improve water infiltration into the soil.

Seedbed preparations for vegetation establishment on steep slopes will have to be considered for sites where it is a concern, and could include slope stabilisation, flowing channel runoff protection through the use of mats and mulch or organic matter application. Soil properties including organic matter content and nutrient level must also be addressed to promote successful re-vegetation.

Revegetation must be done with appropriate engineering consultation to ensure that the roots of seeded species will not adversely affect the structural properties of the surface to be revegetated. Following construction of project infrastructure, revegetation can be immediately implemented on areas disturbed during construction, but which are no longer required for operations (e.g., overburden stockpiles, disturbed borrow pits, along road and road ditches).

**Silt Fencing**

Installing silt fence as a sediment control method is a common method employed for level areas with diffuse erosion potential from sheeting on light soils. Silt fences are used to protect downslope areas and prevent further movement of the sediment as it is being transported. Settling of coarser material occurs as the runoff ponds upstream of the fence. Silt fencing is not appropriate for heavy flow areas and requires continuous maintenance.

**Sheeting**

Impermeable polyethylene sheets can offer immediate and temporary erosion control. Their use is suited for emergency responses or for short term protection in areas where the sheets will not be disturbed as they are susceptible to tearing or movement by wind and heavy rainfall events. Also, they require inspection and maintenance until more permanent erosion measures can be implemented. However, properly installed and anchored, they can provide complete isolation of the erodible surfaces from the effects of wind and water erosion.

**Off-Road Vehicle Control**

Install and maintain measures to control unauthorised vehicle access to the right-of-way. These measures may include:

- Signs;
- Fences with locking gates;
- Slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and
- Appropriate trees or shrubs across the right-of-way.

**MONITORING**

Initial erosion can be visually inspected by searching for light surface material (litter or soil) movement, while sedimentation resulting from erosion can be found by searching for deposition of soil particles at the bottom of slopes and depressions. Rilling, gullyling, unusual compaction, hoof shearing and rut are also indicators of erosion problems.

Ditches will be examined during heavy runoff and the outlets of culverts and pipes visually inspected to ensure that roads and other permanent structures are not being compromised and sediment loads are not becoming excessive. Movement of the lighter and finer top soils before vegetation has taken root on reclaiming plots will be monitored closely and mitigation efforts employed to prevent compromising the seed and soil.
Monitoring of surface structures and of the receiving environment for evidence of erosion and sediment accumulation is summarised in the table below.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>LOCATION</th>
<th>FREQUENCY</th>
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<tbody>
<tr>
<td>Visual inspection</td>
<td>Bottoms of slopes and depressions of large structures.</td>
<td>Monthly during the rainy season and following significant rainfall events</td>
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<td></td>
<td>Roads: ditches and outlets of culverts and pipes.</td>
<td>Monthly during the rainy season and following significant rainfall events</td>
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<tr>
<td></td>
<td>Near sensitive areas such as wetlands or drainage lines</td>
<td>Monthly during the rainy season and following significant rainfall events</td>
</tr>
<tr>
<td>Mapping of erosion problem area and extent of erosion</td>
<td>Entire site</td>
<td>Quarterly</td>
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<tr>
<td>Inspection and maintenance</td>
<td>Temporary erosion control measures.</td>
<td>On a daily basis in area of active equipment operation.</td>
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<td></td>
<td></td>
<td>On a weekly basis in areas with no equipment operation.</td>
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<tr>
<td></td>
<td></td>
<td>Within 24 hours of each 1.5 cm of rainfall, or every day during rainy season</td>
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<td></td>
<td>Permanent erosion control measures</td>
<td>Evaluation of success rate - Quarterly</td>
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<tr>
<td></td>
<td>Revegetated areas</td>
<td>Monthly during the rainy season and following significant rainfall events</td>
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<tr>
<td>Water quality monitoring for Total suspended solids (TSS)</td>
<td>Water quality monitoring stations</td>
<td>Weekly and during heavy runoff periods.</td>
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</tbody>
</table>

**ROLES AND RESPONSIBILITIES**

The Supervising Engineer team is responsible for:

- Inspecting Contractor activities for compliance with the requirements of this Plan and other environmental permits and approvals;
- Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;
- Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and evaluating the need for additional erosion control devices;
- Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the project site area;
- Keeping records of compliance.

The Contractor is responsible for:

- Detailing erosion/sediment control and soil stabilisation needs in all areas;
- Ensuring that the design of slope breakers will not cause erosion or direct water flow into sensitive areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;
→ Ensuring restoration of contours and topsoil;
→ Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts; and
→ Reporting to the Supervising Engineer.

**TRAINING**

All concerned employees should be trained to identify activities that could require erosion control measures and to know the procedure to follow when erosion is observed. Employees working on erosion control should be trained to properly implement the control measures and to monitor the performance of these measures.

**8.1.2.4 CULTURAL AND ARCHAEOLOGICAL HERITAGE MANAGEMENT PLAN**

**OBJECTIVE**

The purpose of the Cultural and Archaeological Heritage Management Plan (CAHMP) is to provide concise and achievable management measures to preserve and protect physical cultural heritage associated with the burial and archaeological sites from adverse impacts associated directly with construction of any of the project components.

Specifically, the CAHMP will result in the following:

→ A significant reduction in social grievances associated with the loss of cultural, historic and archaeological sites;
→ Collaboration with government officials charged with managing national heritage resources through engagement with archaeologists trained in modern mapping, survey, and preservation techniques;
→ Reduction of potential project delays through compliance and engagement with national laws and institutions as well as with international best practices.

The overall purpose of this management plan is to clearly state the general characteristics and importance of the burial and archaeological sites located in the project’s ROW, and to identify the specific steps that will be taken to protect these resources, along with the rationale of these steps. This management plan will comply with the WB’s OP 4.11. The policy addresses the protection of Physical Cultural Resources, which it defines as:

“Movable or immovable objects, sites, structures, groups of structures, and natural features that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance, found in urban or rural settings, above or below the ground surface, or under water; and their cultural interest may be at the local, provincial, national or international level.”

The policy also states that:

“Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic or social development, and as integral parts of a people's cultural identity and practices.”

The policy requires that the assessment of the project impacts include physical cultural resources including:

→ consideration of likely impacts;
→ appropriate measures for avoiding or mitigating impacts;
→ development of a CAHMP;
IMPACTS AND MITIGATION

Ground disturbing activities, especially during construction within the ROW have the potential to impact and irreversibly damage physical cultural resources. As ground disturbing activities are only expected during the construction phase, associated impacts should only arise at that time. To avoid and minimize these localized impacts, the following monitoring activities should be integrated into the CAHMP:

- Verification with members of the community and families to determine each site's level of importance;
- Integration of locational data from mapping surveys and burial site importance information from consultation activities into a project's cultural heritage GIS database;
- Discussions with stakeholders about ways of addressing the cultural aspect and how to adequately compensate (rituals, sacrifices, ceremonies, etc.);
- Map identified archaeological sites into a cultural heritage GIS database;
- Develop and provide training and information on physical cultural heritage issues and the chance finding protocol to all personnel working for or on behalf of the project;
- Document deposits and artifact finds during the construction phase by means of a chance finding protocol including archaeological monitoring (watching brief) executed during ground-disturbing activities.

CHANCE FINDING PROCEDURE

The chance finding procedure objectives are to identify and protect previously unrecorded cultural heritage sites, objects, or features from project-related damages. The protocol applies to potential cultural heritage objects, features or sites identified as a result of vegetation and topsoil removal and other ground disturbing construction activities. The procedure complements the other mitigation measures described above addressing finds that may not have been identified in the environmental assessment study.

As a key part of the chance finding procedure, an archaeologist will be assigned on-site to observe ground disturbing activities. This plan should be accompanied with financial and logistical assistance to communities for the relocation of known burial grounds, sacred sites, or any other cultural sites of importance, when needed.

Chance findings may be made by any project person, but must be evaluated by an archaeologist as being of cultural heritage. Two types of chance finds are likely to be encountered during construction works: cultural and non-cultural heritage chance findings.

Non-cultural heritage chance findings may include modern objects and features as well as isolated artefacts. Individual artefacts, even out of their context, may be important indicators of the presence of nearby surface or subsurface cultural heritage sites.

The principal value of most cultural heritage artefacts is only realised, however, when the objects are part of an interpretable cultural heritage site. Distinguishing between the two types of chance findings requires the expertise of an archaeologist. This procedure addresses artefacts as potential indicators of sites themselves rather than artefacts of individual importance.

In the case of a chance finding, project activities will cease temporarily in the vicinity and the area will be marked for avoidance. Construction supervisors, field personnel and staff will be notified, as well
as the PIU (E&S experts) (refer to section 8.2). Government cultural heritage representatives will be notified as well, so appropriate treatment strategies are developed and approved.

Site treatment scenarios to be considered include in-place preservation through redesigned or specialized construction techniques, and rescue excavations in advance of additional construction work, if avoidance is not possible. After treatment work is agreed upon and required excavations are carried out, project excavation or construction activities will be cleared to resume in the area.

Artefacts collected with chance findings will be minimized. Those finds, because they are accidentally unearthed or broken free of their soil matrix, will be collected with precise notation of their original location, and with photographs taken of their original context. Photos of the artefacts and site photos may be useful for consultation regarding chance findings and should be taken as soon as possible.

Artefacts and associated notes and photographs taken by any project personnel should be given to the PIU (E&S experts). Ultimately the artefacts belong to the national government, and project staff will be responsible for transferring the material to the appropriate authorities.

### 8.1.2.5 EMERGENCY RESPONSE PLAN

The contractor should develop an emergency measures plan to identify and account for all project related risks. As a more comprehensive emergency measures plan will be needed in the operational phase of the project, the details on its content and the best management practices are outlined in the next section (Operation Phase).

### 8.1.2.6 COMMUNICATION PLAN

The contractor, in collaboration with ESCOM, will need to elaborate a communication plan to establish and maintain communication channels with the national, provincial and regional authorities as well as with the affected population.

#### JUSTIFICATION AND OBJECTIVES

The construction of the new 400 kV Transport Transmission Line linking the Matambo substation in Mozambique to the Phombeya substation in Malawi could induce social disturbance and conflicts due to noise emissions, presence of strangers, disturbance of daily patterns of life, etc. This risk can be effectively controlled through the establishment of effective communication channels between the Contractor and Proponent and the local populations, to ensure that they are aware of the work to be undertaken and to timely flag and address any source of community discontent.

The aim of the Communication Plan is to ensure that the local communities are well informed of the planned and ongoing activities and to prevent any social conflicts that may disturb the social dynamics of the local populations and hinder or prevent the execution of the planned work.

#### PROPOSED ACTIONS AND IMPLEMENTATION SCHEDULE

Table 8-2 presents the main proposed actions for the implementation of the Communication Plan.
<table>
<thead>
<tr>
<th>Control and Mitigation Actions</th>
<th>Description</th>
<th>Implementati on Schedule</th>
<th>Responsibility for Implementation</th>
<th>Supervision</th>
</tr>
</thead>
</table>
| Engage with provincial and district authorities                                           | - The appropriate Ministry should be informed of the planned activities prior to starting the work;  
- Before the start of the activities, meetings with the district administrator should be scheduled to advise of the proposed activities and to be presented to the chiefs of the administrative posts and the different communities located in the vicinity of the areas where construction activities will be carried out, as well as other stakeholders; | Planning phase             | Contractor and ESCOM             | ESCOM       |
| Engage with local and traditional authorities                                               | - Before starting work in a specific administrative unit (administrative post, locality, village), initial meetings should be held with the administrative post chiefs and local community leaders in order to present the program of the construction activities, identify any potential social conflict and identify potential strategies to engage the community in the project.  
- The Contractor should appoint a field technician to be the focal contact point with the local and traditional authorities, during the construction phase;  
- Establish a community liaison committee (CLC), which will work closely with the construction management team. The CLC must register and monitor the resolution of potential conflicts.  
- During the execution of works near each specific village or community, the Contractor should establish and maintain daily contact with the local authorities. This will help identify any population grievance or complaint and timely flag any potential social disturbance or conflict;  
- Interact with the local administration and the police to implement control mechanisms in public places to prevent crime.  
- Inhabitants of local communities near the construction fronts should be informed ahead, by the contractor, about the upcoming construction activities, including information on the planned start, the nature and duration of work. This communication should also include information regarding the project nature and goals;  
- A grievance mechanism will be established whereby communities can submit complaints or concerns and receive a response. This mechanism will be communicated to communities prior to commencement of construction.  
- The social dialogue process of the promoter (ESCOM), of its representatives and of the contractor should not be limited to contacts established between the proponent and the different agents involved in the work. A | Planning phase | Contractor | ESCOM                      |             |
| Inform local communities                                                                      |                                                                 | During construction           | Contractor | ESCOM       |
| Establish continuous communication channels                                                   |                                                                 | Before starting construction work in the proximity of a given community | Contractor | ESCOM       |
|                                                                                               |                                                                 | During construction           | Contractor and ESCOM | ESCOM       |
permanent dialogue with stakeholders should be established, using tools that will build stable relationships with the different members of the public involved, based on transparency and respect for local values;
- The building of communication channels will be important to guarantee the transfer of information to the local communities on safety aspects to be observed during construction activities. The dialogue with local communities should be as simple and direct as possible and technical language should be decoded into a more popular language nearer to local reality. Translation to local languages may be necessary;
- A permanent process for the identification of the local and strategic stakeholders should be established, as well as a continuous record of stakeholder engagement.

PERFORMANCE AND REPORTING

PERFORMANCE INDICATORS

The following performance indicators should be monitored for the Communication Plan:

- Number of meetings held with district administration;
- Number of meetings held with local and traditional authorities;
- Number of meetings held with local communities;
- Number of complaints or grievances from local populations.

The performance indicators results should be determined monthly and compiled in quarterly reports, as indicated in the following section.

REPORTS

The following table summarizes the documental records that should be kept to control the execution of this management program. These documents should be prepared, archived and maintained by the contractor, in order to document the results of the program implementation. Records of relevant events should be made following the occurrence and a quarterly Performance Report should be prepared, reporting on the recorded events and performance indicators. Copies of all reports should be communicated to the ESCOM’s Project Management Unit for review and comment.

Table 8-3 Record Documents for the Communication Plan

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Document Type</th>
<th>Frequency of Record or Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record of meetings held with stakeholders</td>
<td>Record</td>
<td>Whenever meetings with stakeholders are held</td>
</tr>
<tr>
<td>Record of complaints or grievances filed by local communities</td>
<td>Record</td>
<td>Whenever complaints or grievances are filed by local communities</td>
</tr>
<tr>
<td>Performance Report</td>
<td>Report</td>
<td>Quarterly</td>
</tr>
</tbody>
</table>
8.1.2.7 OCCUPATIONAL HEALTH, SAFETY AND SECURITY MANAGEMENT PLAN

The contractor should also develop an occupational health, safety and security management plan compliant with requirements of the IFC EHS Guidelines. This plan provides clear direction on health, safety and security management, to ensure compliance with national and international standards and to provide the basis for driving improvements. The plan addresses the management of workers HSS across all aspects of the project implementation and associated activities, including workers tasks and accommodation. It applies to all workers including contractor and subcontractor employees.

This plan shall be developed by the Lead Contractor through a comprehensive job safety or job hazard analysis leading to a prioritization of analysis results as part of an action plan based on likelihood and severity of consequences, and later application of prevention and control measures. Examples of prevention and control measures are provided below:

- Establish equipment storage yards and maintenance areas on adapted surfaces (clear of vegetation, stripped of topsoil, leveled and compacted murram);
- Cut grass and brush near ground level outside the equipment storage yards / worker camps perimeter to maintain a perimeter for fire break;
- Develop a Health and Safety Policy, including personal safety, site conduct, security, site safety zoning and emergency procedures;
- Require all contractors and sub-contractors to comply with relevant WB/IFC health and safety requirements, including specific provisions for:
  - Introduction, and use of, poisonous or other chemicals injurious to health;
  - Provision of sanitation at camps, substations and tower erection points;
  - Provision of separate accommodation and sanitation facilities in worker camps in order to satisfy both gender needs;
- Provide suitable and safe accommodation and sanitation facilities, including available drinking water and improved latrines;
- Provide medical facilities for the use of workers where required;
- Handling of domestic and specialised waste as well as dangerous goods;
  - Training;
  - Provision of potable water;
  - Working environment committee;
- Fire suppression system;
- Use of personal protective equipment such as helmets and other safety equipment;
- Personal injuries and accidents;
- Damage to material, equipment and buildings;
- Poison treatment, chemical and fire injuries;
- Safety audit;
- Work done by hired personnel or firms;
- Work done near live electric components;
- Work done at heights;
- Work done in areas where there are dangerous animals (ex remote areas);
- Operating cranes;
- Working with heat in confined places;
- Corrective actions;
Protective action; and,

Utilisation of fall arrestors and anti-climbing devices to prevent public injury.

In case of accidents, declaration of accidents should be done through an accident reporting mechanism in which official accident reports are prepared and monitored. An example of Accident Report Template is provided in Appendix 9.

8.1.3 OPERATION

Table 8-4 shows measures to be implemented during the operational phase. In particular, an Emergency Response Plan will need to be developed by ESCOM.
<table>
<thead>
<tr>
<th>Mitigation measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain equipment and machinery in good running condition, including brakes, mufflers and silencers, catalysts and clean (power washed), free of leaks, excess oil and grease.</td>
<td>Air quality, Noise and vibrations, Hydrography and water resources, Safety and public health</td>
<td>Temporary air quality deterioration, Increase in noise and vibration levels, Surface water contamination, Groundwater contamination, Increased stress related to nuisances</td>
<td>Maintenance and repairs, Transportation and circulation</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Implement an operator training program on noise reduction near sensitive receptors (see Appendix 5). Prohibit idling of vehicles on-site and near sensitive receptors. Generators and machinery will be shut down when not in use. Restrict speed on loose surface roads to 20 km/h during dry or dusty conditions and install signposts and road humps where relevant. Use water for dust suppression on stockpiles, exposed soils and roads if dust generation is visible.</td>
<td>Air quality, Noise and vibrations, Hydrography and water resources, Safety and public health</td>
<td>Temporary air quality deterioration, Increase in noise and vibration levels, Increased stress related to nuisances</td>
<td>Maintenance and repairs, Transportation and circulation</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Implement ESCOM’s Emergency Measures Plan.</td>
<td>Soils, Hydrography and water resources, Safety and public health, Workers’ health and safety</td>
<td>Changes in soil chemical properties and risk of soil contamination, Surface water contamination, Groundwater contamination, Risk of accidents and physical injuries involving local workers and residents</td>
<td>Maintenance and repairs, Transportation and circulation</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Inspect regularly all equipment at the substations that may contain contaminants, such as transformers.</td>
<td>Soils, Hydrography and water resources</td>
<td>Changes in soil chemical properties and risk of soil contamination, Surface water contamination, Groundwater contamination</td>
<td>Waste and hazardous materials management</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Carefully select the landing area of falling trees to minimize damages to crops.</td>
<td>Land use</td>
<td>Occasional infringement of machinery on crops for maintenance purposes</td>
<td>Maintenance and repairs</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Maintain all work inside the access road and ROW footprints to reduce encroachment on natural habitats. Clearly mark the extent of vegetation control in the ROW, identify and mark the vegetation to be preserved along sections of the ROW.</td>
<td>Terrestrial flora</td>
<td>Impairment of natural habitats and flora communities</td>
<td>Maintenance and repairs</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Undertake selective control of the vegetation in order to keep low scrubby and herbaceous species that do not represent a risk for the powerline (species that cannot grow more than 4m in height).</td>
<td>Terrestrial flora, Aquatic habitats and associated fauna</td>
<td>Impairment of natural habitats and flora communities, Disturbances of the water’s physical and chemical characteristics causing modifications in aquatic habitat and its associated fauna, Potential introduction of invasive alien species</td>
<td>Maintenance and repairs</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Dispose of organic material removed from the ROW property and in collaboration with local communities. Use mechanical method for vegetation control inside the ROW. Forbid use of chemical pesticides to control vegetation in the ROW. Undertake ROW vegetation cutting with the supervision of a botanist in order to identify and relocate if possible species of conservation concern as well as protect vegetation that does not represent a risk for the powerline. Any species of conservation concern that need to be cut will be located and its habitat will be fully described.</td>
<td>Terrestrial flora</td>
<td>Impairment of natural habitats and flora communities</td>
<td>Maintenance and repairs</td>
<td>ESCOM, ESCOM operation budget</td>
<td></td>
</tr>
<tr>
<td>Implement an invasive alien species monitoring program following project construction and site re-vegetation in sensitive areas, forest reserves, and forest stands. Consider conduction along with ROW management.</td>
<td>Terrestrial flora, Aquatic habitats and associated fauna</td>
<td>Disturbances of the water’s physical and chemical characteristics causing modifications in aquatic habitat and its associated fauna, Potential introduction of invasive alien species</td>
<td>Maintenance and repairs</td>
<td>ESCOM, $20,000</td>
<td></td>
</tr>
</tbody>
</table>
### Table 8-4  Management Measures to be Implemented during the Operation Phase (cont’d)

<table>
<thead>
<tr>
<th>Mitigation measure</th>
<th>Environmental and/or social components</th>
<th>Potential impacts</th>
<th>Source of impact</th>
<th>Responsibilities</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement a bat mortality monitoring program in partnership with local communities. Develop specific mitigation measures for species that are involved in mortality.</td>
<td>Terrestrial fauna</td>
<td>Bat electrocutions and collisions</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Implement a bird mortality monitoring program in partnership with local communities that will review mitigation measures according to their efficiency and develop specific mitigation measures for species that are involved in bird mortality.</td>
<td>Avifauna</td>
<td>Bird electrocutions and collisions</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Schedule ROW management activities to avoid breeding and nesting seasons of bird species with special status.</td>
<td>Avifauna</td>
<td>Modification and alteration of bird habitats, with associated modifications in fauna communities</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Avoid the destabilization of shores and sediments or other pollutant rejections in watercourses during road and wayleave maintenance.</td>
<td>Aquatic habitats and associated fauna</td>
<td>Disturbances of the water’s physical and chemical characteristics causing modifications in aquatic habitat and its associated fauna</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Allow grazing cultivation in the ROW, provided that plantations do not exceed 4 m in height. If possible, the ROW in urban areas can be used for a number of purposes that will increase quality of life in neighborhoods crossed by the wayleave, e.g. gardening, playgrounds, walking paths.</td>
<td>Land use</td>
<td>Land use restriction in the ROW</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Plan for maintenance activities to be conducted outside of the growing and grazing seasons.</td>
<td>Land use</td>
<td>Occasional infringement of machinery on crops for maintenance purposes Effects on women due to crop loss</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Announce in advance any maintenance or repair work so illegal occupant can move the structures they have built in the ROW. Try to plan work in such a way as to avoid having to remove the structures present.</td>
<td>Built Environment</td>
<td>Destruction of illegally constructed primary or secondary structures.</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Apply human resource policies favoring local labor. Implement training programs to build local capacity.</td>
<td>Employment and economic development</td>
<td>Creation of jobs</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Compensate PAPs for any damaged crops during maintenance works.</td>
<td>Land use</td>
<td>Occasional infringement of machinery on crops for maintenance purposes</td>
<td>Maintenance and repairs</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Gender aspects</td>
<td></td>
<td>Effects on women due to crop loss</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disclose information on newly created business opportunities.</th>
<th>Employment and economic development</th>
<th>Creation of jobs</th>
<th>ROW management</th>
<th>ESCOM</th>
<th>ESCOM operation budget</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maintenance and repairs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maintain a minimum working distance of 2.5m to the energized components during maintenance work.</th>
<th>Worker's health and safety</th>
<th>Risk of electrocution</th>
<th>Maintenance and repairs</th>
<th>ESCOM</th>
<th>ESCOM operation budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educate local populations on safe behavior in the presence of a high voltage power line such as bushfire, slash and burn practices under and close to the powerline.</td>
<td>Safety and public health</td>
<td>Risk of electrocution caused by all forms of unsafe contacts</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Install warning signs and anti-climbing devices on pylons.</td>
<td>Safety and public health</td>
<td>Risk of electrocution caused by all forms of unsafe contacts</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Ensure the development of local and regional emergency plans in case of infrastructure breakdowns, especially near roads or residential areas.</td>
<td>Safety and public health</td>
<td>Risk of electrocution caused by equipment breakdowns, illegal connections, steel thefts and all other forms of unsafe contacts</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Monitor and control illegal connections.</td>
<td>Safety and public health</td>
<td>Risk of electrocution caused by illegal connections, steel thefts and all other forms of unsafe contacts</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communicate with communities effectively and involve their leaders.</th>
<th>Communities and social cohesion</th>
<th>Tensions between local populations and outside workers</th>
<th>Presence of workers</th>
<th>ESCOM</th>
<th>ESCOM operation budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow tree and shrub species whose height is limited to 5 m to grow within the ROW.</td>
<td>Landscape</td>
<td>Permanent alteration to the landscape</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
<tr>
<td>Create visual barriers to reduce line visibility in sensitive areas when possible.</td>
<td>Landscape</td>
<td>Permanent alteration to the landscape</td>
<td>Presence and operation of line, substations and access roads</td>
<td>ESCOM</td>
<td>ESCOM operation budget</td>
</tr>
</tbody>
</table>
8.1.3.1 EMERGENCY RESPONSE PLAN

The following sections outline the main components of such a plan as well as some of the best practices that will need to be included into this document.

OBJECTIVE

In terms of risk management, the project’s objective is to reduce them to the lowest levels, as much as is reasonably possible. However, an accident could affect people on-site as well as personal objects and the environment. Thus, risk identification is important in order to deploy appropriate staff and personnel to intervene with diligence and confidence in the case of a major accident.

NATURE OF THE EMERGENCY RESPONSE PLAN

An appropriate emergency response plan will be elaborated in a more formal manner. The proponent will be required to complete an emergency plan in order to mitigate every risk that will have been identified in relation to the work needs. Furthermore, the emergency plan will regularly be reviewed and adapted to the project’s evolution. The review must include all activities and associated risks.

Any event that could threaten or affect the environmental components will trigger the emergency plan. The plan will list appropriate actions to be followed in order to properly respond to the emergency situations arising from the identified risks. The main elements that need to be retained and integrated in the emergency response plan are outlined. The emergency response plan has three general objectives which are:

- clearly defining the role and responsibilities of all stakeholders;
- facilitating communications to all concerned parties such as workers and the general population;
- serving as a reference document during warning, mobilization and intervention procedures.

In order to minimize risks for all employees, the population and the environment, the following information will need to be detailed in the plan:

- mechanisms to alert stakeholders and all concerned organizations;
- coordination of the operational and intervention crews;
- definition of the role and responsibilities of all stakeholders;
- specification of the different levels of authority;
- measures that will reduce the intervention time in order to minimize the effects on the environment.

ANALYSIS OF ENVIRONMENTAL RISKS

The use of a power line or an electrical station entails some environmental risks. These risks may be of a natural or a technological origin. In general, natural risks are caused by natural phenomenon such as rain fall, floods, tornados, droughts, bush fires, etc. Natural risks could be the source of hazards or technological risks. Technological risks rely on hazard identification (hazardous products, system failures, sources which lead to breaking, generic project risks etc.).

Natural risks associated to the current project are mostly due to lightning which could short circuit the system, erosion in particular in floodplains or in areas which are prone to erosion and bush fires which could start in areas close to the lines or substations. However, these risks are mitigated at a technical level during the design of the project (grounding cable, appropriate choice of tower location, foundation composition, adequate clearing zone, etc.).

The risk analysis relies mostly on the technological risks associated to the use of the power line and the substations along the line. The sources of the two main risks are the storage and use of petroleum
products and hazardous substances as well as the use of electrical transformers. Downed wires pose an additional risk.

**STORAGE AND USE OF PRETROLEUM PRODUCTS AND HAZARDOUS SUBSTANCES**

This section outlines the potential risks associated with the storage and use of petroleum products such as, diesel, light crude oils, fuel, lubrication oils and grease.

The hazards which can lead to identified major accidents are: petroleum product spills, fires and/or explosions involving petroleum products as well as oil and grease spills.

**Petroleum Product Spills**

The nature and the location of petroleum products and other solicited hazardous substances are detailed in the feasibility study to come. Equipment corrosion, breaking/leaks in equipment or human error can lead to spills of petroleum products or hazardous substances resulting in the contamination of surface water, groundwater and soils or fires.

The following design measures have been adopted in order to reduce the risks of accidents, as well as their consequences in an emergency situation:

- the design of equipment and tanks in accordance with the regulations, standards, applicable codes and appropriate industrial practices;
- the storage of hazardous material, refueling and servicing of equipment and vehicles will be done minimally 100 m away from wetlands and watercourse floodplains;
- the control and reduction at the source of the production of waste and hazardous waste;
- double-wall tanks with a secondary retention basin with a sufficient capacity to contain up to 110% of the stored volume.

Additionally, ESCOM will:

- offer continuous training to all employees who are assigned to the handling of bulk petroleum products;
- develop and use work procedures;
- update the emergency response plan including the intervention procedures in case of an incident involving a petroleum product;
- store all ignitable, reactive, flammable, corrosive and toxic materials in clearly labelled containers;
- store all hazardous materials in a manner that prevents interaction with each other or with the environment or from being tampered accidentally;
- store and use intervention materials near the handling areas of petroleum products;
- maintain an on-going service contract with a company that specializes in the cleanup of spills and in industrial cleaning;
- undertake preventative maintenance of tanks and all related equipment in order to reduce potential breaks and premature wear of the equipment;
- ensure that a risk analysis is done by employees before realizing tasks which have not been described by an appropriate work procedure;
- prepare International Chemical Safety Cards (ICSC) or Material Safety Data Sheets (MSDS) that will be readily available in an easily understood language to exposed workers and first aid personnel;
- inspect and realize conformity assessments of the bulk petroleum product storage tanks.

Therefore, in the event of a spill, it would be confined to the area of the incident due to the measures outlined above.
Fire/Explosion Involving Petroleum Products or Hazardous Substances

A fire/explosion involving petroleum products or other hazardous substances could occur in exceptional circumstances, for example, a fire close to the petroleum tanks. Therefore, the probability of occurrence is very low. This type of incident could lead to serious injuries and potentially to the loss of the life of persons located within the impact radius, as well as damage to nearby buildings and infrastructures. In this event, an interruption of all operations would be needed that would inherently lead to economic losses.

At the preliminary stage, the equipment and tanks were designed in accordance with regulations, standards, applicable codes and appropriate industrial practices. Additionally, the following measures will be implemented to reduce the risks of accidents, as well as their consequences in case of an emergency situation:

- offer continuous training to all employees who are assigned to the handling of bulk petroleum products;
- develop and use work procedures;
- store all ignitable, reactive, flammable, corrosive and toxic materials in clearly labelled containers;
- store all hazardous materials in a manner that prevents interaction with each other or with the environment or from being tampered accidentally;
- update the emergency response plan including the intervention procedures in case of an incident involving a petroleum product;
- store and use intervention materials near the handling areas of petroleum products;
- store all ignitable, reactive, flammable, corrosive and toxic materials in clearly labelled containers;
- store all hazardous materials in a manner that prevents interaction with each other or with the environment or from being tampered with accidentally;
- update the emergency response plan including the intervention procedures in case of an incident involving a petroleum product;
- store and use intervention materials near the handling areas of petroleum products;
- store all ignitable, reactive, flammable, corrosive and toxic materials in clearly labelled containers;
- store all hazardous materials in a manner that prevents interaction with each other or with the environment or from being tampered with accidentally;
- maintain an on-going service contract with a company that specializes in the cleanup of spills and in industrial cleaning;
- undertake preventative maintenance of tanks and all related equipment in order to reduce potential breaks and premature wear of the equipment;
- ensure that a risk analysis is done by employees before realizing tasks which have not been described by an appropriate work procedure;
- prepare International Chemical Safety Cards (ICSC) or Material Safety Data Sheets (MSDS) that will be readily available in an easily understood language to exposed workers and first aid personnel;
- inspect and realize conformity assessments of the bulk petroleum product storage tanks.

Oils and Grease Spills

Spills of lubrication oils and grease can occur when there are breaks or leaks in equipment, handling errors and machinery spills and can lead to soil, surface and groundwater contamination.

The following preventive measures will be in place in order to reduce the risks of accidents, as well as their consequences in an emergency situation:

- offer continuous training to all employees on the protection of the environment;
- develop and use work procedures;
- store all ignitable, reactive, flammable, corrosive and toxic materials in clearly labelled containers;
- store all hazardous materials in a manner that prevents interaction with each other or with the environment or from being tampered with accidentally;
→ update the emergency response plan including the intervention procedures in case of an incident involving oils and greases;
→ undertake preventative maintenance of tanks and all related equipment in order to reduce potential breaks and premature wear of the equipment;
→ ensure that a risk analysis is done by employees before realizing tasks which have not been described by an appropriate work procedure;
→ prepare International Chemical Safety Cards (ICSC) or Material Safety Data Sheets (MSDS) that will be readily available in an easily understood language to exposed workers and first aid personnel.

A spill of lubrication oils and greases could occur during the operational phase of the project. The impact level on the environment is deemed to be low given the quantities of products that could be implicated and the mitigation measures in place.

**USE OF ELECTRIC TRANSFORMERS**

This section outlines the risks associated to the presence of electric transformers. The hazards which can lead to identified major accidents are the spills of dielectric oils and fires/explosions involving an electrical transformer.

**Spills of Dielectric Oil**

Spills of the insulating oil found in the transformers could lead to the contamination of surfaces, groundwater and soils, following the corrosion of equipment, breaks/leaks of equipment or due to human errors.

The following preventive measures will be in place in order to reduce the risks of accidents as well as their consequences in case of an emergency situation:

→ preventive maintenance of transformers and related equipment in order to thwart equipment breaks and premature wear;
→ protection against lightning;
→ retention basin for all transformers that contain dielectric fluids;
→ extra transformers, in stock, in case a break or failure occurs, to avoid a stop in operations;
→ prepare International Chemical Safety Cards (ICSC) or Material Safety Data Sheets (MSDS) that will be readily available in an easily understood language to exposed workers and first aid personnel;
→ risk analysis done by employees before realizing tasks which have not been described by an appropriate work procedure.

**Fires/Explosions Involving an Electric Transformer**

A fire in a transformer is a potential risk. Potential causes for a fire are contaminated dielectric oils, short-circuits and overheating. The following preventive measures will be in place to reduce the risks of accidents as well as their consequences in an emergency situation:

→ preventive maintenance of transformers and related equipment in order to thwart equipment breaks and premature wear;
→ protection against lightning;
→ store all ignitable, reactive, flammable, corrosive and toxic materials in clearly labelled containers located as far as possible from the transformers;
→ store all hazardous materials away from the transformers and in a manner that prevents interaction with each other or with the environment or from being tampered with accidentally;
→ retention basin for all transformers that contain dielectric fluids;
→ extra transformers, in stock, in case a fire or explosion occurs, to avoid a stop in operations;
→ risk analysis done by employees before realizing tasks which have not been described by an appropriate work procedure.

DOWNED WIRES

This section outlines the risks associated to the breakage of conductors. The hazard which can lead to identified major accidents are downed wires.

Downed wires can lead to serious or fatal injuries of community members, especially if the downed conductor is live.

The following preventive measures will be in place in order to reduce the risks of accidents as well as their consequences in case of an emergency situation:

→ preventive maintenance of conductors and related equipment in order to thwart equipment breaks and premature wear;
→ protection against lightning;
→ ongoing sensitization of the local communities along the line about dangers of high voltage transmission lines;
→ ongoing sensitization of the local communities along the line about dangers of electrocution in cases of contact with transmission line components and especially downed wires.

ORGANIZATION AND RESPONSIBILITIES

A planning committee in charge of the emergency measures will be active and will maintain an up to date emergency plan in order to efficiently mobilize workers in an emergency. A thorough review of every item in the plan will be regularly completed by the planning committee. The committee will be involved in elaborating, preparing, updating and disseminating the emergency response plan as well as initiating and preparing large-scale simulations, reviewing the results and ensuring follow-ups. The committee will also train the workers and upper management, via simulation and evacuation exercises, to develop proper intervention relations with the civil authorities as well as initiate the annual emergency response plan review process and ensure that the operation plans are updated.

Additionally, an internal emergency intervention team will consist of on-site staff and personnel representing the first line emergency team, in charge of the communication and deployment in an emergency situation. The role of this team will consist of receiving all emergency calls, giving them priority and giving them the required and needed attention.

The team will convey all information to upper management without delay, as well as all appropriate emergency services and, if necessary, acquire external aid.

EMERGENCY INTERVENTIONS

ESCOM and its subcontractors will ensure that emergency procedures are rapidly put in place in the event of an accidental petroleum product spill. Appropriate procedures will be established and communicated to all operating staff, as well as suppliers. These procedures will outline the proper way of recuperating and cleaning all accidental petroleum product spills and any related products, on and off site. The following will be assured:

→ wear of appropriate clothes and personal protective equipment (i.e. security goggles or sealed goggles, resistant gloves, etc.);
→ management and control of the leak (i.e. eliminating the ignition source, identifying the product which was used, and stopping, if possible, the source of the spill, by disabling or turning off the equipment that controls the flow of the product);
The emergency response plan will include specific procedures for every emergency situation. All persons and organizations that must be notified for each situation will be identified in the emergency response plan. Also, the emergency response plan will include a risk communications program to the general population and a section on preventive measures.

After each event, a report on the emergency situation will be completed with the personnel staff that is in charge, in order to evaluate the measures which were taken, specify possible improvements and make the necessary changes to the procedures.

**TRAINING**

The operating staff will benefit from continuous training in order to guarantee a certain level of knowledge and adequate competence. The operating staff must fully understand the emergency response plan’s procedures. Each worker will be trained in order to know the warning and intervention procedures in the event of an emergency.

The emergency response plan will be regularly tested in order to verify its efficiency level. A program consisting of a series of exercises will allow the users to verify the efficiency level of every aspect of an intervention, of the equipment and of the workers identified in the emergency response plan. The plan will outline the types of exercises which need to be done and the frequencies. Every exercise will be evaluated in order to validate and/or improve the operational processes of the emergency response plan. These exercises will be analyzed in a post-mortem report.

**8.2 INSTITUTIONAL FRAMEWORK FOR PROJECT IMPLEMENTATION**

Responsibilities for the implementation and monitoring of elements in the ESMP are shared between various stakeholders, including relevant ministries, competent authorities, ESCOM and its contractors.

In this context, ESCOM should consider setting up a Project Implementation Unit (PIU) responsible for the project’s execution. This would help ensure that decisions are well coordinated and the various management measures/plans, as well as the ESMP and eventually the Resettlement Action Plan (RAP), are properly executed. Figure 8-1 illustrates the possible structure of this institutional organization.
8.2.1 GOVERNMENT OF MALAWI AND PROJECT SPONSORS

The Government of Malawi oversees the project's high-level planning, financing and implementation via the Ministry of Natural Resources, Energy and Environment and the Ministry of Finance.

Financial partners, for their part, also contribute to the project’s high-level planning before financing its construction. Their environmental and social safeguards provide guidance regarding project design and implementation mechanics, in order to minimize and properly manage its environmental and social impacts.

8.2.2 PROJECT OWNER: ESCOM BOARD AND MANAGEMENT

As the project owner, ESCOM will have direct responsibility for proper project and ESMP implementation. Under the structure illustrated above, the roles attributed to its Board and management team would be the following:

- Be the interface between ESCOM and financial partners regarding environmental and social issues;
- Ensure that applicable financial partners’ safeguard policies are implemented and respected, by analyzing E&S monitoring reports received from the PIU E&S specialist and other partners, and identifying gaps against financial partners’ safeguard policies;
- Take ultimate technical decisions about environmental and social problems raised or observed by other project stakeholders, if need be;
- Guide and support the top management/technical management for everything that relates to the project’s environmental and social management;
- Ensure that the environmental and social management process is working well and that no significantly negative and irreversible impact are produced by the project;
- Centralize all information and documentation regarding the project’s E&S management.
8.2.3 PROJECT IMPLEMENTATION UNIT

In order to ensure smooth conduction of the Project preparation and implementation processes, ESCOM will create a Project Implementation Unit (PIU) within the company, consisting of both technical and environmental/social teams. The PIU will be fully dedicated to the Project implementation, and be the main entity in charge of ESIA and eventual RAP implementation.

The technical team will be composed of technical experts able to ensure compliance with construction standards included in the project plans and specifications, bidding documents and contracts. This team would be composed of national engineers and experts, supervised by ESCOM’s Principal Project Engineer.

The Environmental and social team will be composed of experts from the fields of environment, ecology, agronomy, sociology, etc., and ensure proper implementation of the environmental and social management measures contained in the ESMP, but also the eventual RAP. These experts could come from ESCOM’s professional staff but if necessary the team will be completed with outside staff. PIU’s environmental staff would act under the authority of ESCOM’s Principal Environment Officer acting as Environmental and Social lead for the PIU. That PIU E&S lead will be part of the PIU management team.

PIU’s environmental and social teams would be responsible for the monitoring of ESMP implementation during the project pre-construction and construction phases. As such, its main responsibilities would be as follows:

- **Pre-construction phase:**
  - Coordinate E&S aspects of project procurement, inter alia inclusion of E&S aspects (ESMP & RAP), as well as the World Bank’s General Environmental Management Conditions for Construction Contracts in contractor(s) and supervising engineer tender documents and contracts;
  - Coordination of population resettlement & compensation, as well as implementation of other RAP measures;

- **Construction phase:**
  - Supervise proper implementation of ESMP & RAP when relevant during construction.

In order to achieve the objectives above, it is recommended that PIU E&S team implements, with the help of the environmental personnel of the Lead Contractor, a project specific Environmental and Social Management System (ESMS). The ESMS should comply with international standards and include the elements presented in section 8.3.

The PIU E&S team should also conduct field inspections monthly in order to monitor proper implementation of relevant E&S measures by the contractor, and proper monitoring by the supervising engineer.

In the case of an incident that could potentially cause serious damage to the environment or equipment, PIU’s E&S team will be authorized to stop work or to give instructions to the head contractor to ensure that impacts are minimized or eliminated.

8.2.4 CONSULTANT (SUPERVISING ENGINEER)

The supervising engineer’s general role is to represent ESCOM in order to monitor proper project implementation. As such, the supervising engineer would monitor proper implementation of the project’s technical, environmental and social aspects. Generally, his role would include verification/approval of technical execution studies/drawings, as well as supervision and monitoring of the project’s construction work. To that effect the supervising team need to include experienced social and environmental specialists to supervise the CESMP preparation and implementation.
The supervising engineer would appoint qualified environmental specialists who would be responsible for the following main tasks:

→ Prior to initiation of construction:
  - Verification/approval of lead contractor’s candidates as environmental specialists’, based on their qualifications;
  - Verification/approval of the detailed ESMP and RAP implementation plans during the project’s construction phase, for elements under the Contractor’s control (Project Worksite ESMP) to be prepared by the lead contractor’s environmental specialists;
  - Verification/approval of training provided to the lead contractor and subcontractors’ staff;
  - Review of Contractors’ Method Statements to ensure that environment and social risks are assessed and mitigations put in place before any activity commences;

→ During construction:
  - Review of Contractors’ Method Statements to ensure that environment and social risks are assessed and mitigations put in place before any activity commences;
  - Monitor adequate implementation of the Worksite ESMP by the lead contractor and subcontractors, with systematic controls;
  - Control the quality and quantity of E&S reports produced by the lead contractor;
  - Monitor ongoing project environmental and social impacts;
  - Oversee communications done by the contractor against the worksite’s ESMP, control the way the contractor manages the complaints issued by the public;
  - Handle/keep records of complaints under his competence;
  - Produce by-weekly E&S monitoring reports for the PIU. Report contents:
    - Analysis of contractor’s environmental management reports;
    - Results of the surveillance of complaints and critical incidents/accidents handled by the contractor;
    - Complaints handled directly;
    - Level of implementation of the project’s ESMP / worksite’s ESMP and observed deviations;
    - Identification of unanticipated impacts (not identified in the ESMP);
    - Results of the controls done regarding the communications and awareness activities done/planned by the contractor.
  - Oversee complaints issued by the contractor;
  - When necessary, take decisions concerning the implementation of the Worksite ESMP.

The supervising engineer’s assignment should come to an end at the end of the project’s pre-construction / construction phases.

**8.2.5 LEAD CONTRACTOR**

The lead contractor shall appoint qualified environmental, social and communication specialists and submit their CVs to the supervising engineer who will assess sufficiency of their qualifications for ESMP implementation. After approval of their qualifications, contractor specialists will be responsible for daily implementation and management of all relevant E&S measures provided in the ESMP and RAP, during the whole construction phase. As such, their main tasks would be the following:

→ Prior to initiation of construction:
  - Preparation of detailed ESMP and RAP implementation plans for the project’s construction phase, for elements under the Contractor’s control (Project Worksite ESMP);
  - Preparation of all plans and policies required by the ESMP;
Training of relevant contractor and subcontractor staff on Worksite ESMP in order to ensure integration in general planning of work;

During construction:
- Measurement of environmental and social parameters on work sites. Those measurements are to be done before, during and after conduction of work at a given site, in order to assess efficiency of mitigation measures;
- Ensure permanent field E&S surveillance of construction work conducted by contractor / subcontractors;
- Environmental management of the worksites and monitoring of work, particularly of the respect of the Worksite ESMP by foremen and workers;
- Produce weekly E&S reports to the supervising engineer detailing the state of ESMP implementation;
- Declare accidents/incidents/events that may affect the quality of the environment and/or the human environment;
- Answer and take necessary actions regarding complaints by affected population (when the complaint is related to the contractor).

It should be noted that the lead contractor is to be held accountable for all H&S infractions, E&S infractions, and ESMP infringements caused by its sub-contractors.

The Lead Contractor should also appoint health & safety staff who would be responsible for application of health and safety obligations and reporting on H&S issues. All applicable national health & safety regulations, as well as ESCOM standards, will have to be respected. In the absence of specific rules, it is suggested to use, where appropriate, the WHO or World Bank standards.

The Lead Contractor must hold all necessary licenses and permits before the work begins. It will befall on them to provide ESCOM and PIU with all the required legal documents, among which the signed agreements with owners, authorizations for borrow pits, authorizations for temporary storage sites, etc.

The Lead Contractor’s contract should come to a close at the end of the project’s pre-construction / construction phases.

8.2.6 EAD AND OTHER NATIONAL AUTHORITIES

Independent oversight of ESMP implementation and respect of applicable laws and regulations shall be done by the Environment Affairs Department.

8.3 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

The implementation of the ESMP and the general coordination of all environmental and social activities associated with the project should be managed through the development of a project specific environmental and social management system (ESMS). This ESMS, which does not necessarily need to be certified, must be inspired by recognized international standards such as ISO 14001 (for environmental aspects) and OHSAS 18001 (for health and safety aspects).

The typical breakdown of a project specific ESMS includes:
- A project environmental and social policy;
- A summary of the risks and impacts associated with the project;
- A list of mitigation measures and management plans;
- A definition of the organizational capacity and competency;
- A communication and stakeholder engagement structure;
A monitoring and review structure.

A good source of information for the preparation of an ESMS is the IFC Environmental and Social Management System Implementation Handbook and Toolkit that were published respectively in 2014 and 2015.

8.3.1 ENVIRONMENTAL AND SOCIAL POLICY

This Policy must be developed to the agreement of the various project proponents (ESCOM and Lead Contractor) and set the rules when it comes to dealing with environmental and social aspects during the project. The Policy must deal with Environmental, labor and working conditions and community health, safety and security aspects.

8.3.2 IDENTIFICATION OF RISKS AND IMPACTS

The risks and impacts are easily identified as they correspond to those identified in the current ESIA report (see chapter 7 and table 8-1).

8.3.3 MANAGEMENT PROGRAMS

The management programs should be based on the mitigation measures and management plans proposed in the ESIA’s ESMP (see section 8.1). While developing the ESMS, it will be important to further develop, in compliance with the project needs, the various management plans proposed in the ESMP including the labor and work conditions plan (covering human resources policies and procedures, working conditions and terms of employment, workers’ organization, non-discrimination and equal opportunity rights, retrenchment aspects, workers’ grievance mechanisms, protection of the workforce, child labour, forced labour, workers engaged by third parties and supply chain) and the emergency preparedness and response plan.

8.3.4 ORGANIZATIONAL CAPACITY AND COMPETENCY

This section of the ESMS should be based on the information supplied in section 8.2 of the ESIA’s ESMP to establish the composition of the organizational structure. This structure should be organized in such a way as to ensure efficient communication and all employees should be aware to whom they should report in case of an environmental or social situation.

Competency of the workers and other employees must be ensured through initial and continuous training on environmental, social and health and safety (H&S) aspects. The training activities should include:

- General introductory sessions to introduce the various themes required for the various employee groups;
- Weekly meetings to review environmental, social and H&S associated with the activities to be conducted during the work period;
- Specific training sessions for employees that are to conduct specialized work or that will work in environmentally or socially sensitive areas.

Existing training structures from ESCOM or the Lead Contractor should be used to accelerate and facilitate training implementation. See also section 8.6 of the ESMP for additional training guidelines.

8.3.5 COMMUNICATION AND STAKEHOLDER ENGAGEMENT

The objectives of the communication and stakeholder engagement activities are to:

- Maintain a social and institutional dialogue with the population, authorities and other concerned organizations;
- Ensure compliance with good public engagement practices, and;
→ Ensure the project implementation process contributes to strengthening ESCOM’s efforts to build lasting relationships with affected communities, relevant authorities and other stakeholders.

The target groups should be identified using the available information resulting from the various public consultation activities completed during the ESIA process (see Chapter 6).

8.3.5.1 COMMUNICATION ACTIVITIES DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASES

Throughout the Right-of-Way clearing, land preparation and construction works, affected communities and other stakeholders should be notified in advance of the nature and timelines of the work planned.

Information publicly disclosed should include the following:
→ Previous announcements of planned field activities (objectives, nature, organizations involved and timelines);
→ Any significant adjustments to the overall schedule, if any;
→ The anticipated local labor needs in the short and medium terms;
→ The results of the environmental and social monitoring program;
→ The evolution of the implementation of RAP and other specific management plans;
→ The dangers to public safety associated with the presence of a powerline, the mitigation measures adopted and the dangerous behaviors to be avoided.

The means of communication for this phase of the project implementation could include specific consultation meetings, production of information newsletter, public adverts in local medias, use of websites or, if required, individual meetings with specific stakeholders.

8.3.5.2 COMMUNICATION ACTIVITIES DURING THE OPERATIONAL PHASE

At this stage, the following information should be made available to communities and other stakeholders in an accessible format and language:
→ Results of the project’s environmental and social monitoring program;
→ Planning of maintenance works on the right-of-way and facilities;
→ Guidelines for land use restrictions within the right-of-way;
→ The dangers to public safety associated with the presence of a powerline and the dangerous behaviors to be avoided.

The preferred means of communication should include production of annual reports and rendering them available in the project area (District offices or other locations) and on websites, information meetings and public adverts in local media.

8.3.6 MONITORING AND REVIEW

Monitoring and review is aimed at both ensuring that all recommended mitigation measures and environmental plans are implemented during construction (see sections 8.4 and 8.5 of the ESIA’s ESMP) and that the ESMS is well implemented, that all activities are documented and that any glitch in the system can be rapidly identified and adjusted.

8.4 GRIEVANCE MECHANISM

Grievance redress mechanisms are essential tools for allowing stakeholders affected by the Project to voice concerns about environmental and socioeconomic issues affecting them as they arise and, if necessary, for corrective action to be taken in a timely fashion. Such mechanisms are fundamental to achieving transparency in the ESMP implementation process. The grievance redress procedure includes the use of records (grievance log) to determine the validity of claims.
It is essential that all projects incorporate a Grievance Redress Mechanism and one that is accessible, free, easily understood, transparent, responsive and effective, that does not restrict access to official grievance channels (such as the courts including traditional courts), and causes no fear of negative consequences for its recourse amongst users. Affected individuals and households should be informed about the existence of a grievance redress mechanism. General information regarding the existence of such mechanisms should be made public through community consultations.

The objective of the proposed grievance redress mechanism is to respond to the complaints of aggrieved stakeholders in a fast and transparent manner, and to ensure that they have avenues for presenting and addressing their grievances related to any aspect of the ESMP.

Potential grievances and disputes that arise during the implementation of the ESMP are often related to the following issues:

- Issues related to influx of labour including inflation, gender-based violence, sexual abuse and child abuse among others;
- Dissatisfaction regarding economic benefits to local communities during construction/operation phases;
- Issues related to nuisances caused by construction works such as dust and other air pollutant emissions, noise emissions, drinking water pollution, etc.;
- Environmental impacts affecting ecosystem services used by community members (ex. water pollution or hydrological regime modifications affecting fisheries resources);
- Issues related to effects of land-use changes caused by the project construction or operation;
- Issues related to damages caused to village or district infrastructures (roads among others);
- Disturbance of important cultural and archaeological heritage elements;
- Increased marginalization of vulnerable groups.
- And any other possibilities.

With respect to the implementation of the RAP, the complaints are mainly those related to the process and those related to ownership:

- Process complaints and litigation are typically associated with the following causes:
  - the omissions of assets in the surveys;
  - wrong registrations of personal or community data;
  - errors in the identities of the people affected;
  - undervaluation feelings;
  - the basis for calculating compensation;
  - resettlement conditions;
  - disagreements on parcel boundaries, fields either between the affected people of the same locality or between two neighbors;
  - disputes over the ownership of a property or land use (two or more affected persons claim to be the owner of a certain property);
  - disputes over the sharing of compensation.
- Complaints and disputes over the right of ownership usually relate to the following cases:
  - the recent change in ownership of the asset;
  - succession in inheritance;
  - divorces;
  - the appropriation of a common good or production capital put in place by several people;
  - landholdings.
A grievance procedure will be established for resolution of the disputes and complaints before the pre-construction phase for RAP implementation and community level and district level redress committees will have been put in place. This procedure created during RAP implementation should continue during the construction and operation phases and the same grievance process should apply for all stakeholders affected by the project.

Considering the complexity of resolving disputes and grievances, all grievances will be addressed through mediations at the lower level of Government and through existing committees. This will ensure that the affected stakeholder or PAP does not travel long distances or incur advocacy costs.

The claims and complaints will need to be brought to the attention of the village Head first. They will then forward grievances to the higher levels of authorities, as desired. The Grievance Redress Mechanism is expected to have two (2) interrelated tiers: 1) village/community level, and 2) district level.

8.4.1 FIRST LEVEL: COMMUNITY LEVEL RESETTLEMENT AND GRIEVANCES REDRESS COMMITTEES

At the village/community level, the Resettlement and Grievances Redress Committees will be at GVH (Group Village Headman) clusters. A committee shall be created for (at the most) five (5) wards affected by the project in the same district. The committees may at any time co-opt any member to help in resolving grievances if it seems necessary. Composition of committees as formed is presented below:

- Villages Heads;
- Village Development Committee (VDC) Chairpersons;
- Elected PAP representatives;
- Women representatives;
- Elder representatives;
- Witness NGO.

Affected stakeholders or PAPs shall submit grievances in writing, to the GVH, which will register the complaint.

Affected stakeholders or PAPs will receive an acknowledgement from the GVH as proof. If they are unable to write, the NGO or the local government shall record the same on behalf of the affected stakeholders or PAP. Upon receipt of grievance, the village head shall try to resolve the grievance amicably with the active participation of the aggrieved party within five (5) working days from the date of the filing of the grievance.

If the grievance is resolved and the affected stakeholders or PAP is satisfied with the decision, a report shall be prepared by the witness NGO. A copy of the report shall be handed over to the affected stakeholders or PAP and a copy submitted to PIU for the record. If the grievance is not resolved, the the aggrieved party must pass to the second level.

8.4.2 SECOND LEVEL: DISTRICT LEVEL RESETTLEMENT AND GRIEVANCE REDRESS COMMITTEES

If the affected stakeholders or PAP is not satisfied with the first level’s decision, the case shall be forwarded to the District Resettlement and Grievances Redress Committees (which will be composed by the Local Resettlement Committees) with a preliminary report prepared by the witness NGO. Composition of these committees, as formed, is presented below:

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6 For example, if in a district, 10 wards are impacted by the project, two (2) committees will be formed. If the district has only three (3) wards impacted, only one (1) committee will be created.
These committees will:

- Represent the interests of affected stakeholders or PAPs and communities in the district.
- Support the Project in identification of affected stakeholders or PAP and envisaged land, enterprise or livelihood losses.
- Act as an appeal and exit point for all grievances lodged by Complainants arising from resettlement activities.
- Ensure transparency and accountability during property valuation and loss of livelihood claims through public participation.
- Act as ESCOM’s local monitoring and oversight committee on encroachment and lines infrastructure vandalism.
- Monitor safety standards, labour requirements and community health issues during construction works and reports to PIU.
- Prepare progress reports and present them to the PIU during monthly meetings.

The report must have the details of the grievance, a preliminary assessment by RGRC at the village/community level, a hearing date and the decision of local government.

Upon receipt of grievance, the committee, if desired, may direct the witness NGO to collect further information related to the grievance and submit the same to the committee for its use while hearing the grievance. The hearing shall be completed within 10 working days of the date of case referral. The date, time and venue of the hearing shall be communicated to the affected stakeholders or PAP at least five (5) days in advance by the committee.

If the grievance is resolved and the affected stakeholders or PAP is satisfied with the decision, a report of the same shall be prepared by the witness NGO. A copy of the report shall be handed over to the affected stakeholders or PAP and a copy submitted to the PIU for the record. If the grievance is not resolved, the affected stakeholders or PAP must pass to the third level.

8.4.3 THIRD LEVEL: TRIBUNALS AND/OR COURT SYSTEM

If all avenues have been exhausted without success, then the matter will be brought before the existing local court system for the administration of justice. All such decisions must be reached within four (4) months, from the day the complaint is lodged by the affected stakeholders or PAP to a grievance redress system. If the local courts and Land Tribunals cannot settle the matter, it will go to the High Court for resolution. ESCOM will handle such appeals. The court’s decision is final.

8.5 ENVIRONMENTAL AND SOCIAL SURVEILLANCE

Environmental and social surveillance will be carried out during construction work (Table 8-5). It aims to ensure compliance of the work with commitments and obligations listed in the ESMP, and due application of all mitigation measures (Table 8-1).

The environmental and social surveillance program aims to ensure that the Lead Contract’s specifications and management measures are applied in accordance with their activities. If necessary, penalty terms should be applied for non-compliance with environmental clauses included in the specifications. The Lead Contractor will also have to identify an E&S specialist, as per mentioned above.

The Supervising Engineer’s role and powers with respect to contractors should also be indicated in the specifications. He will have the necessary authority to require contractors to modify their techniques or approaches to work, if the situation warrants.

A site meeting will take place at the beginning of the work with all contractors. Other meetings can also be led at an increasing frequency during the construction phase. These meetings will be intended specially to inform and educate staff on environmental and safety provisions to observe during construction activities.
In general, environmental surveillance should result in the following:

- Review of Contractors’ Method Statements to ensure that environment and social risks are assessed and mitigations put in place before any activity commences;
- Regular visits to work areas, and reporting of general findings;
- Take note of contractors’ strict compliance to various commitments, obligations, actions and other requirements;
- Assess the quality and effectiveness of management measures and adapt mitigation measures if required;
- Note and report any non-compliance or environmental and social issues.

The environmentalist in charge of the surveillance will then share his observations with the site manager so appropriate corrective actions are given and adopted as soon as possible. The corrective actions will then be integrated in the surveillance program to ensure the follow up of the application and effectiveness of the corrective actions taken.

**8.6 ENVIRONMENTAL AND SOCIAL MONITORING**

Environmental and social monitoring allows assessing the efficiency of mitigation measures during the pre-construction/construction phases. The effectiveness of the management measures is validated to ensure proper mitigation of anticipated impacts throughout the life of the Project. Consequently, the monitoring plan should evolve and be adapted over time to address any unexpected changes or impacts. Environmental and social monitoring is based on:

- Site inspections;
- Verification of the effectiveness of mitigation measures.

Table 8-5 lists the project’s main E&S monitoring measures to be applied during the pre-construction/construction phases. It should be stressed that the monitoring obligations below are meant to add up to those detailed in Table 8-1 which relate to the application of mitigation measures themselves.

Additionally, and as per mentioned above, responsibility for collection of baseline measurement and conditions’ data prior to initiation of work, lies with the Contractor. This arrangement is meant to ensure that baseline conditions to which monitoring results are compared to, are site-specific, recent and therefore reflect the true situation on the field prior to construction work. Baseline data collection should be performed at various representative sites along the project line route.

The cost of these environmental and social surveillance and supervision measures cannot be specified at this point since they will be borne out by project stakeholders, from their operating budgets.
<table>
<thead>
<tr>
<th>Components</th>
<th>Parameter</th>
<th>Standards / targets</th>
<th>Location</th>
<th>Frequency</th>
<th>Responsibilities</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Erosion</td>
<td>Visual inspection of construction sites and access roads</td>
<td>Avoid significant degradation of baseline conditions; Avoid heavy rainfall periods; Where possible, maintain natural vegetation; Design channels and ditches for post-construction flows and avoid gulley formation; Stabilize soils and re-vegetate areas promptly; Bypass and minimize length and steepness of slopes; Reduce water velocity; At the end of construction work, sow or stimulate natural vegetation recovery. Along ROW, access roads and work areas</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
<td></td>
</tr>
<tr>
<td>Surface water quality</td>
<td>pH, TSS, turbidity, phosphorus, BOD, coliform bacteria, temperature increase, visual observations (presence of oil, litter, etc.)</td>
<td>Avoid significant degradation of baseline conditions. World Health Organisation (WHO) and National standards; Prevent release of water at high speed in the watercourse (by maintaining natural vegetation, softening slopes, avoiding gulley formation, soil stabilization, etc.); Segregate or divert clean water runoff to minimize the volume of water to be treated prior to release.</td>
<td>Selected sites along rivers and streams crossed by the ROW Workers’ camps and communal water withdrawal points near work sites</td>
<td>Once a month during construction work</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>State of vegetation</td>
<td>Visual inspection of construction sites and access roads</td>
<td>Avoid significant degradation of baseline conditions.</td>
<td>ROW and Substation sites</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Fish habitats</td>
<td>Visual inspections at aquatic habitats crossing to identify habitat destruction and siltation.</td>
<td>Avoid significant degradation of baseline conditions.</td>
<td>ROW</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
</tbody>
</table>
Table 8-5  Environmental and Social Control Measures, Pre-Construction / Construction Phases (cont’d)

<table>
<thead>
<tr>
<th>Components</th>
<th>Parameter</th>
<th>Standards / targets</th>
<th>Location</th>
<th>Frequency</th>
<th>Responsibilities</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow-breasted Apalis</td>
<td>Identification of nests during clearing activities</td>
<td>Avoid nest destruction during clearing activities</td>
<td>Along the ROW</td>
<td>During clearing activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Air quality</td>
<td>Visual inspection of construction sites and access roads</td>
<td>Avoid significant degradation of baseline conditions</td>
<td>Along ROW, access roads and work areas</td>
<td>Continuous during pre-construction and construction activities;</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Noise Levels</td>
<td>Inspection of construction sites and access roads</td>
<td>World Bank and national standards</td>
<td>All communities and cluster of houses within 500 m of ROW</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Damage to neighbouring properties</td>
<td>Visual inspection of construction sites and access roads, as well as properties used for cultures, livestock and other activities</td>
<td>Avoid significant degradation of baseline conditions</td>
<td>ROW and Substation sites</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Employment and economic development</td>
<td>Inflation of base product prices</td>
<td>Similar or lower than national rate for given year</td>
<td>Community markets within 3 km of worker camps</td>
<td>Every 3 months during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td></td>
<td>Proportion of local workers among contractor employees</td>
<td>35% minimum</td>
<td>Entire construction workforce</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Cultural and Archaeological Heritage</td>
<td>Number of complaints for destroyed / damaged cultural heritage elements</td>
<td>0 complaint</td>
<td>Along ROW, access roads and work areas</td>
<td>Continuous during pre-construction and construction activities;</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
</tbody>
</table>
### Table 8-5  Environmental and Social Control Measures, Pre-Construction / Construction Phases (cont’d)

<table>
<thead>
<tr>
<th>Components</th>
<th>Parameter</th>
<th>Standards / targets</th>
<th>Location</th>
<th>Frequency</th>
<th>Responsibilities</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender relations</td>
<td>Proportion of women among contractor employees</td>
<td>15% minimum</td>
<td>Entire construction workforce</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Communities and Social Cohesion</td>
<td>Proportion of resettlement-related conflicts solved via grievance redress mechanisms</td>
<td>100%</td>
<td>ROW and Substation sites</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Community Health and Security</td>
<td>Accidents involving project vehicles and community members or assets</td>
<td>0 accident</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td></td>
<td>Number of complaints regarding project-related nuisances (noise, dust, air pollution)</td>
<td>0 case</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Worker Health and Safety</td>
<td>Proportion of workers having received health &amp; safety training</td>
<td>100%</td>
<td>Entire construction workforce</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td></td>
<td>Proportion of work accidents duly reported</td>
<td>100%</td>
<td>Entire construction workforce</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td></td>
<td>Number of notices of violation received for failure to comply with health and safety regulations</td>
<td>0 notice</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Components</td>
<td>Parameter</td>
<td>Standards / targets</td>
<td>Location</td>
<td>Frequency</td>
<td>Responsibilities</td>
<td>Supervision</td>
</tr>
<tr>
<td>------------</td>
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<td>----------</td>
<td>-----------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>Number of underage sex cases</td>
<td>0 case</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities;</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>Number of sexual abuse cases involving project workers</td>
<td>0 case</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities;</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>Number of child labour cases</td>
<td>0 case</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities;</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>HIV/AIDS prevalence rate increase</td>
<td>0%</td>
<td>Districts crossed by project</td>
<td>Every year during pre-construction and construction activities</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Labour influx and presence of foreign workers</td>
<td>Number of complaints related to worker behaviour</td>
<td>0 complaint</td>
<td>Entire project area</td>
<td>Continuous during pre-construction and construction activities;</td>
<td>Contractor, supervising engineer</td>
<td>PIU</td>
</tr>
<tr>
<td>Component</td>
<td>Method</td>
<td>Standards/targets</td>
<td>Location</td>
<td>Frequency</td>
<td>Responsibility</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Soil integrity</td>
<td>Visual inspection of construction sites and access roads</td>
<td>Avoid the installation of erosive processes or control them. Reduce soil compaction Avoid soil profile structure destruction</td>
<td>Work areas in use and around pylons</td>
<td>Annually during the whole operational phase</td>
<td>ESCOM</td>
<td></td>
</tr>
<tr>
<td>Plant communities</td>
<td>Evaluation of the plant communities’ composition via flora surveys</td>
<td>Follow the plant communities’ evolution after eventual degradation from openings and border effects</td>
<td>In the different types of habitats found in the ROW, focusing on areas with higher ecological integrity</td>
<td>Annually for the first five years</td>
<td>ESCOM</td>
<td></td>
</tr>
<tr>
<td>Social and economic advantages for local communities</td>
<td>Monitoring of the rate of rural electrification and number of development projects</td>
<td>Maximizing economic benefits for communities</td>
<td>Communities within 10 km from the ROW and substation sites</td>
<td>Annually for the first five years</td>
<td>ESCOM</td>
<td></td>
</tr>
<tr>
<td>Built environment</td>
<td>Survey of relocated households</td>
<td>Satisfaction in terms of process and relocation sites.</td>
<td>Along the line where households were relocated</td>
<td>After the first year and as required following the results</td>
<td>ESCOM, in collaboration with customary authorities</td>
<td></td>
</tr>
<tr>
<td>Employees’ health and safety</td>
<td>Complete register of the cause and type of workers’ injuries/accidents</td>
<td>No injuries or accidents</td>
<td>Work camps and work sites</td>
<td>Annually</td>
<td>ESCOM</td>
<td></td>
</tr>
<tr>
<td>Communities’ health</td>
<td>Complete register of the cause and type of injuries/accidents associated with the presence of the line or its substations within communities</td>
<td>No injuries or accidents</td>
<td>Communities in the ROW and near substation site</td>
<td>Annually for the first five years and as required following the results.</td>
<td>ESCOM, in collaboration with customary authorities</td>
<td></td>
</tr>
</tbody>
</table>
Also, additional programs will need to be developed as outlined in the management measures presented above, such as:

- Development of an invasive alien species control program;
- Application of the revegetation plan;
- Establishment of a monitoring program of bat and bird mortality.

8.7 INSTITUTIONAL CAPACITY-BUILDING AND TRAINING NEEDS

The ESMP is based on a collaborative approach where the responsibility for the implementation and monitoring of the environmental and social management measures are shared among many stakeholders, to varying degrees. Relevant authorities and stakeholders have their own specific expertise, but do not always make the connection between their work and cross-cutting themes of environmental and social management.

In this context, successful ESMP implementation and, more particularly, its institutional arrangements and its environmental and social monitoring programs, will be based on a program of institutional support and capacity-building that focuses on the following points:

- Train and daily orient all project participants in H&S issues, including identification of risks and how to mitigate the risks.
- Educate and train all project participants (departmental staff to entrepreneurs and workers) on the implementation of the ESMP monitoring procedures and their rationale;
- Through the PIU and its technical and environmental staff, facilitate the increased participation of ESCOM and governmental departments, involved in the planning, in multidisciplinary consultation meetings;
- Promote improved engagement of civil society organizations in ESMP implementation (for example, implementation of mitigation measures that require local knowledge), monitoring and continuous adjustments;

In addition, training is important to ensure the continuous improvement of environmental practices and compliance with the requirements of current legislation relating to the environment.

Contractors must also be aware of the need to integrate best practices in their work. A training program will be implemented through the ESMP to enhance the environmental awareness of contractors’ key personnel.

ESCOM staff directly assigned to the project will also receive specialized training in environmental and social issues related to electricity interconnection projects, as well as training in health, safety and quality.

Finally, experience in previous power line projects shows that some people still erect buildings within the right of way, in locations where they are not permitted to. Training and awareness-raising activities for these populations are necessary to prevent accidents and improve safety. However, this ESMP does not contain specific measures dealing with this category of stakeholders since it befalls on ESCOM, in their normal activities of awareness-raising and information, to discuss these subjects with their clientele.

Table 8-7 shows the main aspects of the Capacity-Building Plan.
Table 8-7  Capacity-Building and Training Program

<table>
<thead>
<tr>
<th>Trainees</th>
<th>Training mode</th>
<th>Thematic</th>
<th>Agency animating training</th>
<th>Approx. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESCOM Environmental &amp; social Personnel</td>
<td>Workshops and Seminars</td>
<td>Overview of environmental &amp; social aspects of energy projects</td>
<td>External National Consultants International Experts</td>
<td>According to the number of participants and sessions may go up to US $100,000</td>
</tr>
<tr>
<td>Ministries Staff</td>
<td>Case Studies on site of existing projects and current project</td>
<td>Regulations and Laws surrounding environment, socioeconomic issues and energy activities</td>
<td>ESMP Health and Safety Quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Workshops Case Studies on the site of existing projects and current project</td>
<td>ESMP Implementation Best Environmental &amp; social Practices Integrating environmental &amp; social management measures in plans and specifications Environmental &amp; social Monitoring of construction work Environmentally-friendly and socially responsible construction management Health and Safety Quality</td>
<td>External National Consultants International Experts</td>
<td>According to the number of participants and sessions may go up to US $100,000</td>
</tr>
</tbody>
</table>

8.8 IMPLEMENTATION TERMS AND COST SUMMARY

8.8.1 IMPLEMENTATION SCHEDULE

The pre-construction phase enables the creation of the PIU according to the guidelines provided above. The fact that several individuals have to contribute to the PIU on a regular basis calls for a sound selection of the members. Institutional continuity is key in this process, and changes in the composition of the teams should be kept to a minimum to maximize their efficiency. Therefore, nearly 6 months are attributed to the identification, selection and preparation (including training) of the PIU team.

Ground work is also completed, with final consultations of populations as well as final determination of ROW and surveying of PAPs.

The construction phase is characterized, with regards to the ESMP, by the clearing of the ROW and the compensation/rehabilitation of revenue-generating properties and land. Also, and in parallel with these activities, is the implementation of the ESMP and its monitoring by the PIU. It is crucial that responsibilities for the supervision and monitoring of the ESMP are clearly defined within the PIU. It is recommended that the supervision and verification of the implementation of the ESMP is done through periodical audits, preferably by a third party. The cost of audits is included in the overall ESMP implementation costs.

In the first year of the operation phase, some ESMP measures will still be implemented (such as some wildlife monitoring plans). More generally, however, the first year of operations will be devoted to measuring the performance of the project against the environmental and social indicators listed above.

A detailed ESMP implementation schedule is proposed in table 8-8.
### Table 8-8: ESMP and RAP Implementation Schedule – Line and Substations

<table>
<thead>
<tr>
<th>Activities</th>
<th>Before Project Start</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase 0: Preparatory activities (6 months)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1 Setting-up of PIU</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2 Implementation of training program</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3 Communities' information and awareness</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.4 Instruments, procedures and monitoring and compensation processes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 Right of way identification and establishment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6 Plot/land investigation and structure identification</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7 Implementation of local resettlement committee (LRC)</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.8 Compensation standards identification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.9 Compensation evaluation and signing of an agreement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phase 1: Pre-construction (6 months)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Reconstruction of house and community structures</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Payment of compensations to PAP</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Assessment and resolution of grievances</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4 Population resettlement</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 Development of environmental health and security plan by Contractor</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>1.6 Approval of Contractor's environmental health and security plan by Supervising Engineer, Client and WB</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>1.7 Right of way clearing</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8 Implementation of waste management plan</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.9 Implementation of cultural and archaeological heritage management plan</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phase 2: Procurement and construction (18 months)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Mitigation and improvement measures implementation</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.2 Implementation of waste management plan</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.3 Implementation of cultural and archaeological heritage management plan</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.4 Implementation of emergency response plan</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.5 Implementation of environmental surveillance program</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.6 Restoration of income generator assets</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.7 Implementation of communication plan</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.8 Implementation of education and environmental awareness plan</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.9 Achievement of community support activities</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Phase 3: Operation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESCOM1 Implementation of mitigation and improvement measures</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESCOM2 Compensation and revegetation plan</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESCOM3 Waste management plan</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESCOM4 Emergency measures plan</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESCOM5 Implementation of environmental monitoring program</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESCOM6 Environmental and social audits</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESCOM7 ESMP update</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.8.2 COST SUMMARY

Most of the costs associated with the implementation of mitigation measures and improvements cannot be specified at this stage of the study. Many of these measures are to be under the responsibility of the contractor(s) who will build the project, so those costs will be integrated with other construction costs. It should be mentioned that the present ESMP imperatively needs to be appended to the construction tender documents to be published in order to ensure that those costs are placed under the responsibility of the project contractor(s).

In addition, since the implementation of certain measures will be under ESCOM and PIU’s responsibility, part of the operational budget to be applied to the application of measures is not known at this point. Table 8-9 shows a summary of the main costs for the implementation of resettlement aspects, plans, programs and some management measures.

Table 8-9 Preliminary ESMP Budget Estimate Based on Main Costs

<table>
<thead>
<tr>
<th>Phase</th>
<th>Item</th>
<th>Cost (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Construction</td>
<td>RAP implementation</td>
<td>2,353,376</td>
</tr>
<tr>
<td></td>
<td>Capacity Building and Training Program</td>
<td>250,000</td>
</tr>
<tr>
<td></td>
<td>PAP compensation for damage to crops or assets during construction activities</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td>Tree compensation</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>Involvement of a botanist for clearing activities</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Implementation of the CAHMP, including the presence of an archaeologist during excavation activities</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>On-going communication program with Stakeholders during construction</td>
<td>35,000</td>
</tr>
<tr>
<td></td>
<td>ESCOM and PIU operating budgets for management, auditing and environmental surveillance activities</td>
<td>350,000</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total</strong></td>
<td><strong>3,198,376</strong></td>
</tr>
<tr>
<td>Construction</td>
<td>Development and implementation of an invasive alien species control program</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>Installation of bird diverters in areas where required</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>Development of an Emergency Response Plan including the purchase of spill kits</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>Install warning signs and anti-climbing devices</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>On-going communication program with Stakeholders during operation</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>Capacity building and training program</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td>Monitoring of environmental and social performance, including the development of adapted mitigation measures (if necessary)</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total</strong></td>
<td><strong>355,000</strong></td>
</tr>
<tr>
<td>Operation</td>
<td><strong>Preliminary grand total</strong></td>
<td><strong>3,553,376</strong></td>
</tr>
<tr>
<td></td>
<td>Administration costs (2%)</td>
<td>71,068</td>
</tr>
<tr>
<td></td>
<td>Contingencies (10%)</td>
<td>355,338</td>
</tr>
<tr>
<td></td>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>3,979,781</strong></td>
</tr>
</tbody>
</table>

7 Including preparatory activities.
9 CONCLUSION AND RECOMMENDATIONS

The environmental and social impacts assessment was conducted by literature review, field surveys and through stakeholder consultations. This study identified stakeholder concerns and expectations, social and environmental constraints associated with the receiving environment and has identified the environmental and social impacts associated with the pre-construction, construction, operation and decommissioning phases of the Mozambique-Malawi 400 kV Interconnection Project.

Management measures prescribed for the various phases of the project limit the significance of negative impacts on the physical, biological and human environments, compensate for impacts that cannot be avoided or minimized, or enhance the project’s positive impacts.

The main source of impact at the pre-construction phase is the resettlement of the PAPs. Impacts and management measures for the resettlement is covered by the Resettlement Policy Framework (RPF), a separate document to this ESIA. During construction, the most important impacts are on terrestrial fauna and flora, avifauna, land use and built environment, gender aspects, safety and public health, as well as labour influx and presence of foreign workers. Their significance after implementation of mitigation measures is considered moderate. It will be important to ensure a strict implementation of the proposed management measures and plans by the various stakeholders. The successful implementation of the RPF and compensation measures for habitat loss are two fundamental elements for the reduction of anticipated impacts occurring during these phases. During the operation phase, significant impacts would also be felt, but the probability of occurrence is often lower.

The environmental and social surveillance and monitoring will remain key elements for assessing the quality of prescribed measures, their effectiveness and to detect unanticipated impacts. Proper implementation of the emergency response plan and of bird mortality monitoring, as well as the adoption of measures adapted to sensitive areas, will contribute to the environmental acceptability of the project.

The ESMP is based on a collaborative approach where the responsibility for the implementation and monitoring of the environmental and social management measures are shared among many stakeholders. In this context, successful ESMP implementation will be based on a program of institutional support and capacity-building.

The ESMP is a commitment of ESCOM to the stakeholders involved, especially to the Malawi authorities and local communities. Its implementation will ensure the project’s environmental and social compliance at all phases of execution.
10 REFERENCES

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