Environmental and Social Impact Assessment Report for the 220 kV Transmission Line Project between Lubango and Moçâmedes, Huíla and Namibe Provinces

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Environmental and Social Impact Assessment Report for the 220 kV Transmission Line Project between Lubango and Moçâmedes, Huíla and Namibe Provinces.

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List of Acronyms

ADI	Area of Direct Influence
AGT	*Administração Geral Tributária* (General Tax Administration)
ANPG	*Agência Nacional de Petróleo, Gás e Biocombustíveis* (National Agency of Petroleum, Gas and Biofuel)
ANAM	*Agência Nacional de Acção Contra Minas* (National Agency for Action Against Mines)
ANR	*Agência Nacional de Resíduos* (National Waste Agency)
AoI	Area of Influence
ARAP	Abbreviated Resettlement Action Plan
Arfl	Ferralic Arenosols
AREA	*Autoridade Reguladora de Energia Atómica* (Atomic Energy Regulatory Authority)
BCC	Benguela Current Convention
CBD	United Nations Convention on Biological Diversity
CED	Executive Demining Commission
CNIDAH	National Inter-Sectoral Commission for Demining and Humanitarian Assistance
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CR	Critically Endangered
DAA	Directly Affected Area
DNEE	*Direcção Nacional de Energia Eléctrica* (National Directorate of Electricity)
DNPAIA	*Direcção Nacional de Prevenção e Avaliação de Impactes Ambientais* (National Directorate for Prevention and Environmental Impact Assessment)
EBSA	Ecologically or Biologically Significant Marine Area
EDPA	Environmental Pre-Feasibility Study and Scope Definition or Environmental Pre-Feasibility Study and Scoping Report
EHS	Environment, Health and Safety
EPC	Engineering, Procurement and Construction
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Study
EN	Endangered
ENDE	Electricity Distribution National Public Company
ERW	Explosive Remnants of War
ESMP	Environmental and Social Management Plan
FAO	Food and Agricultural Organization
FONGA	Fórum das ONGs Angolanas
GW	Giga Watts
HIV	Human Immunodeficiency Virus

HSE	Health, Safety and Environment
IBA	Important Bird Area
ICNIRP	International Commission of Non-Ionizing Radiation Protection
IFC	International Finance Corporation
IIA	Area of Indirect Influence
IGCA	Angolan Geographic and Cadastral Institute
IGEO	Institute of Geology e Mines
IMO	International Maritime Organization
INAMET	*Instituto Nacional de Meteorologia e Geofísica* (National Weather Institute)
INBAC	*Instituto Nacional da Biodiversidade e Áreas de Conservação* (National Institute for Biodiversity and Conservation Areas)
INBC	*Instituto Nacional da Biodiversidade e Conservação* (National Institute for Biodiversity and Conservation)
INAVIC	*Instituto Nacional da Aviação Civil* (National Institute of Civil Aviation)
INGA	*Instituto Nacional de Gestão Ambiental* (National Institute for Environmental Management)
INE	*Instituto Nacional de Estatística* (National Institute of Statistics)
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
JNCC	Joint Nature Conservation Committee
LBA	*Lei de Bases do Ambiente* (Environment Framework Law)
LRBA	*Lei dos Recursos Biológicos Aquáticos* (Aquatic Biological Resources Act)
LV	Luvisols
MCTA	*Ministério da Cultura, Turismo e Ambiente* (Ministry of Culture, Tourism and Environment)
MINAGRIP	*Ministério da Agricultura e Pescas* (Ministry of Agriculture and Fisheries)
MINEA	*Ministério da Energia e Águas* (Ministry of Energy and Water)
MINUA	*Ministério do Urbanismo e Ambiente* (Ministry of Urbanism and Environment)
MINTRANS	*Ministério dos Transportes* (Ministry of Transport)
MSF	Médecins Sans Frontières
MW	Megawatts
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-Governmental Organization
NTS	Non-Technical Summary
OECD	Organization for Economic Co-operation and Development
PDP	Provincial Development Plan
PNA	National Water Plan
PNGA	National Environmental Management Plan

PRODEL	Electricity Production – Public Company
RNT	*Rede Nacional de Transporte de Electricidade* (National Transportation Network – Public Company)
RoW	Right of Way
TEPSCO	Tokyo Electric Power Services Co., Ltd.
ToR	Terms of Reference
TWA	Time Weighted Average
TS	Technical Survey
USAID	United States Agency for International Development
WB	World Bank
WMP	Waste Management Plan

CHAPTER 1

INTRODUCTION

1 INTRODUCTION

Angola is located on the South Atlantic coast of West Africa and has a territorial extension of 1,246,700 Km^2 and borders four countries namely: The Republic Democratic of the Congo (north and east), the Republic of the Congo Brazzaville (north), Zambia (east) and Namibia (to the south). The country has a diversity of natural resources, a cultural tradition based on ethnic-linguistic structures, a population estimated of approximately 30,810,000 inhabitants and an estimated Gross Domestic Product (GDP) of about 105.8 billion United States Dollars.

Energy consumption plays a central role in the sustainable development of a country, in its social (fight against poverty), economic (security of supply) and environmental (environmental protection) dimensions. The accelerated process of urbanization leads to an increasing supply of electricity, through models guided by increased supply to meet equally growing demand. Electricity consumption therefore has a significant participation of the residential segment due to population growth. Between 2001 and 2009, access to electricity from the grid almost doubled in Angola, however, in peri-urban and rural areas there is still a lack in the supply of electricity (INE, 2015).

Republic of Angola still has a poorly diversified economic structure, concentrated in the oil and gas industry (capital intensive and, therefore, with little effect on job creation), low competitiveness concerning imports and export, structure highly concentrated in oil products. An inclusive growth strategy should be based on the construction of infrastructures aiming the production and promotion of goods, satisfying population basic needs, foster the emergence of jobs, enhance the use of endogenous natural resources and streamline national supply chains (Government of Angola, 2018).

Aligned with Angola 2025 strategy for energy sector, the priorities defined within the scope of the electricity policy are as follows: a) to increase the overall national electrification rate, and reduce access asymmetries throughout the national territory; b) progressively replace public investment for electricity generation by long-term private financing, with public funding being reserved for investments that have a structural nature; and c) to enable electricity access expansion in many municipal districts across the national territory, through the establishment of partnerships between Municipal Administrations or Electricity Distribution National Public Company (ENDE) and the private sector to manage the dispersed and isolated communities or using renewable energy (for example photovoltaic, wind, etc.) rental or commercialization solutions.

The current country electricity production capacity, including projects that are already underway (with emphasis on the construction of the Caculo-Cabaça Hydropower Dam in Cuanza Norte province, designed to produce 2,172 Megawatts (MW), requires additional investments in electricity transmission lines projects, which will play an extremely important role in the Electric Sector consolidation and optimization, supplying energy to the most needed consumers in country, far from the production sites, mainly dams, hybrid and thermal plants.

In this context, in order to reinforce the National Electricity Transport Network, enabling the Northern production system capacity to be transported to the Central and South Region, the National Transportation Network – Public Company (hereinafter referred to as RNT) in partnership with Japan International Cooperation Agency (hereinafter referred to as JICA) and their contractor, Tokyo Electric Power Services Co., Ltd. (hereinafter referred to as TEPSCO) intend to build a 220 kV electricity transmission line from Lubango (in Huíla province) to Moçâmedes (in Namibe province), including the construction and installation of 220/60 kV substations in Lubango and Moçâmedes municipalities.

1.1 Background

The Environmental and Social Impact Assessment Report for the 220 kV Transmission Line Project between Lubango and Moçâmedes cities was developed according to applicable Angolan legislation, namely Presidential Decree No. 117/20 of April 22nd on the General Regulation for Environmental Impact Assessment and the Environmental Licensing Procedure, and considers recommendations proposed by multilateral environmental agreements ratified by Angola. It has also considered the IFC standards and JICA Guidelines for Environmental and Social Considerations (2010).

This Environmental and Social Impact Assessment (hereinafter referred to as ESIA) is categorized as Category A Project according to Angolan Legislation – Presidential Decree No. 117/20 of April 22nd) and presents an assessment of the potential environmental, social, community health and cultural impacts associated with the proposed implementation and operation of 220/60 kV East Lubango and New Namibe substations and 220 kV transmission line Project between Huíla and Namibe provinces, in Angola (hereinafter referred to as 220 kV TL Project). This document also recommends adequate mitigation measures to reduce potentially harmful impacts and enhance the Project benefits.

This chapter summarizes the 220 kV TL Project and describes the ESIA work scope, Terms of Reference (ToR), ESIA justification and objectives. It also presents the project promoters and the consultants involved in the ESIA report development, methodology used to prepare the report, the reliability and general limitations and report structure.

1.2 Project Promoters and Consultancy Company

According to the request from the Government of Angola to the Government of Japan, this Project is expected to be implemented by the Japanese Official Development Assistance (ODA) loan, and the National Transportation Network – Public Company (RNT) is the **Project Proponent**, Angolan entity representative. The preparatory survey for this Project has been implemented by Japan International Cooperation Agency (JICA) since November 2019 with their contractor, Tokyo Electric Power Services Co., Ltd. (TEPSCO).

The Japan International Cooperation Agency (JICA) aims to contribute to international cooperation promotion, as well as the development of the Japanese and global economy by supporting the socioeconomic development, recovery or economic stability of developing regions. In accordance with the Development Cooperation Charter, JICA will work on human security and quality growth, and with its partners will take the lead in forging bonds of trust across the world, aspiring for a free, peaceful and prosperous world where people can hope for a better future and explore their diverse potentials.

JICA is also advancing its activities around the pillars of a field-oriented approach, human security, and enhanced effectiveness, efficiency, and speed.

Tokyo Electric Power Services Co., Ltd. (TEPSCO) was established in December 1960 as an affiliated company of Tokyo Electric Power Company, Incorporated (TEPCO) to provide consulting services for electric power industry. TEPSCO services cover power sector studies, master plans and feasibility studies supported by multilateral donors such as JICA, World Bank (WB) and Asian Development Bank (ADB). In developing countries facing power sector challenges, TEPSCO also carry out project management services (including designs, contract management and construction supervision), with the objective of guaranteeing the sustainability of the Project.

The National Transportation Network – Public Company (RNT) is engaged in the electricity transport through the National Electric System (System Operation) management, the operation of the Market (Single Buyer) and the National Transport Network (Network Operation) operation, which comprises the very high voltage, the transmission network, dispatch facilities and related goods and rights. It should also act as an intermediary entity in energy purchase and sale between production and distribution, fostering competition between the different power generation centres, in order to minimize country's energy production costs.

RNT is a company committed to environmental, hygiene, health and safety issues at work and sustainability in general of all the projects that coordinated on behalf of the State. The company contacts are shown in **Table 1-1**.

Table 1-1: Contacts of the Project Promoter (RNT).

Company	
Company name	National Transportation Network – Public Company (RNT)
Commercial Registry Number	2015.46
Address	Camama Urban District, between Camama Road and Via Expressa (near Camama Electric Substation)
Contacts	(+244) 222 704 400 /222 704 401
Website	http://www.rnt.co.ao
Legal Representative	
Nome	Rui Pereira do Amaral Gourgel
Position	Chief Executive Officer (CEO)
Telephone	(+244) 222 704 400 /222 704 401
E-mail	tcardoso@RNT.co.ao

For the ESIA development report, **Tokyo Electric Power Services Co., Ltd**. awarded a contract to **Holísticos – Serviços, Estudos & Consultoria, Lda**. which developed this report. Holísticos is an Angolan environmental consulting company, established in 2006, with its headquarters in Luanda, registered in the Ministry of Culture, Tourism and Environment (see **Appendix 5**). Holísticos has a team of dynamic and multidisciplinary specialists with vast work experience in environmental and social issues in Angola (see **Table 1-2** for contact details).

Table 1-2: Contacts of the Consultant Company.

Company	
Company name	Holísticos, Lda. – Serviços, Estudos & Consultoria
Commercial Registry number	299-06
Taxpayer number	5401156421
Environmental Consultant registration number at the Ministry of Culture, Tourism and Environment (MCTA)	12159922221
Address	Urbanização Harmonia, Rua 60, Casa 559, Lar do Patriota, Talatona, Luanda
Telephone	(+244) 226 434 549 / 927 442 844 / 912 034 779
Website	www.holisticos.co.ao
Legal representative	
Name	Miguel Morais, Managing Partner
Address	Rua 60, Casa 559, Urbanização Harmonia
Telephone	+244 923 41 01 86
Post office box (*Caixa Postal*)	2426 Apartado IV
E-mail	holisticos@holisticos.co.ao

1.3 ESIA Justification

Given the characteristics of the Project, its location, nature and dimension, some environmental and social impacts are expected in the implementation and operation phases of the 220 kV TL Project. In accordance with the Appendix I of the Presidential Decree No. 117/20 of April 22nd on the General Regulation for Environmental Impact Assessment and the Environmental Licensing Procedure, this type of project listed in category A. As such, this ESIA follows Angolan legislation and considers recommendations proposed by multilateral environmental agreements ratified by Angola. It is also aligned with the JICA Guidelines for Environmental and Social Considerations (April, 2010) which requires that an environmental impact assessment report is required to be publicly available in the country where the project is implemented, including to local communities and other stakeholders, and to be accessible to local communities and other stakeholders at all times, and copies are required to be made available to them.

This ESIA follows a systematic process to characterize the Project and evaluate any potential negative and positive impacts of the Project that may have on aspects of the physical, biological and socio-economic environment. Subsequently, given the legislation applicable to the implementation of a project of this nature, it must be preceded by an ESIA report that must address, but is not limited to, the following points:

- Description of the 220 kV TL Project;
- Project technological alternatives versus the hypothesis of non-execution of the Project;
- Identification and systematic evaluation of the environmental impacts generated by installation activities and operation phases of the 220 kV TL Project, including details regarding specific aspects of the functioning of adopted technologies;
- Definition of geographic limits of directly or indirectly affected areas by the project impacts, known as the Project Areas of Influence, considering, in all cases, human populations and other living creatures within these areas;
- Other elements considered relevant due to its particularities and characteristics, including its economic national development importance.

1.4 ESIA Report Objectives

The objectives of the ESIA report involves the identification, prediction and evaluation of potential environmental, social and community health impacts of the Project, and outlines the proposed mitigation measures for residual impacts, and enhancement measures for positive impacts which the Project should implement.

The main objectives of the ESIA are to:

- Describe the project and analyses the environmental and social benefits inherent to the 220 kV TL Project development phases;
- Provide information on the alternatives to avoid, mitigate or reduce potential impacts within sensitive areas, as well as, measuring the effectiveness of each option and presenting the reasons to support the selection of the preferred options;
- Identify and assess adverse environmental and social impacts associated with the proposed 220 kV TL Project;

- Identify and describe population, natural elements and existing infrastructures that may be affected by the Project activities and potentially cause of adverse environmental, socio-economic and cultural impacts;
- Possess techniques and assessment methodologies that can be presented to decision-makers concerning the adverse effects of the Projects to the natural and social environment that are difficult to quantify or assess;
- Propose mitigation measures to reduce and/or avoid pollution, environmental disturbance such as soil structure deterioration, soil erosion, habitat fragmentation or loss, and other negative impacts caused during the construction activities and operation phase of the 220 kV TL Project;
- Provide a record of comments and responses received from the Interested and Affected Parties during the ESIA process; and
- Define an environmental monitoring system to the proposed 220 kV TL Project and propose an appropriate environmental monitoring plan.

1.5 ESIA Report Scope

The ESIA is an important instrument to identify and mitigate potential negative impacts on the project areas of influence, because sets out the criteria to be adopted during the implementation and operation phases of the 220 kV TL Project. In this context and taking into consideration its objectives, the scope of the ESIA report includes the following:

- Identify the aspects and significant environmental and social effects caused by certain activities inherent to the 220 kV TL Project between Lubango and Namibe (focusing in the Lubango and Humpata municipalities of Huíla province and Bibala and Moçâmedes municipalities of Namibe province) and the 220/60 kV substations implementation and operation in Lubango and Namibe;
- Identify significant effects upon the environment, surrounding communities/populations and activities (e.g., land farming, livestock breeding, agricultural areas, transhumance spaces, etc.) along the proposed 220 kV TL route and East Lubango and New Namibe substations sites surrounding areas, and workers affected by the Project activities, caused by the expected environmental, social and cultural impacts;
- Propose technological alternatives for the execution of the 220 kV TL Project with minimal environmental interference;

- Contact mediation, promoting to the interested and affected people information related to the project areas of influence environment and its importance;
- Assess population's concerns and suggestions, related to the identified project's potential impacts, during the stakeholder's engagement process.

Detailed information on the project description is provided in the **Project Description**, Chapter 2. The Stakeholder Engagement Plan was developed for the 220 kV TL Project (see **Appendix 2**), to engage persons, groups or communities external to the core operations of a project who may be affected by the project or have interest in it.

1.6 Terms of Reference

The 220 kV TL Project between Lubango – Moçâmedes was registered on the Integrated Environment System (SIA) platform of the Ministry of Culture, Tourism and Environment on the January 19th, 2021, as per Terms of Reference (ToR) for Environmental Impact Studies (Executive Decree No. 92/12 of March 1st) (see **Appendix 1**). Following this registration under Protocol number 3561602204, the Ministry of Culture, Tourism and Environment (hereinafter referred to as MCTA) issued recommendations (No. 63867) dated of January 22nd, 2021, confirming that the Project is category A, requesting the previous development of the Environmental Pre-Feasibility Study and Scoping Report (EPDA) in fulfilment of the Presidential Decree No. 117/20 of April 22nd. The EPDA was developed and submitted to the authorities for approval in August 2021 and approved by the authorities in December 2021. This ESIA report will be submitted to the authorities in September 2022.

After the ESIA registration process and project's ToR completed, the ESIA was developed containing the information required by the national legislation. Hard copies of the ESIA report must be prepared in accordance with the requirements of Presidential Decree No. 117/20 of April 22nd and will be submitted (in Portuguese) through the Ministry of Energy and Water (MINEA), to be endorsed by MCTA. Once the ESIA report has been reviewed internally by MCTA's staff a pre-licensing visit will be organized to compare the information contained in the ESIA report with the conditions on the Project site. At this stage the MCTA might require additional information and decide on the need for a public consultation meeting.

If the ESIA is subjected to a public consultation process this will typically include a public meeting organized through the DNPAIA. MCTA owns this process but the proponent of the project will be responsible for the logistical arrangements and associated costs (e.g., *per diem* fees, venue, refreshments, adverts, invitations and legal fees). Regulations state that the consultation process must take place over a period of five to ten days and the costs are covered by the project developer. The public consultation activity usually takes one day in a venue selected by the DNPAIA.
However, MCTA can establish a period of up to eight days, after the public consultation, for interested and affected parties to provide additional comments and/or questions.

Upon completion of the public consultation process, the final decision as to whether to an issue an environmental license will be made by MCTA. If a favourable outcome is received, MCTA will issue, once the license is paid by the Project proponent, the environmental license (installation or operational) for the proposed Project as per Presidential Decree No. 117/20. In the event the ESIA is rejected the proponent may appeal through the administrative courts.

At the end of the process the MCTA will be responsible for issuing the respective environmental licenses which will contain appendices with the proposed mitigation measures, compensation measures and the requirements for environmental monitoring and progress report.

1.7 ESIA Report Team

Holísticos is an Environmental Consulting Company headquartered in Luanda and registered with the Ministry of Culture, Tourism and Environment as showed in **Table 1-2**. It consists of a dynamic and multidisciplinary team of specialists with extensive experience working on environmental issues. For this ESIA, Holísticos prepared a multidisciplinary team that was involved with the various report activities of the report, namely field work (environmental, social and cultural surveys), analysis of the biotic samples, meetings with the administrative authorities of Huíla and Namibe Provinces and elaboration of the final report.

Three site visits were undertaken by Holísticos, which included a preliminary ornithological survey between the 20th and 27th of November 2020. A second visit was conducted between March 31st and April 5th, 2021, which was planned to coincide with the peak of the rainy season, to obtain environmental, socioeconomic and cultural baseline, and stakeholder engagement meetings with

twelve settlements mapped along 1 Km TL route buffer. A third fieldwork survey was organised in September 2021 to coincide with dry season. The different Holísticos specialists involved in the ESIA report and, their respective areas and contributions are described in **Table 1-3**. These specialists have a large experience in providing environmental, social and cultural consultancy, including electrification and energy transport projects.

Table 1-3: List of experts involved in the ESIA Report.

Name	Academic Qualifications	Role	Electronic Signature
Vladimir Russo	Master in Environmental Education	Project Director: Project Director, ESMP and ESIA lead author	
Pedro Vaz Pinto	Forest Engineer and PhD in Conservation Biology	Biodiversity Expert: Fauna – birdlife, reptiles and amphibians	
Miguel Morais	Biologist, MSc in Sciences of the Sea and Coastal Areas	Biodiversity Expert: Fauna – birdlife, mammals and impact assessment	
Eduardo Ferdinand	Engineer in Natural Resources and Environment / Master's in Environmental Audits and Management	Project Coordinator, Socioeconomic Baseline, Impact Assessment and Stakeholder Engagement	
Pedro Sá	Marine Biologist, Master in Aquaculture	Marine Biologist specialist – Project description, baseline and impact assessment	
Francisco Maiato	Biologist	Environmental Specialist: vegetation survey	
Amândio Gomes	Biologist	Environmental Specialist (vegetation) and Document Review	
José Luís	Social Specialist	Social Consultant – Social Baseline and Stakeholder Engagement	
Nuno Moreira	Engineer in Natural Resources and Environment, Master's in Environmental Audits and Management	Social Baseline and Stakeholder Engagement	

Name	Academic Qualifications	Role	Electronic Signature
Suzana Bandeira	Biologist, Master´s in Biodiversity and Natural Resources Conservation	Environmental Baseline and document review	
Teresa Ferreira	Engineer in Natural Resources and Environment	Environmental Advisor – Report Review	
Elayne Miranda	Engineer in Natural Resources and Environment	Environmental and Social Advisor – Stakeholder Engagement	
Manuela Viage	BSc in Biology	Environmental Advisor – Report Review	
Luís Veríssimo	BSc in Geography and Master in Ecology	GIS Expert	

1.8 ESIA Report Methodology

For the ESIA report of the 220 kV TL Project between Lubango - Moçâmedes the following methodology was applied:

- Relevant literature review of the project description and previous Environmental Impact Studies conducted by Holísticos in Huíla and Namibe provinces (e.g., Humpata, Lubango, Bibala and Moçâmedes municipalities);
- Fieldwork survey to the 220 kV TL route and 220/60 kV substations sites (two visits during rainy season in April and one visit during dry season in September) to define its environmental, social and cultural baseline, including the identification of potential impacts, using the method of preparing the checklist and synthesis of impacts;
- Stakeholder engagement meetings with local authorities, potentially affected communities and other stakeholders;
- Bibliographic review for environmental and social baseline and potential impacts identification including environmental baseline and socioeconomic aspects;
- Undertaking a scoping workshop and developing a scoping report which enabled the identification of gaps and development of Terms of Reference;

- Meetings with RNT, JICA and TEPSCO representatives responsible for the 220 kV TL Project and relevant local authorities of the two provinces (Huíla and Namibe) as well as representatives of relevant institutions in Luanda province.

In addition to the several meetings held during the development of this ESIA report as well as for the scoping phase (see **Section 5.**4), additional meetings will be organised to meet JICA's requirements. This will include consultation meetings with residents, local government officials, and officials of institutions related to the Project to present the ESIA report. These meetings are to take place between May or June 2022.

1.9 Reliability and General Limitations

This ESIA report was prepared by Holísticos using all the technical knowledge, available information and data obtained during the *in situ* surveys, meetings with local authorities and communities, sites visits during the rainy and dry seasons and available bibliography as well as the professional experience of environmental and social experts.

The content of this report is for the exclusive use of the National Transportation Network – Public Company (RNT), Japan International Cooperation Agency (JICA) and Tokyo Electric Power Services Co., Ltd. (TEPSCO) and may not be disclosed, published or amended without the prior written consent of all companies. Holísticos reserves the right to rely on all information, documents or data provided by or to the client without the need for independent investigation or verification. Holísticos will not be responsible for relying on incomplete or inaccurate information, documentation or data. Holísticos assumes no responsibility to the customer and other third parties regarding any issues outside the scope of this work. The conclusions drawn by Holísticos are based on the project description provided by RNT, JICA and TEPSCO and included in **Project Description** (**Chapter 2**) of this ESIA report.

1.10 ESIA Report Structure

The report of the present ESIA is structured as follows:

- **Chapter 1 – Introduction:** This chapter presents an overview of the 220 kV TL Project between Huila– Namibe and substations construction in Lubango and Moçâmedes municipalities. It also presents the legal justification for the elaboration of the ESIA report, its objectives, scope, applied methodology and the multidisciplinary team involved in the ESIA report development.
- **Chapter 2 – Project Description:** This chapter presents the 220 kV TL Project, providing the general information regarding location, the main characteristics of the Project, description of equipment and Project development methodologies, essential support infrastructure and other activities to be executed by the Project that is detailed enough to enable the evaluation of potential environmental, socioeconomic and cultural impacts related to Project implementation activities that will ensure the normal operation of the Project facilities.
- **Chapter 3 – Institutional and Legal Framework:** This chapter summarizes and presents the Angolan legal and regulatory framework in force and documents the environmental and social standards and good practices for the electricity sector, which the Project must comply with. The chapter also includes JICA Guidelines for Environmental and Social Considerations (2010), RNT Health, Safety and Environmental Policies and IFC Performance Standards on Environmental and Social Sustainability (2012).
- **Chapter 4 – Environmental and Social Baseline:** This chapter describes the environmental and social baselines conditions that characterize the current situation of the TL route between Lubango and Moçâmedes and substations construction site in Lubango and Moçâmedes cities, and areas that are considered relevant for the activities envisaged by the Project implementation and operation phases.
- **Chapter 5 – Assessment of Impact and Mitigation Measures:** This chapter focuses on the evaluation of potential environmental, social and cultural impacts resulting from the activities described in the 220 kV TL Project and substations construction. For each potential impact the corresponding mitigation measures are proposed. This chapter also presents the technical gaps in the information identified during the development of the ESIA report.
- **Chapter 6 – Environmental Management System:** This chapter describes the Environmental and Social Management Plan (ESMP) for project's sustainable development and implementation. The ESMP includes an impact follow up and monitoring program aimed at providing the essential elements for mitigating the potential negative impacts and maximizing the positive ones, resulting from the phases of the Project (implementation and operation).

- **Chapters 7 and 8 –** Chapter 7 (**Concluding Remarks**) presents the report's final thoughts and conclusions for the ESIA report. Chapter 8 (**Bibliography**) present the bibliography used during the ESIA development.

Apart from this report, the following will also be prepared for this Project:

- **Non-Technical Summary (NTS):** Presents the most important details of the ESIA report in a summarized and non-technical manner. This document is often distributed during the public consultation process.
- **Stakeholder Engagement Plan:** This plan was developed to engage persons, groups and other entities within the Project area that are directly influenced (actually or potentially, positively or adversely) by the Project and/or have been identified as most susceptible to change associated with the Project, and who need to be closely engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measures.
- **Waste Management Plan:** This plan was developed according to Presidential Decree No. 190/12 of August 24th to introduce good waste management practices in the Project, which will include reduction at source, reuse, recycling, reclaim, donation and environmentally sound disposal as well as monitoring of discharge points, to foster the environmental homeostasis of the Project.

CHAPTER 2

PROJECT DESCRIPTION

2 PROJECT DESCRIPTION

This section describes the facilities and activities planned for the development the 220 kV Transmission Line Project and two 220/60 kV substations (hereinafter referred to as 220 kV TL Project), including the planning background, project design guidelines and the key elements and activities involved in the planned implementation and operation phases, as well as schedule, cost and expected land take.

2.1 Project Justification

Access to electricity brings a number of social and economic benefits. Access to electricity tends to increase the quality of life of populations and enhance economic development. A little throughout the country there are several villages still without access to electricity and a good part of those that already have electricity have large deficits in their supply.

Currently, energy consumption has been progressively growing, and by 2025, energy needs are expected to reach 7.2 GW (Giga Watts) in Angola, that is, four times more than the current consumption, corresponding to an average increase of 12.5% between 2017 and 2025, as a result of increased residential consumption, development of the service sector and the country's increasing industrialization. In this sense, the Angolan executive, under the Angola Energia 2025 program, has made several efforts, with the help of several international entities, to increase and make more efficient the transport and distribution network of energy through the various provinces of Angola, contributing to the widespread development.

According to the biophysical characteristics of Angola, the Middle Kwanza Basin has been identified as a key area for the development of hydroelectric projects to produce electricity to support the growth and development of Angola. In fact, the Cuanza River is one of the largest rivers in Angola, with a hydrographic basin of approximately 150,446 km (SWECO, 2005) and about 960 km long, flowing into the Atlantic Ocean south of Luanda. Cuanza's water resources are intended for the production of hydroelectric energy to support Angola's economic growth by supplying electricity for industrial growth and expansion of neighbourhoods on the outskirts or within the city of Luanda. They also serve to support the development of agricultural irrigation and provide energy to other provinces in the Cuanza River region (Malanje, Cuanza-Norte and Cuanza-Sul).

The Kwanza Basin has been selected to produce 7,000 MW of electricity, but the country plans to quadruple its current production capacity to 9,000 MW by 2025 from renewable sources. There are two biggest dams – Cambambe (recently trained for 960 MW) and Capanda (520 MW) – and two more are under final construction (Laúca – 2,067 MW and Caculo Cabaça – 2,172 MW) and others have been proposed in the same region.

In order to transport energy from these hydroelectric projects, a complex network of transmission lines (including multiple substations and associated infrastructure) are being built in the country (with great efforts since 2014) by different Engineering, Purchasing and Construction Management (EPC's) companies and currently being expanded. This project fits into these government efforts to interconnect energy production and distribution systems.

2.2 Project Location

This project spans in Huíla province from northern Lubango to northern Humpata whereas in Namibe province, it goes from northern Bibala to the municipality of Moçâmedes. The proposed 220 kV TL of about 196 km length is located in southern Angola and will cross four (4) municipalities (Lubango, Humpata, Bibala and Moçâmedes) in both provinces. **Table 2-1** shows the locations (municipalities and communes) that the electricity TL between Lubango – Moçâmedes will cross.

Table 2-1: Transmission line localities (route).

PROVINCE	MUNICIPALITY	COMMUNE
Huíla	Lubango	Arimba
		Lubango
	Humpata	Humpata
Namibe	Bibala	Kapangombe
	Moçâmedes	Moçâmedes

The proposed 220 kV TL with the footprint are summarised in **Figure 2-1**. The 220/60 kV East Lubango and New Namibe substations will be installed in the Arimba commune (Lubango municipality) and Aida neighbourhood (Moçâmedes municipality). The TL will leave Nombungo Substation connecting to East Lubango Substation and subsequently connecting with New Namibe Substation.

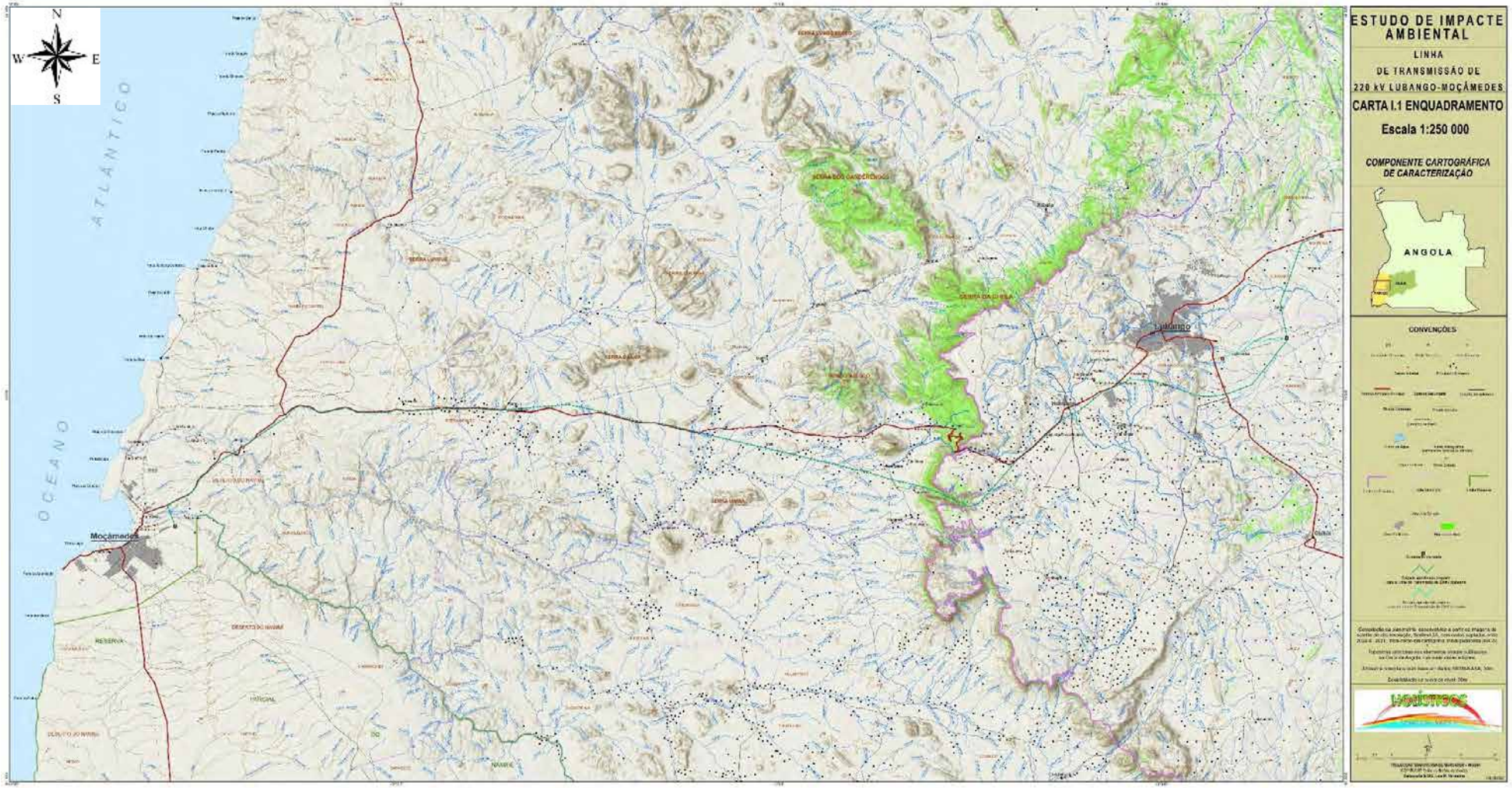


Figure 2-1: The proposed 220 kV transmission line route.

2.3 Areas of Influence

The definition of a Project´s area of influence allows the establishment of geographical boundaries of areas subject to change, in a positive or negative, direct or indirect, permanent or temporary way allowing the establishment of guidelines leading to the assessment of possible environmental and social impacts. To define the areas of influence of this project, topographic, physiological, climatic and biological aspects were considered, as well as possible changes in the socio-economic context and quality of life of the population existing in the directly and indirectly affected areas, and in this case Lubango, Humpata, Bibala and Moçâmedes municipalities were considered. Given the characteristics of the project, its location and the aim of clarifying the degree of impact of the project on environmental and social issues, three (3) areas of influence were defined for this project, namely:

- Directly Affected Area (DAA);
- Area of Direct Influence (ADI);
- Area of Indirect Influence (AII).

Directly Affected Area (**DAA**): characterized by the area affected by the direct footprint of the Project (e.g., physical implantation of the Project and associated infrastructure). It includes the implementation of physical structures and transmission line support infrastructures (such as RoW – Right-of-Way) within 45 meters, 22.5 meters to each side from the central demarcation of the towers (220 kV), substations and construction sites inside the perimeter of the Project area (see **Figure 2-2**). This DAA is applicable both for the social, cultural and environmental components.

Area of Direct Influence (**ADI**): determined based on the potential direct impacts that are likely to be caused by Project activities. The ADI is the surrounding Project areas, existing access roads and associated traffic which could result is vegetation removal and dust dispersion. The environmental ADI includes 250 meters around of the Project site (towers position). Direct impacts may occur here as a result of implementation phases (namely removal of vegetation, setting up of accesses, demining and installation of overhead power lines) and operation of overhead power lines (including the line maintenance works). This category will include all the definitive and/or temporary route that will offer direct access to project implementation sites and to other sites nearby that may undergo temporary improvements to facilitate construction activities.

The ADI includes demining non-intrusion works that may be necessary before the construction and implementation of transmission line phases. Mitigation measures will be developed for this category and will be incorporated in the project Environmental and Social Management Plan (ESMP). This all means that the ADI will be represented by a corridor, corresponding to the line, with a width of 22.5 m to each side from the central demarcation of the towers in question. From the socioeconomic perspective, the Social ADI includes the Lubango, Humpata, Bibala and Moçâmedes municipalities where workers and raw materials could be sourced from the Project.

This also considers the potential direct beneficiaries of the power to be provided by the Project. Mitigation measures will be developed for these aspects particularly with regards to the development of a Traffic and Transportation Management Plan, a Local Employment and Procurement Plan, Biodiversity Management Plan and Community Health and Safety Management Plan and these will be incorporated in the project Environmental and Social Management Plan (ESMP).

Area of Indirect Influence (**AII**): the AII for both environmental and social components is defined by the broader the Huíla and Namibe provincial context, with respect to future energy provision by connecting to the national grid and are those subjected to Project Indirect Impacts such as sites for obtaining raw materials and water abstraction for the construction and operation phases (which are outside the scope of this ESIA report). Whenever possible and when potential indirect impacts are measurable, adequate mitigation measures will be incorporated in the ESMP. The AII also includes promotion of socioeconomic activities determined by the needs of the workforce for the implementation and operation phases of the Project and the acquisition of goods, materials and civil construction equipment and third-party services (food, telecommunication, transport, safety, etc.).

2.4 Description of the Transmission Line

The 220 kV TL Project will pass in parallel to the existing 60 kV TL that connects the Ferrovia Substation (in Lubango urban centre) to Moçâmedes, avoiding whenever possible to cross:

- Aeronautical or radio service;
- Urban or urban expansion areas and rural residential areas;
- Ecologically and biologically sensitive areas;
- Hospital, school buildings and Cultural heritage sites, etc.

Permanent project components include the electrical infrastructure (220/60 kV in substations in Lubango and Moçâmedes, control/equipment housing buildings, transformers, switchgears, support structures, reactive power compensation, etc.), the towers that will support the overhead TL, foundations to support the towers, and access roads and RoW. In addition, to reduce the potential negative impacts on avifauna in the area, bird flight diverters may be required on the TL at certain sections, as recommended by the ecologist. The Project design will also include the following elements:

- **Lightning Shields:** for the lightning shields there are two ground wires, on top of the TL, for the entire length of the 196 km line and over the conductors, to produce an umbrella effect to protect conductors. The lightning current will be grounded using the ground wires connected to every tower steel structure. The structure is connected to the ground by specific ground connection wires and network in order to meet the RNT specifications.
- **Aircraft signalling:** The project includes beacons for aircraft signalling to be implemented as needed to fulfil the regulations and furthermore.
- **Dampers:** Vibration dampers are expressly considered in the project.

Table 2-2 shows the nearest points of interesting along the Project areas and focused on the minimum infrastructures and safety technical information for overhead TL and substation installation.

Table 2-2: Nearest points of the planned New Namibe substation.

ITEMS	CONDITIONS
Substation	
Coordinates	15°10'15.19"S; 12°12'36.88"E
Altitude of ground level	160 m above sea level

2.4.1 Right-of-Way and Clearances

The implementation of a TL requires that procedures to be adopted and standards are put in place to ensure proper installation, reliability and, above all, the safety of everything and everyone around these structures. The RNT Technical Specification states that there must be a minimum vertical distance of six (6) meters between TL and buildings, five (5) meters between the TL and trees. During the detailed project, the engineering team, together with social and environmental experts, will seek

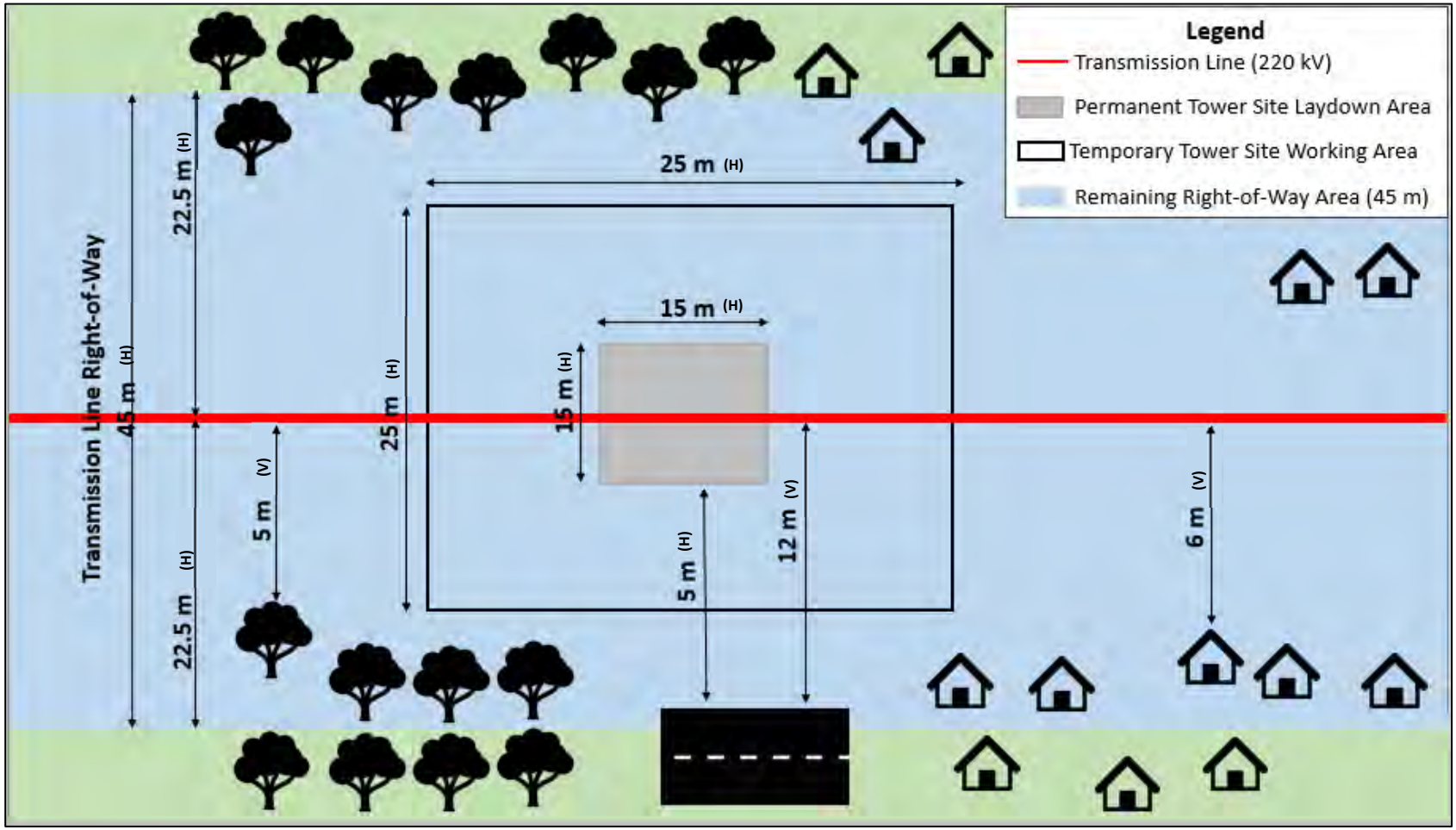
to find possible solutions to prevent the loss of structures and trees into TL route. Trees within the safety area must be cleaned or pruned for the right-of-way, following the detailed technical specifications of the RNT in order to minimize the cleaning area and ensure that the work is carried out safely. Thus, in the construction and installation of the TL along the defined stroke, the safety distances associated with cables contained in **Table 2-3** will be considered.

According to RNT procedure, RoW needs to be maintained to ensure the TL's safety. The minimum safety distance between the TL and other structures/objects are provided in **Table 2-3**. These widths take into consideration the distance from adjacent structures under blow-out, the audible noise, as well as electrical and magnetic fields measured at the servitude edges. The clearance requirements, e.g., maximum heights permissible for the TL, can be found also in **Table 2-3**. **Figure 2-2** below shows the minimum safety distances.

Table 2-3: Minimum safety distances from the transmission line in relation to different structures.

Line Voltage (220 kV)	Distance (m)
Distance from physical structures	45 (22.50 each side)
Ground	12.00
Trees	5.00
Buildings	6.00
Roads	12.00
Electrified Railway lines	15.00
Non-Electrified Railway lines	12.00

Source: MINEA, 2014.



Note: Subscripts (H) and (V) in each number indicate horizontal distance (H) and vertical separation distance (V), respectively.

Figure 2-2: Minimum distances between the 220 kV transmission line and other infrastructures.

The RoW will therefore impose restrictions on the land use within the TL route. A 45 meters wide strip will be cleared of trees and obstacles within the servitude, as well as a footprint of approximately 15m x 15m around each tower. Access tracks will be required for construction purposes and would remain in place for the operational lifespan of the infrastructure, as they will continue to be used for maintenance. Local and existing access roads and tracks are to be used as far as practicable, with further access and inspection roads created in the servitude running along the TL where necessary.

No paved access roads will be constructed, unless there are steep sections of the route where erosion is a risk. Generally, the access track would be a single dirt track with limited earthworks to protect the road and surroundings from erosion. Access roads can run the length of the proposed RoW and be directly below the TL, unless an access road already exists (such as EN280 and access roads for the existent 60 kV line). Existing roads will be used as far as possible and upgraded if necessary. Due the 220 kV TL will be in some zone parallel to the existed 60 kV TL and as the corridor is running in close vicinity of main National Road No. 280, it is expected that existing access will be utilized, if necessary and where possible, the four meters right of way will be cleared and access roads re-established.

2.4.2 Site Preparation Activities

RNT, JICA and TEPSCO will establish a set of procedures to build securely and install the proposed TL. The implementation phase will involve a set of activities that will be carried out sequentially. During this preliminary phase, within a corridor of 60 meters, vertices and singular points of the route, identification and marking of the terrain and demining operation will be carried out. The site preparation phase will consist of activities such as initial start-up and sanitation work including deforestation and tree felling (if necessary and where possible). A method statement (Demining Plan) is to be prepared by CED (Comissão Executiva de Desminagem), which the regulatory entity for the demining operations under the relevant sector in Angola.

Project Start

The project crosses an area, which includes a number of dispersed rural villages/homesteads and associated subsistence activities such as crops and cattle farming. Natural resources, such as woodlands for firewood, transhumance transitory space, pasture for cattle and surface and ground water sources, are also present in the study area.

Land acquisition is required for the proposed project, primarily for the 45 m servitude which must be cleared of obstacles to a certain extent (bush clearing), and for the construction of an access road (where it is not feasible to use the existing access roads). MINEA (RNT) shall grant the builder the right of access and occupation of all TL proposed route and Lubango and New Namibe substations sites.

The team will position the intermediate towers based on the approved profile. If necessary, a basic access path will be created for the position of each structure, moving obstacles such as rocks, levelling high points and filling holes. The work will be carried out in order to minimize the impact on the environment in the surrounding area. Existing paths will be used whenever possible and new access will be created to reach the positions of the poles or tower, if the existing accesses are impassable.

Deforestation

When tree felling is required, all activities will be supervised by duly qualified officials. The forest and slow-growing trees will be removed via front stacker. All shrubs and trees will be cut into pieces of wood before leaving the site, and then the wood is put on the side of the road, at the disposal of the surrounding communities, to use it as firewood or in construction. Deforestation will be as little as possible and will only occur if extremely necessary (removal of vegetation for the right-of-way).

The placement of TL structures will be carried out on the ground defined for each tower, in an area of 15 x 15m. The tower structure will be mounted and erected on the ground indicated for it. The total area of clean land to accommodate the tower (area for permanent positioning of the tower) is 15 x 15m. In total, approximately 495 towers will be erected in about 400 meters of distance between each.

Construction Phase Activities

Include implementation activities for TL, site excavation, concrete base construction to support the towers that will accommodate the TL, including the implementation of tips, transport of tower components and other raw materials, assembly and erection of towers and placement of TL. In summary, this phase will entail the following (not necessarily as per the order below):

- Mobilising workers, machinery and construction equipment;
- Surveying and development of access roads;
- Clearing vegetation and stripping topsoil within the boundaries of the construction camps, construction sites, RoW, East Lubango and New Namibe substations, and for each tower point;

- Setup of construction camps;
- Transport of all the required materials, equipment and components to the construction camps and to each tower location;
- Movement and operation of heavy machinery and equipment;
- Management of waste produced;
- Clearing trees from the right-of-way;
- Surveying and pegging of towers locations;
- Earthworks associated with the tower and substations foundations/platforms;
- Construction of concrete foundations to support East Lubango and New Namibe substations and the towers (including installation of stay-cables to the ground and the installation of support bases);
- Assembling and erecting tower using temporary laydown areas at each tower;
- Laying of cables, conductor stringing, line signalling, aerial beacons and bird diverters - entails unrolling, adjusting and securing of the cables, using the areas around, or between, the towers.
- Installation of temporary protective structures where cables cross over or beneath obstacles (namely roads, railways and other aerial lines);
- Conductor and Optical Ground Wire (OPGW) stringing;
- Building and assembling all required equipment and structures inside the substations (East Lubango and New Namibe) areas (usually undertaken by highly qualified teams), including associated buildings and security fencing;
- Commissioning of the substations, which involves carrying out several tests to ensure that the equipment, and the protection and control systems, are properly installed and functioning correctly before the substation commences operation;
- Installing anti–climbing devices on the towers; and
- Demobilising construction work sites and rehabilitating affected areas, including the following actions:

    - Removal/decommissioning of contractor's camps;
    - Removal and disposal of all construction equipment and rubble;
    - Rehabilitation of all areas disturbed by construction works;
    - Rehabilitation of all access roads not required in the operational phase.

2.4.3 Workers' Camps

During implementation, temporary laydown and site camp areas will be required. They will serve as logistical centres for construction activities along a given length of the line. Two workers' camps will be established, one in Lubango in an area of 10,000 m^2, and the other in Moçâmedes in an area of 8,000 m^2. The camps will be restricted to the minimum size that is practically required to facilitate construction and will be preferentially located in already disturbed (cleared) locations. Selection of the laydown areas will be done in consultation with RNT's team. The temporary construction worker camps and laydown areas will be rehabilitated once construction is complete. Each worker camp is expected to include the following components:

A site office, consisting of the following prefabricated units:

- Accommodation (if located far from settlements), consisting of prefabricated units;
- Eating and ablution facilities;
- Laydown areas for infrastructure;
- Concrete mixing plant;
- Storage facilities for materials, equipment or waste;
- Vehicle/equipment parking area;
- Power supply (generator);
- Fuel storage containers for generators and vehicles;
- Water supply (borehole, water treatment plant, or a water tank);
- Security fencing; and
- Mobile toilets and/or French drains for treated sewage disposal.

As the project is in Feasibility Study Stage, the materials and resources that are likely to be used or generated on the construction site are not known at this stage of the ESIA development report.

2.4.4 Tower Structure Options

Various types of tower structures can be used, depending on the landscape, engineering and the biophysical environment and areas topography. The final towers sizes and positions will only be

determined once the project has finished the Feasibility Study, once negotiations with landowners and RNT, have been finalised, and after detailed geotechnical assessments and a pre-construction environmental and social walk-through has been completed. The final towers positions will take into consideration any sensitive areas, Ramsar sites and/or No-Go areas identified by the ESIA specialists and during the walkthrough before construction.

Towers will be selected and installed in accordance with the latest industry standards, and according to JICA and RNT's technical requirements at the time of construction, within the parameters of this assessment. Tower will vary between 45 m and 55 m in height and the distance between each tower will be between 400 m, depending on terrain. LL-ACSR conductors or AAAC conductors are considered. The footprint of each tower foundation will be up to 15m x 15m and foundations may be up to a maximum depth of 5 m. Foundations will occupy small portions of the servitude footprint, and the remainder of the footprint will remain open. The foundation types and depths vary, based on the tower, type of soil, and type of terrain (rock). A combination of the following family of tower structures will be used in Angola (see **Figure 2-3**).

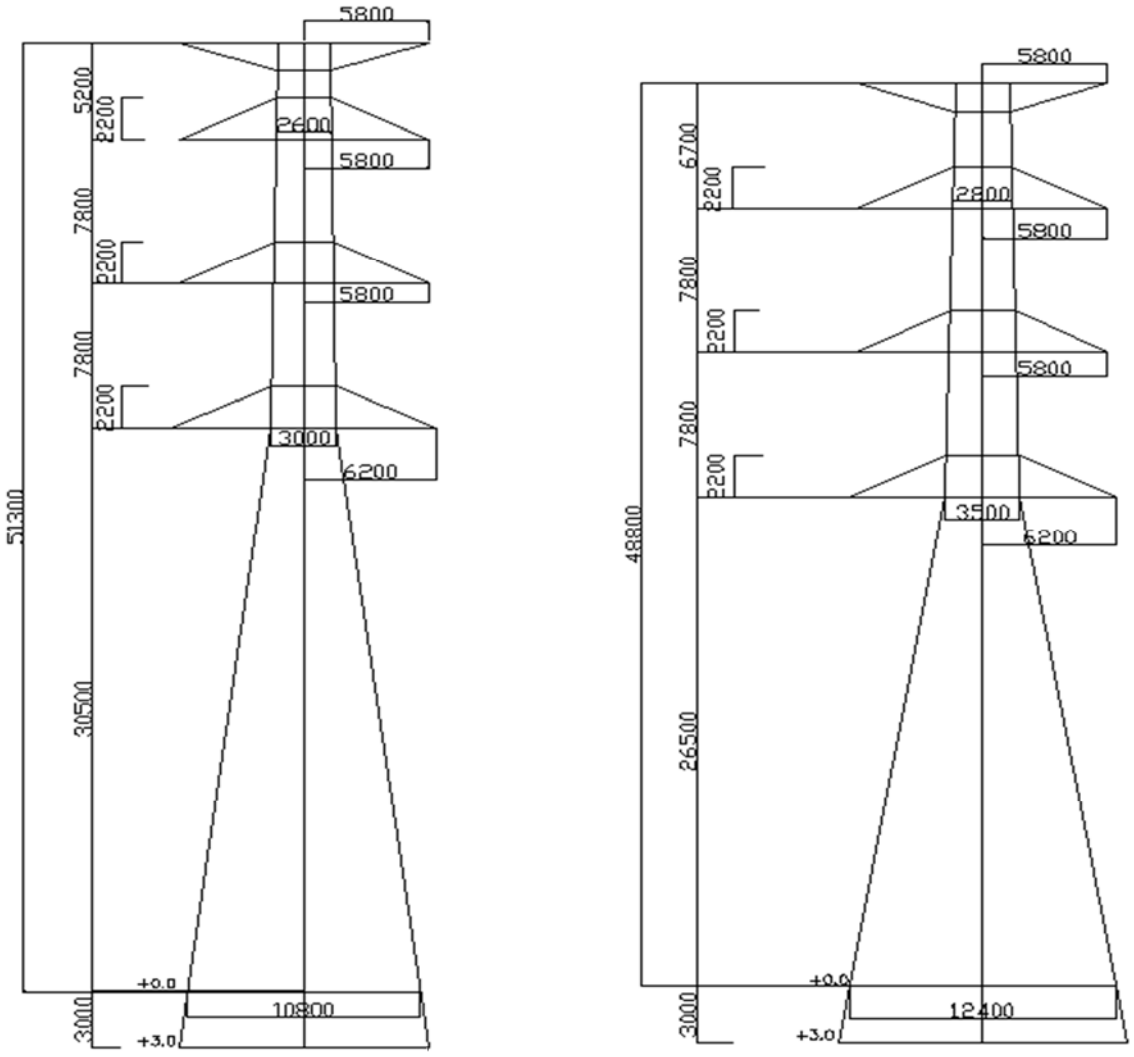


Figure 2-3: Type of tower structure proposed to use in 220 kV TL Project.

2.4.5 Conductors

Conductor selection and optimisation normally involves the consideration of a number of factors and criteria to minimise losses and corona. The criteria include the corona inception gradient, radio interference limits, audible noise and surface gradient. Viable options are then considered in a financial analysis to determine the capital cost and associated losses per annum. The results are then ranked to determine the optimised conductor size. Discussions between RNT, JICA and TEPSCO, will indicate the best selection of conductors for the project.

2.5 New Namibe and East Lubango Substations Description

There are two (2) options for New Namibe substations construction. The first option is an outdoor type, the 220/60 kV New Namibe Substation will be implemented in an area of approximately 11,700 m^2 (90m x 130m), building area of approximately 875 m^2 (35 m x 25 m) ensuring the space for 4 + 2 planned expansion for 220 kV transmission line feeder porticos under this project, with consideration by the direction of Tômbwa and Sacomar. Reserve space for additional expansion (additional gantry, transformer, etc.) will be guaranteed, **Figure 2-4** shows the layout of New Namibe Substation first option.

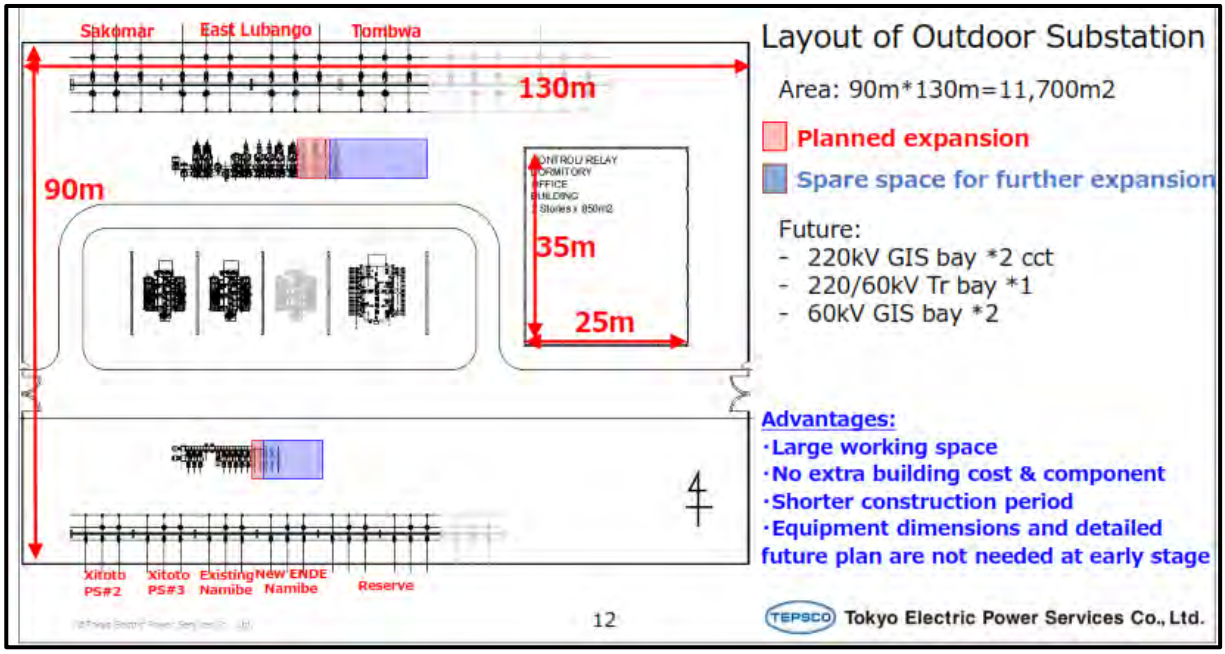


Figure 2-4: Layout of New Namibe substation (First option). **Source:** JICA, 2021.

The second option is an indoor type, the 220/60 kV New Namibe Substation will be implemented in an area of approximately 14,300 m^2 (110m x 130m), building area of approximately 875 m^2 (35 m x 25 m) ensuring the space for 4 + 2 planned expansion for 220 kV transmission line feeder porticos was secured. However, depending on manufacturer, changes of size may occur, leading to the reduce of number of planned feeders inside the estimated GIS room, with consideration by the direction of Tômbwa and Sacomar. Reserve space for additional expansion (additional gantry, transformer, etc.) will be guaranteed, **Figure 2-5** shows the layout of New Namibe Substation second option.

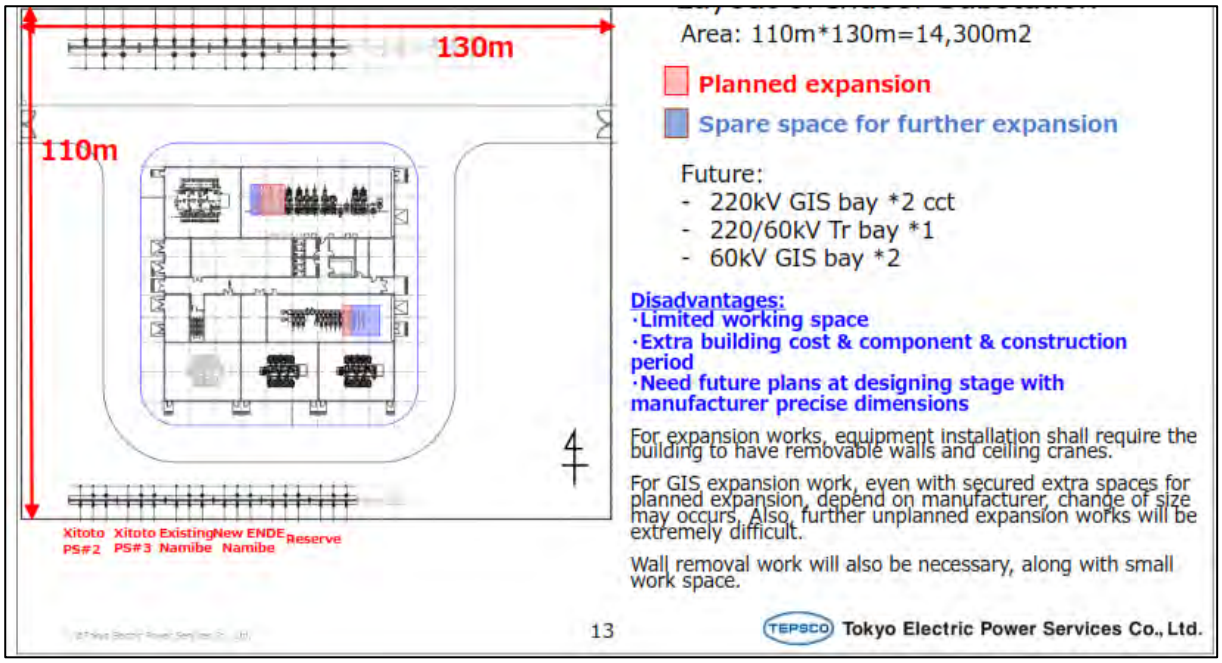


Figure 2-5: Layout of New Namibe substation (Second option). **Source:** JICA, 2021.

The 220/60 kV East Lubango Substation will be implemented in an area of approximately 40,500 m^2. **Figure 2-6** shows the layout of East Lubango Substation and additional information on operation and future connections.

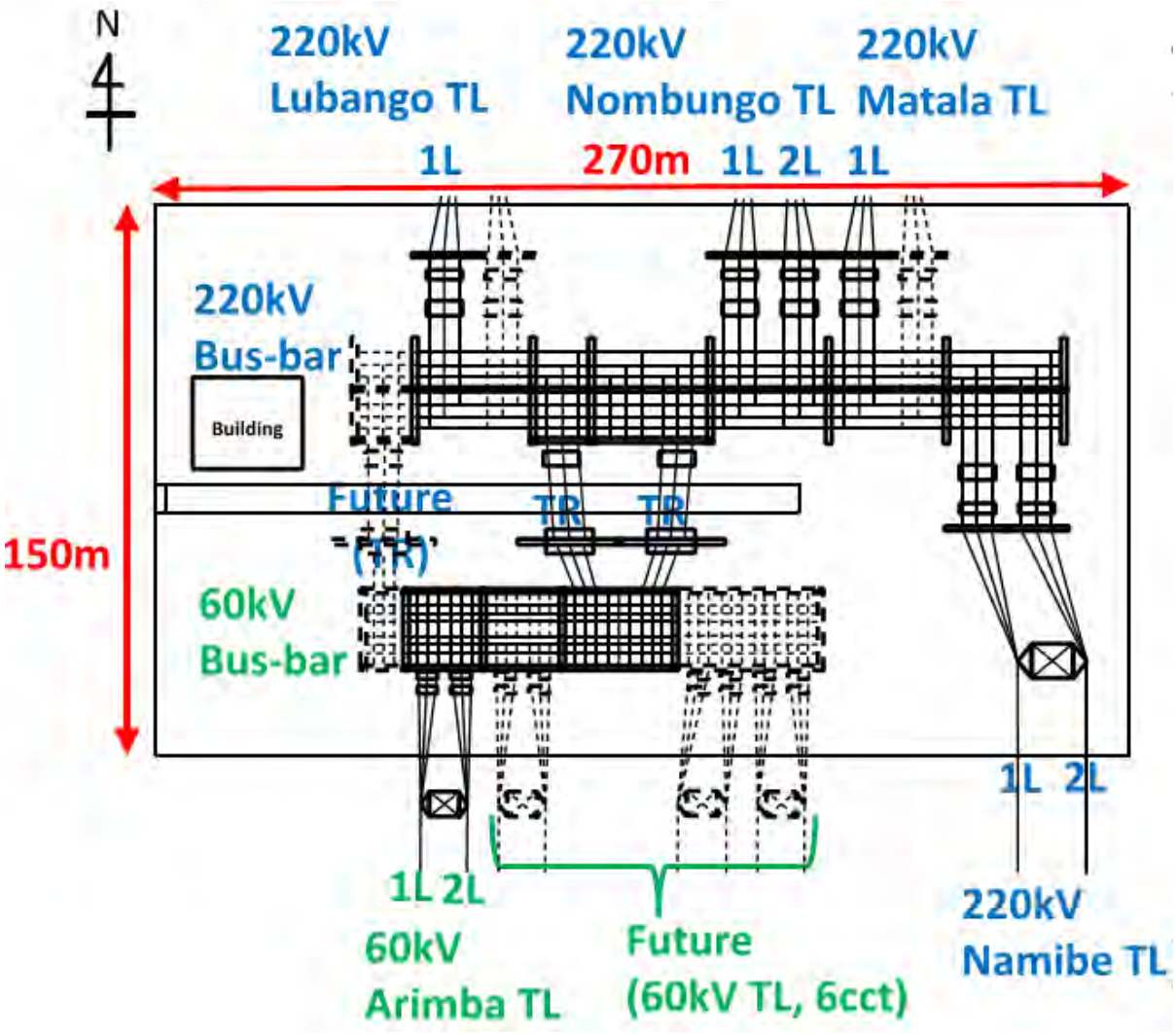


Figure 2-6: Layout of East Lubango substation and specification. **Source:** JICA, 2021.

The 400/220/60 kV Nombungo substation will be built, as part of another project called Belém do Dango - Lubango High Voltage Transmission Lines Project, about 68 km NE of the Lubango urban centre, near the national road (EN 280). The substation will be about 400m x 400m in area, comprising a control building and external equipment such as transformers. It will be fenced with access restricted to authorised persons, according to **Figure 2-7**. The 60 kV and 400 kV lines will be tied into the Substation from the Northwest quadrant and the 220 kV lines will be tied into the Southeast quadrant. The platform area of the substation to be constructed is approximately 62,000 m^2.

Technical buildings will be also constructed, namely: a command building, an auxiliary service house, four (4) panel houses; a 400 kV panel house, two 220 kV panel houses and a 60 kV panel house.

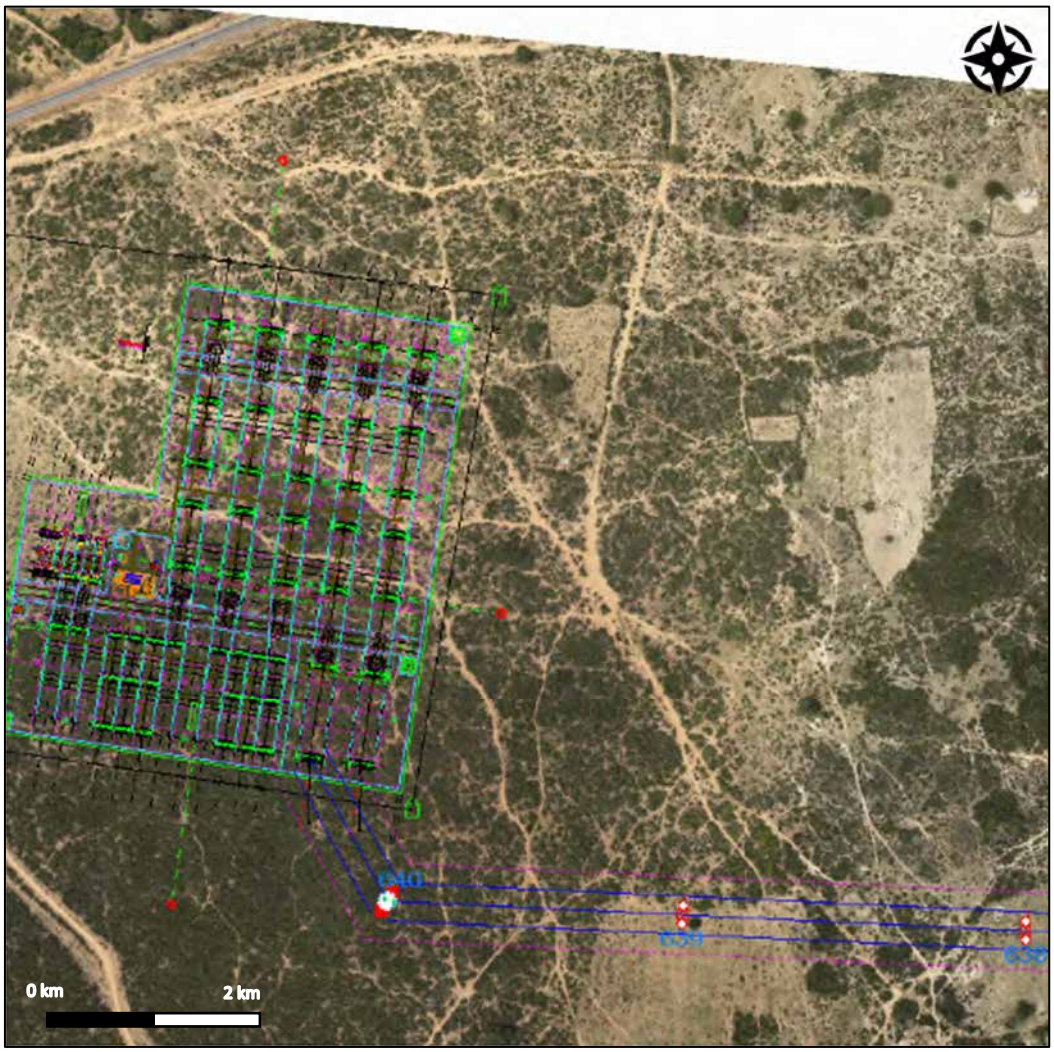


Figure 2-7: Layout of Nombungo substation. **Source:** RNT, 2019.

As mentioned previously above, the complete design of the Nombungo substation does not form part of the RNT, JICA and TEPSCO scope of work and is included in the 400 kV TL Belém do Huambo - Lubango project (undertaken by others), which has already received an Environmental License.

2.6 Transmission Line Demining Process

ANAM is the National Agency for Action Against Mines (established by Presidential Decree n.º 172/21 of July 7th), whose objective is to regulate, accompany, monitor and inspect all those involved in the demining activity sector. ANAM has replaced the National Inter-Sectoral Commission for Demining and Humanitarian Assistance (CNIDAH). ANAM will be responsible for undertaking external quality

assurance and quality control of mine action activities, including quality control of all completed tasks prior to handover of land to beneficiaries. This means that it is mandatory that the transmission line assigned ground strip (60 m wide along the path) shall be certified as defined by an authorized ANAM.

In terms of demining process, all ground assigned to the project needs be certified as mine cleared before commencement of the implementation works. Based on information provided by CNIDAH and Armed Forces information database, as well as local survey, the ground to be cleared is classified as low, medium or high risk, and by the type of potential explosive contamination identified.

This will give permission to plan and mobilize the teams of demining operator(s) and the demining equipment required for the activity. All the areas are considered for demining, even the low-risk areas have to be demined, unless they have a certificate for having been demined previously, as it is the case for roads, farms, agricultural and livestock areas, villages and residential areas.

All the areas within the 60 m wide RoW (and 30 cm depth excavation) along the path will be considered safe after the demining works, as it will be certified by the accredited operator. ANAM will endorse this, no area is considered safe until Mine Clearance certification as been issued. It could be the case that some areas, fields or residential areas were certified previously as cleared, even if they are inside the transmission line 45 m RoW. That is to be disclosed with the analysis of the information database and survey.

The technology and methodologies to be used for the demining process will be explicitly detailed in the Demining Plan and SOPs by operator(s). This Plan should be prepared consistently with the survey and the information analysis. Along the Project route, the focus will be for anti-personnel mines (APM) including Explosive Remnants of War (ERW). Consequently, manual using metal detectors operated by trained deminers with protection should occur. Before that ground preparation operation and Technical Survey (TS) will be conducted by tools of operator(s) in the event that specific areas considered to contain antivehicle mines (AVM) and/or ERW are identified, and the Plan will consider these special circumstances and the technology and methodologies required.

2.7 Water and Electricity

During the implementation stage, the Project Manager will require potable water for the construction camps. Water will also be required for the construction of the foundations for the towers and the substations construction as well as for other any constructions activities. Water will be sourced from contracted water trucks approved by the local authorities and provided as bottled drinking water for the staff. Daily water consumption is expected in the order of 44.04 m^3. During the development of the Project, electricity consumption will be ensured by generator group. At least one generator is expected to be installed at each workers' camps. In the future, the substations will be self-sustaining.

2.8 Waste Management

All municipal and similar waste, industrial, electrical and other expected in the workers camp will be packed in specific containers for the treatment or recycling of the same, these containers will be installed in strategically defined and correctly signposted places. A Waste Management Plan (MWP) will be prepared in compliance with Presidential Decree No. 190/12 of August 24th on the Waste Management Regulation. In this way, all waste resulting from the construction activities of electricity TL such as waste from chemical containers, packaging, cardboard, paper, cardboard, labels, wood pallets, electrical equipment and damaged glass, etc., will be required to be recycled or reused (when or whenever applicable).

The area of the proposed TL does not have essential infrastructure, including the collection network of domestic wastewater and rainwater. Taking into account the nature of the Project, large quantities of water are not expected to be produced on the different work fronts. The effluents produced in the sanitary facilities of the workers camp will be correctly routed in a PVC biological septic tank sized according to the production of effluents expected in the Project.

When they reach the limit, they will be removed by sanitation companies based in the provinces of Namibe and Huíla, previously authorized for the exercise of activity at the level of both regions.

2.9 Work Schedule

The whole project (including substations, towers, and transmission lines, etc.) will be constructed within approximately 24 to 30 months. **Table 2-4** provides a preliminary schedule of the construction of the major project components. The Project is expected to have a lifespan of at least 40 years, in the operation phase a 45 m-wide right-of-way will be constituted of along the line, where the land use will be conditioned. A buffer area will be maintained, in which there may be no buildings (schools, houses and hospitals) or large trees, periodically requiring cutting or pruning activities and maintaining access roads to the towers for maintenance purposes.

Table 2-4: Preliminary Project Schedule.

ACTIVITY	DURATION
East Lubango Substation	24 months
Transmission line	24 months
Namibe substation	24 months
Workers' camps	(T/L Lubango area) 24 months (T/L Namibe area) 18 months (East Lubango SS) 24 months (New Namibe SS) 24 months

2.10 Workforce and Investment Budget

A mixture of unskilled temporary employees, semi-skilled and highly-skilled employees will be required for implementation. The unskilled labourers are generally trained by the contractors and sourced from local communities. Skilled staff will be accommodated in rented accommodation in nearby communities or accommodated within a temporary workers' camps, depending on the distance to the construction site.

The total number of people in the workforce will be approximately 10-30 persons for 220 kV TL in the first six months, 285 persons from 11th month to the 21st month. The workers will be divided into two areas, namely Lubango and Moçâmedes.

The installation of the 220 kV TL will be conducted by an international contractor under a contract with RNT, which will provide the necessary specialized equipment and trained personnel to complete the work. Local workers may be hired to assist in transportation, line cleaning, placement/recovery of receivers, assistance in cleaning and restoring the lines. RNT staffs may also have direct participation in the Project management.

For the construction of the substation, a maximum of approximately 240 personnel will be involved with the construction works (peak 120 workers for Namibe Substation and peak 120 workers for East Lubango Substation. From the Pre-feasibility Study, the estimated total project capital investment requirement is 180,000,000.00 USD (one hundred eighty million United States Dollars). This estimate does include contingency, consultant fee, and demining cost.

2.11 Operation and Maintenance Phase

The operational phase refers to the operation of the proposed TL (electricity transmission) and associated infrastructure (e.g., 220/60 kV East Lubango and New Namibe substations), which will be maintained periodically according to the specifications of the RNT company. The following activities will be required during the anticipated operational lifespan of 40 years:

- General functioning of the transmission line (physical presence and functional characteristics);
- Periodic inspections, monitoring, and maintenance of the line, entailing the verification of the state of the conductors and structures (and replacement of components, if damaged), assessment of the compliance of the safety distances between the vegetation and the conductors, and environmental and social monitoring impacts;
- Vegetation management along the 6 m maintenance road (e.g. cutting and pruning of trees, selective herbicide application, and bush clearing);
- Management of waste production associated with the periodic maintenance actions (limited to towers footprints and substation interiors); and
- Periodic maintenance activities at the substations, which include cleaning insulators, checking circuits, testing batteries, replacing transformer oils, etc.

2.12 Alternatives Locations

This section describes the analysis of technically and financially feasible alternatives considered in the development of the Project and provides documentation of the rationale for selecting a particular option. The purpose of the alternatives analysis is to identify feasible alternatives that could improve the sustainability of the Project's design, implementation and operation. A significant portion of the TL route will be located in parallel to the existing 60 kV TL. There will however be greenfield development involving expansion and/or extension of the corridor. As part of the design process, RNT and TEPSCO in 2020 investigated various options to minimise the impact on the public and private infrastructure and the natural and social environment.

The project's alternatives were explored to ensure that development will be sustainable in the context of socio-economic (employment, health, etc.) and physical (topography, landscape, etc.) needs of the Project area and surroundings. Several alternative routes were explored given the presence of important elements of Biodiversity and sites of geological importance such as the Tundavala Rift and the Leba Mountain Range. Considering that the potential positive impacts resulting from the implementation of the project will more effectively enhance the public electricity network in southwestern Angola, the option of not implementing the Project is not considered as a better alternative to the proposed Project.

However, three alternatives for the route of the TL have been identified in the region. After two visits along the route of the three options and fourteen online workshops between RNT (in Luanda), and TEPSCO (in Tokyo) during COVID-19 locked-down. The light-blue route was chosen because apparently required less resettlement of houses, infrastructure and areas for cultivation or livestock, and influence of Tundavala area and discussion on a proposed conservation area in the region. In some parts, the proposed TL route (pink line) will pass in parallel to the current 60 kV TL (blue line) that connects the Ferrovia Substation (in Lubango) to Moçâmedes (see **Figure 2-8**). The 220 kV TL will leave Nombungo Substation in the north connecting to East Lubango Substation and subsequently connecting with New Namibe Substation. Through a site visit by TEPSCO in August 2021, the following changes were made and finalised to the pink line route (see **Figure 2-8**); to bypass the Ivantala Lake between Nombungo SS and East Lubango SS; to avoid steep slopes in southern Lubango; to align along the route of the

National Road 280) wherever possible to minimise environmental disturbance on soil structure and stability in western steppe and desert areas.

Currently, the 220 kV TL route is the final, however, may be changed, and several studies such as geomorphological, soils and topography studies are required to identify the best options particularly for the tower sitting. Consequently, both siting alternatives and technology were evaluated individually, and was decided that the 220 kV transmission line between Lubango and Moçâmedes would run parallel to an existing 60 kV transmission line that connect Lubango – Moçâmedes (see **Figure 2-8**). However, the physical positions of the transmission line, their geographical coordinates and the tower's location will be defined by topographical works allowing certain adjustments to avoid any physical resettlement and to limit construction into populated areas. This route design will be redefined in detail after the topographic studies are conducted.

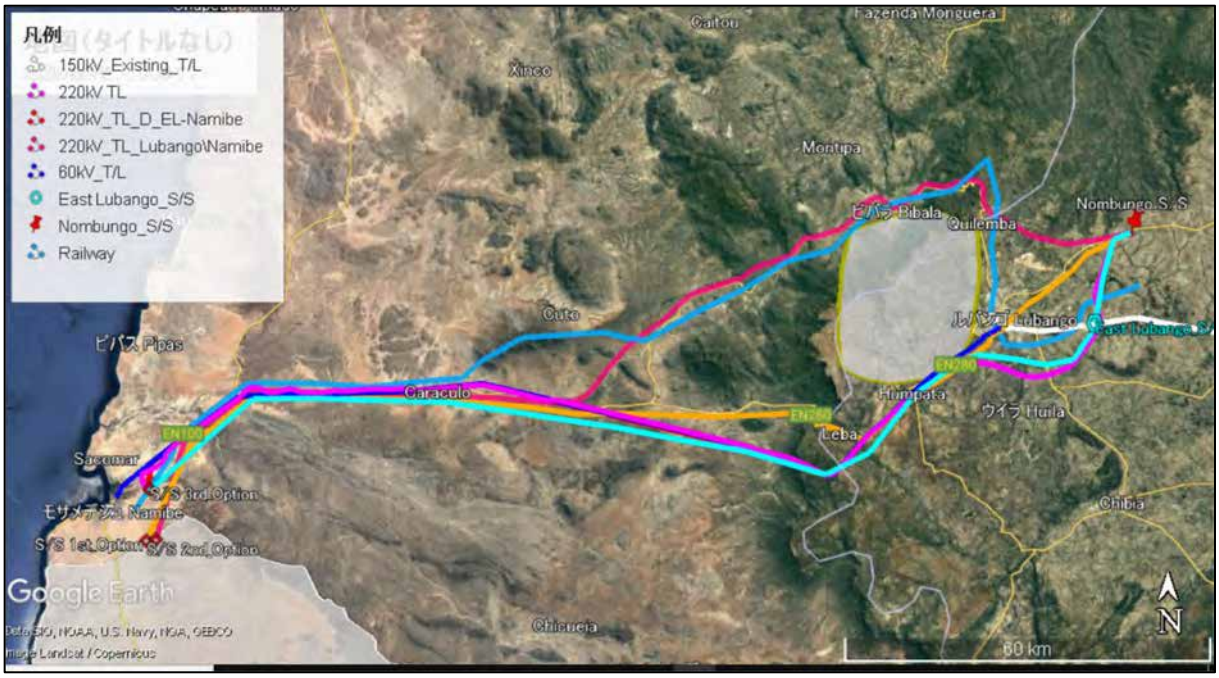


Figure 2-8: Project's alternatives mapped in Lubango – Namibe.

'Zero-option'

A comparison of the impact of not implementing the project (Zero-option') is shown in the **Table 2-5**. In the case where the project is not implemented, no construction work itself will take place, so there will be no impact during construction and no negative impacts from the implementation of the project.

On the other hand, there is concern that the electricity supply and capacity will remain at the current level or decline over the long term, which could result in a medium- to long-term increase in the amount borne by consumers, as well as a decline in the quality of social infrastructure and social services and negative impacts on business and household-level livelihood activities.

The negative impacts of Zero-option project are significant, while the negative impacts of implementing the project could be mitigated, so there is no advantage to the Zero-option.

Table 2-5: Comparison of environmental and social effects without project implementation 'Zero-option'.

Aspect	Positive effect of Zero-option	Negative effect of Zero-option
Electricity demand, stable supply of electricity	None.	• The benefits of the development of a linkage from the north to the central and southern regions, which is underway to address the increasing demand for electricity in southern Angola, will not be available in the southern region. • Delays in meeting increased electricity demand in the Lubango region, Angola's second-largest city. • The only transmission line between Lubango and Namibe Port, a logistics and mineral export hub in the south, is a 60 kV transmission line built in the 1950s, which means that the electricity supply in the Namibe region is strained and would be severely damaged in the event of a collapse or other accident due to ageing.
Physical environment	No effects of soil pollution, air pollution, noise/vibration or waste generation will occur as a result of the construction and use of the facility.	• There are concerns about increased environmental pollution associated with increased maintenance activities due to the inability to back up and renew existing 60 kV transmission facilities. • In the unlikely event of a collapse or other accident, disaster waste will be generated.

Aspect	Positive effect of Zero-option	Negative effect of Zero-option
Natural (physical) environment	There is no need for tree felling and land clearance due to power line ROW and access road construction, etc., and no fragmentation or loss f habitat of the ecosystem occurs. -No habitat loss, bird strikes or other impacts associated with the provision of facilities will occur.	• Energy shortages and increasing poverty due to inadequate and unstable electricity supplies are causing secondary impacts, such as illegal logging of forests and poaching of animals, leading to ecological destruction.
Social and economic	- No land acquisition or resettlement occurs. - The adverse impact on local communities caused by access restrictions, traffic blockades and the establishment of labour camps resulting from the laying of transmission lines and the construction of substation facilities does not arise in the case of the degree of adverse impact on local communities.	• No contribution to local employment, such as employment opportunities in the project area, is obtained. • If only the existing 60 kV transmission facilities continue to be used, there will be no improvement in electricity supply and capacity, and there will be long-term negative impacts on social infrastructure and quality of social services, as well as on business and household-level livelihood activities. • It could lead to an increase in the price of electricity sold and a corresponding increase in the price of electricity purchased, in which case the increased costs could be reflected in higher government subsidies or in the amount borne by consumers.

Source: JICA survey team, 2022.

Alternative analysis of the location options

Four location options for an overhead transmission line between Lubango and Moçâmedes were considered in terms of technical, environmental, socio-economic and financial economic aspects (see **Figure 2-8**). Lubango is the second largest city in Angola, located at the south-western edge of the Angolan highlands at an altitude of around 1,700 m. The Tundavala area, about 15 km west of the city, is one of the Important Bird and Biodiversity Area (IBA), internationally recognised as an important habitat for birds and it is recognised as an IBA (AO0023), and the approximately 1,000 m steep cliffs

on the western edge of the plateau and Mt. Leba are important scenic features for the area. In addition, the Namibe Partial Reserve is designated in the southern part of Moçâmedes.

The four plans differ in the route from the Nombungo substation through the Lubango area, the route through the steep cliffs in the Tundavala area and the route from the steep cliffs to the wooded area, while the route west from approximately halfway between Nombungo and Namibe substations is basically the same and follows National Road 280 or the existing 60kV distribution line.

- **Plan A:** The route passes through the cultivated areas north of Lubango urban area, west and north of Tundabara through the steep cliffs with sufficient separation from the railway, and through the mountainous areas in the north.
- **Plan B:** The route passes through the existing Lubango substation in the centre of Lubango urban area, the eastern side of the Tundavala area along National Road 280, and in front of Mt. Laba.
- **Plan C:** The route passes the eastern cultivated area of Lubango urban area and along the existing 150 kV transmission line up to the existing Lubango substation, and the steep cliff section through the gorge along the existing 60 kV distribution line.
- **Plan D:** The route bypasses the Lubango urban area from the eastern cultivated area to the southern hilly areas and passes through the steep cliff gorges along the existing 60 kV distribution line.

Table 2-6 shows the results of the alternative analysis of the four options. Route D was selected because of its technical, environmental, social and economic advantages in terms of following the existing 60 kV distribution line.

Table 2-6: Items considered in the transmission line route selection and comparison results.

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
Environment	Important habitats. IBA (AO0023: Tundavala area)	Avoided, but there is a high degree of natural continuity to the north, and there is concern about the impact.	Can be avoided, but passes closer than Plans C and D.	Avoidable.	The most remote routes can be avoided.	Plan D is considered to be the best route for minimising the impact on the natural environment.
	Protected Area: Namibe Partial Reserve	Depends on location of Namibe substation.	Same as the left	Same as the left	Same as the left	
	Tourist attractions and other landscapes Lubango City	No impact is envisaged.	There is concern about the impact on the cultural landscape (the Christ statue seen from the city area in Lubango).	Impacts can be avoided.	Impacts can be avoided.	
	Mt. Leba	No impact assumed.	There will be a significant impact	Impact can be avoided.	Same as the left	
	Flora and Fauna	The route is more natural than the southern route, and the impact of the construction work will be significant, as well as the	The impact on trees will not be significant in the section of shrub savannah from the foot of Mt. Leba to	Although the impact of the works in the section of shrub savannah from Kapangombe to Caraculo will be higher than in Plan B, regeneration is	Same as the left	

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
		impact on birds flying along the cliff line around the Tundavala area.	Caraculo, and the impact on flora and fauna will not be significant, whereas the impact on trees on the slopes of Mt. Leba will be significant.	expected in the steep cliffs, and the direct and indirect impacts of the access road during operation phase can be minimised by the provision of the access road on the existing 60 kV line.		
	Forest.	The impact of logging on highly natural and secondary forests will be most significant, and there is concern that this will increase new access routes into the forest, thus increasing human-impacted deforestation.	Although the area cleared is smaller than others, the regeneration period on steep area can be longer than others.	The impact of new logging and secondary disturbance, such as Inducing illegal logging will be minimised as the access road can be shared with the existing 60 kV line access road.	Same as the left	
Community	Resettlement and land acquisition	Resettlement will not occur (and if it does, it will be minimal) and will be the least impact, as it will not pass through	As it will pass through a dense residential area in the urban area of Lubango, it will be a	The relocation of mainly informal residents (around 200) will occur. There is also potential for temporary relocation	As the project will not pass through dense residential areas such as urban areas, the	Plans A and D have the least impact in terms of resettlement.

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
		densely populated residential areas such as the Lubango urban area. In addition, there is a possibility of temporary relocation during the construction period (mainly of agricultural land) and associated temporary relocation during the construction period. Permanent acquisition of steel tower bases (small scale) will also occur.	significant impact on land use, particularly in Lubango city, and the scale of impact on the livelihood will be significant. There is also potential for temporary relocation during the construction period (mainly of agricultural land) and associated temporary relocation during the construction period. Permanent acquisition of steel tower bases (small scale) will also occur.	during the construction period (mainly of agricultural land) and associated temporary relocation during the construction period. Permanent acquisition of steel tower bases (small scale) will also occur.	permanent resettlement will not occur (and even if it does, it will be minimal) and the impact will not significant). However, there is a possibility of temporary relocation during the construction period (mainly of agricultural land) and associated temporary displacement during the construction period. Permanent acquisition of	

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
					steel tower bases (small scale) will also occur.	
	Impact on indigenous peoples.	The construction of overhead power lines and there is no land fragmentation. Construction will be phased in various locations, thus avoiding impacts on grazing routes.	Same as the left	Same as the left	Same as the left	
	Schools, religious institutions, local community facilities	Impact is avoidable.	Same as the left	Same as the left	Same as the left	
Location feature.	Large river	There are (2) crossings on the west side common route.	Same as the left	Same as the left	Same as the left	The optimum location should be determined by a cross-stream crossing point survey.
	Existing power line	Consideration needs to be given to the location of the existing 60 kV on the west side.	It is necessary to take into account the location of the existing 60 kV in the west and the location	Consideration needs to be given to the location of the existing 60 kV west of the city of Lubango, and consideration needs to be	Consideration needs to be given to the location of the existing 60 kV on the west side.	All plans share the need for consideration in areas that run parallel to 60 kV distribution lines, but

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
			of the existing 150 kV in the city of Lubango.	given to the location of the 150 kV within Lubango.		Plans A and D have an advantage in that they do not require consideration for 150 kV transmission lines.
	Railway	Needs to be discussed with Moçâmedes Railways west of Lubango.	None.	Needs to be discussed within the city of Lubango	None.	Plans B and D have an advantage.
	Cultural property	Almost no impact	There is no impact on the Christ statue itself, which is an important cultural asset, but the cultural landscape will be affected. Other measures can be taken by maintaining a certain distance from cultural assets located along the National Highway	A certain distance from cultural assets located near the route from Caraculo to Humpata can be addressed.	Same as the left	Plans A, C and D have advantages.

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
			280 and near the route from Caraculo to Humpata.			
	Land mine	Unexplored and cannot be determined.	Same as the left	Same as the left	Same as the left	Safety should be confirmed based on detailed location studies of routes and pylons.
Design and construction	Extended distance (km)	194 km	185 km	197 km	196 km	Plan B is the shortest and most advantageous.
	Construction costs	It passes through mountainous areas and steep slopes in the north and is therefore more costly than Plan D due to the cost of the main body of work and the access road.	The line length is the shortest, but it passes through densely populated residential areas, is expected to be difficult to construct in the steep terrain of Mt. Leba is more costly than Plan A and C.	Access roads for existing 60 kV line can be utilised but are more costly than Plan D because the line length is the longest and passes through densely populated residential areas.	Access roads to existing 60 kV transmission lines can be utilised, and costs are lowest with fewer access roads as they do not pass through dense residential areas and are often along major roads.	Plan D has the lowest relative advantage.

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
	Construction work and construction period	In the northern mountainous areas, the process is likely to be longer than in Plan D, as there are no access roads from the existing roads, so their construction will be all new.	Construction is more difficult than Plan C, taking into account the passage through the dense residential areas of Lubango town and the difficulty of constructing the steep areas of Mt. Leba.	Construction is more difficult than Plan A and D because it passes through a dense residential area in the Lubango city area.	Construction is easiest than other plans due to the proximity and parallelism to existing 60 kV transmission lines and existing roads.	Plan D is the most advantageous.
	Maintainability	Maintenance is inferior to Plan D due to longer distances between mountain districts in the north and maintenance of access roads.	The area around Mount Leyva is steep and maintenance is inferior to other plans. In addition, there are concerns about public hazards due to the passage of urban areas, and measures to prevent such hazards will increase.	There is concern about public hazards and other disasters caused by urban transit, and measures to prevent such disasters are increasing.	Many sections are close to or parallel to existing 60 kV transmission lines and existing roads, so access roads can be shared and are easy to maintain.	Plan D is the most advantageous.

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
Economy	Maintenance costs	Maintenance costs are relatively high due to the need for new patrol routes	Maintenance costs are considerably higher due to the need for new patrol routes on steep cliff slopes.	Highly economical, as almost the same patrol routes as existing transmission lines can be used.	Some parts are along existing 60 kV distribution lines, while others are new routes.	Plan D is the most advantageous.
	Ripple effect	It does not contribute to stable supply in the Lubango region.	Contributes to a stable supply in the Lubango region but is constrained by the existing Lubango substation site.	Contributes to a stable supply in the Lubango area but is constrained by the existing Lubango substation site.	Very effective in ensuring stable supplies in the Lubango region.	Plans B, C and D have an advantage.
Comprehensive evaluation		The impact on the natural environment during the construction and operation stage will be relatively significant, meanwhile the social impacts, such as resettlement, will not be significant. Because of long mountainous terrain passage, the	The impact on the natural environment in the forest area will be significant, and there was strong objection because of the impact on the landscape around Mt. Leba, In addition a large-scale	Although the impact on the natural environment will not be significant. it is assumed that the resettlement of informal residents will occur.	In terms of the natural environment, although it is important to take measures to prevent scioning of swamps and trends that are characteristic at the regional level,	Plan D has an advantage.

Item	Subjects for consideration that need to be taken into account	Plan A	Plan B	Plan C	Plan D	Result
		construction period and cost, and maintenance cost will be high. Ripple effect will not be high.	resettlement is expected.		it is considered that the impact of the project can be minimised and reduced during construction and operation phases, and that the project will have a significant effect on the conservation of swamps in the vicinity of the Shashi Electric Station and on the residents using the route, with little similar juicy impact expected.	
Selection results		Rejection (of an application)	Rejection (of an application)	Rejection (of an application)	Adoption	

Source: JICA survey team, 2022.

CHAPTER 3

INSTITUTIONAL AND LEGAL FRAMEWORK

3 INSTITUTIONAL AND LEGAL FRAMEWORK

This chapter describes the institutional framework (organic statutes of the Angolan ministerial departments and provincial government) and national legislation (laws, regulations, policies and applicable decrees) relevant to the Project activities in Namibe and Huíla provinces. It also presents relevant international multilateral environmental agreements to which Angola is party and are relevant for the energy transmission lines projects.

3.1 Institutional Framework

Article 39 (of February 5th, 2010) of the Constitution of the Republic of Angola establishes environmental law that rules the State institutions that enforce environmental protection. This article states that everyone has the right to live in a healthy, unpolluted environment and the duty to defend and preserve it. The State takes necessary measures to ensure the environmental law is upheld thus protecting flora and fauna species, ecological balance and the environment within the national territory. It also regulates the location of economic activity and the use of all-natural resources in the context of sustainable development and respecting the rights of future generations.

Considering the nature of the Project, the above responsibilities and environmental legislation regulations are the responsibility of the Ministry of Energy and Water, Ministry of Culture, Tourism and Environment, Ministry of Transport, the Provincial Governments of Huíla and Namibe.

3.1.1 Ministry of Energy and Water

This Ministry was restructured under Decree No. 223/20 of August 28th. It is the Executive ministerial department that proposes, formulates, manages, conducts, executes, and controls the Executive policy in the domains of energy, water and sanitation. The main attributions of the Ministry of Energy and Water are as follows:

- Propose and promote policy execution in the energy and water sectors;
- Establish strategies, promote and coordinate the profit and rational utilization of energy and water resources, assuring sustainable development;

- License, supervise, and inspect hydraulic profits, and water and sanitation supply system licensing; and
- Collaborate with Local State Administration bodies in the elaboration and implementation of electrification programmes, water supply and support the development of rural, urban and pre urban zones.

These attributions are executed by its central executive services, namely the National Directorate of Electric Energy; Local and Rural Electrification; and Renewable Energy and Water. The National Directorate of Electric Energy is the direct executive service of the Ministry of Energy and Water (MINEA), whose aim is the planning, study, conception, and accompaniment of policy execution relating to the production, transportation, distribution, and use of electric energy.

Energy and Water (MINEA) has recently undergone major restructuring in the energy sector in Angola through the promulgation and coming into force of Presidential Decree No. 305/14 of November 20th, 2014. This decree, in alignment with the macro Power Sector Transformation Program (PSTP), resulted in the creation of different organizational structures within the MINEA to oversee various aspects of the power sector in Angola, namely: production (e.g., operation of power generating facilities), transportation (e.g., power system management, market operation, and management of the transmission network) and electrical distribution. **Figure 3-1** below captures key institutions associated with energy management in Angola and the subsequent pages describe the roles of such institutions and list applicable national regulation and relevant international guidelines.

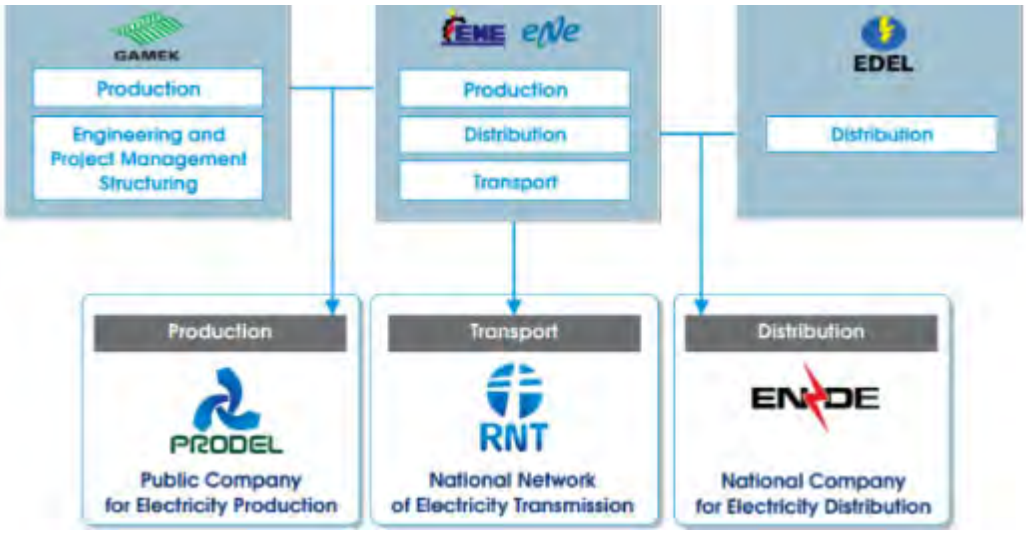


Figure 3-1: Energy-related Organizations in Angola.

PRODEL, is a strategic company legally recognized with administrative, financial, patrimonial and management autonomy, governed by the Organic Statute approved by the Presidential Decree N. º 305/14 of 20th November, through complementary norms of execution, together with the legislation applicable to public companies and, in terms of what is not clearly regulated, by the norms of the Commercial Right (*Direito Comercial*) and further norms of private rights in force. The company's main objective is the production of electric energy as per the scope of the Public Electric System (PES) and in accordance with the terms and conditions of the respective concessions or licenses. PRODEL, core business includes the production of hydroelectric energy, thermal, hybrid and renewable energy. Within the organisation structure, there is a specialized department for Quality, Health, Safety and Environment (QHSE).

The National Electricity Transportation Network (RNT) is a public company with the responsibility of the management and planning of all the transmission network of the country, integrating all the Very High Voltage Transmission assets of former ENE. The main objective of the RNT is to transport electric energy through the exploration of the National Electricity Transportation Network (NETN). As per the General Electricity Law concession and its regulations, NETN comprises the national very high-tension system, interconnection net, national dispatch installations, as well as the goods and rights connected in parallel with the market operator function (a single buyer). The Transportation Tension levels under responsibility of RNT are 400 kV, 220 kV, 150 kV, 132 kV and 110 kV.

The National Company for Electricity Distribution (ENDE), is a public company with the responsibility of distributing electricity, integrating all the activities and assets of former EDEL and the distribution assets of former ENE. The main responsibility of ENDE is to distribute and commercialize electricity at the national level, through the exploitation of distribution network infrastructure (HT, MT, LT) in High, Medium and Low Voltages, under public service regime, under the terms of the General Electricity Law and related Regulations.

Besides PRODEL, RNT and ENDE, The Gabinete de Aproveitamento do Médio Kwanza (GAMEK) is other public entities with relevant roles in terms of power related projects. GAMEK is under the Ministry of Water and Energy and it has legal, administrative, and financial autonomy; being driven by its Organic Statute approved by the Joint Dispatch No. 14/86 of 17 March 1986.

GAMEK is currently the institution responsible for the management of the Middle Kwanza Basin, and for all energy projects under construction including thermal and hybrid plants, hydropower dams, and transmission line projects. Among other development projects, GAMEK is currently also responsible for management of the Capanda Dam, which is a hydroelectric dam located within the Kwanza River basin in the Municipality of Cacuso, in the Province of Malanje North of Angola. The Capanda dam has a total electric generating capacity of 520 MW.

3.1.2 Ministry of Culture, Tourism and Environment

The Ministry of Culture, Tourism and Environment (MCTA), restructured under Presidential Decree No. 162/20 of June 8th, is the institution responsible for formulating, conducting, monitoring, evaluating and enforcing policies in the field of culture, tourism and the environment. This includes the implementation of strategic programmes and projects to promote culture, tourism development and environmental management. In the environmental sector, MCTA has among others, the following competencies:

- Promote the public dissemination of information about the environment in the country;
- Promote environmental training and education, dialogue and citizen participation to better understand the phenomena of environmental balance;
- Coordinate national actions to respond to global environmental problems by implementing the recommendations of international conventions and agreements;
- Propose the creation and classification of environmental conservation areas of national and regional scope;
- Promote the management of conservation areas, including national parks, nature reserves and biosphere and landscape protection and preservation.

These duties are carried out by direct executive bodies and services, namely: The National Directorate for Environment and Climate Action, and the National Directorate for Prevention and Environmental Impact Assessment. The latter, responsible for the implementation of Presidential Decree No. 117/20 of April 22nd on the Environmental Impact Assessment Regulation and Environmental Licensing Procedure. MCTA is also responsible for the registration of companies authorized to carry out Environmental Impact Studies, as well as for providing or approving the specific Terms of Reference for Environmental and Social Impact Studies.

In order to fulfil the Terms of Reference for the development of Environmental Impact Studies (Executive Decree No. 92/12 of March 1st), the project was registered with the Ministry of Culture, Tourism and Environment on January 19th, 2020. **Figure 3-2** is a graphic illustration of the Environmental Impact Assessment (EIA) process according to the environmental legislation and all other legislation in place in the Republic of Angola.

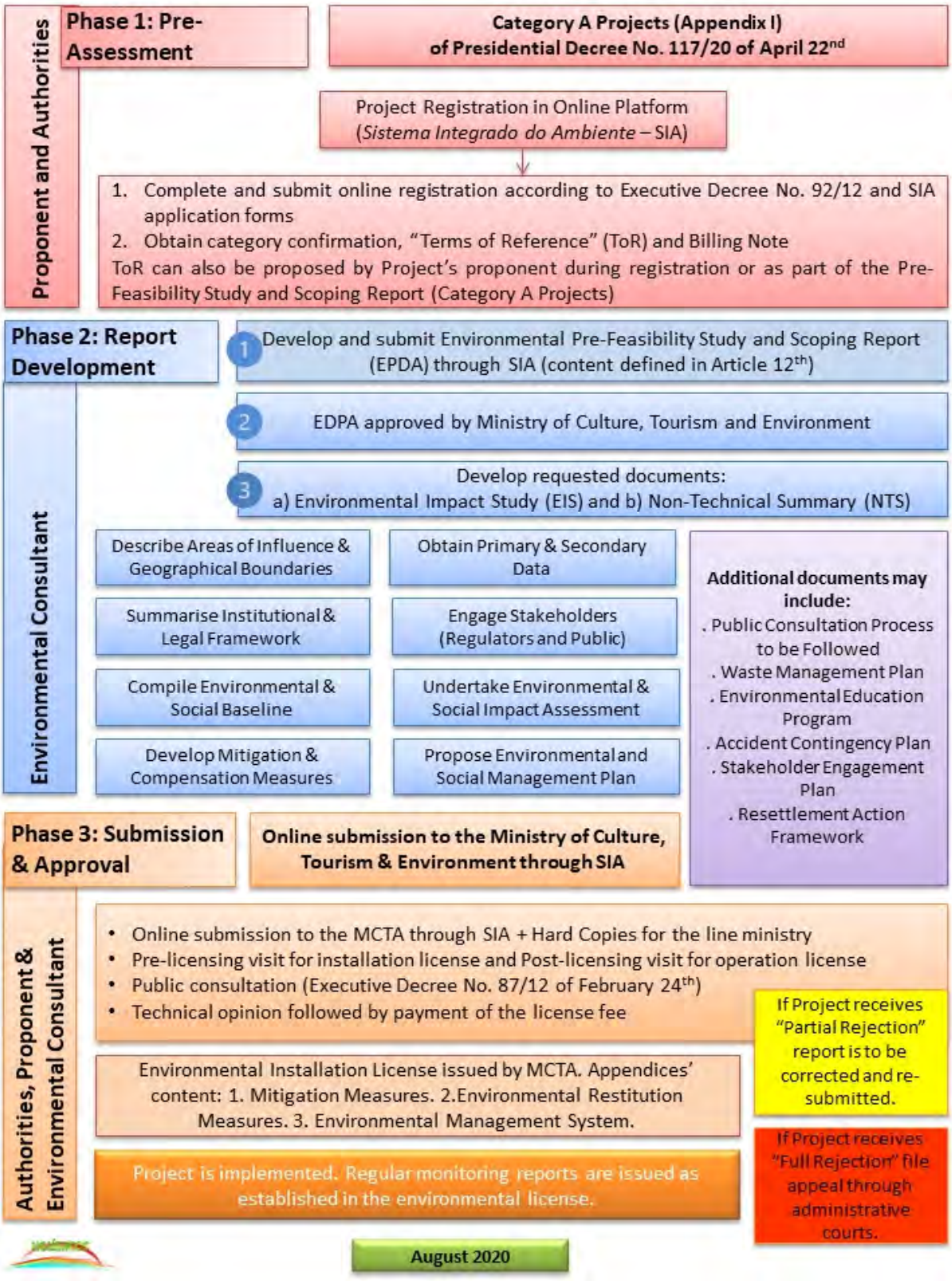


Figure 3-2: Representation of the Angolan Environmental Impact Assessment process.

3.1.3 Ministry of Transport

The Ministry of Transport was restructured under Presidential Decree No. 233/20 of September 14th, 2020. The Ministry of Transport (MINTRANS) has the mission to propose the formulation, conduction, execution and control of the Executive's Policy in the field of transport.

These attributions are executed by its institutions of superintendents that have their own structures, namely the Institute of Civil Aviation (INAVIC); Institute Maritime and Port of Angola; National Institute of Road Transport; National Institute of Railway of Angola; National Porters Council and Institute of Hydrology and Maritime signalling.

Since the transmission line proposed route will be in the manoeuvre zone of two airports (Mukanka International Airport in Lubango, and Welwitschia Mirabilis International Airport in Moçâmedes) the civil aviation is also involved in this process. The Institute of Civil Aviation (Presidential Decree No. 2/15 of January 2th) it is a public institute with administrative, financial and patrimonial, endowed with legal personality and management autonomy, designed to support the aeronautical authority in the performance of its coordination, guidance, control, inspection, licensing and regulation of all activities related to the Sector of Civil Aviation developed in Angola or in the airspace under its jurisdiction.

3.1.4 Ministry of Agriculture and Fisheries

The Ministry of Agriculture and Fisheries, abbreviated as MINAGRIP, was restructured under Presidential Decree No. 177/20 of June 23rd, 2020.

The Ministry of Agriculture and Fisheries is the ministerial department of the Angolan Executive, which is responsible for propose the formulation, execution, conduction and control of the Executive's policies in the fields of agriculture, livestock, forests, food security and management, management and planning of aquatic biological resources, sustainable fishing and aquaculture activities, salt production, research, experimentation and technological innovation in the area of the sea, prospecting, use, exploitation and enhancement of aquatic resources, and an economy of the sustainable sea, with a view to sustainable development.

These attributions are executed by its central executive services. In terms of energy related projects (transmission line), the Agriculture Land Management Office, the National Agricultural and Livestock Directorate, and the Forestry Development Institute are particularly important.

The Agriculture Land Management Office is responsible for the management of land use regarding agriculture, livestock and forestry. Consequently, it concedes use titles, technical reports for agricultural, commercial, and industrial businesses susceptible to influence national development, and implements several activities related to land structuring.

The National Agriculture and Livestock Directorate proposes policies and development strategies on agriculture and rural engineering, as well as measures to protect and rehabilitate degraded agricultural land. And the Forestry Development Institute ensures promotion, coordination, and execution of forestry, fauna, rural, and technology transfer policies.

3.1.5 Government of Huíla and Namibe Provinces

It is the responsibility of the Huíla and Namibe Provincial Governments to promote the orientation of socioeconomic development based on the principles and strategic options defined by the Central Government, as well as to assure that public services are rendered at respective geographical areas. In the field of the environment and in accordance with the Law on the Organization and Functioning of State Administration Bodies, the following powers are attributed to them: promotion measures aimed at the defense and preservation of the environment; promote and encourage local business development initiatives; promote sanitation and the environment, as well as the construction of rural and urban equipment, and promote environmental education campaigns.

This project covers areas from northern Lubango to northern Humpata in Huila province, whereas in Namibe province, it goes from northern Bibala to Moçâmedes municipality, as shown **Figure 2-1** in the **PROJECT DESCRIPTION**. In Huíla and Namibe provinces, any activity implemented at a local level that is related to environmental issues is the responsibility of the Environment, Waste Management and Community Services Provincial Office (Executive Decree No. 46/18 of April 12th for Huíla province and Executive Decree No. 31/18 of March 26th for Namibe province).

3.2 National Legislation

This section summarizes the enforceable legislative provisions in Angola that must be considered in the ESIA, in consequence, must be an integrate part of the Project. The summary presented in this section is exhaustive, however, only refers to the environmental legislation relevant to the project.

The necessity for environmental protection and the requirements for achieving sustainable development is founded on the right of all citizens to live in an unpolluted, healthy environment, as well as the duty to defend and preserve it, as defined in Article 39º/1 of the Constitution. The same article notes that the State must adopt the necessary measures to protect the environment and the flora and fauna species throughout the national territory, maintain ecological balance, correct location of economic activities, and the rational utilization and exploitation of all-natural resources, within the framework of sustainable development and with respect to the rights of future generations and the preservation of different species.

On the other hand, the environmental licensing of activities related to similar projects with impacts on ecosystems is carried out by the MCTA, while the responsibility for the licensing of such activities (construction of energy infrastructures) rests with the MINEA. Both ministries are responsible for environmental protection, which at the provincial level are carried out by the respective affected Provincial Directorates of the Huíla and Namibe Provincial Governments.

It is in this context and taking into account the need to prevent and mitigate potential adverse social and environmental impacts of projects involving the construction of infrastructures, exploitation of natural resources, and the consequent eviction of effluents, that the Government of Angola adopted the Environmental Framework Law (Law No. 5/98 of June 19th). In absence of national legislation regarding specific aspects, or if it is incomplete, particularly in the area of technical specifications, the project promoters must implement international instruments containing good practices in relevant fields, or the appropriate standards in force in other countries.

Table 3-1 shows a legislation summary, relevant to the project from an environmental, health, safety and hygiene point of view.

Table 3-1: Summary of National Legislation Applicable to the Project.

#	TOPIC	LEGISLATION	DESCRIPTION & SCOPE
Environmental Legislation			
1	Environmental Framework Law	Law No. 5/98 of June 19th.	Establishes the general duty regarding environmental protection and the sustainable use of natural resources, as well as to contribute to the quality of life (Articles 3rd/1 and 25th, referring expressly to citizens and businesses in the public and private sectors).
2	Environmental Licensing Rates	Executive Decree No. 96/09 of October 6th and No. 130/09 of October 26th.	Defines fee amounts to be charged for the issuance and renewal of environmental installation and operation licences, registration of consultants, and the costs of the Environmental Impact Assessment, including the shareholder engagement process.
3	National Policy on Forests, Wild Fauna and Conservation Areas	Resolution No. 01/10 of 14th January.	Promote the sector's contribution to the sustainable development of the country, through the preservation, conservation, development and wise use of forests, wild fauna and conservation areas, for the benefit of present and future generations.
4	Regulation on Responsibility for Environmental Damage	Presidential Decree No. 194/11 of July 7th.	Establishes the responsibility regarding the risk and degradation of the environment based on the "polluter pays" principle in order to prevent and remedy environmental damage.
5	Regulation on Public Consultation	Executive Decree No. 87/12 of February 24th.	This defines "public consultation" as the "procedure within the framework of public participation that aims to collect opinions and suggestions from stakeholders on projects subject to an Environmental Impact Assessment."
6	Term of Reference for the Elaboration of Environmental Impact Studies	Executive Decree No. 92/12 of March 1st.	Establishes the guidelines for the preparation of studies subject to an Environmental Impact Assessment, including laying out the minimum content that must be contained within the Environmental and Social Impact Assessment report.
7	Regulation of Waste Management	Presidential Decree No. 190/12 of August 24th.	Establishes that all public and private entities that produce waste or carry out activities related to waste management shall prepare a Waste Management Plan (WMP) prior to the commencement of their activity, containing at least all information set out in Appendix I and II, respectively.

#	TOPIC	LEGISLATION	DESCRIPTION & SCOPE
8	Executive Decree Regarding Construction and Demolition Waste Management	Executive Decree No. 17/13 of January 22nd.	Establishes legal regulations relating to waste management resulting from the construction or demolition of buildings or landslides, briefly referred to as construction and demolition wastes, including its prevention and reuse and operations of collection, transport, storage, sorting, treatment, recovery, and disposal.
9	Criminalisation Regarding Infringements and Underlying Money Laundering	Law No. 3/14 of February 10th.	Aims to regulate a range of conduct, aiming to exercise the criminal laws of Angola to regarding the protection of certain fundamental legal rights, including crimes against the environment.
10	Forest and Wildlife Law	Law No. 6/17 of January 24th.	Establishes the norms that aim to guarantee the conservation and sustainable use of the forests and the fauna within the national territory.
11	Forest Regulation	Presidential Decree No. 171/18 of July 23rd.	Provides the regulation for sustainable use of forestry resources and its ecosystems and establishes norms and procedures for its conservation and sustainable use.
12	National Biodiversity Strategy and Action Plan	Presidential Decree No. 26/20 of February 6th.	The National Strategy and the Biodiversity Action Plan aims to ensure the conservation and sustainable use of biodiversity components, taking into account the fair and equitable sharing of the benefits from the use of resources conservation, preservation, protection and restoration of biodiversity in Angola.
13	Environmental Impact Assessment Regulation and Environmental Licensing Procedure	Presidential Decree No. 117/20 of April 22nd.	Approval of the General Regulation for Environmental Impact Assessment and the Environmental Licensing Procedure, establishing its rules and procedures that, by their nature, location or dimension, are likely to cause significant environmental and social impact, applicable to all public or private activities that directly or indirectly can influence the environmental components and regulates Impact Assessment, Environmental Licensing and Inspection, fines and Fees and repeal of Decree No. 51/04 of July 23rd on Environmental Impact Assessment, and Decree No. 59/07 of July 13th - On Environmental Licensing.

#	TOPIC	LEGISLATION	DESCRIPTION & SCOPE
14	Taxes for Emission and Renewal of Environmental Licenses	Presidential Decree No. 83/22 of 12 April 2022	Establishes the fees to be charged for the issuance and renewal of environmental licenses for the Environmental Impact Assessment, as well as the registration and renewal of environmental consulting companies.
Health and Safety Legislation			
15	General Regulation of Occupational Health and Safety Services	Executive Decree No. 6/96 of February 2nd.	Establishes the principles that aim to promote safety, hygiene and health at work in companies, commercial and industrial establishments, and cooperatives.
16	General Regulation of Safety and Health at Work Signalling	Executive Decree No. 128/04 of November 23rd.	Lays down minimum requirements for placement and use of occupational safety and health signs at work and is applicable to public companies, joint ventures, cooperative and private enterprises.
17	Legal System for Work-Related Accidents and Occupational Diseases	Decree No. 53/05 of August 15th.	Approval of the legal regime of work-related accidents and occupational diseases, considering as such events that occur during the course of employment within a company or institution that cause the employee injury or bodily harm resulting in inability, partial or total, temporary or permanent to work or resulting in death.
18	General Labour Law	Law No. 7/15 of June 15th.	Stipulates that employers have a responsibility to ensure the quality of the work environment, including the adoption of "appropriate measures of safety and health at work".
Energy Sector Legislation			
19	Regulation on Substation Safety	Decree No. 42895, dated March 31st of 1960.	Approves the safety standards for substations and transformer stations in order to establish the technical conditions to be met during the operation of substations and jobs for the protection of people and the safeguarding of collective interests.
20	Regulation of the Protection of High Voltage Transmission	Decree No. 46.847 dated 1966.	Regulates safety and security of high voltage transmission lines. Restrictions include: i) houses and structures allowed as long as distance between transmission line axis and the top of the structure is more than 4-5m; ii) crops and trees allowed as long as distance to the transmission line axis is more than 4 meters; and iii) Establishes a protection corridor of 50 meters wide.

#	TOPIC	LEGISLATION	DESCRIPTION & SCOPE
21	General Electricity Law	Law No. 14-A/96 of May 31st.	Establishes the general principles of the legal regime relating to activities of production, transmission, distribution and use of electrical energy.
22	General Electricity Law (amended)	Law No. 27/15 of December 14th.	Approves the Independent Electricity Production Regulation, establishing the legal regime applicable to independent electricity production, and the rules on acquisition of its surplus for public consumption, applicable to all natural and legal persons who carry out independent electricity production activity.
23	Regulation of Electric Power Production	Decree No. 47/01 of July 20th.	Establishes the legal regime relating to the production of electrical energy within the Public Electrical System (PES). Production outside the scope of the PES, which comprises the self-production and private supply is developed only in accordance with the rules laid down in the regulations for licensing and safety of electrical installations.
24	Regulation of Licensing of Installations of Production, Transport and Distribution of Energy	Decree No. 41/04 of July 2nd.	Defines the principles and rules which must be observed during the licensing of Electrical Installations which are designed, built and operated for the purpose of producing, transporting or distributing electricity for public consumption and the legal and administrative provisions that regulate the establishment and operation of such facilities.
Water Sector Legislation			
25	Water Law	Law No. 6/02 of June 21st.	Establishes the general principles of the legal systems regarding the use of water resources.
26	Regulation of Water Quality	Presidential Decree No. 261/11, of October 6th.	Establishes water quality standards and criteria for the purpose of protecting the aquatic environment and improving the quality of water on the basis of their main uses. Applies to inland waters, both superficial and groundwater, as well as the water for aquaculture, livestock, agricultural irrigation, and seaside resorts.
27	Regulations on the General Use of Water Resources	Presidential Decree No. 82/14 of April 21st.	Defines the regime for the general use of water resources, including the mechanisms for planning, management and economic and financial retribution. Establishes the fees and tariffs and the method of payment and collection thereof, as well as the regime for occupation, expropriation and easement and

#	TOPIC	LEGISLATION	DESCRIPTION & SCOPE
			establishes the respective system of inspection and sanctions, being applicable to surface and underground waters (e.g., rivers, watercourses, etc.).
28	Regulation of Public Water Supply and Sanitation of Wastewater	Presidential Decree No. 83/14 of April 22nd.	Defines the rules regulating public water supply and wastewater sanitation activities.
Spatial Planning Sector Legislation			
29	Spatial Planning and Urbanism Law	Law No. 3/04 of June 25th.	This law has as its object the biophysical space, consisting of all urban soils and rural areas, subsoil, the continental shelf and inland waters, with a view to ensure actions which result in the occupation and use of the spaces above, through the implementation of spatial and urban planning instruments.
30	Land Law	Law No. 9/04 of November 9th.	Establishes the general bases of the legal regime of land included in the original property of the State, land rights that may be levied on them, and the general scheme of transmission, constitution, exercise and extinction of these rights.
31	General Regulation for Land Concession	Decree No. 58/07 of July 13th.	Establishes the legal framework for the concession of free lands within Angola and does not apply for private property lands. It also indicates that where there is expropriation for public use or for temporary requisition of lands, fair and adequate indemnity to the owner and to affected holders of other property rights is always owed.
General Law			
32	Public Expropriation Law	Law No. 1/21 of January 7th.	The Law of Expropriation for Public Utility establishes the principles and rules to be observed in expropriation for public utility by Organs competent bodies of Public Administration. Within the scope of the Expropriation process, several general principles must be observed, including the principles of legality, justice, proportionality, impartiality, public utility, fair and prompt compensation, respect for private property, and the land rights of local communities and the right to reverse. It is important to mention that in addition to the State, Local Authorities

#	TOPIC	LEGISLATION	DESCRIPTION & SCOPE
			may benefit from expropriation, as well as any public or private legal person to whom this quality is recognized, provided that there are well-founded reasons for public utility.
33	Cultural Heritage Law	Law No. 14/05 of October 7th.	Defines cultural heritage as all material goods and intangible assets which, by their recognised value, shall be subject to the authority and protection of the law, presenting a series of activities which are considered infringements against cultural heritage.
34	Criminalization of Offenses Underlying Money Laundering	Law No. 3/14 of February 10th	Its purpose is to proceed with the criminalization of a set of conducts, aiming at adapting Angolan criminal legislation to the protection of certain fundamental legal assets. This law includes crimes against the environment.
35	Administrative Offences Law	Law No. 12/11 of February 16th.	Establishes the general bases applicable to administrative offences committed by an individual or collectively by citizens or public or private collective entities.
36	Regulation on Resettlement	Presidential Decree No. 117/16 of May 30th.	Defines the rules, procedures and criteria to be used during the process of resettlement and relocation of populations in specific situations, such as natural disasters, rehabilitation and urban redevelopment, public works and housing fires and aims to improve the social conditions of the population.
37	Regulation for the Transfer of Waste for Reuse, Recycling and its Recovery	Presidential Decree No. 265/18 of November 15th	Establishes the rules and procedures relating to operational and administrative control over the transfer of waste for reuse, recycling and its recovery abroad. This Diploma is only applicable to non-hazardous waste destined for reuse, recycling and recovery, to be transferred abroad.

3.3 Land Acquisition Process for Transmission Line

Land concession, for the 220/60 kV substations implementation and 220 kV transmission line route, in Angola is governed by two (2) processes. One is the formal land concession process documented in the Land Law (Law No. 9/04 of November 9th) and General Regulation for Land Concession (Decree No. 58/07 of July 13th), which generally applies to land with private property, or surface rights (regardless of land size). The other is the informal process, which is undocumented, and applies primarily where

acquisition involves parcels of land held with customary land rights or useful civil domain rights. The informal process is generally administered by the traditional authorities (*Regedores*, *Seculos* and *Sobas*) or the community with the support of the municipal administrations as needed.

In the context of the Project, both the formal and informal processes may apply, with the formal process more likely to apply in urban and peri urban areas, and where businesses or economic activities are affected. The rights to the land, and therefore the required process, will likely only be confirmed through topographic and asset inventory processes. The combined steps of the formal and informal processes that the Project is expected to follow for the land concession is summarized in **Table 3-2.**

The formal land concession process for the East Lubango and New Namibe Substations will start with the submission of the request by the interested party and is followed by community disclosure and consultation and the provisional demarcation of the land, consideration of the application and approval or rejection, followed by the definitive demarcation, after which a concession contract is usually signed and the concession title granted. The final step is the registration of the right in the land registry (Provincial Governments of Huíla and Namibe).

Table 3-2: Phases of the Formal and Informal Land Concession Processes[1].

Items	Formal and Informal Land Concession Processes	Activities necessary
1	Application submission	• Project informs provincial government, municipality authority and traditional authorities (Soba).
2	Consultations with interested parties and local communities.	• Project discloses activities and land location to the Soba and community.
3	Temporary land demarcation	• The traditional authorities (Soba) identify affected landowners and users. • Survey and asset inventory. • Negotiation and agreement on Compensation. • Soba informs the authorities of the agreement.
4	Consideration and approval or rejection	• Project compensates affected landowners and users.
5	Definitive demarcation	
6	Concession contract signing	
7	Concession title granted	
8	Land registration	

[1] **Note:** (*) The first column corresponds to the formal process as described in the land legislation and concession regulation (*Lei de Terras* n.º 9/04 and *Regulamento Geral de Concessão de Terras* n.º 58/07), whereas the second column presents the informal process as documented during the field survey and based on input from local specialists.

Compensation Process

For the 220 kV TL Project, according to the Public Expropriation Law (Law no. 1/21 21 of January 7th), "immovable assets and related rights may be expropriated for public utility purposes through payment of fair compensation". Fair compensation shall be determined based on the actual value of the expropriated property as determined by a specialized land valuator, always calculated assuming the value of "perfect property" or "perfect ownership", and including any additional related prejudice or costs. In the event that rights other than the right of "perfect ownership" are expropriated, compensation shall be determined for the prejudice and losses resulting from the deprivation of rights.

The capital gain resulting from public works or improvements, or any other circumstance initiated by the affected person or third party after the declaration of the expropriation for public utility, shall not be taken into consideration. The declaration is always published in the government Republic Gazette. In fact, the "cut-off" date for compensation is established as soon as the parties are informed that the Project has been approved and is going forward (e.g., during final demarcation). In practice, compensation is paid for crops and trees and physical structures. Compensation rates for loss of agricultural crops, and trees are established by the Ministry of Agriculture and Fisheries.

As for land, compensation for loss of land rights only occurs in the case that affected people have a land ownership title, either as a result of a private ownership right or surface right. In this case, compensation is paid for permanent land take; compensation for temporary loss of access is not considered in the law. Decree No. 58/07 of July 13th (General Regulation for Land Concession) also states that the expropriating entity may alternatively concede to the expropriated party a parcel of land in the same judicial situation, appropriate similar use. Compensation in cash or in kind is generally subject to negotiation and agreement between the expropriating entity and the affected party. There is a Grievance Mechanism that has been established for any issues.

Project Land Acquisition Background

The Angola Government will ensure all rights necessary, including the land space, for the 220 kV TL and 220/60 kV substations (East Lubango and New Namibe) implementation.

For the 220/60 kV East Lubango and New Namibe substations (in Lubango and Moçâmedes), and transmission line route between Lubango - Moçâmedes, the relevant Municipal Administrations and the Angolan Geographic and Cadastral Institute (IGCA – *Instituto Geográfico e Cadastral de Angola* –

in the Namibe and Huíla provinces) (the public institution responsible for, amongst others things, promoting the execution, maintenance and renovation of the land and cadastral registry) will issue an internal opinion at the request of Provincial Governments before the granting of land-related titles, in addition to preparing a location map on the target land.

IGCA should be able to provide information (*croquis de localização*) on the project location, total area, geographic coordinates, number of registries in the Real Estate Registry Office or declaration of omission in the Registry, as well as any circumstances relevant for the identification of the target land. Upon confirming that the locations are owned by the State, the Provincial Government should, ex-oficcio, promote the registration of the rights in the name of RNT before the Real Estate Registry Offices. To summarize, the process of the land transfer involves three (3) Angolan state entities and will be effectuated from Provincial Governments of Huíla and Namibe to Angolan state-owned RNT.

3.4 JICA Guidelines for Environmental and Social Considerations (2010)

Regarding Environmental and social considerations, JICA has created clear requirements, which project proponents etc., must meet. JICA provides project proponents and other project intervenient with support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation projects. JICA examines undertakings by project proponents, in accordance with the requirements, and makes adequate decisions regarding environmental and social considerations based on examination results. JICA recognizes the following seven (7) principles to be very important:

1) A wide range of impacts must be addressed;
2) Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage;
3) JICA is responsible for accountability when implementing cooperation projects;
4) JICA asks stakeholders for their participation;
5) JICA discloses information;
6) JICA enhances organizational capacity;
7) JICA makes serious attempts at promptness.

JICA responsibility take the initiative to deal with the environmental and social considerations of projects, JICA provides support for and examinations of the environmental and social considerations that project proponents etc. implement in accordance with Sections 2 and 3 of the guidelines, depending on the nature of cooperation projects.

JICA classifies projects into four (4) categories according to the extent of environmental and social impacts, considering an outline of project, scale, site condition and others, as follows:

- **Category A**: Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas. An illustrative list of sensitive sectors, characteristics, and areas is provided in one of its appendices.
- **Category B:** Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily.
- **Category C:** Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.
- **Category FI:** Proposed projects are classified as Category FI if they satisfy all of the following requirements: JICA's funding of projects is provided to a financial intermediary or executing agency; the selection and appraisal of the sub-projects is substantially undertaken by such an institution only after JICA's approval of the funding, so that the sub-projects cannot be specified prior to JICA's approval of funding (or project appraisal); and those sub-projects are expected to have a potential impact on the environment.

When necessary, JICA can change a category even after screening. This might occur such as when a new significant impact has come to light as a result of the cooperation project process, or in other specific situations. This project, taking into account the nature and type of intervention to be performed falls within in Category A.

Table 3-3 shows the results of gap analysis between JICA Guidelines and Angola's institutional/legislation systems on the environmental and social considerations.

Table 3-3: Gap analysis between JICA Guidelines and Angola's institution/legislation systems on the environmental and social considerations.

No	Item	JICA Guidelines for Environmental and Social Considerations (April 2010)	Angolan domestic law	Existence of gaps and policy for addressing them
1.	Underlying Principles	Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (Appendix 1.1)	Environmental assessment studies are required for all public and private sector projects to assess impacts and develop environmental management and monitoring plans.	No difference.
2.	Information disclosure	- EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them; - EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. (Appendix 2)	Environmental assessment reports must be prepared in Portuguese, the official language, and a summary version for the public (non-technical summary) must be prepared. However, the environmental assessment report is a proprietary document of the operator, and therefore viewing and obtaining copies is not permitted.	While there are no differences in the use of official languages and the preparation of a summary field for the public, there are restrictions on the full publication of the report, and the summary version for the public and the report for JICA are used. Note that the official government language is Portuguese and the local language is almost never used as a written language, so the publication is in Portuguese.
3.	Social Acceptability	- Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and	For Category A and Category B projects, public consultation takes	Although there are differences, this does not preclude the implementation of two

No	Item	JICA Guidelines for Environmental and Social Considerations (April 2010)	Angolan domestic law	Existence of gaps and policy for addressing them
		locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. (Appendix 1, Social acceptability 1) - In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. - Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. (Appendix 2. Environmental Assessment Report required for Category A).	place only once after the environmental assessment report has been submitted to the Ministry of the Environment, but the relevant authorities are briefed at the planning stage.	stakeholder consultations in line with JICA guidelines.
4.	Scope of Impacts to be Assessed	1 The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted 28 through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also	As indicated in the previous section (3), there is a set of sub-items for which impacts should be assessed, and the Ministry of Environment will present the matters to be	No difference.

No	Item	JICA Guidelines for Environmental and Social Considerations (April 2010)	Angolan domestic law	Existence of gaps and policy for addressing them
		include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. 2. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. (Annex 1. 3. Scope of impacts to be assessed)	implemented (TOR) after the EIA project is registered.	
5	Monitoring / Grievance mechanism	1) During the project implementation period, the existence of situations that were difficult to predict, the implementation status and effectiveness of pre-planned mitigation measures, etc. must be ascertained, and appropriate measures must be taken based on the results.	In the environmental assessment report: mitigation measures and: monitoring content and implementation systems and reporting methods	As there is no provision for the publication of monitoring results, public consultations should be held regularly as part of the monitoring survey, to provide an overview of the results to residents and an opportunity to

No	Item	JICA Guidelines for Environmental and Social Considerations (April 2010)	Angolan domestic law	Existence of gaps and policy for addressing them
		2) Where adequate monitoring is considered essential for proper environmental and social considerations, such as in projects where mitigation measures are to be implemented with known effects, it must be ensured that the project plan includes a monitoring plan and that the plan is feasible. 3) Efforts should be made to publicise the monitoring results to local stakeholders involved in the project. 4) In the event of specific indications from third parties, etc., that environmental and social considerations are not sufficient, etc., a forum should be established with sufficient information disclosure for stakeholders involved in the project to discuss and consider measures, and efforts should be made to agree on procedures to resolve the problem.	should be described. There is no provision for the publication of monitoring results.	hear their views, as well as to ensure a grievance redress mechanism.
6	Ecosystem and biota	Projects must not involve significant conversion or significant degradation of important natural habitats or important forests.	There is a strong need to conserve ecosystems and biota and to protect protected areas, etc.	No difference.
7	Indigenous People	All possible ways of avoiding the project's impacts on indigenous peoples must be considered. Where avoidance is not possible after such consideration, effective measures for indigenous peoples must be taken to minimise impacts and compensate for losses.	There are no provisions on indigenous peoples.	Where indigenous peoples are identified among the affected population, an 'Indigenous Peoples Plan' should be developed in accordance with JICA guidelines to avoid, reduce or compensate.

3.5 International Finance Corporation Guidelines

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development. The IFC's Performance Standards offer a framework for managing environmental and social risks of projects. They define clients' responsibilities for managing their environmental and societal risks, are regarded as an international benchmark and have been adopted by many organisations as a key component of their environmental and social risk management (IFC, 2012).

The Performance Standards (PSs) provide guidance on how to identify risks and impacts and are designed to avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable manner (see **Table 3-4**). The IFC uses the Sustainability Framework together with other strategies, policies and initiatives to guide the business activities of the Corporation, in order to achieve the general objectives of development.

Table 3-4: The Performance Standards of the International Finance Corporation.

Items	Performance Standards	Objectives
1	**Performance Standard 1. Social and Environmental Assessment and Management System** Risks and Impacts: emphasizes the importance of social and environmental management performance throughout the duration of a Project (any business activity that is subject to assessment and management).	o **Identification and Evaluation of Impact**. Identify and evaluate social and environmental impacts, adverse or beneficial, to the project or area of influence; o **Mitigation**. To avoid, or when it is not possible, minimise, mitigate or compensate for adverse impacts on workers, the affected communities, and the environment; o **Commitment of interested and/or affected parties**. Ensure that the affected communities are properly aware of issues that could potentially affect them; o **Effective Management**. Promote better environmental and social performance of companies through the effective use of management systems.
2	**Performance Standard 2. Terms and Conditions of Employment** Recognizes that achieving economic growth through job creation and income generation must be balanced against the basic workers' rights.	o Establish, maintain and improve the employee - management (administration) relationship; o Promote the fair treatment, non-discrimination, and equal opportunities for workers and fulfil national laws on employment and working conditions; o Protect the workforce, reporting child labour and forced labour; and

Items	Performance Standards	Objectives
		o Promote safe and healthy working conditions and workers' health.
3	**Performance Standard 3. Resource Efficiency and Pollution Prevention** Recognises that high levels of industrial activity and urbanisation often generate high levels of water and land pollution that may threaten a community and the environment at local, regional and global levels.	o Avoid or minimise adverse impacts on human health, and the environment by preventing or minimising pollution caused by project related activities; o Promote the reduction of emissions that contribute to climate change.
4	**Performance Standard 4. Community, Health and Safety** Recognises that the activities, equipment and infrastructure of a Project often bring benefits to communities including employment, services, and opportunities for economic development.	o Prevent or minimise risks and impacts on the health and safety posed to the local community during the life cycle of the project, both routine and non-routine; and o Ensure that the safeguarding of personnel and property is carried out in accordance with legitimate measures in order to avoid or minimise risks to the safety of the community.
5	**Performance Standard 5. Land Acquisition and Involuntary Resettlement** Outlines involuntary resettlement referring to both transfer (relocation or loss of housing) and economic displacement (loss of assets or access to assets that leads to loss of scouse income or means of livelihood) as a result of Project land acquisition.	o Avoid or minimise displacement by exploring designs of alternative projects; o Avoid forced removal; o Anticipate, prevent and minimise negative social and economic effects arising from the acquisition of land or restrictions on land; o Improve or restore the livelihoods and standards of living of displaced persons.
6	**Performance Standard 6. Biodiversity Conservation and Sustainable Management of Natural Resources** Recognises that protecting and conserving biodiversity - the variety of life in all its forms, including genetic diversity, species and ecosystems - and its ability to change and evolve is critical to sustainable development.	o Protect and conserve biodiversity; and o Promote the sustainable management of living natural resources through the adoption of practices that integrate the needs of conservation and development priorities.
7	**Performance Standard 7. Indigenous Peoples** Recognises that Indigenous Peoples, who's social identity differ from those of dominant groups in national societies, are often among the most marginalised and vulnerable segments of the population.	o Ensure that the development process promotes the full respect for human rights, dignity, aspirations, culture and livelihoods based on natural resources of Indigenous peoples; o Avoid adverse impacts on communities of indigenous peoples, or when not possible, minimise, mitigate or compensate for such impacts by providing opportunities for development in a culturally appropriate way; o Establish and maintain a permanent relationship with Indigenous peoples affected by the project throughout the life cycle of the project; o Promote negotiation in good faith with the informed participation of indigenous peoples when the projects are located on traditional lands or lands commonly used by indigenous peoples; o Respect and preserve the culture, knowledge and practices of indigenous peoples.

Items	Performance Standards	Objectives
8	**Performance Standard 8. Cultural Heritage** Recognises the importance of cultural heritage for present and future generations.	o Protect cultural heritage from the adverse impacts of project activities; o Promote the sharing of benefits from the use of cultural heritage in commercial activities.

IFC Environmental, Health and Safety for Electric Power Transmission and Distribution

The IFC's Environmental, Health, and Safety Guidelines (EHS) Guidelines (IFC, 2007) are technical reference documents with general and industry-specific examples of good international industry practices. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. The EHS Guidelines prescribe minimum performance levels and measures that are generally considered achievable in new facilities using existing technology at reasonable costs. The guidelines cover issues under environmental, occupational health and safety, community health and safety, construction and decommissioning. Industry specific impacts and management measures are included within the Guidelines, including information on construction impacts such as:

- Construction site waste generation;
- Soil erosion and sediment control from site preparation activities;
- Fugitive dust emissions and other emissions;
- Noise from heavy equipment and truck traffic; and
- Potential for hazardous materials and oil spills associated with heavy equipment operation and fuelling activities.

Operational impacts are associated with the following:

- Terrestrial habit alteration (through right of way construction and maintenance, potential for forest fires, and avian and bat collisions and electrocutions);
- Electric and magnetic fields; and
- Hazardous materials (e.g., insulating oils/gases and fuels in addition to herbicides for right of way vegetation maintenance.

Information is also provided on Occupational Health and Safety hazards associated with live power lines, working at height, electric and magnetic fields and exposure to chemicals.

3.6 International Commission on Non-Ionizing Radiation Protection

As an independent organization, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) provides recommendations and scientific guidance on the environmental and health effects of non-ionizing radiation (NIR) to protect people and the environment from harmful exposure to NIR.

The ICNRIP has prepared guidelines for limiting exposure to electric, magnetic and electromagnetic fields that vary in frequency (up to 300 GHz). The ICNIRP guidelines are based on a careful analysis of research data on the effects of exposure to extremely low frequency fields (Extremely Low Frequency – ELF) on health and include safety margins. The guidelines were initially proposed in 1990, and were reconfirmed in 1993 and 1998, after consideration of more recent research.

The main objective of these guidelines is to establish threshold of exposure to electromagnetic fields that will provide a high level of protection for all people against known adverse health effects from direct, non-medical exposures to both short, and long-term, continuous and discontinuous radiofrequency electromagnetic fields. The ICNIRP has continued to review new studies published since 1998. Recently, draft guidelines (and two appendices) have been proposed which are currently under discussion, namely:

- **Guidelines for Limiting Exposure to Time** – Varying Electric, Magnetic and Electromagnetic Fields (100 kHz to 300 GHz), July 2018.

The ICNIRP concluded that the only effects clear in research data were those caused by currents induced in the body by electric and magnetic ELF fields. In very strong fields, these induced currents can interfere with the body's nervous system and, therefore, should be limited to levels where no such effect can occur; the ICNIRP also wanted to limit the possibility of experiencing minor shocks in strong electrical fields. While recognizing the results of studies that have found a weak association between exposure to magnetic field ELF and the risk of childhood leukaemia, the ICNIRP considered the results too weak and concluded that the findings lacked support from other sources to form the basis for exposure guidelines. Other recent revisions, including a review of the World Health Organisation (WHO,

2007), came to the same conclusion stating that the data currently available does not warrant the establishment of stricter exposure limits.

The ICNIRP guidelines have established a basic restriction on the density of electrical current induced in the body by ELF. As the density of induced currents is difficult to measure in the body, the guidelines also prescribe reference levels in terms of the most easily measured field strengths. The guidelines specify quantitative EMF levels for safe personal exposure. The ICNIRP guidelines for exposure to electric and magnetic fields were incorporated into the ESIA as a reference to the plan of supervision and monitoring of impacts. A more detailed description of issues pertinent to the basic restrictions is provided in the appendices of the proposed guidelines which are accessible in the following links:

- https://www.icnirp.org/cms/upload/consultation_upload/ICNIRP_RF_Guidelines_PCD_Appendix_A_2018_07_11.pdf
- https://www.icnirp.org/cms/upload/consultation_upload/ICNIRP_RF_Guidelines_PCD_Appendix_B_2018_07_11.pdf.

3.7 International Legislative Framework

The Republic of Angola is a signatory to several multilateral environmental agreements (conventions, treaties and protocols) relevant to the environmental aspects of very high voltage electricity transmission line construction activities. These agreements have been considered for this ESIA and are described in below **Table 3-5**.

Table 3-5: Multilateral Environmental Agreements relevant to the Project.

Items	Multilateral Environmental Agreements	Descriptions
1	United Nations Convention on Biological Diversity (UNCBD) ratified by Resolution No. 23/97 of 4 July; entered into force in Angola on 23rd July 1997 (Deliberation No. 23/97).	UNCBD objectives are the conservation of biodiversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources.
2	United Nations Framework Convention on Climate Change (UNFCCC) ratified by Resolution	UNFCCC aim is to stabilize concentrations of greenhouse gases in the atmosphere. Commitments and obligations were defined for

Items	Multilateral Environmental Agreements	Descriptions
	13/98 of 28th August; entered into force in Angola on August 28, 1998 (Resolution No. 13/98).	all countries (called Parties to the Convention). Projects implemented on Angolan territory must respect Angolan legislation (Resolution no. 13/98 of 28th August) that aims to minimise emissions of gases that contribute to the greenhouse effect.
3	Basel Convention – Controlling transboundary movements of hazardous wastes and their disposal (Angola accession was approved through Accession Letter No. 3/16 of 23rd August).	Basel Convention is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). It does not, however, address the movement of radioactive waste. The convention is also intended to minimize the rate and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate.
4	Bamako Convention on the Prohibition of the Importation of Hazardous Waste and the Control of Transboundary Movement and Management of Hazardous Waste in Africa (Angola accession was approved through Accession Letter No. 1/16 of 23rd August).	It establishes obligation on African Union members to prohibit the import of radioactive and hazardous waste, as well as its disposal into oceans and inland water bodies. Countries are also obliged to minimise the transboundary movement of such waste and must obtain the country's consent if it needs to cross it.
5	Convention on Wetlands (Ramsar). Angola is the newest member of the Convention on Wetlands of International Importance (Angola accession was approved through Accession Letter No. 4/16 of 23rd August).	Ramsar Convention promotes an integrated approach to managing wetland systems so that human uses of these areas are carried out in a way that maintains their natural "capital" for future generations. It provides a list of wetlands of international importance.
6	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES or Washington Convention) (Angola accession was	CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals

Items	Multilateral Environmental Agreements	Descriptions
	approved through Resolution No. 1/17 of 14th February).	and plants does not threaten the survival of the species.
7	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (Angola accession was approved through Resolution No. 14/03 of 15th April).	Bonn Convention is an international agreement that aims to conserve migratory species throughout their ranges. CMS has two Appendices, namely Appendix I – Endangered migratory species and Appendix II – Migratory species conserved through Agreements.
8	Convention Concerning the Protection of the World Cultural and Natural Heritage. This Convention was ratified by Angola on 7 November 1991.	To encourage the identification, protection, and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity. The Convention defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List.

Chapter 4

SCOPING RESULTS

4 SCOPING RESULTS

In compliance with the Presidential Decree No. 117/20 of April 22nd on Environmental Impact Assessment Regulation and Environmental Licensing Procedure and JICA Guidelines for Environment and Social Considerations was prepared beforehand the Environmental Pre-Feasibility Study and Scope Definition or Environmental Pre-Feasibility Study and Scoping Report (EPDA). EPDA has been undertaken with the following objectives:

- Identify the Project's Area of Influence (AoI) (and thus an appropriate Study Area – see detailed information in **Section 2.3** in **Chapter 2**);
- Identify where there are interactions between the Project and Project activities result in effects to environmental and social resources and receptors;
- Make a tentative evaluation of the impact of such effect and identify which should be included in the scope of the impact assessment; and
- Develop the Terms of Reference or plan for a detailed assessment of impacts.

For the Project, the direct AoI is the spatial extent of the Project footprint and related facilities as well as on the associated effects on the receiving environment. This encompasses the transmission line RoW and substations sites as follows: 500 m either side of line for the 220 kV line (i.e 1000 m in width), including East Lubango and New Namibe substations.

The indirect AoI encompasses areas potentially affected by cumulative impacts as well as areas that could be impacted indirectly by Project activities. The indirect AoI will differ between various resources and receptors; for example, indirect impacts to social resources may extend to nearby 15 settlements mapped along the transmission lines. Specifically for the project, AoI includes all the municipalities crossed by the transmission lines, namely: Lubango, Humpata, Bibala and Moçâmedes.

4.1 Potential Sensitive Receptors

Table 4-1 presents the resources and receptors considered in the scoping together with the changes that might indicate a Project-related impact.

Table 4-1: Resources, receptors and impacts considered in the scoping phase.

RESOURCES AND RECEPTORS	POTENTIAL IMPACTS
Water Quality and Resources	Water will be required during construction activities (cement mixing and potable water for the workers). There is the potential to impact on nearby water users. Further, accidental events (such as spills and uncontrolled releases) have the potential to lead to groundwater contamination depending on the depth of the water table and the material spilt/leaking.
Waste and Hazardous Material Management	The construction and operation of the East Lubango and New Namibe substations and 220 kV transmission lines will require the use of hazardous materials such as insulating oils and gases in addition; the use of herbicides will be used to maintain the right of way (RoW) for the transmission lines. There is the potential for the waste to be generated from the used materials during construction and operation activities that could cause land and groundwater contamination if spilled or not handled, stored and disposed of correctly.
Land Use	There is a change in land use for some sections of the transmission lines. Whilst some sections of the lines are proposed within existing 60 kV transmission line servitudes that actually connect Ferrovia substation (in Lubango) with Moçâmedes substation (see **Section 2.12** in **Chapter 2**); there is also land that is used for grazing and agriculture, including large farmers in Humpata region.
Avian Species	Considering that the majority of the project will be taking place in non-urban areas and the fact that the Project route crosses the regions of Tchivinguiro and Bruco, the potential for avian collisions is medium to high. Additionally, the combination of the height of the transmission towers and distribution poles and the electricity carried by the transmission lines can pose potentially fatal risks to bird and bat species through collision and electrocutions.
Community Health and Safety	Community health and safety impacts during construction and operation of East Lubango and New Namibe substations and transmission lines including electrocution, Electromagnetic Field (EMF), interference visual amenity, noise and air quality and aircraft navigation safety. Further, excavation activities and the increased traffic on the road from worker and equipment transportation has the potential to create more road accidents and fatalities during the construction phase.

RESOURCES AND RECEPTORS	POTENTIAL IMPACTS
Occupational Health and Safety	There is the potential for occupational health and safety incidents throughout the life cycle of the project; the risk is particularly high during construction and decommissioning phases.
Land Tenure and Distribution	Physical resettlement could be required for the Project RoW. There is also the potential for impacts on existing land access and distribution.
Economy and Livelihoods	Economic resettlement and compensation will be required as part of the development of the 220 kV transmission line route between Nombungo substation to New Namibe substation.
Access to Infrastructure and Services	An increase in population within the AoI could lead to additional pressure on existing infrastructure and services.
Electromagnetic Field (EMF)	There is public and scientific concern over the potential health effects associated with exposure to EMF. Whilst there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmission lines, it remains a cause of concern that should be investigated further.
Cultural Heritage	Two (2) cemeteries have been mapped along the route of the electricity transmission line, which are likely to be affected if the current route is chosen.
Cumulative Impacts	The potential for cumulative impacts within the Project AoI is considered low as is not expected significate urban developments to occur as a direct cause of the project - the future transmission line will provide energy o the greater Moçâmedes city. Consequently, is not likely to result in increased traffic activity in the AoI, increased pressure on waste management facilities and accidental events such as spillages or uncontrolled releases.

4.2 Preliminary Evaluation and Terms of Reference

Potential impacts of the Project have been identified through a process whereby the features and activities (both planned and unplanned) associated with the pre-construction, construction and operation of the Project have been considered with respect to their potential impact on resources and receptors. Potential impacts have been classified in one of three categories:

- **No interaction:** where the Project is unlikely to interact with the resource and receptor;

- **Interaction likely, but not likely to be significant:** where there is likely to be an interaction, but the resultant impact is unlikely to change baseline conditions in an appreciable and detectable way; and
- **Significant interaction:** where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource and receptor.

As a tool for conducting scoping, the various project features and activities that could reasonably act as a source of impact were identified, and these have been listed on the vertical axis of a Potential Interactions Matrix. The resources and receptors relevant to the Environment and Social Baseline have been listed across the horizontal axis of the matrix. Each resulting cell on the Potential Interactions Matrix thus represents a potential interaction between a Project feature and activity and a resource and receptor.

The completed Potential Interactions Matrix is presented in **Table 4-2**, with the following noted**:** the interactions that are coloured **white** have been 'scoped out' of further consideration in the impact assessment process (justification provided in **Table 4-2**); the interactions that are coloured **grey** have also been 'scoped out', and the justification for scoping out these interactions (e.g., past experience, documented data) has been included in the present Environmental and Social Impact Assessment Report; the interactions that are shaded **black** have been retained for further consideration in the impact assessment process.

The resources and receptors with interactions that have been identified as likely, but which are not likely to lead to significant impacts are presented in **Table 4-3**. Interactions that are likely to lead to significant impacts are presented in **Table 4-4** and will be the focus of the impact assessment.

Table 4-2: Potential interactions matrix.

Resources and Receptors	Environmental Resources													Socio-economic Resources							
Project Activities and Hazards	**Air Quality**	**Landscape**	**Water Quality**	**Soil Contamination**	**Soil Erosion**	**Noise and Vibration**	**Waste**	**Change of Land Use**	**Geology and Topography**	**Avian Species**	**Fauna and Flora (Excluding Avian)**	**Ecosystem Services**	**Community Health and Safety**	**Occupational Health and Safety**	**Land and Livelihoods**	**Economy and Employment**	**Demographic Pattern**	**Access to Infrastructure and Services**	**Cultural Heritage**	**Electromagnetic Field**	**Cumulative Impact**
Construction Phase																					
Right-of-Way Clearance	■	■			■	■	■	■			■		■	■	■		■		■		■
Excavation Work	■	■		■	■	■	■				■		■		■		■		■		
Equipment/Material/Worker Transport	■												■		■		■				■
Accidental Events (Spills and Uncontrolled Releases).			■	■														■			■
Waste Storage and Disposal			■				■				■		■	■		■	■				■
Operation Phase																					
Presence at Site (East Lubango and New Namibe substations, including 220 kV TL)				■						■										■	
Ongoing Maintenance (Including Vegetation Control).	■	■								■			■	■	■	■					

Table 4-3: Interactions identified as Likely, but are not likely to lead to significant impacts.

Interaction (between Project Activity and Resource/Receptor)	Justification for Expectation for Non-Significant Impacts
Air Quality	Emissions during construction will vary in magnitude, frequency and duration for the various construction activities required. Air emissions will be associated with combustion emissions from construction machinery, as well as dust emissions from exposed areas and earth moving activities. All of these emissions will be temporary in nature and will be effectively managed through the construction Environmental and Social Management Plan (ESMP).
Noise and Vibration	The construction phase will be characterised by noise generated by mobile construction, earth moving equipment (including excavators), and concrete and steel works. There will also be increased traffic associated with the transportation of construction materials, transformers and monopoles. Construction activities are limited to daylight hours, and noise generation will be limited to the construction period and is not expected to extend into the operational phase. The noise generated during construction will be effectively managed through the construction ESMP.
Soil Erosion	Whilst there is the potential for soil erosion to occur during the excavation activities for the installation of East Lubango and New Namibe substations and transmission lines, this will be effectively minimised through the implementation of the ESMP and built-in controls during the construction period, such as progressive rehabilitation and sediment control measures.
Demographic Pattern	Population influx in search of employment opportunities within the Project is expected only during construction phase. Most positions will be recruited in urban centres, with only low skilled positions such as vegetation clearance, cooking and cleaning roles anticipated to be sourced from the nearby settlements along the transmission line route.
Access to Infrastructure & Services	An increase in population within the Project AoI is not expected, and additional pressure on existing infrastructure and services is not likely to occur.

Table 4-4: Interactions that is likely to result in significant impacts.

Interaction (between Project Activity and Resource/Receptor)	Justification for Expectation for Non-Significant Impacts
Landscape and Visual Amenity	During construction the impacts should be evaluated, as they are commonly linked with clearance of vegetation along the transmission line corridor and in substations sites, construction workers' camps and access roads (including EN280), the presence of large construction vehicles and equipment, worker presence and activity, as well as dust emissions resulting from construction activities and traffic. During operation, the potential impact is not expected to be significant. The presence of transmission lines and towers/monopoles and the clearance of vegetation for maintenance of the RoW are the expected sources of potential impacts during operation.
Water Quality and Resource	Water will be required during the construction activities (e.g. cement mixing and potable water for the workers). At this stage it is not known where the water will be sourced from, although it will most likely be sourced from local subcontractors, which could subsequently impact nearby water users (e.g. by abstracting ground and surface water without the necessary legal permits). Further, accidental events (such as spills and uncontrolled releases) have the potential to lead to groundwater contamination, depending on the depth of the water table (at this stage unconfirmed) and the nature of the material spilt/leaking.
Waste (hazardous waste and materials) and Soil Contamination	The construction and operation of the transmission lines, East Lubango and New Namibe substations will require the use of hazardous materials such as insulating oils and gases. In addition, the possible use of herbicides will be required to maintain the RoW for the transmission lines. Material waste could cause land and/or groundwater contamination if spilled or not handled, stored and disposed of correctly. It will be necessary to identify appropriate waste handling facilities that can accept waste and hazardous waste.

Interaction (between Project Activity and Resource/Receptor)	Justification for Expectation for Non-Significant Impacts
Flora and Fauna (excluding avian species)	Based on field work data as well as imagery analysis, the Project region is dominated by 10 ecoregions, namely: Angolan Montane Forest-Grassland Mosaic, Angolan Scarp Savanna and Woodland, Angola Mopane Woodland, Angolan Highlands, Angolan Escarpment, Mopane Woodlands, Semi-Arid Spiny Savannas, Namib Escarpment Woodlands, Kaokoveld Desert and Namib Desert (see **Section 5.2** in **Chapter 5**). Frequent fire episodes and intense agriculture are the main drivers for limited fauna (e.g. mammals). In terms of aquatic biodiversity, the project is not likely to have significant impacts on water bodies. However, it should be noted that the Ivantala Lake nearby the transmission line route is an important feature for aquatic biodiversity (aquatic birds), and that the Tchivinguiro and Bruco area are nesting places for many endemic birds. Mitigation measures should focus in Ivantala Lake, Tchivinguiro and Bruco. The proposed transmission line was adjusted to cross close to the Ivantala Lake thus reducing the impacts on the local birdlife.
Bird Species	Although a portion of the project development will be taking place within the desert setting of Namibe, it should be noted that the Ivantala Lake nearby the transmission line route is an important feature for aquatic biodiversity (aquatic birds), and that the Tchivinguiro and Bruco area are nesting places for many endemic birds. The combination of the height of the transmission towers and the electricity carried by the transmission lines can pose potentially fatal risks to bird and bat species through collisions and electrocutions in these areas. The cumulative effect of the existing transmission lines should also be considered in this assessment. It should be noted that the proposed transmission line was adjusted to cross close to the Ivantala Lake thus reducing the impacts on the local birdlife.
Community Health and Safety	Community health and safety impacts during construction and operation of East Lubango substation, New Namibe substation and transmission lines include electrocution, EMF interference, visual amenity, noise, and aircraft navigation safety. Further, excavation activities and the increased traffic on the road from worker and equipment transportation has

Interaction (between Project Activity and Resource/Receptor)	Justification for Expectation for Non-Significant Impacts
	the potential to increase the occurrence of road accidents and fatalities during the construction phase. Noise has been 'scoped out' on the basis of the temporary nature of the impact. Aircraft navigation has also been 'scoped out' due to the distance from the airport; whilst visual amenity has been scoped owing to the urban nature of part the Project AoI.
Gender Discrimination	One of the main challenges for women in Angola, particularly in rural areas, relate to lack of access to education and exclusion from decision-making. Rural women are rarely represented in politics, even by women leader. Regardless of the source of land access (e.g., inheritance, lease, purchase), Angolan women generally do not have land access equal to men. As a result, not only do women fail to obtain the benefits of the more individualized rights, but they may also simultaneously lose their traditional right of access. The Project will adhere to the Maputo Protocol which aims at ensuring a wide range of rights for women and calls for an end to gender-based violence and discrimination against women.
Occupational Health and Safety	There is the potential for occupational health and safety incidents throughout the life cycle of the project; the risk is particularly high during construction phase.
Cultural Heritage	Two (2) cemeteries have been mapped along the route of the electricity transmission line in Humpata region, which are likely to be affected if the current route is chosen.
Land and Livelihoods	Physical resettlement is expected to occur in some sections of the transmission line route with more probability in Lubango and Humpata municipalities, 15 settlements were mapped along the transmission line route. There is also a potential for impact on existing land access resulting in economic displacement and subsequent impacts to individuals' livelihoods, which will require adequate compensation.
Economy and Employment	The Project is expected to generate employment opportunities during construction and operation, which will mostly benefit population in urban centres and peri-urban areas, and to a lesser extent the population in the Study Area for low skilled jobs.

Interaction (between Project Activity and Resource/Receptor)	Justification for Expectation for Non-Significant Impacts
Electromagnetic Field	There is public and scientific concern over the potential health effects associated with exposure to EMF. Whilst there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmission lines, it remains as an uncertainty and cause of concern that should be investigated further.
Cumulative Impacts	There is a potential for cumulative impacts related to the project, in relation to other existing lines within the Project areas of influence. This is likely to be most applicable to potential impacts linked with avifauna. In the areas closer to Lubango, potential impacts are potentially related to increased traffic activity in the AoI, increased pressure on waste management facilities and accidental events such as spillages or uncontrolled releases.

Chapter 5

ENVIRONMENTAL AND SOCIAL BASELINE

5 ENVIRONMENTAL AND SOCIAL BASELINE

This Chapter describes environmental baseline data of the Project, mainly regarding the installation of 220 kV TL Project between Lubango and Moçâmedes. These data include both historical and recent data, from previous assessments and recent field surveys conducted in the Project site, route and surrounding areas during rainy and dry seasons. Due to its characteristics, local and regional importance this section also highlights socioeconomic aspects of the Project area in both provinces.

5.1 Physical Environment

In the next sections are presented an environmental baseline, covering climate, geomorphology, physiography and hydrology, landscape and air quality aspects of the Project area. The proposed Project area spans from northern Lubango to northern Humpata whereas in Namibe province, it goes from northern Bibala to the municipality of Moçâmedes, with a length of approximately 196 km. The TL will leave Nombungo Substation connecting East Lubango Substation to New Namibe Substation.

5.1.1 Climate and Meteorology

The climate in the general Project region is driven by differences in ecosystems and microhabitats in both provinces. In the southwest, the arid *Acacia/Commiphora/Colophospermum* savannas, dwarf shrublands and desert of the Karoo-Namib region are found, penetrating northwards as a narrowing wedge along the coastal lowlands. In Huila province (From Nombungo substation TL km 0 to Bruco zone TL km 70) the climate is warm and temperate. In dry season (known as *cacimbo*) occurs from June-September and is the coolest time of year. The climate is classified as Cwb according to Köppen and Geiger (Diniz, 1992). Huíla has an average temperature of 18.2 °C. 799 mm is the average annual rainfall (Diniz, 1992) (see **Figure 5-1** below).

According to series data provided by INAMET in the Namibe province although the rainy season runs from September to May in the area approximately from Bruco TL km 70 to New Namibe substation site in km 196 route, it lasts less than three months, usually from February to May, with average daily maximum temperature above 30°C. The hottest day of the year is usually in mid-April, whose average maximum temperature is 31 °C and the average minimum is 23 °C. The dry season usually lasts for

approximately three months, from June to August, with maximum daily temperature on average below 26 °C (see **Figure 5-2** below). The coldest day of the year being in mid-August, with an average of 17 °C for the minimum temperature and 25°C for the maximum (worldbank, 2020).

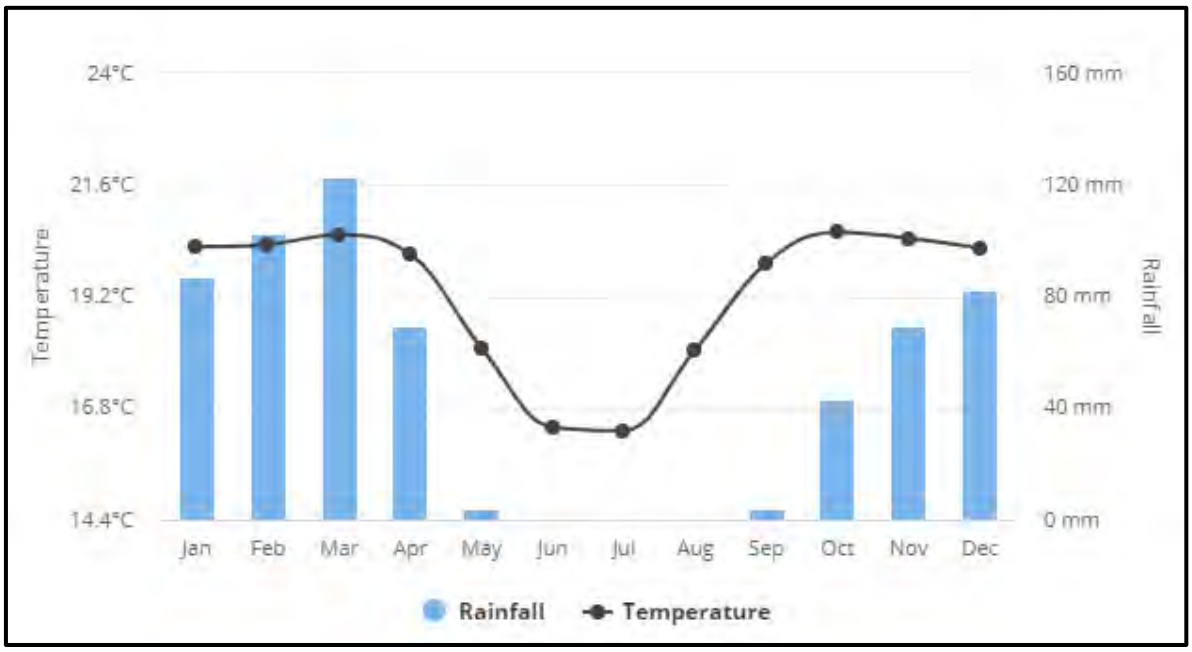


Figure 5-1: Average monthly temperature and rainfall in Huíla province.

Source: worldbank.org (accessed at 10/02/2021).

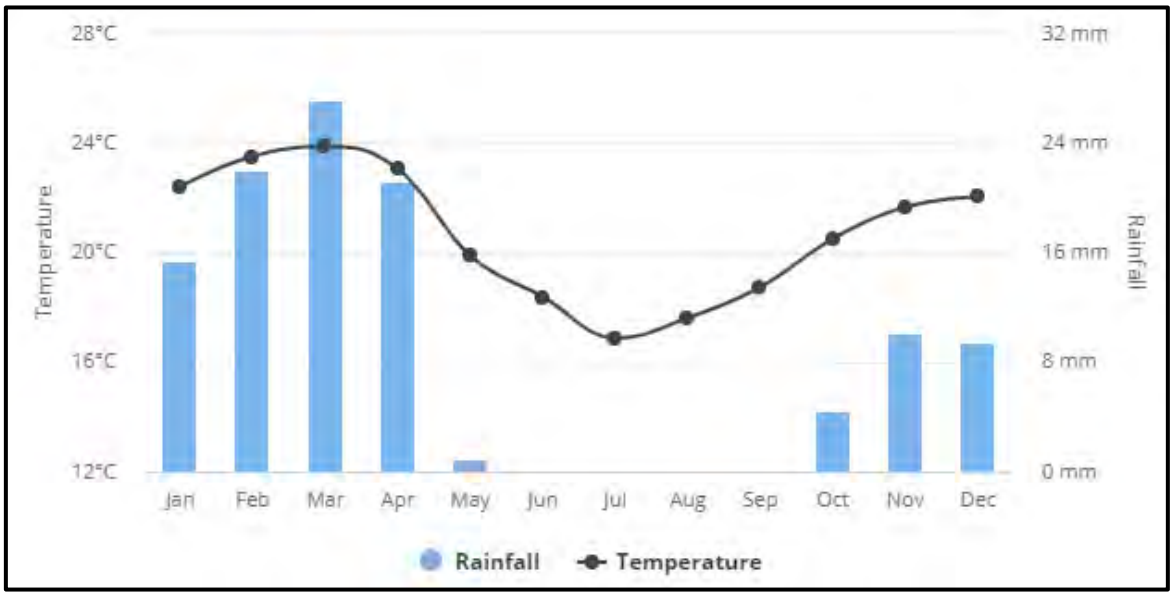


Figure 5-2: Average monthly temperature and rainfall in Namibe province.

Source: worldbank.org (accessed at 10/02/2021).

In the Humpata municipality (km 52 of the TL) three major climatic types predominate according to the climate classification of Köppen, namely: the tropical climate of altitude with dry season (Cw), the desert climate (BW) and the semi-arid steppe climate (BS) (Data clime, 2021). The climate of the region is influenced by two general physical-climatic causes, one planetary (latitudinal) and another local (distance to sea): the first causes decreased rainfall as the team moved away from the Equator, that is, approached the tropical anticyclone; and, the second, causes high atmospheric humidity and high absence of rain (near the sea), characteristics that are attenuating inland. The average annual temperatures increase with the removal of the sea to the base of the escarpment (Serra da Leba) causing Humpata to reach annual average temperature values of 17.2°C and 17.8°C (Vela, 2015). The influence of relief translates into high annual precipitation quantitative.

Along the proposed transmission line, there are a few areas that would be identified as sensible, due the impact of climate change (TL corridor from km 70 to km 85 in Bruco). These areas include a few agriculture fields and areas near rivers, where the effects are more evident and have been impacted local communities.

As a mechanism to reduce and/or mitigate the severe effects of climate change, the Angolan government, through the Sustainable Development Goals (2018) report, has established national targets/priorities and their indicators. In the face of climate change and its impacts, the following priorities have been established: **(i)** adapting the national territory to the impacts of climate change; **(ii)** develop strategies and implement actions in the framework of Adaptation and Mitigation of Climate Change, with emphasis on media to combat drought and desertification; **(iii)** implement nature and biodiversity conservation actions and strengthen sectoral policies related to the protection of flora and wildlife; (**iv**) strengthen waste collection and selection actions, promote environmental awareness and education actions and environmental monitoring; (**v**) prevent natural hazards and protect populations in vulnerable areas; and (**vi**) promote the transition to a low-carbon economy.

5.1.1.1 Average Annual Temperature, Minimum and Maximum Temperatures

The **Figure 5-3** (map of average temperature during the year) shows the strong effect of altitude on temperature in Southwest Angola (highlighting Huíla and Namibe Provinces). As elevations increase, air temperatures fall; conversely, the lowest areas are generally hottest. Places close to each other may therefore be quite different. Bibala and Humpata municipalities are good examples, being less

than 30 kilometres apart but among the warmest and coldest places in the region, respectively. Thus, the highest areas over 1,800 metres above sea level near Humpata on top of the Chela Plateau and in the northern Plateau highlands are the coolest (John & Stephie Mendelsohn, 2018).

By contrast, as explained in section above, the hottest areas are around Bibala (From km 100 to 164 of the TL route in Namibe) at about 700 metres above sea level where average temperatures exceed 24˚C. Even during dry season (known as *Cacimbo*), average temperatures around Bibala only drop by about 10°C, remaining at a mild average of 14°C (John & Stephie Mendelsohn, 2018).

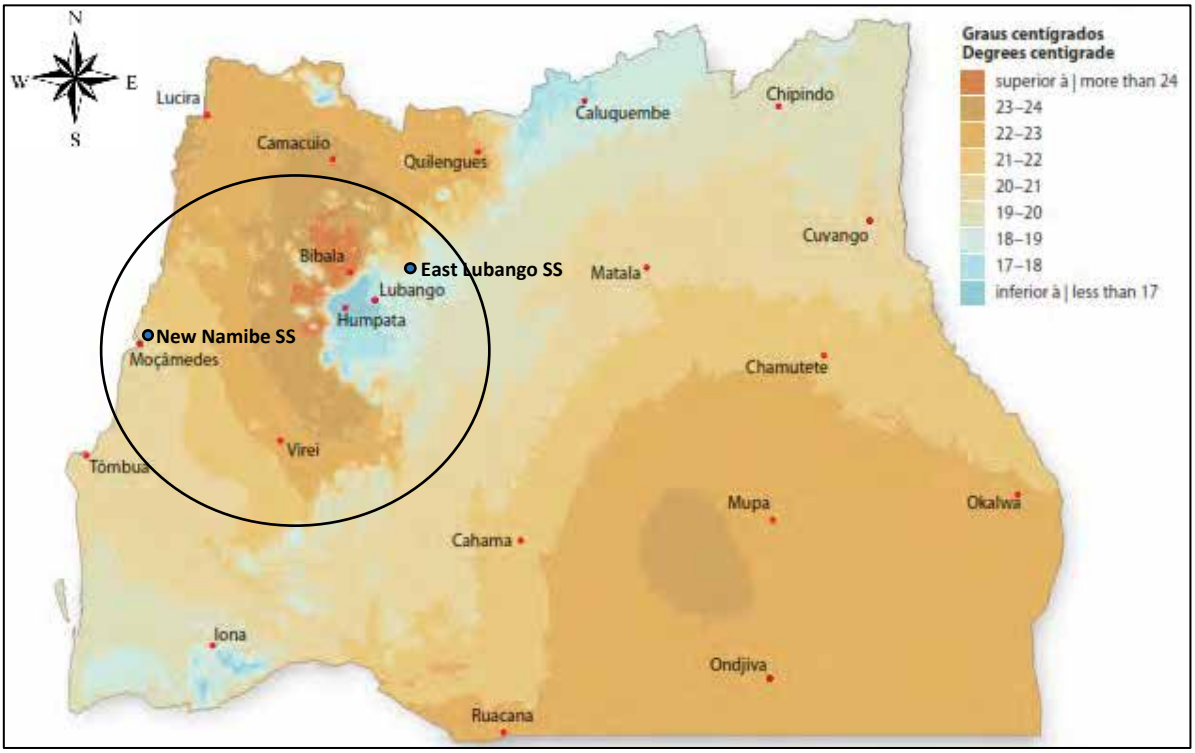


Figure 5-3: Average temperature in Southwest Angola (highlighting the 220 kV TL Project region).
Source: John & Stephie Mendelsohn, 2018.

According to John & Stephie Mendelsohn (2018), the average maximum and minimum temperatures in the region, respectively during the warmest months (January or February in most areas) and the coldest (June or July). The hottest areas in summer are in the south-east, while the coldest places in winter are on the Chela Plateau west of Lubango (see **Figure 5-3**). There is a strong divide along the Escarpment between the east and west during the coldest months. Temperatures in the east then plummet, dropping below 0˚C on some nights. To the west, the coastal plain maintains warmer, more stable temperatures that are moderated by maritime air from the Atlantic (see **Figure 5-3**).

5.1.1.2 Cloud Cover

The **Figure 5-4** shows the percentage of days on which clouds occur each year in Southwest Angola (highlighting Huíla and Namibe Provinces). The most overcast areas are along the coast and where elevations are highest. The plateau in the northeast, the Chela Plateau near Lubango and even the isolated massif of Serra da Neve all experience cloud cover for more than half of the year.

Fog originates offshore where moist sea air meets the cold waters of the Atlantic Ocean. The cold, wet air condenses to form a belt of fog that frequently pushes inland, sometimes across the coastal plain; occasionally even close to the escarpment. Fog is most frequent in the morning and it generally disappears during the middle of the day when the sun warms the moist air, causing water droplets to vaporise (John & Stephie Mendelsohn, 2018).

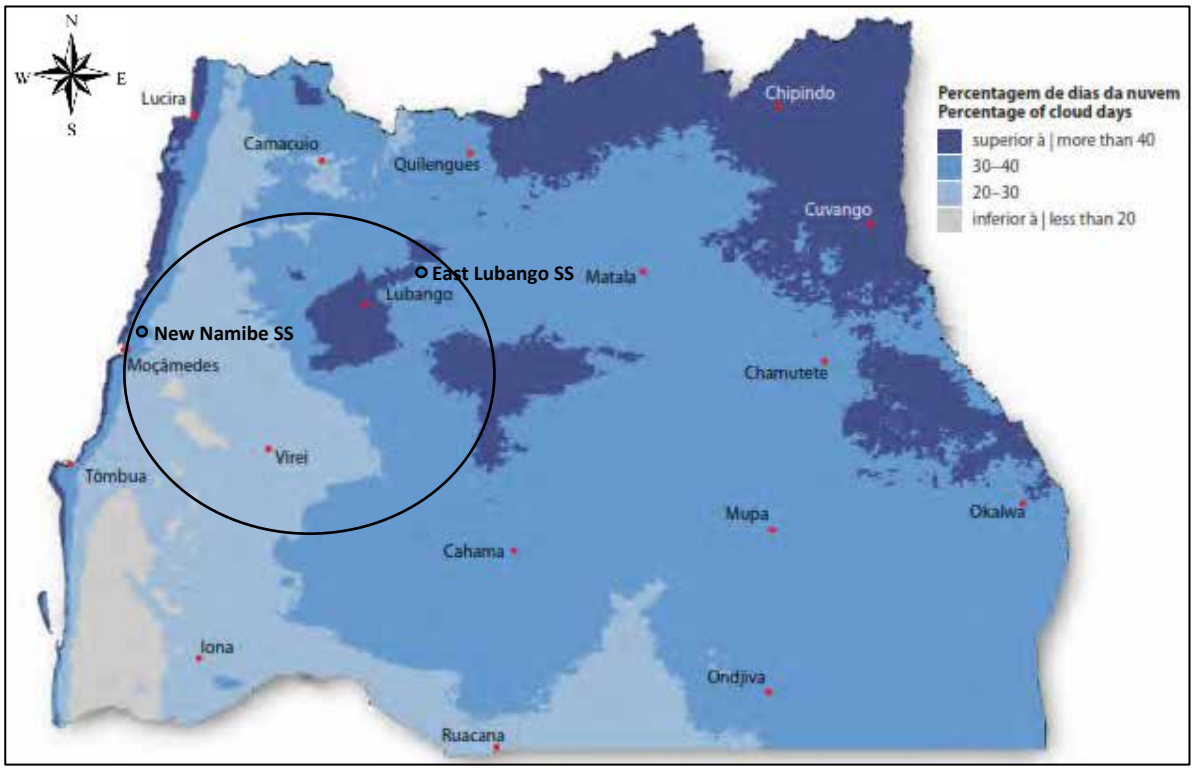


Figure 5-4: Cloudiness in Southwest Angola (highlighting Project region).

Source: John & Stephie Mendelsohn, 2018.

5.1.1.3 Sea Temperatures

Temperatures of the water at the sea's surface vary considerably during the year, as well as up and down the Angola coast and even along that of the Namibe and Huíla region. The water is warmest in the summer months when warm water of the Angola Current pushes south. By contrast, the sea is coldest in the dry season months when the cold Benguela current is driven north by the South Atlantic Anticyclone. Low temperatures in the south are also a product of upwelling which brings deep, cool nutrient-rich water to the surface. It is on these upwelling cells that so much marine life depends along Angola's southern coast (John & Stephie Mendelsohn, 2018). This includes the fishing industry.

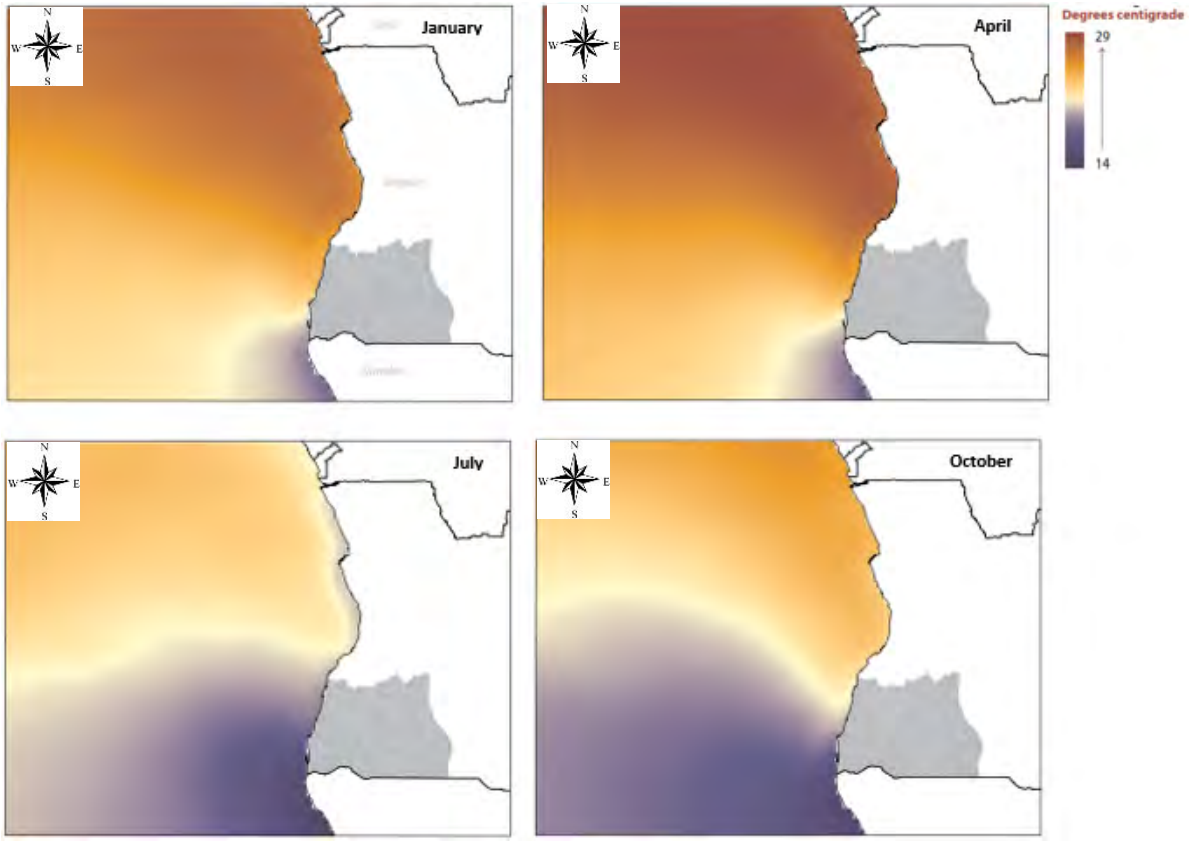


Figure 5-5: Sea temperatures in Southwest Angola (highlighting Huíla and Namibe Provinces).
Source: John & Stephie Mendelsohn, 2018.

Throughout the year, relative humidity is high along the coast, even as far inland as Caraculo. This is a consequence of the continuous local presence of moist maritime air and rather stable temperatures. Inland, by contrast, relative humidity varies considerably between the lowest levels in dry season when dry air is in circulation, and much higher figures in the summer months when moist air feeds into the region from the north.

5.1.1.4 Ocean Winds

The strongest winds are in the south, particularly along the coast, while conditions further north are much calmer. It is during the summer months that winds along the southern coast are strongest. Throughout the year winds prevail generally from the south or southwest and hug the margin of the coastline. Calmer winds off Angola's central coast swing towards the northeast.

Frequent strong winds along the coast are usually driven north by the South Atlantic Anticyclone. In addition, cool maritime air blows inland towards areas of low pressure caused by air heating and rising over the coastal plain during the day. These winds from the south and west blow sand from the beaches inland, thus forming the swath of sand dunes found in Iona National Park. These winds are strongest during summer months, bringing in cool air from the south to keep temperatures low on the coast. At Humpata the highest wind speeds are recorded in the dry season. Those dry season winds are also the product of a large anticyclonic system. In this case, it is the Botswana Anticyclone blowing anti-clockwise from east to west. Air driven by the wind warms as is descends onto the coastal plain where it often causes surprisingly hot weather in dry season (John & Stephie Mendelsohn, 2018).

5.1.1.5 Winds

The wind experienced at any given location is highly dependent on local topography, geomorphology, and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Huíla, particularly in Lubango, experiences mild seasonal variation over the course of the year. The windier part of the year lasts for over 4 months, from May to September, with average wind speeds of more than 6.0 miles per hour. The windiest day of the year is usually in mid-July, with an average hourly wind speed of 7.4 miles per hour. The calmer time of year lasts for 7 months, from September to May. The calmest day of the year is usually by mid-March, with an average hourly wind speed of 4.7 miles per hour (weatherspark, 2020).

The average hourly wind speed in Namibe experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 5 months, from October to February, with average wind speeds of more than 7.6 miles per hour. The windiest day of the year is usually by end of November,

with an average hourly wind speed of 8.2 miles per hour. The calmer time of year lasts for 8 months, from February to October. The calmest day of the year is usually at the end of August, with an average hourly wind speed of 7.0 miles per hour (see **Figure 5-6** and **Figure 5-7**) shows annual averages of wind in Huíla and Namibe provinces, where the transmission lines are located (weatherspark, 2021).

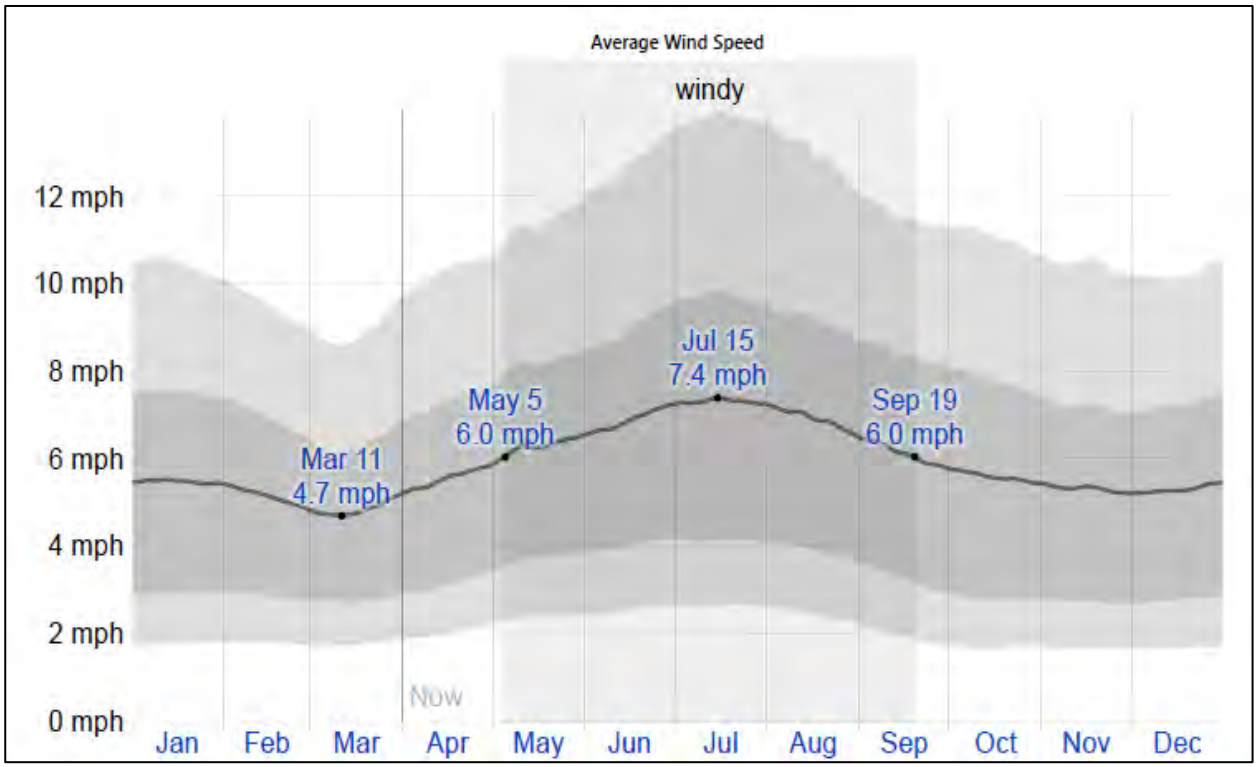


Figure 5-6: Average wind speed in Huíla Province.

Source: weatherspark.com (accessed at 02/2021).

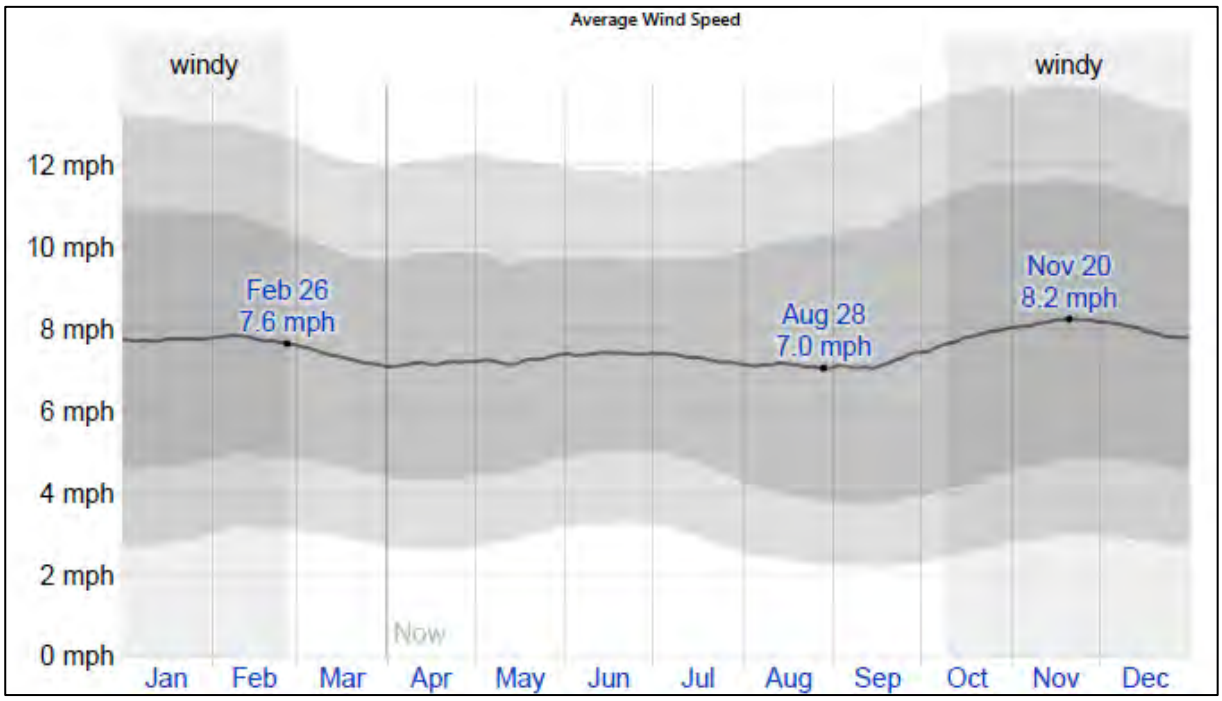


Figure 5-7: Average wind speed in Namibe Province.

Source: weatherspark.com (accessed at 02/2021).

Both these average wind data are consistent with the wind data supplied by Azevedo *et al* (1972) which was calculated based on data collected from 1941 to 1974 in the weather stations in Lubango and Moçâmedes.

5.1.2 Geology

The Transmission Line (TL) study region stretches from the Humpata Plateau until the Namibe Desert (from the km 38 to 71 of the TL route at an elevation between 2013 m and 370 m), which geologically comprises the old rocks from Archean age up to the young deposits from Neogene to Quaternary ages. Nevertheless, and in general, the project region is mainly characterized by Archean rocks (see **Figure 5-8**), represented by the Southwest Angola metamorphic suite, the Gabbro-Norite Charnockitic Complex and the Reworked Basement (mainly Eburnean). The Archean outcrops are clearly discontinued due to granitoid intrusions, which occurred in latter orogenic cycles, mainly during in the Eburnean (Pereira *et al*., 2003).

The transmission line project region is mainly represented by Archean outcrops and in accordance with the Geological Map of Angola (see **Figure 5-8**), all outcrops from Archean age present evidence of migmatization. Proterozoic outcrops are also well represented in the project region, although, they are, mainly, located in the Huíla Province and in specific regions of the Namibe Province.

The lower Archean (Eoarchean – Paleoarchean), outcropping only in the lower Southwest part of the project area, is characterized by the Lower Group composed by gneisses (biotite-horneblendic, biotitic-hypersthenic, garnet-bimicaceous with kyanite and graphite), amphibolite, biotitic schists and bimicaceous, leptites and quartzites. The upper Archean (Mesoarchean – Neoarchean), which represents most part of the outcrops in the project area, is characterized by bimicaceous gneisses, plagiogneisses, bimicaceous schists with garnets and kyanites sometimes carbonaceous, epidotites, para-amphibolites, calciferous and marbles, quartzites. Igneous and ultrametamorphic rocks from Mesoarchean – Neoarchean age are also identified, mainly in the Northeast part of the project area, represented by biotitic granites, granodiorites and diorites. Nevertheless, small outcrops are also identified, in the centre and Southwest of the project area, intruding the metasedimentary sequence described previously.

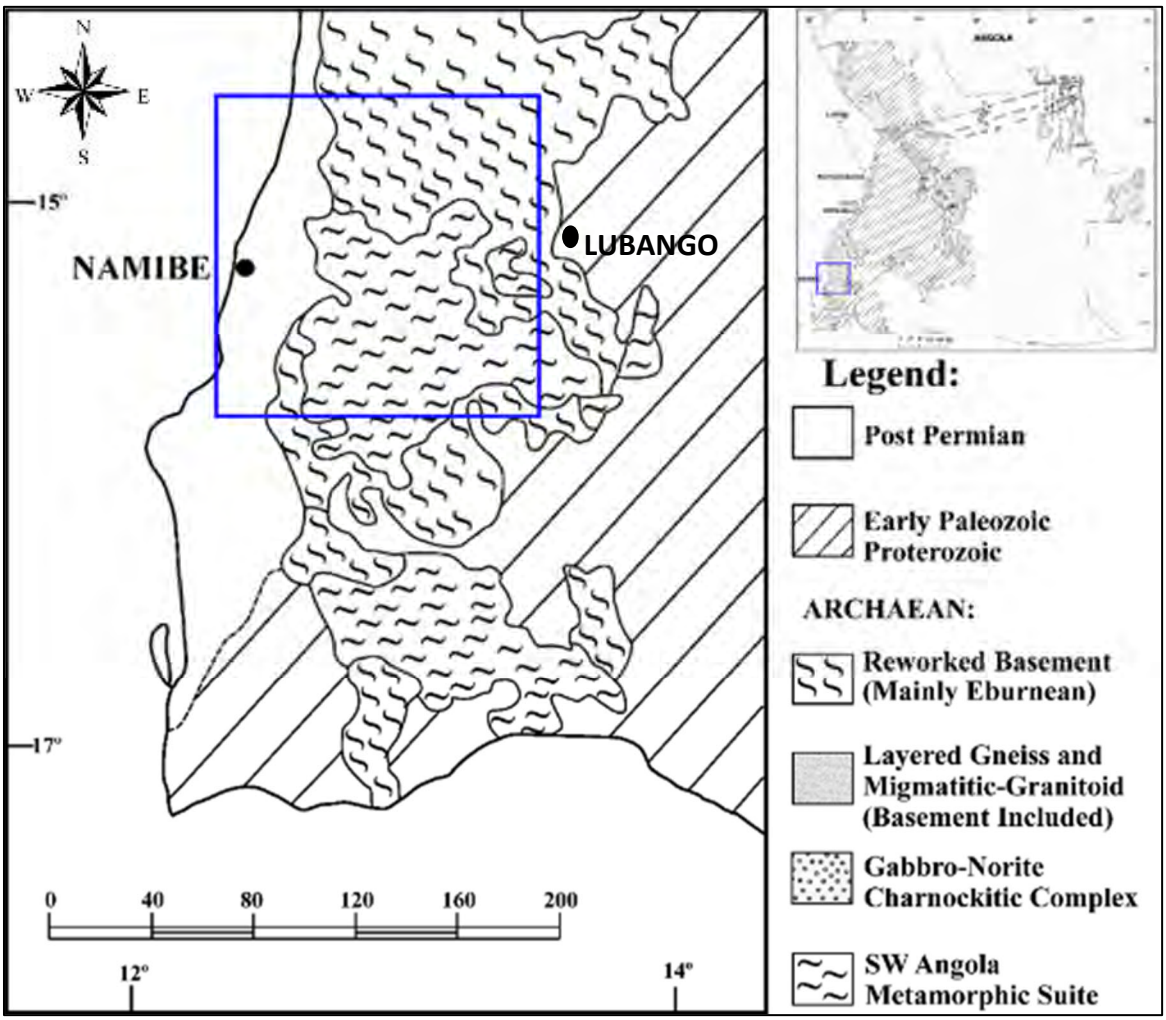


Figure 5-8: Precambrian basement of Angola - Geological Sketch Map. **Source:** Pereira *et al.*, 2003.

Proterozoic outcrops, as previously mentioned, are also identified in the project area. The metasedimentary rocks from Paleoproterozoic age (lower Proterozoic) are represented by the Oendolongo Group unit, which outcrops only in a small area in the North part of the project and is, mainly, characterized by the following metasedimentary rocks: conglomerates, quartzites, sandstones, siltstones, micaceous schists and itabirites. Igneous and ultrametamorphic rocks from Paleoproterozoic age are also and mainly identified in North of the project area, which are dominated by intrusive bodies of dolerites, and Quibala Granites (porphyroblastic biotite granites and leucocratic granites). Acid, medium, basic and ultrabasic dykes of Paleoproterozoic age are also detected in the North and Northeast of the project area.

The metasedimentary rocks of Mesoproterozoic to early Neoproterozoic age are represented by the Chela Group unit, which is characterized by the Humpata Formation (quartzites, conglomerates, sandstones, siltstones, mudstones and volcanoclasts) and the Leba Formation (dolomitic limestones with stromatolites, sandy-limestones and cherts). Both formations are mainly identified in the Humpata Plateau (Northeast of the project area). Igneous and ultrametamorphic rocks from Neoproterozoic age, mainly characterized by dolerites and gabbros, are, also, identified in the Humpata and in South of the Humpata area (from km 52 to 70 of the TL route).

The young outcrops from Mesozoic to Cenozoic (Cretaceous to Quaternary) age are mainly identified in the Namibe coast, which are part of the Namibe Sedimentary Basin. The Lower Cretaceous (Aptian) is represented by marls, limestones, sandstones and gypsum, which outcrops are identified in the North part of the Namibe Basin (Northwest of the project area). The Upper Cretaceous (Cenomanian – Turonian) is characterized by oolitic and pisolitic limestones, marls, sandstones and conglomerates, which outcrops are also identified in the Northwest part of the project area, but also in the centre.

The later Upper Cretaceous (Maastrichtian) is also outcropping in Northwest and centre of the project area, but it is represented by igneous and ultrametamorphic rocks, which are characterized by basalts, dolerites, espilites, trachy-andesite basalts, latites, trachytes, tefrites, granite-porphyres and rhyolites. The Paleogenic (Paleocene – Eocene) rocks, are characterized by sedimentary rocks, composed by limestones and marls, outcrops in the West centre part of the project area. The youngest deposits from undifferentiated Quaternary, characterized by aeolian sands and sands and alluvial-proluvial clays, are identified in the Southwest part and in the Humpata region of the project area, respectively.

As well known, the complexity of relationships between physical and biological components of ecosystems and habitats is a fact. Additionally, it is also evident that this complexity of relationships is intimately related to the geological background of a specific area, due to its contribution to the formation of soils and its influence on defining the topography. These soils are inherently fertile, but prone to poor drainage. Sedimentary rocks in the project area are mainly identified in the coast (Namibe Basin) and in the Humpata area (see **Figure 5-9**).

Igneous rock types present discernible chemical and physical characteristics when compared to sedimentary rocks, mainly in their lower calcium mineral content, which is considered a major influence in the general vegetation community. This type of rocks has a specific mineralogical

composition and consequently a specific chemistry, which in turn has specific effects on plant community's development. These effects produced on flora growth by an igneous parent material are most relevant when the bedrock is represented by mafic and ultramafic rocks, due to their high concentrations of magnesium and iron. In **Figure 5-9** is possible to confirm that igneous mafic and ultramafic rocks are mainly located in the centre of the project are.

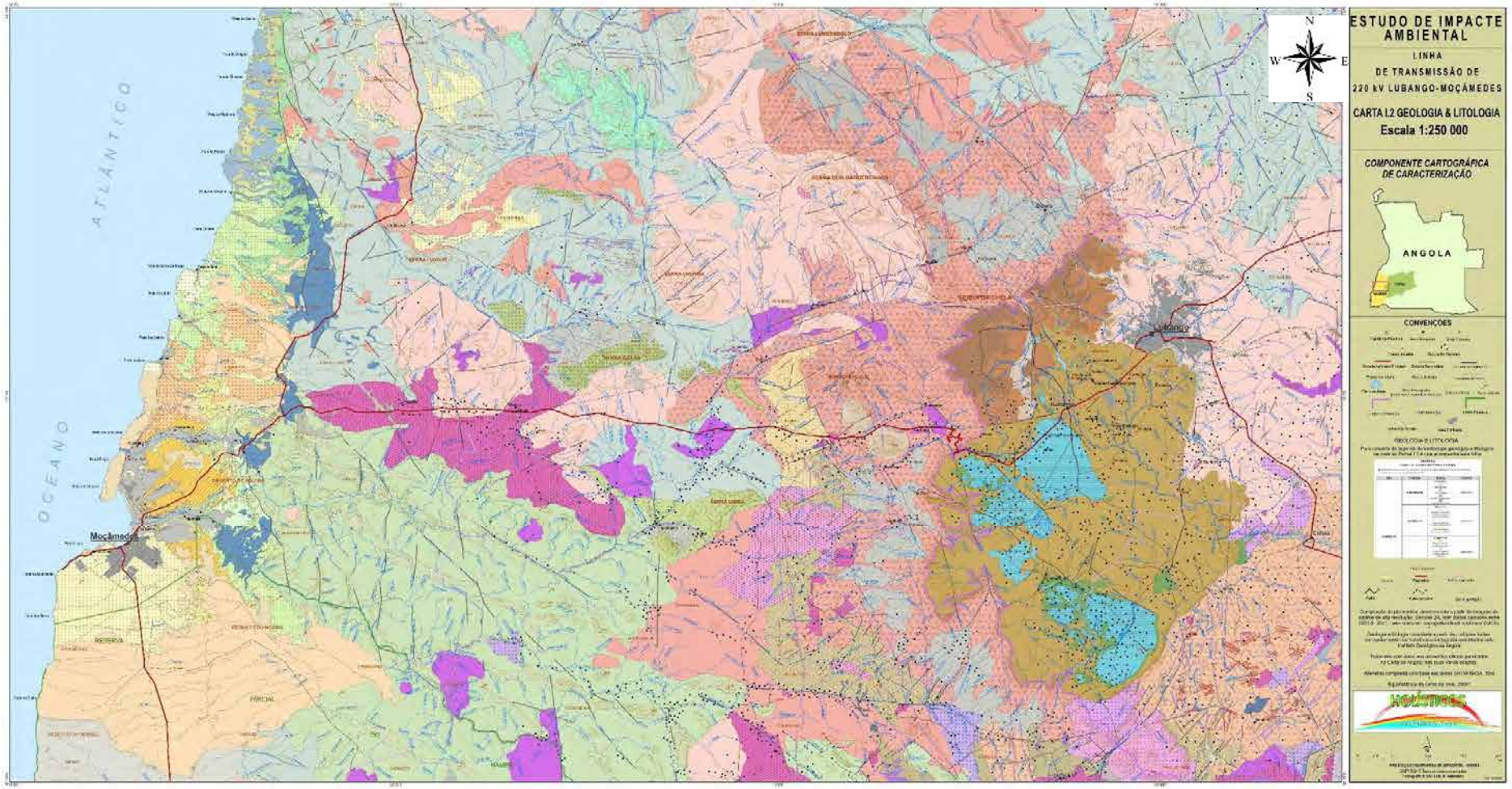


Figure 5-9: Geological and lithological map of the project area.

5.1.3 Geomorphology and Relief

The study area, comprising the Humpata Plateau in the East (Huíla Province) up to the Namibe Dessert in the West (Namibe Province), exhibits quite irregular landscapes, in terms of distribution, shapes and representativeness. Given that, the project area is, mainly, represented by two main geomorphological units, the Marginal Mountain Chain and the Escarpment Zone (Peneplain), the later also known as the Transition Zone between coastal plains and inland plateaus (see **Figure 5-10**). At this point, it is pertinent to understand the relationship between the geological background and the geomorphological units' development, e.g., the pronounced reliefs are closely related to the quartzite-schist and igneous rocks including diverse granites, diorites and granodiorites (see **Figure 5-8**).

In the study area, the Marginal Mountain Chain Geomorphological Unit, which comprises the Northern half of the plateau edge, from Humpata Plateau to the top of the Escarpment of Chela, is represented by very sharp reliefs with altimetric values of 2,300 m, which drops steeply to the West and introduces altimetric variations up to 1,000 m. The Escarpment Zone Geomorphological Unit, extending parallel to the Atlantic Ocean, corresponds to a wide flattening that occupies most of the study area and gradually descends to the West with altimetric values changing from 600 m up to 300 m.

The Escarpment Zone Geomorphological Unit, descending from the Escarpment of Chela to the Atlantic Ocean, is represented by a succession of plateaus at different levels in a steep horizon of pinnacles, shafts, sometimes impressive scarps of bare rock. The granite formations outcropping in this flattening landscape with forms of residual relief, the so-called island hills or even "inselbergs", assume a magnificent aspect with altimetric values similar to those identified in the Humpata Plateau. Nevertheless, it is also relevant to mentioned a third and fourth main geomorphological units also embodied by the project area, the Ancient Plateau, which is represented by a flattened and tectonically uplifted surface, occurring only in Lubango and Chibia areas, and the Coastal Zone identified near from the Namibe town (see **Figure 5-11**).

The Humpata Plateau, located in the Marginal Mountain Chain Geomorphological Unit (see **Figure 5-10**), is a structural relief that represents the highest level of flatness in the Southwest Angola and consists a preponderant element of the geology of the Southern sector of Congo Craton, which has remained stable since the Proterozoic age (Duarte *et al*., 2014).

The Humpata Plateau is (km 48 of the TL route), usually, characterized by two (2) subunits surfaces: the Humpata (approximately 2,000 m high) and the Bimbe (approximately 2,300 m high). The two (2) subunit surfaces are relatively extensive and have steep steps, which allowed the separation from the lower plateau surface, also called the Main Plateau of the Humpata surface (see **Figure 5-11**). Additionally, the small surface of Bimbe subunit with unevenness of approximately 100-300 m, culminated in the developments of a set of escarpments and flattening's which allowed the formation of a mountainous structure, giving rise to the regional designation of "Serra da Chela" (Joaquim, 2015).

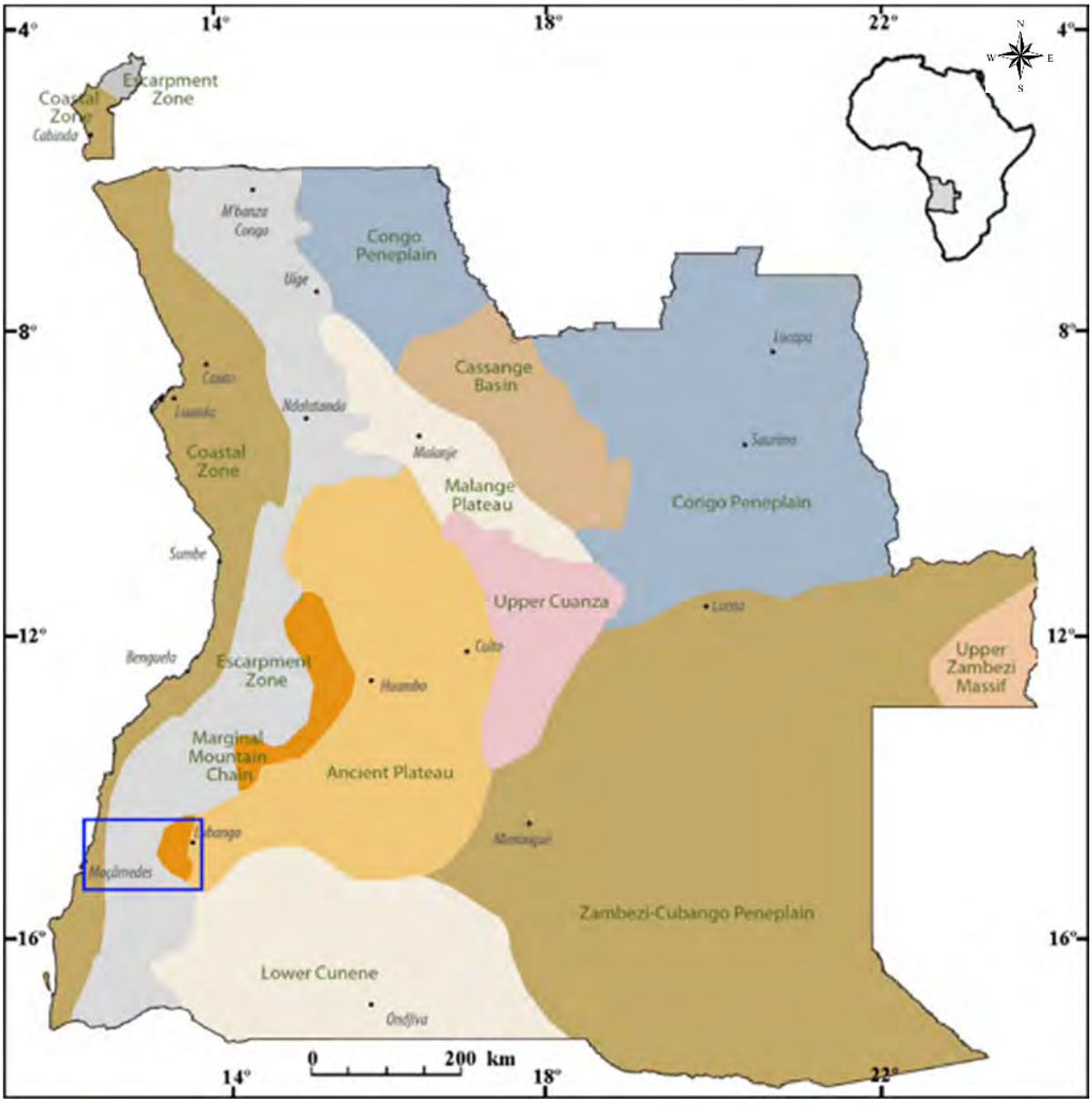


Figure 5-10: Main geomorphological units of Angola. **Source:** Huntley, 2019.

The transmission line project area from Serra da Leba to Namibe town (from km 70 to km 196 of the TL route), located in the Escarpment Zone Geomorphological Unit, is an irregular pediplain with altimetric values ranging from 300 to 600 m above the sea level, in which inselbergs of various sizes, as previously mentioned, represent a typical feature in the Namibe Province (Moçâmedes town). These inselbergs were formed as a result of pediplanation processes, i.e, the differential erosion of sedimentary units of volcanoclastic, metamorphic and carbonated rocks rest in nonconformity over a sialic base granite of Pre-Eburnean origins (Pereira *et al*., 2003), which are, mainly, identified in the North-Center of the study area.

The major isolated semi-tabular features (inselbergs), such as "Serra de Gandarengos" Mountain, "Serra da Chonga" Mountain and "Serra da Lua" Maintain reach altimetric values up to 1,575 m, 1,413 m and 1,067 m, respectively (see **Figure 5-9,** and **Figure 5-12**). Nevertheless, near from the Namibe town and along the entire coast, located in the Coastal Zone Geomorphological Unit, it is possible to identify low altimetric values, less than 100 m, which are mainly related with less resistant lithostratigraphic units from Mesozoic to Cenozoic age (see **Figure 5-9,** and **Figure 5-12**).

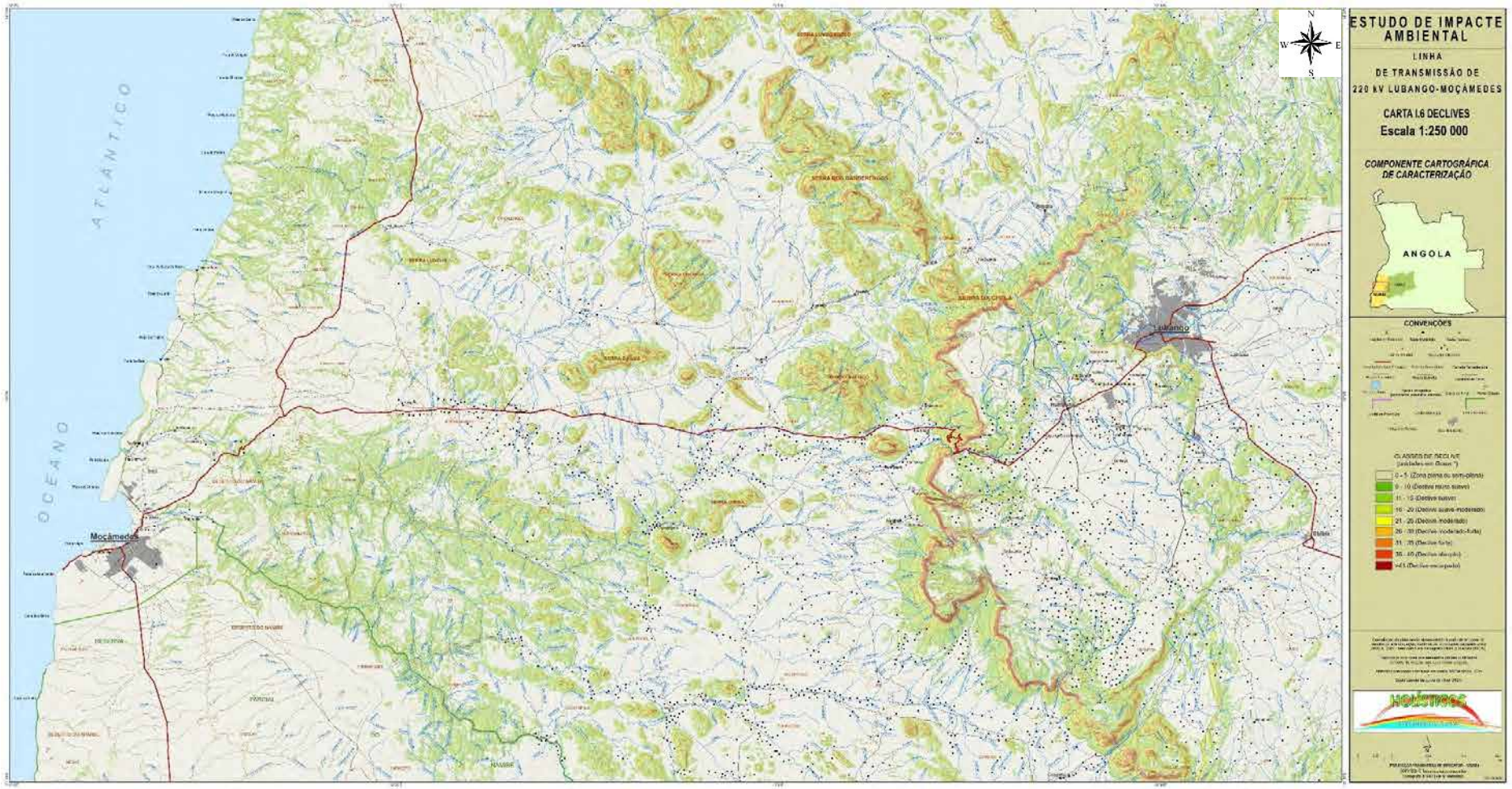


Figure 5-11: Geomorphologic map highlighting the main existing slopes in the TL Project route.

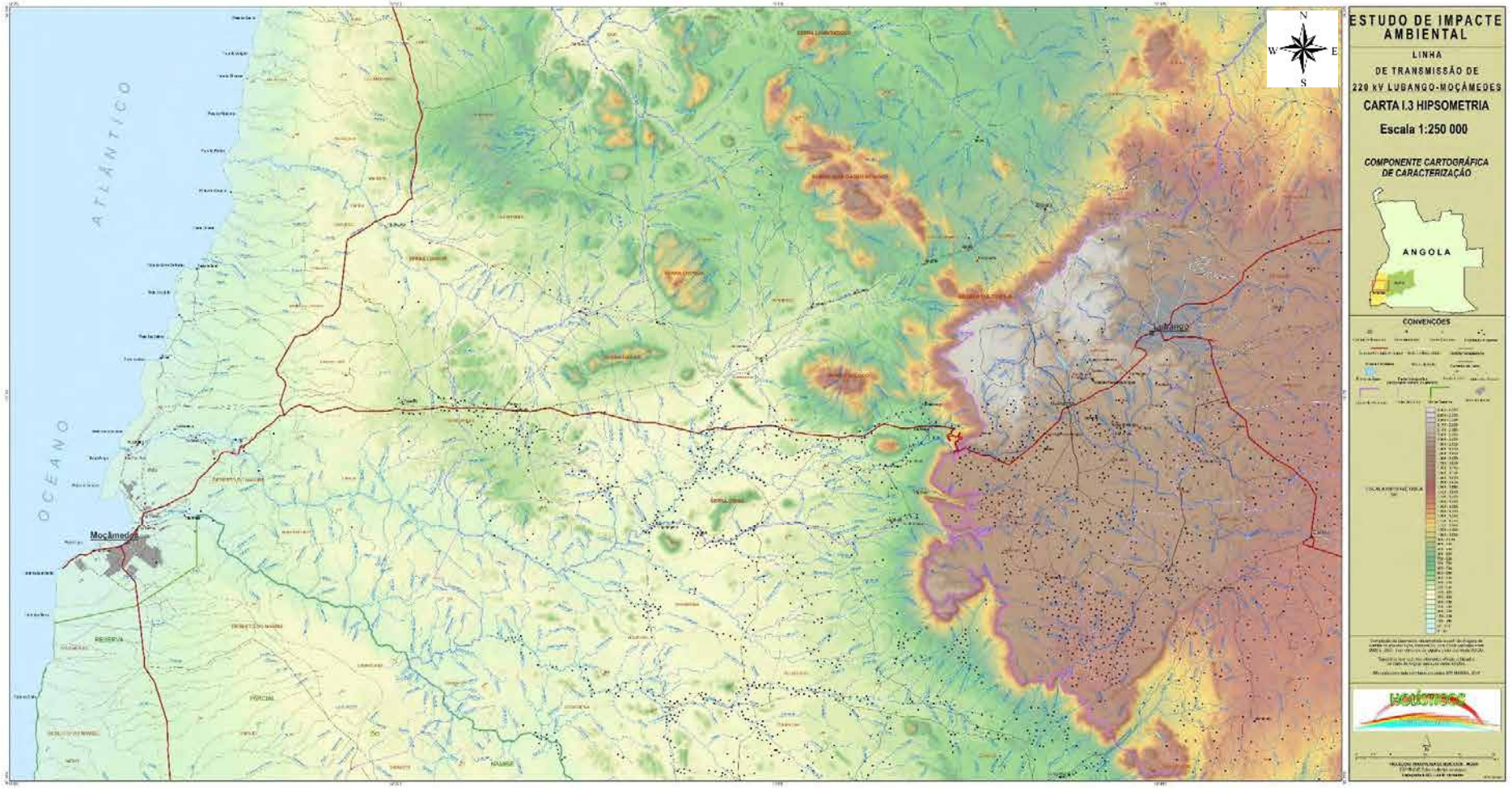


Figure 5-12: Geomorphologic map showing the altitude values of the project area.

5.1.4 Bathymetry

The topography of the sea floor west of the coast is quite different from the shape of the land surface to the east. Immediately offshore is the continental shelf which gradually drops to its western margin lying about 150–250 metres (m) below the surface. The shelf is broadest in the south where it extends out about 50 Km. By contrast, the shelf edge in the north is only 5 to 10 Km from the coastline (John & Stephie Mendelsohn, 2018).

The floor of the Atlantic drops rapidly west of the continental shelf, plummeting to the edges of the abyssal plain at depths of 2,000–2,500 m. From there, the plain slopes gradually down to the west, reaching depths of 5,000 m within 400 Km of the coast. The isolated sea mounts might be volcanic cones that erupted as South America and Africa drifted apart (John & Stephie Mendelsohn, 2018).

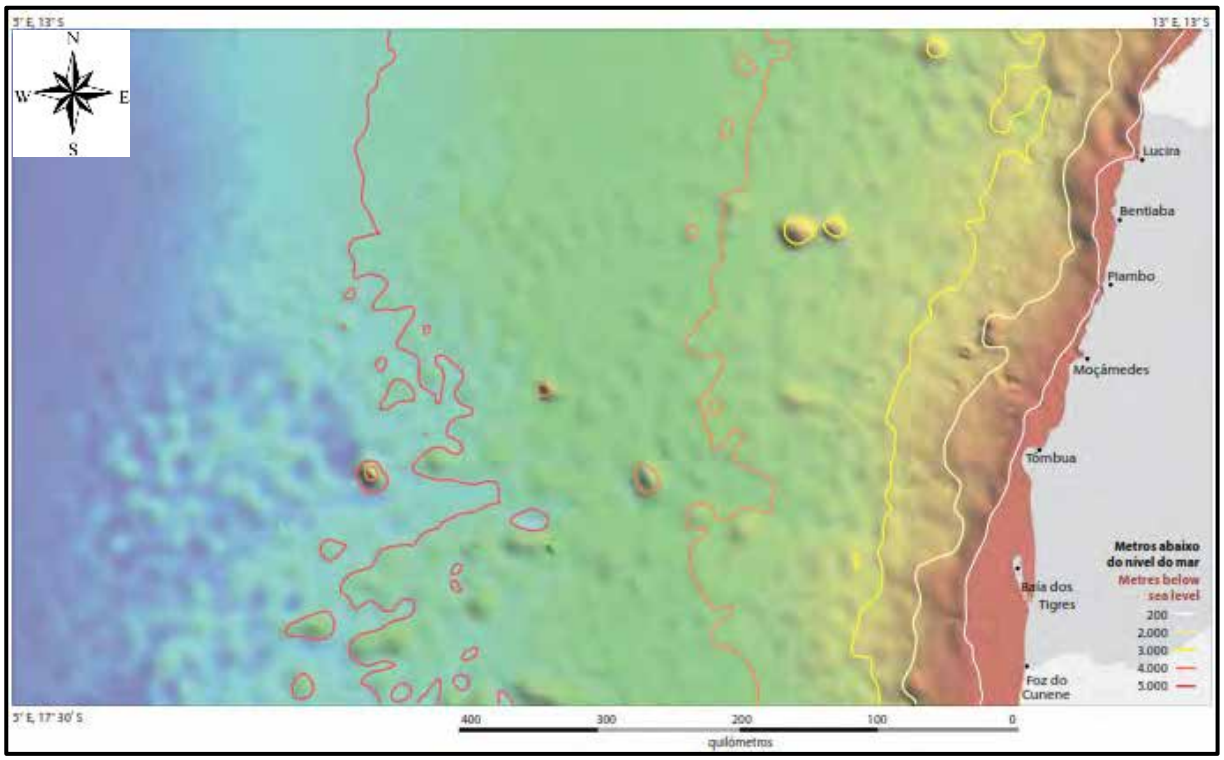


Figure 5-13: Bathymetry of Namibe coastline.

Source: John & Stephie Mendelsohn, 2018.

5.1.5 Soils

The soil formation is controlled by several factors, namely parent rock (source rock), climate (temperature and precipitation), organisms (flora, fauna including man) and relief (Weil & Brady, 2016). The climatic gradients reflect strong differences between the inland highlands (Lubango) and the coastal plains (Namibe). Therefore, between the Marginal Mountain Chain Geomorphological Unit and the Escarpment Zone Geomorphological Unit there are clear climate differences influenced by global sea surface temperatures and wind currents, such as the Benguela Current, which play a crucial role in precipitation and temperature controls (Dabas *et al*., 2020).

The Humpata municipality (From km 38 to 72 of the TL route) is characterized by a sub-humid climate, which is influenced by the escarpment of "Serra da Chela" mountain. The Namibe Province, from east to west, shows significant climate variations, such as temperate, arid and dry. According to the Thornthwaite climate classification system, the study area fits, mainly, in the arid to semi-arid climate range. According to the FAO-UNESCO soil classification system, the project area is, mainly, characterized by leptosols and calcisols, followed by cambisols, and finally by ferrasols (**Figure 5-14**).

Leptosols in the project area are, mainly, identified along the Namibe Province, as well as on North of Humpata Plateau, in which the lithological bedrock is represented by hard rocks, such as gneisses and granites from Archean and Proterozoic ages. Genetically, leptosols are shallow and young soils, characterized by many coarse fragments and therefore by low water holding capacity, which in the case study are intimately related to the parent material (igneous and metamorphic rocks). This soil formation is also associated to different topographic and physiographic settings, such as the ones acknowledged in the project area, e.g., the leptosols is identified in low terrain positions associated to arid and dry climates, which conditions are typical in the Namibe Province, but also in elevated or accidented terrains with sub-humid climate, such as North of Humpata Plateau, where soil formation is delayed by low temperatures or erosion.

Calcisols are soils with significant accumulation of secondary calcium carbonates, which are common on calcareous parent material in regions with distinct dry seasons, as well as in dry areas where carbonate-rich groundwater comes near the surface. Therefore, in the project area, calcisols only occur along the Namibe Province, in which the lithological background is characterized by carbonates rocks.

The Namibe coast is composed by marls and limestones from Cretaceous and Paleogene ages and in the Namibe Province inland, these soils are identified in rocks from upper Archean (Mesoarchean – Neoarchean) age, which are characterized by bimicaceous gneisses and plagiogneisses, but also by carbonaceous and calciferous material. The calcisols formation was, as previously mentioned, conditioned by climate, therefore these soils usually occur in arid and semi-arid regions, such as the climate identified in the Namibe Province. Most calcisols have a medium or fine texture and good water holding properties. Nevertheless, the sedimentation and crust formation processes can make difficult the infiltration of rain and irrigation water, especially where surface soils are silty.

Cambisols holds an incipient soil formation. In fact, the appreciable quantities of weatherable minerals and absence of any evidence of advanced pedogenesis, such as illuviated clay, organic matter, aluminium and/or iron compounds, confirm that cambisols are in an early stage of soil formation. Nevertheless, moderately developed soils occur in all environments, from the sea level to highlands, from the equator to the boreal regions, and under all kinds of vegetation. In the project area, cambisols are identified in the boundary between Huíla and Namibe provinces, which is also represented by the boundary between the Marginal Mountain Chain and Escarpment Zone Geomorphological Units. Therefore, in the present case study, cambisols are specifically identified in the flattened areas at the foot of the Humpata Plateau, which is highly characterized by water courses.

In this context, the parent material is mainly characterized by alluvial deposits from Quaternary age, but also by granites from Proterozoic age. Additionally, the temperate climate, where cambisols were identified, is one of the reasons to slow down the processes to soil formation and consequently to allow the formation of an incipient soil. Most cambisols are medium-textured and have a good structural stability, a high porosity, a good water holding capacity and good internal drainage.

Ferralsols are deeply weathered soils with a very low cation exchange capacity and are virtually devoid of weatherable minerals. These soils comprise the typical red and yellow soils of humid tropical climates, in which high soil temperatures and moistures promote rock weathering and rapid decay of soil organic matter. Therefore, ferralsols are usually characterized by a long history of dissolution and transport of weathering products, allowing the formation of deep and genetically mature soils.

The parent material is usually represented by old rocks and tend to occupy the upper portions of stable geomorphic surfaces, which general characteristics are identified in Humpata Plateau, where ferralsols occur. The type of soil coverage is presented in **Figure 5-14**.

In fact, Humpata Plateau is characterized by quartzites, conglomerates, sandstones, siltstones, mudstones and volcanoclasts (Humpata Formation) and dolomitic limestones with stromatolites, sandy-limestones and cherts (Leba Formation) from Proterozoic age, which is located in the Marginal Mountain Chain Geomorphological Unit, representing a flattened structural relief which has remained stable since the Proterozoic age. In fact, this ferralsols formation is, mainly, controlled by ferralitization processes, which consist of a hydrolysis in an advanced stage, although is a very slow process.

Therefore, if the soil temperature is high and the percolation intense, typical in humid climates, such as the one identified in the Humpata Plateau, all weatherable primary minerals will ultimately dissolve and be removed from the soil mass. Additionally, less soluble compounds, such as iron and aluminium oxides and hydroxides and coarse quartz grains remain in the soil mass. Ferralsols are chemically poor soils and are, usually, characterized by relative accumulation of stable primary and secondary minerals.

In fact, easily weathering primary minerals such as iron-magnesian minerals and even the more resistant feldspars and micas, usually, disappeared completely. Quartz is the main primary mineral in ferralsols, and the clay assemblage is dominated by kaolinite, goethite, hematite and gibbsite, depending on the parent rock and the drainage conditions.

Most ferralsols are clayey, due to the advanced weathering, and have strong water retention at permanent wilting point while the presence of micro-aggregates reduces the fields' moisture storage capacity. In fact, these stable micro-aggregates promote the excellent porosity, good permeability, and good infiltration rates, common in this type of soils.

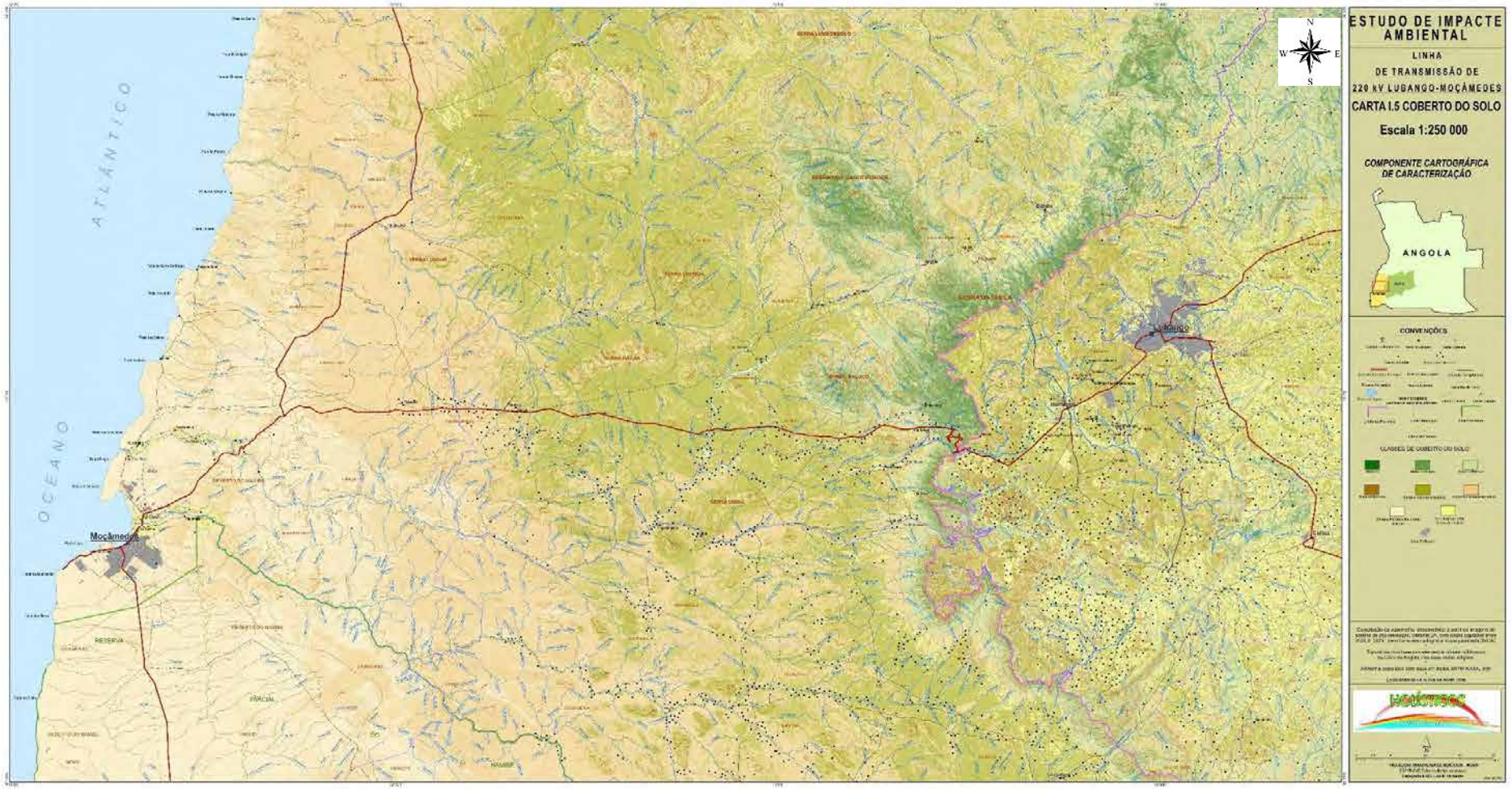


Figure 5-14: Map of soil coverage in the project area.

5.1.6 Hydrography

Angola, as well known, is one of the richest African countries in terms of hydrography. However, the hydrographic network of the transmission line project route and area is reduced (see **Figure 5-15** and **Figure 5-16**), and mainly dominated by the hydrographic basins of Giraúl and Bero rivers. The study area also comprises the Bentiaba and Piambo hydrographic basins and one of the main hydrographic basins of Angola, the so-called the Cunene hydrographic basin. Most of the hydrographic basins, previously mentioned, are circumscribed to the Namibe Province, expect the large Cunene hydrographic basin, which belongs to the Huíla Province. The rivers from these hydrographic basins are dry during the most part of the year except the Cunene River.

The Giraúl River rises in Bibala region, northwest of Lubango, and flows to the Namibe town (see **Photo 5-1** taken in km 170 of the TL route). The hydrographic basin of Giraúl River belongs to the Escarpment Zone Geomorphologic Unit, implying, at the upper level (Serra da Leba), a sudden change in height from 2,200 m to 950 m in just 5 km. After the strong initial altimetric variation, the river begins to flow in a very moderate profile, with an average slope of 0.45% over more than 100 km (Teixeira Pinto *et al*., 2019). The bedrock, in the main part of this basin, consists of different rocks (mainly gneisses and granites) of Archean and Proterozoic ages. Nevertheless, along the coast, the bedrock is characterized by Mesozoic and Cenozoic rocks (mainly limestones, marls and mudstones) and Quaternary sediments (see **Photo 5-1**).

Therefore, taking into consideration the bedrock changes from old rocks located in the Serra da Leba until the young sediments in the Namibe coast, the hydrographic basin of Giraúl River presents significant changes of hydrological characteristics, i.e, the groundwater potentials changed from low to high, the average yield ranges from 1 l/s or less to 6 l/s and the drilling success rates changes from low to high, respectively. Additionally, it is relevant to state, that the upper region of the Giraúl hydrographic basin is naturally where the average yield is lower, as previously mentioned, but on the other hand, where the greatest precipitation occurs (800 mm – 900 mm during about 4 months) and where water retention times are shorter, resulting in high flow rates with high erosive power. After the sudden transition in altitude, the hydrographic basin turns flattened, where the average precipitation ranges from 20 mm to 55 mm (during about 4 months), becoming a suitable place for the

deposition of a large amounts of the sediments, initially composed by large blocks of rocks that usually separate from the mountain cliffs until sand deposits that extend to the mouth of the Giraúl River.

Photo 5-1: Giraúl river in the km 170 of the TL corridor (15° 4'40.73"S 12°17'25.72"E).

The Bero River, such as the Giraúl River, rises in the Huíla Province and flows to the Namibe town and belongs to the Escarpment Zone Geomorphologic Unit laterally limited by the Marginal Mountain Chain Geomorphological Unit, which implies that the upper part (approximately 2,094 m) of the Bero River shows strong altimetric variations of approximately 1,000 m (DNA, 2005). The average annual precipitation is low (54 mm) allowing a mineral content probably too high. The natural aquifer discharge is made to the sea, to the Bero Riverbed and to deeper aquifer units, which is complemented by direct evaporation and evapotranspiration (Azevedo *et al*., 2015).

The hydrographic basins of Bentiaba and Cunene rivers are not well represented in the study area. The Bentiaba River rises in the mountain near Lola village (Huíla Province) and flows to the Bentiaba village in the Namibe coast. The bedrock, in the main part of this basin, is characterized by granites and gneisses of Archean and Proterozoic ages, which groundwater potential is low, with an average yield of 1 l/s or less, and a low drilling success rate.

However, the Bentiaba hydrographic basin presents two (2) small areas of fractured rocks with high groundwater potential. In the southwest, along the border to the Piambo basin, metasediments are supposed to have an average groundwater yield of 3 l/s, and in the south-eastern, where the basin ends, touching the rocks of the Humpata Plateau, the average groundwater yield is of 6 l/s.

The Cunene River rises in the Huambo Province and flows through the Huila and the Namibe Provinces until the Atlantic Ocean. The Cunene hydrographic basin is one of the main basins in Angola, but in the project area, only occurs in the Humpata Plateau. In the project area, the bedrock is characterized by metasedimentary rocks (quartzites, dolomitic limestones, sandstones, mudstones) of Proterozoic age with groundwater yield of 3 l/s on average and has a low mineral content due to high season rainfall (during about 4 months).

The hydrographic basin of Piambo River is relatively small when compared to the previously described. This basin is located between the Giraúl and the Bentiaba basins in the Namibe Province, mainly represented by a flattened area with a mean altimetric value of 500 m, locally high elevations occur, which are produced by specific mountains, such as the “Serra da Chonga” (approximately 1,400 m).

It should be noted that in the location of the two new substations, namely New Namibe and East Lubango there are no rivers of streams. The New Namibe is located in an arid area approximately 1.3 km south of the Giraúl River. The East Lubango Substation is also located in a flat area without any rivers. North of the proposed East Lubango substation there is an intermittent water line.

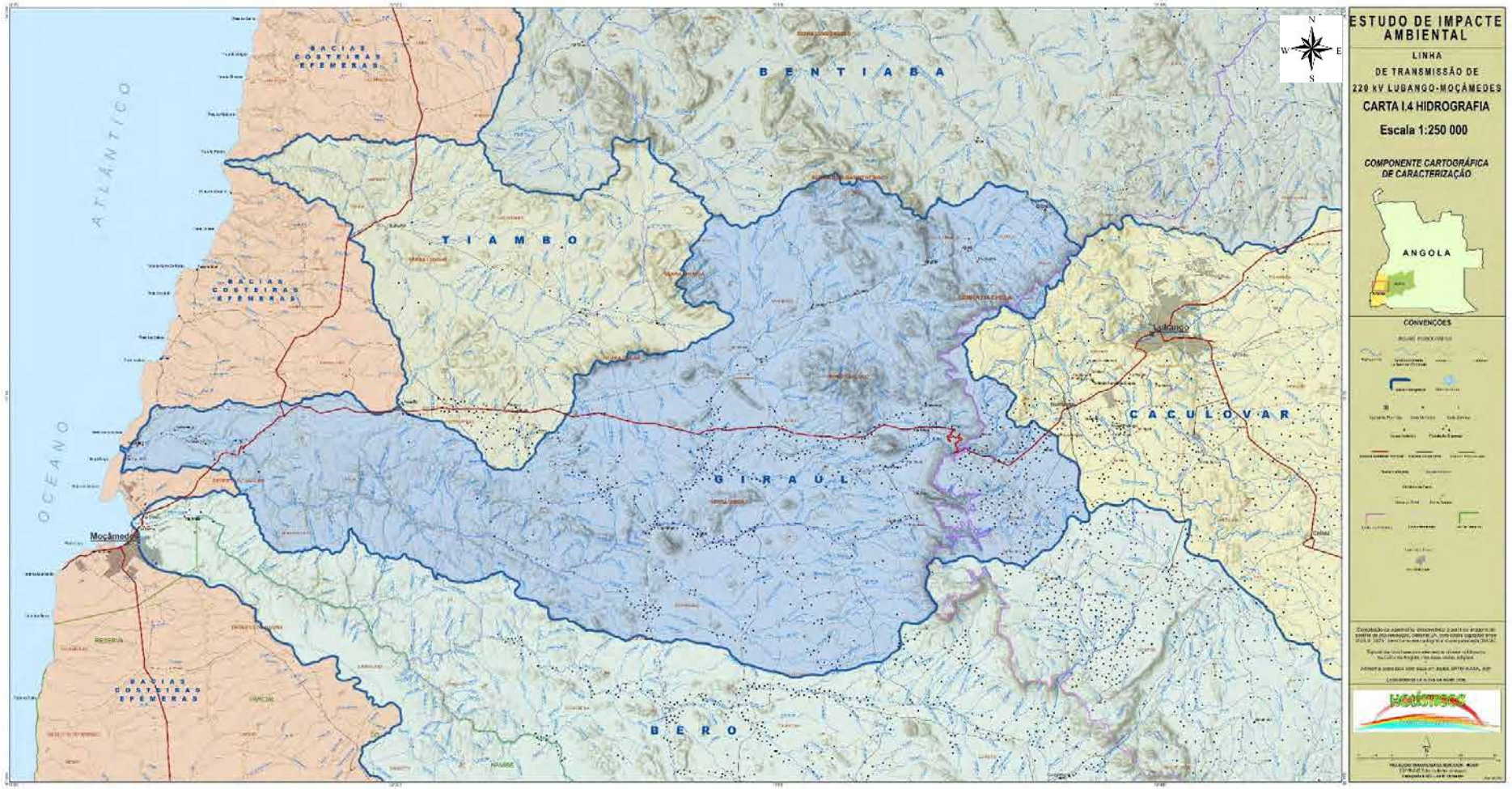


Figure 5-15: Hydrographic network covered by the project area.

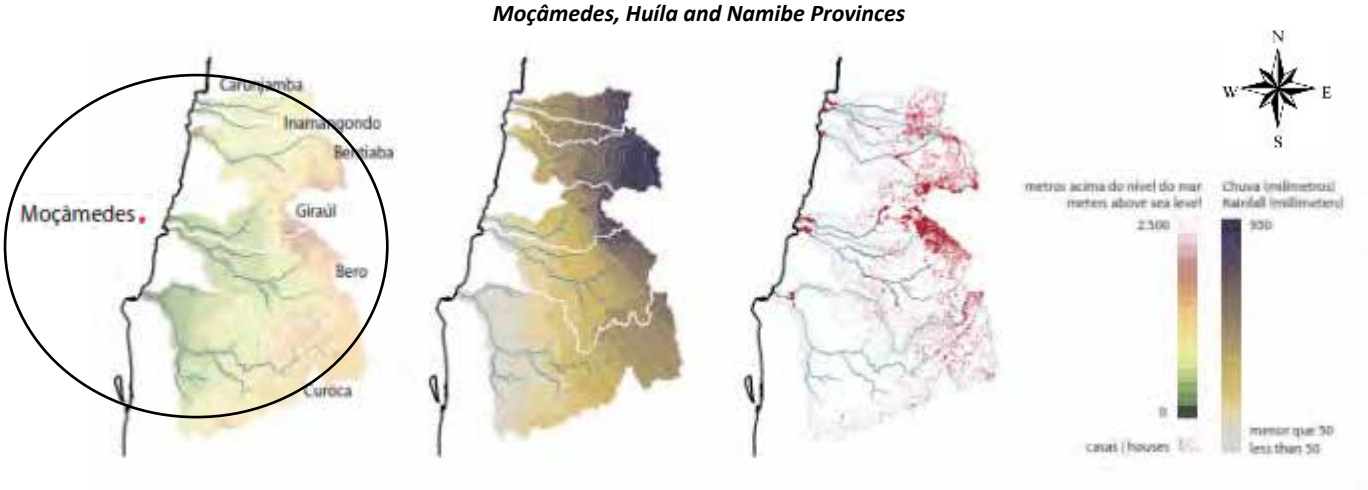


Figure 5-16: Western rivers in the transmission line area of influence.

Source: John & Stephie Mendelsohn, 2018.

5.1.7 Air Quality

The most abundant polluting gases in the Project region are carbon dioxide (CO_2) and methane (CH_4). Among the gases with the greatest implications for human health are nitrogen oxides (NOx), carbon monoxide (CO), sulphur dioxide (SO_2) and small suspended particles (PM_{10}). As has been the case in developing countries that are beginning their industrialization process, there has also been a high influx of the population to urban centres in Lubango, Humpata and Moçâmedes cities, in this case increased by the war situation experienced. The growth of unplanned urban areas and the anarchic development of various sectors of industry have been factors that have contributed to the increase in air pollution levels (MINUA, 2006).

Because of the lack of specific air quality legislation in Angola and a monitoring network, there is no real data on air quality in Republic of Angola. However, based on information from the specialty literature on air pollution and knowledge of the reality of the country, it can be assumed that the predominant emissions to the atmosphere in the country are those from the combustion of fossil fuels. The following sources can be identified:

- Vehicles in circulation;
- Generators used for the supply of energy;
- Torches of oil production and burned.

Road transport is responsible for most emissions of CO (carbon monoxide), COVNM (non-methane volatile organic compounds) and lead CH_4 (methane) emissions come almost as much as possible from the final deposition of municipal solid waste, while water treatment plants can be considered significant sources of NH_3 (ammonia) and N_2O (nitrous oxide). The large geographical area, existing water bodies and meteorological factors also condition the air quality of Angola.

Regarding the air quality of Huíla and Namibe provinces in general, although no specific monitoring has been performed, it can generally be considered as a good quality region due to the low existence of industrial and burned. In addition, there are only small-scale agricultural activities in both Provinces, and the city's design of Lubango and Moçâmedes (capitals) the others still do not have significant road traffic and industries. There is no air quality legislation in Republic of Angola. In this context, the International Finance Corporation (IFC) guidelines and best practices were used as applicable to the Project. For ambient air quality standards, the International Finance Corporation General Environmental, Health and Safety guidelines (IFC, 2007)[2] require that:

> "Solid particles emissions from dust do not result in concentrations of pollutants that meet or exceed established limits and relevant environmental quality standards in matters of environmental quality, by applying legal standards or, in the absence of such standards, the current World Health Organization (WHO)[3] Air Quality Guideline, or other internationally recognized sources."

JICA conducts environmental and social surveys at the ESIA level for **Category A Projects** in accordance with Terms of Reference (ToR). JICA prepares drafts of mitigation measures including avoidance, minimization, and compensation as well as drafts of monitoring plans and of institutional arrangements for environmental and social considerations. Between 2nd and 4th April 2021 (rainy season) and 13th and 14th September 2021 (dry season), eight spot measurements of air quality (four for each seasons) (only concentration of particulate matter - $PM_{2.5}$ and PM_{10} at certain points in the atmosphere of the Project implementation region) were performed at the same points where the measurements of the noise environment were also performed, where measurements were taken for

[2] International Finance Corporation (April 30th, 2007) Environmental, Health and Safety Guidelines: General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality.

[3] WHO. Air Quality Guidelines Global Update, 2016. PM 24-hour value is the 99th percentile.

one (1) hour, as illustrated in **Table 5-1** (rainy season results marked with blue colour and dry season results marked with pink colour) and **Table 5-2** (rainy season results marked with blue colour and dry season results marked with pink colour). The air quality measurements were performed using a Haz-Dust equipment.

Figure 5-17: Particulate matter measuring instrument used.

As mentioned above, all air quality measurements were performed using a Haz-Dust equipment[4] (particulate matter monitor) model EPAM-5000 (see **Figure 5-17 above**) properly calibrated and together with the Hold Peak HP-866B Pro Anemometer, where it was possible to obtain the minimum and maximum wind speed and air temperature at the PM measurement sites. **Table 5-1** and **Table 5-2** present the results of the spot measurements of particulate matter ($PM_{2.5}$ and PM_{10}) and wind in the areas defined for the construction of the East Lubango and New Namibe substations and along the proposed transmission line route/corridor.

Table 5-1: Results of particulate matter measurements in the Project region ($PM_{2.5}$).

Location Geographical Coordinates	Temp (ºC)	Wind Direction	Wind (Km/h)		Parameters (mg/m³)		
			Maximum	Minimum	Maximum	Minimum	TWA*
Selected Locations							
Point 1 – East Lubango Substation **S 14º55'40,4''** **E 13º39'25,1''**	31.6 ºC	SW150º	26	8.2	0.006	0.002	0.001
	28.6 ºC	SW150º	22	4.7	0.051	0.006	0.032
Point 2 – Arimba Thermal Power Plant **S 14º57'14,6''** **E 13º34'47,9''**	31.4 ºC	SW150º	28	3.9	0.036	0.003	0.041
	36.6 ºC	SW120º	43	5	0.059	0.015	0.024
Point 3 – Arimba Commune **S 14º56'48,2''** **E 13º35'38,1''**	31.8 ºC	SW150º	28	5.9	0.048	0.008	0.052
	37.8 ºC	SW120º	10	4.6	0.116	0.002	0.017
Point 4 - New Namibe Substation **S 15º09'42,4''** **E 12º12'48,6''**	40 ºC	SW120º	64	16.9	0.148	0.004	0.062
	38.7 ºC	SW120º	52	12.8	0.176	0.003	0.043

*TWA: Time Weighted Average.

Source: Holísticos, 2021.

[4] The Haz-Dust monitor is a device designed to measure the screening level for ambient air pollution. Its unique sampling design allows you to collect data in real time and perform a gravimetric analysis of the filter using the FRM 47mm located directly behind the optical sensor.

Table 5-2: Results of particulate matter measurements in the Project region (PM_{10}).

Location Geographical Coordinates	Temperature (°C)	Wind Direction	Wind (Km/h)		Parameters (mg/m³)		
			Maximum	Minimum	Maximum	Minimum	TWA*
Selected Locations							
Point 1 – East Lubango Substation **S 14°55'40,4''** **E 13°39'25,1''**	30.6 °C	SW150°	34	8.5	0.036	0.002	0.018
	28.6 °C	SW150°	20	5.6	0.058	0.006	0.032
Point 2 – Arimba Thermal Power Plant **S 14°57'14,6''** **E 13°34'47,9''**	30.8 °C	SW150°	29	6.4	0.052	0.008	0.042
	36.6 °C	SW120°	43	5	0.054	0.009	0.028
Point 3 – Arimba Commune **S 14°56'48,2''** **E 13°35'38,1''**	32.8 °C	SW120°	42	10.6	0.008	0.002	0.032
	37.8 °C	SW120°	10	4.6	0.118	0.002	0.021
Point 4 - New Namibe Substation **S 15°09'42,4''** **E 12°12'48,6''**	42 °C	SW120°	68	14.8	0.184	0.009	0.031
	38.7 °C	SW120°	52	12.8	0.352	0.002	0.035

*TWA: Time Weighted Average.

Source: Holísticos, 2021.

There is no specific legislation on air quality in Angola, neither air quality data for comparison. In this context, the International Finance Corporation (IFC) guidelines and best practices applicable to the project were used. For ambient air quality standards, **Table 5-3** presents the IFC Environmental, Health and Safety general guidelines published in 2007[5].

[5] International Finance Corporation (April 30, 2007) Environmental, Health and Safety Guidelines: General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality.

Table 5-3: IFC Air Quality Guidelines.

Pollutant	Average Period	Air Quality Standard (mg/m^3)
$PM_{2.5}$ and PM_{10}	Annual Average	35
	24 Hours	75

Source: IFC, 2007.

According to the time of the measurements taken, an extrapolation from one (1) hour to 24 hours was made by comparing the maximum average $PM_{2.5}$ and PM_{10} concentrations in **Table 5-1** and **Table 5-2** with the standard set by IFC (see **Table 5-3**). Comparing the maximum mean $PM_{2.5}$ concentrations in **Table 5-1** (for both seasons) with the IFC air quality standard (see **Table 5-3**), no exceedances of the air quality standard were recorded during the measurements. There was no record of approaching the limit value, nor did it exceed the $PM_{2.5}$ air quality standard value (see **Table 5-3**). Of all the measurements taken for $PM_{2.5}$, the maximum emission value of particulate matter was 0.176 mg/m^3 for the installation area of the future 220/60 kV New Namibe substation (dry season result).

Taking into account the comparisons between the maximum average PM_{10} concentrations in **Table 5-2** (for both seasons) with the standard set by IFC (see **Table 5-3**), no values above the air quality standard were recorded during the measurements. There was no record of approaching the limit value nor did it exceed the value of the PM_{10} air quality standard set by IFC (see **Table 5-3**). Of all the PM_{10} measurements taken, the maximum PM_{10} emission value was 0.352 mg/m^3 for the installation area of the future 220/60 kV New Namibe substation (Desert zone - dry season result).

Considering the location of the New Namibe substation region (Desert zone) and the prevailing wind direction at this site, small changes in $PM_{2.5}$ and PM_{10} values in the region's atmosphere are expected at the start of project implementation activities (New Namibe substation construction). The changes are considered small as the construction activities will not increase significantly the air quality in terms of particle matter as the area is already dusty due to the presence of the desert and winds.

Given the current context in the project's implementation region, the Project's construction and operation activities, and the opening of new access roads including the use of existing ones (e.g., EN280 and access roads for the 60 kV line), it is expected that the current situation will be notably altered either in the area where the substations are located or along the route of the Project's transmission

lines, as well as in their immediate surroundings, although specific and intermittent changes are envisaged.

5.1.8 Noise and Vibration

Considering the proximity to the National Road (EN) No. 280 and the high anthropic impact in the area, the transmission line route and substation site are subject to noise emissions that may interfere with the sound condition of the area. On the other hand, the movement of vehicles along the EN 280, and the presence of residential areas are also a source of noise to be considered.

Sound is a normal and desirable part of human life, however, when noise is imposed on people it can lead to disturbances on living environment, nuisances and other inconvenient effects. Noise is measured and quantified in decibels (dB). Setting the logarithmic decibel scale means that noise levels do not change or add according to simple linear arithmetic.

Table 5-4: Shows the noise sources and noise levels and the corresponding typical tolerance levels.

Causes	Noise level, dB (A)	Tolerance
Space launch (rocket) at 100 meters, firing of a firearm	140	Intolerable
Machines in a ship's workshop, rock concert	120	Intolerable
Textile factory, press room with presses in operation	100	Too Noisy
Highway, yelling	80	Noisy
Warehouse, restaurant, speech	60	Noisy
Quiet residential neighbourhood (ambient level)	40	Calm
Recording studio (ambient level)	20	Very calm
Hearing limit for normal youngsters	0	Very calm

Source: Bies & Hansen, 2009.

The term “sound level” is usually used to describe two (2) different sound characteristics: power and sound pressure. Every sound producing source has a Sound Power Level (SPL). The sound power level is the acoustic energy emitted by a single sound source and is an absolute number that is not affected by the surrounding environment. The acoustic energy produced propagates through means such as pressure fluctuations. These pressure fluctuations, also called Sound Pressure Levels (SPL), are what

human ears hear and microphones can measure. Note that sound is physically qualified by amplitude and frequency.

Sound amplitude is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 micropascal). The reference sound pressure corresponds to the typical limit of human hearing. For the average listener, a 3 dB change in broadband sound is considered "almost noticeable"; a change of 5 dB is considered "clearly noticeable"; a change of 10 dB is considered a doubling (or decreasing if the sound is decreasing) of the apparent volume. Sound waves can occur at several different wavelengths, also known as frequencies. Frequency is measured in hertz (Hz) which is the number of wave cycles per second.

The typical human ear can hear frequencies ranging from 20 to 20,000 Hz. Normally, the human ear is more sensitive to sounds at mid frequencies (1,000 to 8000 Hz) and less sensitive to sounds at lower and higher frequencies. As such, the A-weighting Scale was developed to simulate the frequency response of the human ear that resembles the typical sounds of environmental levels. The A-weighting Scale emphasizes mid-range sounds and strips high and low frequencies. For any sound level the A-weighting Scale has been expressed in weighted decibels, or dBA. In Angola there is no guidance or legislation on noise levels during the exploratory or operational preparation phase. However, IFC's Environment, Health and Safety (EHS) guidelines provide criteria and guidelines that have been adopted and are described below. The IFC EHS guidelines provide criteria for the noise levels that have been adopted for this Project. The criteria state as follows:

> "The sound impact shall not exceed the levels given in **Table 1.7.1** or result in a maximum increase of 3 dB background levels at the nearest off-site receivers." **Table 1.7.1** of IFC's EHS guidelines is shown in **Table 5-5**, taken directly from the IFC document.

Table 5-5: Noise levels according to IFC guidelines on EHS.

Receptor	Established Noise Levels – 1-hour LA_{eq}, dB(A)	
	Daytime (07:00 – 22:00)	Night-time (22:00 – 07:00)
Residential, industrial and educational zones	55	45
Industrial, commercial	70	70

Source: IFC, 2007.

In order to obtain detailed information about the noise environment in the areas surrounding the Lubango East and New Namibe substations and along the 220 kV transmission line route, nine noise measurements were carried out at strategically defined points (see **Table 5-6**), lasting 15 minutes for each point. The measurements were performed between 2nd and 4th April 2021 (rainy season) and 13th and 14th September 2021 (dry season) using noise measurement equipment, consisting of a Brüel & Kjær precision sound level meter, model 2245. A Brüel & Kjær ZC 0026 preamplifier and a Brüel & Kjær 4191 microphone were connected to this equipment. The following parameters were used for the interpretation of the results:

- LA_{eq}: equivalent continuous noise level. This is calculated by means of a formula based on the principle of equality of energy (calculation carried out by the appliance). It is a level used to define the continuous value of the equivalent noise in energy existing at the measurement site;
- LAF_{max}: is the highest environmental noise level that occurs during the measurement time. It represents the noise that occurred above 0.1% of the measurement time;
- LAF_{min}: is the lowest environmental noise level that occurred during 0.1% of the measurement time;
- LC_{peak}: is the maximum noise level (peak) during the measurement.

For each series of measurements, a calibration was performed, *in situ*, before the measurements were taken. During the measurements the prevailing wind speed and direction were recorded (using the Hold Peak HP-866B Pro Anemometer, see **Table 5-7**) and the geographic coordinates were registered. Relevant aspects/actions were also observed and recorded during the measurement period. The results, GPS coordinates of the sites and some additional information are presented in **Table 5-6**.

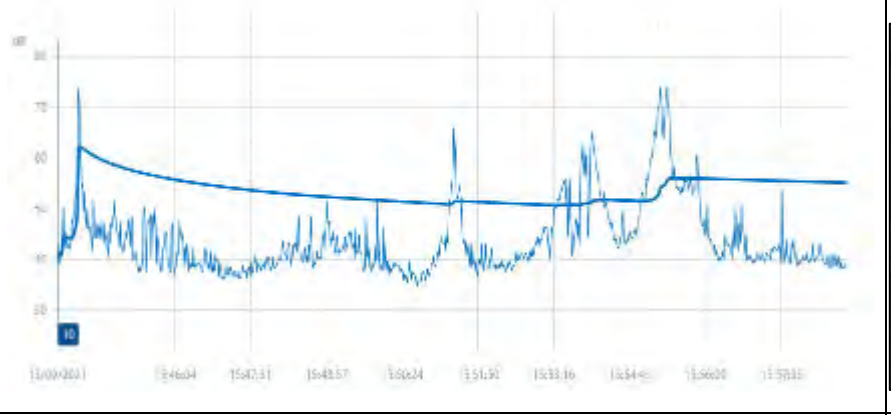
Table 5-7 presents the evidence of the sound environment measurements carried out at some points, mentioned in **Table 5-6**, including graphs, equipment photos and Google maps images.

Table 5-6: Results of the measurements carried out in the project area.

Location Geographical Coordinates	Date	Time	Duration (min)	Measured Noise Levels (dB)				Observed Noise Sourced and Notes
				LA_{eq}	LAF_{max}	LAF_{min}	LA_{pico}	
Selected Locations								
Point 1 – Lubango East Lubango Substation Latitude S 14°55'40,4'' Longitude E 13°39'25,1''	02/04/21	08H00	15	32.2	44.9	28.9	68.9	Measurement at the boundary of the East Lubango substation site. Noise from motorbikes (65%), Poaires primary school (25), and Omatapalo Quarry (10%).
	13/09/21	10H00	15	53.6	83.7	17.1	105.3	
Point 2 – Arimba Thermal Power Plant Latitude S 14°57'14,6'' Longitude E 13°34'47,9''	02/04/21	08H30	15	92	92.9	78.4	107.6	Measurement in the future site of the Arimba substation, adjacent to the Arimba Thermal Power Plant. Noise from the operation of thermal power plant generators and other equipment (100%).
	13/09/21	14H40	15	61.6	80.7	40.7	92.5	
Point 3 – Arimba Commune Latitude S 14°56'48,2'' Longitude E 13°35'38,1''	02/04/21	09H00	15	61.8	88	28.2	103.6	Measurement at the communal headquarters of Arimba. Noise from the secondary school (65%), motorbike traffic (25) and residences (10%).
	13/09/21	15H45	15	51.7	53.9	51.1	63.6	
Point 4 – Heva Settlement Latitude S 14°58'47,7'' Longitude E 13°27'25,9''	02/04/21	11H00	15	34.6	49.8	27.8	79.6	Measurement in the Heva settlement. Noise from dwellings (70%), and nature (30%).
	15/09/21	10H00	15	31.8	33.9	29.9	46.1	
Point 5 – Palanca Settlement (EN 280) Latitude S 14°59'26,8'' Longitude E 13°26'7,6''	02/04/21	12H00	15	74	81.9	69.7	101.3	Measurement at the entrance of the commune of Palanca, in front of the EN280. Noise from motor vehicle traffic (100%).
	15/09/21	11H30	15	66.3	100.3	24.4	114.8	

Location Geographical Coordinates	Date	Time	Duration (min)	Measured Noise Levels (dB)				Observed Noise Sourced and Notes
				LA_{eq}	LAF_{max}	LAF_{min}	LA_{pico}	
Selected Locations								
Point 6 – Camponês Settlement Latitude S 15°0'43,1'' Longitude E 13°23'23,5''	03/04/21	08H30	15	68.3	91.6	38.3	102.1	Measurement at the entrance of the commune of Palanca, in front of the EN280. Noise from motor vehicle traffic (100%).
	15/09/21	12H45	15	71.8	100.3	36.9	114.8	
Point 7 – Jamba Settlement Latitude S 15°1'0,38'' Longitude E 13°23'42,29''	03/04/21	09H00	15	46.6	69.8	27.2	98.3	Measurement in the Jamba settlement. Noise from dwellings (50%), Secondary school (30) and nature (20%).
	15/09/21	12H45	15	36.2	51.8	27.2	69.5	
Point 8 – Onculuvala Settlement Latitude S 15°3'14,0'' Longitude E 13°20'36,0''	03/04/21	10H30	15	51.2	65.4	31.4	105.5	Measurement in Onculuvala settlement near the EN280. Noise from motor vehicle traffic (100%).
	16/09/21	10H00	15	49.2	65.1	24.9	77.1	
Point 9 – New Namibe Substation Latitude S 15°09'42,4'' Longitude E 12°12'48,6''	03/04/21	13h30	15	48.3	69.2	26.7	98.4	Measurement in the northern area of the New Namibe Substation site. Noise from vehicle traffic (70%), sound of conversations (20) and other sounds (10%).
	16/09/21	10H00	15	42.2	63.6	22.3	97.1	

Table 5-7: Evidence of noise measurements (photos, graphs, measuring points and equipment used).

		
Noise Measurement.	Graph of the noise measurement in Arimba.	Noise measurement point in Arimba, Google maps image.
		
Sonometer.	Hold Peak HP-866B Pro Anemometer used during measurements.	Noise measurement point at the future site of the Arimba substation.

The values recorded during the nine noise measurements confirm that this is an area with high anthropic interference on the sound framework, with values exceeding 50 dB (Leq) at some points (Camponês, Palanca and Poaires settlements) as a result of road traffic and current mining activities (Omatapalo Quarry). The values recorded with these measurements allow us to predict that the implementation of the project will alter the current sound framework only occasionally, periodically and intermittently during the construction and operation phases of the substations and electricity TL.

5.1.9 Water Resources

Surface water

Angola is a source of several major river basins including the Cuanza, Cunene, Cuvelai, Cubango/Okavango and Zambezi Rivers. It is also downstream of the Congo River, a major west-draining river that originates in the highlands of the East African Rift system and is fed by major tributaries including the Chambeshi, Uele and Ubangi Rivers (Masse & Laurent, 2015).

Ground water

According to a report[6] by the National Directorate of Water (DNA for its Portuguese initials) dated March 2005, most of the largest alluvial plains in the western part of the country, run along the lower part of the river courses and less than 100 km from the coastline. The largest aquifers of this category are found in the provinces of Huíla, Benguela, Cuanza-Sul, Bengo and Zaire. Some of the groundwater in the alluvial plains is reported to have high contents of iron and sulphate. High mineral content in the groundwater is common in areas of low precipitation and high potential evapotranspiration. In addition, increased iron concentrations may be caused by a lack of circulation in deep groundwater basins. In some of the deltas and in lower parts of the alluvial plains, the groundwater quality is influenced by saline water.

According to DNA's report (DNA, 2005), the use of groundwater for irrigation is important in the coastal area and in the southwestern provinces, especially in the basins of Dande, Bengo, Cuanza, Longa, Queve, Cunene and Cubango.

[6] DNA (National Directorate of Water of the Republic of Angola Ministry of Energy and Water Affairs). 2005. Final Report: A Rapid Water Resource and Water Use Assessment for Angola. Sweco Grøner. Retrieved from http://bibliotecaterra.angonet.org/sites/default/files/00-_final_report_-_full.pdf, on 14 February 2020.

The rainfall is not sufficient for the crops, and groundwater from alluvial plains is used when the rivers dry up. The irrigation may use a substantial part of the water in the rivers, and water taken from the alluvium after the rivers have dried up must be refilled by river water in the beginning of the next precipitation period. In some basin's agriculture will probably use all accessible groundwater.

According to the data of the hydrogeological maps the groundwater potential is sufficient to supply most of the villages in the rural districts of Angola. The water demand in the rural districts at the time of the study (2005) was estimated to be approximately less than 30 litres per capita per day.

According to a more recent study, the Angolan Plateau, including the Huambo Province, has aquifers with low (0.1 – 0.5 l/s) to moderate (1 – 5 l/s) productivity (MacDonald *et al*., 2012)[7].

This project will not be drilling boreholes to source groundwater nor will be extracting water directly from the nearby rivers for the construction activities and for the construction's camps. In addition, no towers in be placed in water courses. For these reasons, no water quality analysis was carried out. Water will be provided by licensed water trucks from sources authorised by the local authorities.

5.2 Biological Environment

This section of the report presents the environmental baseline, covering ecologic aspects of the Project area (between Nombungo 0 km to Moçâmedes 196 km of the TL route), with focus on biodiversity, both in terms of flora and fauna in the areas of Project area of influence, namely in the route of the transmission line and substations sites. The proposed Project area spans from northern Lubango in Huíla province to Namibe province, it goes from northern Bibala to Moçâmedes.

5.2.1 Habitat and Terrestrial Flora

Considering that the proposed transmission line extends for almost 196 km in length and cuts across a very heterogeneous landscape and goes through very different ecological settings, it was deemed

[7] MacDonald A. M., Bonsor H. C., Dochartaigh B. E., and Taylor R. G. 2012. Quantitative maps of groundwater resources in Africa. Environmental Research Letters (7), pp. 7.

important to segregate the data accordingly, so to better provide context and enhance data interpretation. For a classification of different biogeographic units involved, the environmental team broadly followed the work of Burgess *et al*., (2004) and his definition of Terrestrial Ecoregions, but with slight modifications to better reflect the area in question (see **Map 1 in Appendix B** and **Figure 5-18**).

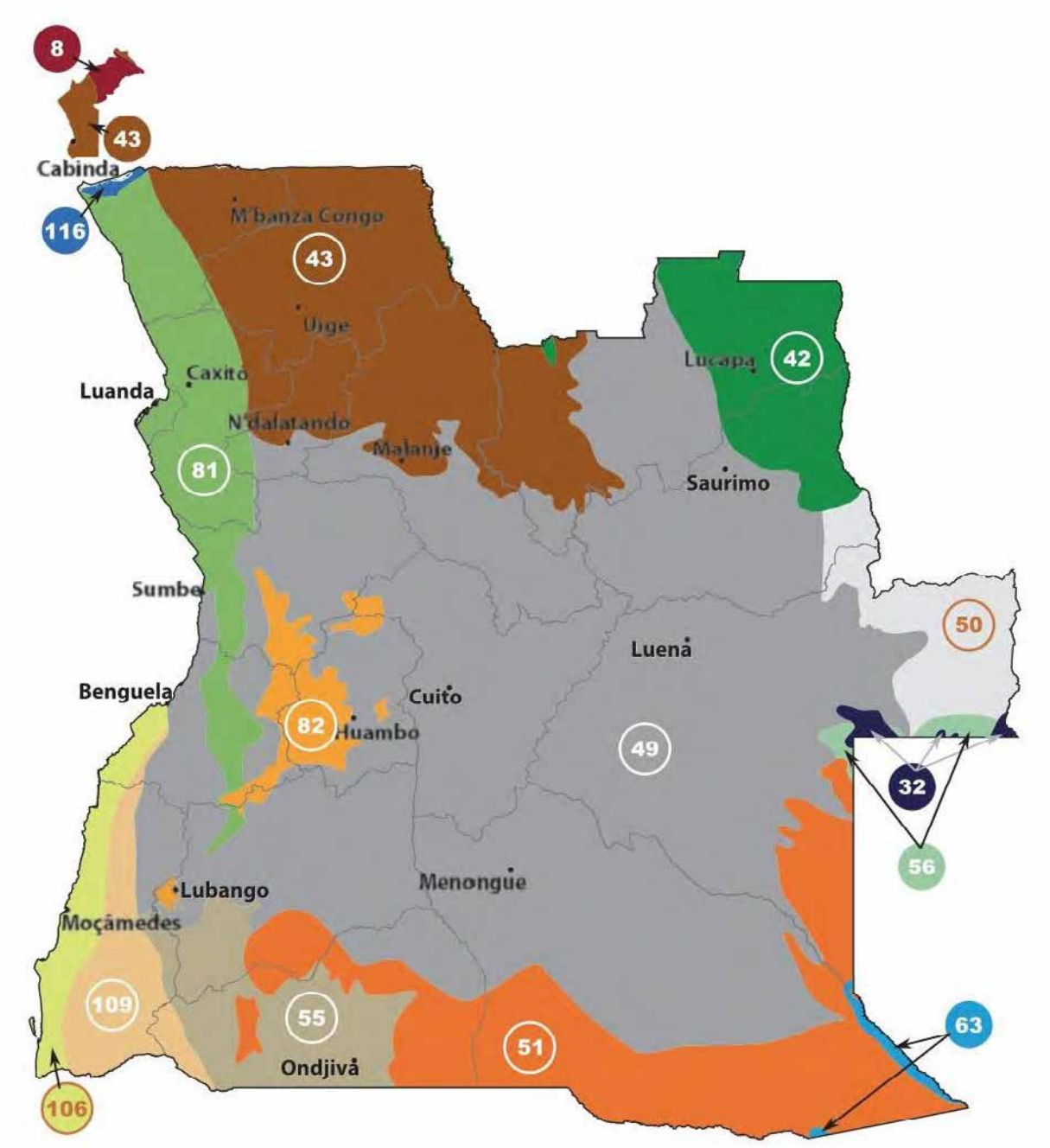


Figure 5-18: Angola ecoregions based on *Burgess et al*.

Source: Burgess *et al*., 2004.

The present study was preceded by a comprehensive literature analysis on vegetation in the area (Barbosa, 2009; Diniz, 2002; 2006; Diniz and Aguiar, 1998; Huntley *et al*., 2019; Vaz da Silva, 2015), which served as a basis for the development of this report. Through further analysis, key vegetation unit's representative of ecosystems that will be impacted by project implementation were identified using maps that detail the route of the transmission lines and satellite imagery. Under these definitions, the proposed transmission line corridor will affect directly areas that fall within five ecoregions, to which new numbers and names, which we believe to be a better fit, were also proposed to use throughout the work. These ecoregions have been compared with those defined in literature (Burgess *et al*., 2004), as shown in **Table 5-8**.

Table 5-8: List of Ecoregions defined in literature (Burgess *et al*., 2004), and as considered in this study, following modifications.

Ecoregions in Burgess *et al*., (2004)	Ecoregions modified for this work
82 – Angolan Montane Forest-Grassland Mosaic	1 – Angolan Highlands
81 – Angolan Scarp Savanna and Woodland	2 – Angolan Escarpment
55 – Angola Mopane Woodland	3 – Mopane Woodlands
109 – Namib Escarpment Woodlands	4 – Semi-Arid Spiny Savannas
106 – Kaokoveld Desert	5 – Namib Desert

According to Barbosa (2009), the is vast and complex in terms of vegetation (and this classification is not harmonized with the Ecoregions indicated in **Table 5-8**), with a wide variety of types and subtypes, including:

- 1) Escarpment vegetation on Atlantic Ocean-facing slopes on the edge of the Chela marginal mountain range, whose characteristic genera are: *Aloe, Humularia, Vernonia, Asplenium, Protea* and *Combretum*;
- 2) Dwarf miombo that are between 2 and 5 meters tall and high altitude "anharas", whose dominant species are *Brachystegia spiciformis, Julbernardia paniculata,* with companion genera such as *Faurea, Protea, Syzygium, Cussonia, Ochna, Parinari*, amoung others;
- 3) Dry, mosaic savanna and steppe woodlands located near the base of the Chela mountain range, dominated by *Colophospermum mopane* with some companion elements such as *Pterocarpus antunesi* and *Croton zambeziacus*;

- 4) Dry, low, dwarf forest, rupicolous vegetation on rocky outcrops and small numerous buttes, whose dominant genera are *Acacia, Colophospermum* and *Sterculia;*
- 5) Steppe, sublittoral, shrubby and herbaceous formations on the sublittoral plain of which *Acacia, Commiphora, Colophospermum, Aristida, Schmidictia* and *Setaria* are the dominant genera;
- 6) Coastal steppe formations corresponding to the coastal plain, dominated by *Aristida, Cissus, Salvadora* and the famous *Welwitschia mirabilis* genera.
- 7) Finally, a strip of sporadic desert vegetation where, in addition the steppe formation species, the desert genera of *Odyssea paucinervis* and *Sporobolus sp.* can be found.

The floristic composition structure is variable depending on variations in relief, local soil, climatic conditions, and the fact that it begins in a plateau region and ends a few kilometres into the coastal plain (which has an arid climate).

Diniz (2002) claims that the region of the proposed TL Project route is home to a variety of plant communities that represent different phytogeographic units. The following plant communities can be distinguished from the coast to the interior, reflecting different phytoclimatic situations, 1) **steppe formation**, very poor in plant elements, with a sparse, creeping, ephemeral herbaceous carpet (*Aristida, Eragrostis, Cissus, Sarcocaulon* and *Welwitschia*); 2) **steppe formation of denser more varied herbaceous** cover with scattered shrubs (*Acacia, Commiphora, Combretum* and *Colophospermum*); 3) **savanna/steppe** community of varied floristic composition (*Colophospermum, Acacia, Spirostachys, Pterocarpus* and *Sclerocarya*); 4) **savanna/woodland** of concentrated *arboreus* elements (*Adansonia, Spirostachys, Pterocarpus, Sclerocarya, Combretum, Dispyros*); 5) **miombo** (dense dry forest) (*Brachystegia, Julbernardia*); 6) **riparian forest galleries** (*Ficus, Adansonia, Combretum, Diospyros, Acacia, Afzelia, Pterocarpus*). **Photo 5-2** shows the vegetation formations near the Serra da Leba.

Barbosa (2009) and Diniz (2002) both describe the same vegetation units and consider the region in question to be very rich and diverse in plant and animal species, considering it a centre of endemism and species diversification with unique characteristics whose vegetation gradient can be observed when descending from the plateau to the desert.

Based on satellite images and available bibliography, five key vegetation units (from the interior to the coast) were defined corresponding to the previously mentioned ecoregions. Despite Angolan miombo

ecoregion 49, being the vast and most representative community in this particular region of the country, this community is not well defined along the transmission line (particularly between Nombungo and East Lubango substations, as the floristic elements which define miombo woodlands – *Julbernardia paniculata* and *Brachystegia spiciformis* occurs only sparsely and appear mixed with other floristic elements as described below. The text mentions the dominant species for each unit whose occurrence is well documented in the bibliography.

Ecoregion 1: Angolan Highlands (mostly the urban and rural areas of Lubango and Humpata plateau)

The area of interest is partly inserted in the southern Angolan highlands, corresponding in this case to the Humpata plateau, whereas the transmission line is expected to crisscross the plateau roughly along the route starting at Nombungo and then connecting Lubango to Tchivinguiro. Overall, this region is highly impacted by human intervention and landscapes have been deeply transformed, and therefore it has lost most of its natural character. However, it is still a quite heterogenous region, containing a mosaic of natural grasslands, rocky outcrops, agricultural land, occasional reeds, tree plantations and small clumps of stunted miombo savanna. Much of the miombo which is the representative vegetation in this ecoregion, has been subject to anthropic degradation that threatens its continued existence as it is situated very close to an urban centre (Lubango city).

The main plant species are *Podocarpus milanjianus, Pittosporum viridiflorum, Erythroxylum dekindtii, Ficus sp.* and *Ilex mitis, as* well as some species of the *Protea* genus. Furthermore, since the area is part of the greater miombo ecoregion, isolated elements and small clusters of poorly formed species such as *Brachystegia spiciformis* and *Julbernardia paniculata,* as well as companion species such as *Faurea saligna, F. rochetiana, Protea petiolaris, Syzygium guineense, Cussonia angolensis, Ochna pulcra,* among others, are present. Much of the miombo has been subject to anthropic degradation that threatens its continued existence as it is situated very close to an urban centre (Lubango city).

Ecoregion 2: Angolan Escarpment

The escarpment region in the TL route is quite short and narrow, and can be basically defined as the area between Tchivinguiro and Bruco (see **Figure 5-23**) (from km 70 to km 85 of the TL route). This section is also very impacted by human activities, that initiated in the 19th century with some farming attempts but especially in recent years it is subject to immense anthropogenic pressure, of which deforestation is probably the most worrisome. Most of the deforestation is caused by communities living in the vicinity of the area between Humpata and Serra da Leba, particularly at the bottom of

Serra da Leba which are active charcoal producers and are expanding their subsistence agriculture activities. In contrast, in the lower part of rocky valley near Bruco there are few evidence of human activities and thus this area still has a relatively good natural status. Notwithstanding being a very narrow section and presently quite degraded, it is also very important in terms of regional biodiversity as shown in **Figure 5-23**, corresponding to southern limit for the distribution range of several forest taxa, including endemic and restricted-range species.

The main flora species present in region are *Humularia welwitschii, Vernonia exsertiflora, Asplenium aethiopicum, Combretum platypetalum, Geigeria acicularis, Vernonia poskeana, Cassia sp*., among others, predominate on edges and crevices and *Carissa edulis, Brachylaena huilensis, Euphorbia dekindtii, Sarcostema viminale, Ptaeroxylom obliquum, Commiphora sp., Pteleopsis anisoptera* and *Buxus benguelensis* can be found away from watercourses in the region. *Commiphora angolensis*, *Spirostachys africana*, *Pycnocoma dentata*, *Rhigozum brevispinosum*, *Croton mubango*, *Grewia mossamedensis*, *Actiniopteris radiata*, *Euphorbia gracilicaulis* and *Adansonia digitata*, among others, are abundant on the rocky outcrops near the escarpment's base (see **Photo 5-2**).

Photo 5-2: Vegetation formations between Serra da Leba and Kapangombe area.

Ecoregion 3: Mopane Woodlands

The mopane region crisscrossed by the future TL route or corridor corresponds roughly to area of hilly savannas and woodlands distributed between Bruco and half-way towards Caraculo city (see **Figure 5-23**) (from km 70 to km 140 of the TL route), and consisting approximately of the eastern third of the TL route on the coastal plain. The region is only moderately impacted by human development, and mostly is affected by cattle production and increasing deforestation for wood and charcoal. Still, it is a generally diverse region and benefits from being a transition zone between the moister habitats in the escarpment and the semi-arid Namibe.

The dominant flora species in this ecoregions are *Colophospermum mopane*, which is sometimes associated with *Acacia kirkii*, *A. nilotica subsp. subalata*, *A. hebeclada subsp. triste, A. erubescens, Balanites angolensis, Combretum apiculatum, Commiphora spp, Dichanthium papillosum, Dichrostachys cinerea, Grewia villosa, Indigofera schimperi, Jatropha campestris, Melanthera marlothiana, Peltophorum africanum, Rhigozum brevispinosum, R. virgatum, Flueggea virosa, Spirostachys africana, Terminalia prunoides*, *T. sericea*, *Ximenia americana* and *X. caffra*. *Acacia kirkii* is abundant in alluvial soils and forms compact clusters (see **Photo 5-3**).

Photo 5-3: *Colophospermum mopane* vegetation associated with *Acacia kirkii*.

Ecoregion 4: Semi-Arid Spiny Savanna

The ecoregion that comprises the semi-arid savannas, consisting mostly of Acacia woodlands and savannas distributed in rocky and arid terrain is a relatively extensive zone which corresponds approximately to the middle section in the coastal plain for the proposed TL This region is already quite dry, and the lack of water resources contributes for it being relatively unpopulated and not very impacted by human interventions. Some moderate exceptions are some mining developments and cattle ranches around Caraculo (km 140 of the TL route). The habitats are therefore relatively well preserved (see **Figure 5-24**), but reflecting the dry character of the region.

The main flora species in region are *Acacia kirkii* (see **Photo 5-3**)*, A. nilotica subsp*. *subalata, A. hebeclada subsp*. *triste, A. erubescens, Balanites angolensis, Commiphora angolensis Dichrostachys cinerea, Rhigozum brevispinosum,* among others. Grassy herbaceous stratum is sparse. The main grass species are *Schmidtia kalahariensis*, *S. pappaphoroides*, *Melinis repens*, *Dactyloctenium aegyptium*, *Urocloa oligotricha*, among others.

Ecoregion 5: Namib Desert

This region corresponds to the westernmost and last section to be covered by the proposed transmission line route (from 140 km in Caraculo to 196 km in Moçâmedes of the TL route as shown in **Figure 5-24**). It is also the most arid zone within the project, receiving minimal annual rainfall and situated on the northern fringes of the Namib, often considered as the oldest desert in the world. The region is mostly depopulated and relatively less disturbed, although there are severe impacts as the route approaches the Moçâmedes city. Overall, the terrain is sandy but with lots of granite outcrops, and it changes from relatively flat to become very broken closer to the coast, especially near the Giraúl (see **Photo 5-1**) and Bero valleys. Vegetation is sparse, typical of desert environment. The region is important in terms of containing various taxa of restricted global range, mostly near endemic vertebrate species, unique to the whole Namib system. On a more local context it is important for its remarkably diversity of reptiles.

In this ecoregion are dominant grasses from the *Stipagrostis* genus, such as *S. prodigiosa, S. hirtigluma, S. uniplumis,* etc., as well as other species such as *Danthoniopsis mossamedensis, Aristida ordeacea* and *Melinis repens*. *Euphorbia virosa*, *Salvadora persica*, *Hoodia currori*, *H. parviflora*, *H. mossamedensis, Euphorbia tirucalli*, *Tribulus zeiheri*, among others, can be observed in sporadic groups.

Cyphostemma uter, with its wineskin-shaped stems, is another desert plant that is characteristic to the region. The well-known gymnosperm *Welwitschia mirabilis* is more conspicuous as it grows abundantly on the arid desert plains and it is not present inside the transmission line corridor.

The main vegetation families and subfamilies identified in the ecoregions described above are shown in **Figure 5-19**.

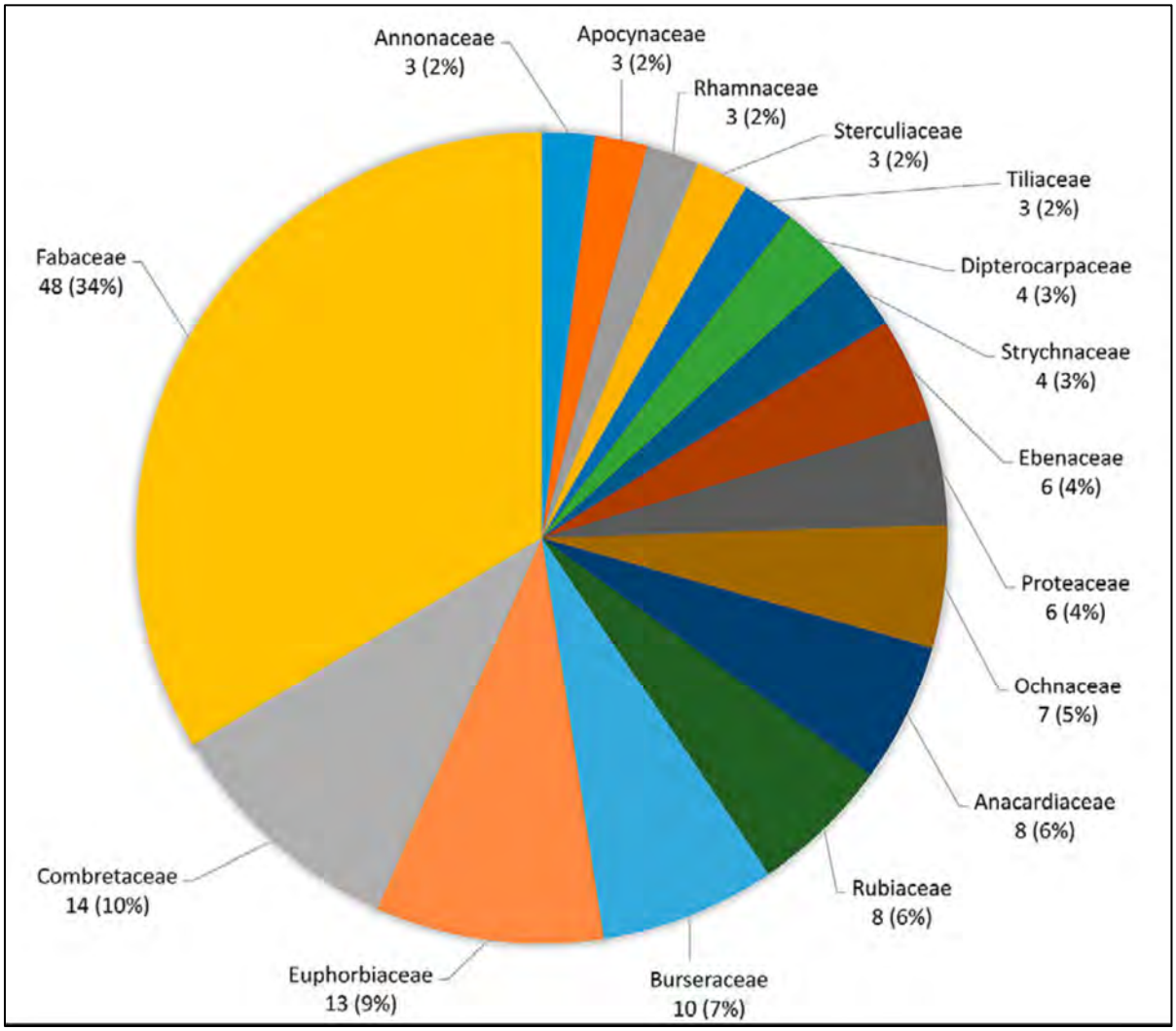


Figure 5-19: Number of tree species per botanical family found in Huíla Province.

Source: Chisingui *et al*., 2018.

In terms of species, the Huila province are characterized mostly based on patches of relict afromontane forest species, as shown in **Table 5-9**. The table also presents the conservation status of the species which are listed in the Angolan Red List Species (LVEA).

Table 5-9: List of plant species in the Project area (Huíla Province).

Scientific name	Common name	LVEA	Likelihood	IUCN Status
Combretum collinum	Variable bush-willow	NE	L	LC
Cassia angolensis	Angolan cassia	NE	M	LC
Pericopsis angolensis	East-African- Afrormosia	Vul	M	LC
Brachystegia boehmii	Prince of Wales feathers	NE	M	LC
Brachystegia spiciformis	Zebrawood	Vul	M	LC
Brachystegia floribunda	Musobo	NE	M	LC
Brachystegia longifolia	Mubombo	NE	L	LC
Parinari curatellifolia	Bambara	NE	M	LC
Julbernardia paniculata	Mutondo	NE	M	LC
Diospyros kirkii	Large-leaved jackal-berry	NE	M	LC
Pteleopsis anisoptera	Four-winged stink-bushwillow	NE	M	DD
Burkea africana	Wild seringa	NE	M	LC
Baphia massaiensis	Sand camwood	NE	M	LC
Commiphera mollis	Soft-leaved commiphora	NE	L	LC
Terminalia sericea	Silver terminalia	NE	M	LC
Spirostachys africana	Tamboti	NE	L	LC
Pterocarpus lucens	Small-leaved bloodwood	NE	M	LC
Dichrostachys cinerea	Chinese lantern	NE	L	LC
Tarchonanthus comphoratus	Camphor bush	NE	L	LC
Haplocoelum foliolosum	Northern galla-plum	NE	M	LC
Buxus benguellensis	Benguela´s Bush	NE	L	LC
Baikiaea plurijuga	Zambezi teak	NE	M	NT

Legend: DD (Data Deficient), LC (Least Concern), NT (Near Threatened), NE (Not-Evaluated), L (Low) and M (Medium).

Regarding Namibe, the province comprises mainly the Kaokoveld desert, Namibian savanna, miombo woodlands, and mopane forest. The Kaokoveld desert, which extends along the coastal regions from southern Benguela province to the Skeleton Coast in Namibia, is mostly dominated by sandy dunes and the occasional presence of *Odyssea paucinervis*, *Sporobolus spicatus*, and *Acanthosicyos horridus*

dominated vegetation. The main plant species found in project area in Namibe province (including Moçâmedes city) are referred in **Table 5-10**.

Table 5-10: List of plant species in the Project area (Namibe province).

Scientific name	Common name	LVEA	Likelihood	IUCN Status
Odyssea paucinervis	Brack-quecke	NE	L	DD
Sporobolus spicatus	Spikdropseed	NE	L	DD
Acanthosicyos horridus	Butternuts	NE	L	DD
Colophospermum mopane	Mopane	NE	L	LC
Isobertlinia angolensis	Mutondo	NE	M	DD
Julbernardia paniculata	Mutondo	NE	M	LC
Baikiaea plurijuga	Zambezi teak	NE	M	NT

Legend: DD (Data Deficient), LC (Least Concern), NT (Near Threatened), NE (Not-Evaluated), L (Low) and M (Medium).

In the proposed transmission line area of influence, the highest production of plant growth and cover is in dense woodland and where shrubs and grasses are abundant, particularly in areas around Bibala and Humpata of the escarpment. By contrast, there is normally little green plant production elsewhere on the Coastal Plain (see **Figure 5-20**). Grasslands such as those along rivers, in the Giraúl River also have relatively low levels of production (adapted from John & Stephie Mendelsohn, 2018).

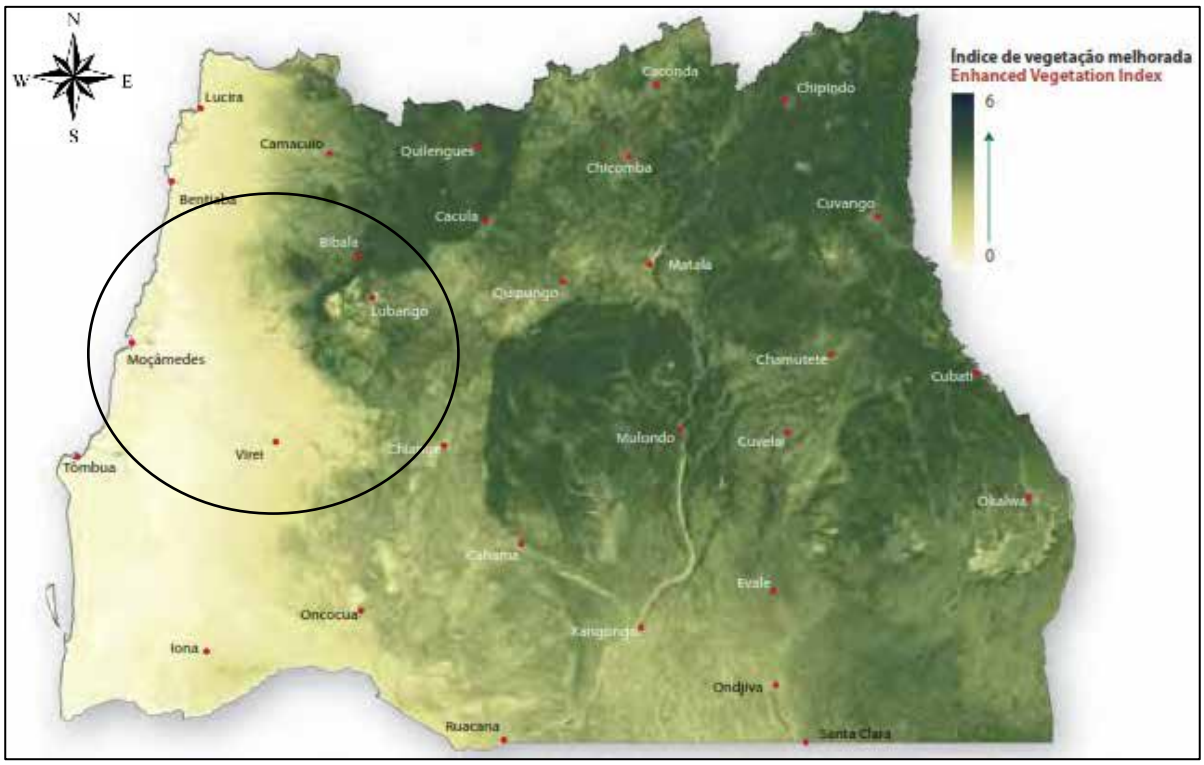


Figure 5-20: Vegetation cover and growth in the transmission line area of influence.

Source: John & Stephie Mendelsohn, 2018.

Little green plant cover is produced in June, July and August. New leaf growth starts to be visible in September where the first rains begin falling in the northeast (see **Figure 5-21**). Production and greenery then spread south and west, before generally starting to decline in April. However, because the far western areas of the region normally receive rain later than (John & Stephie Mendelsohn, 2018). Other areas, the highest levels of production by those arid plant communities are usually in April.

Pastoralists then move their cattle westwards to enjoy the late plant growth, particularly in years when rainfall in the eastern areas of the coastal plain have been below normal. Plant cover and production accumulates during the wet rainy season. As a result, March has the highest green plant cover, with an average index value of 3.2, which is nearly double the lowest value of 1.70 in August (John & Stephie Mendelsohn, 2018).

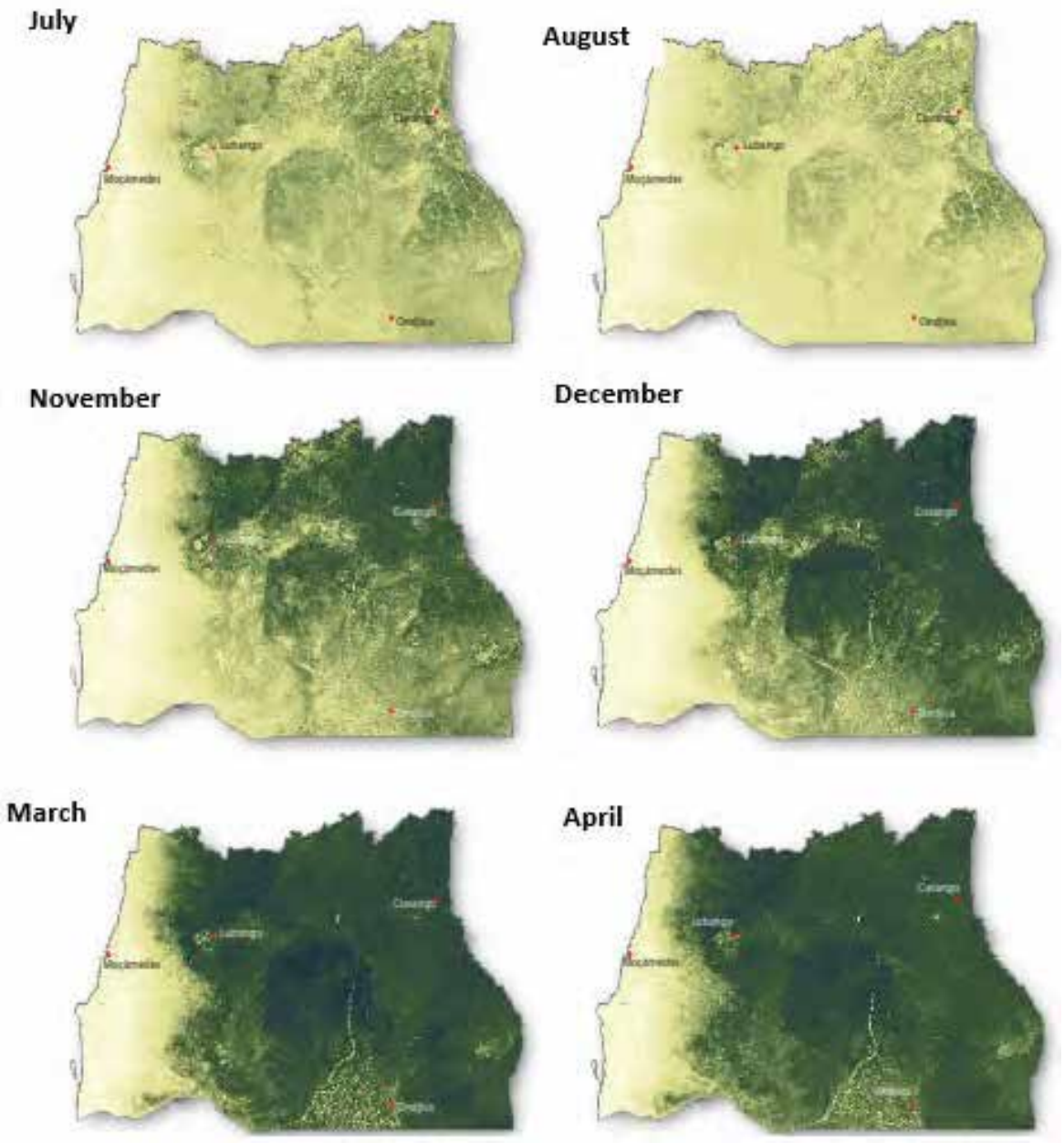


Figure 5-21: Monthly changes in green plant production in the transmission line area of influence.

Source: John & Stephie Mendelsohn, 2018.

Many rocks and trees across Southwest of Angola are decorated by lichens, often with intricate forms or spectacular colours. Although plant-like, lichens are actually combinations of quite different organisms – fungi and algae or cyanobacteria – that live together within the same structures. Lichens are often hardy, and thus able to cling to and live on baking rocks, or desert soil surfaces where they form part of extensive biological crusts.

5.2.1.1 Vegetation Characterization Methodology

Between 5th and 9th of April 2021 (rainy season) the first vegetation survey was carried out along the RoW of the TL Project by the Holísticos environmental team. For the development of this report literature review of studies was also applied to obtain information on the main aspects that characterize the plant communities along the transmission line corridor. For the identification of species, the available literature was used, and in inconclusive cases, plant samples were always collected for subsequent identification in the Lubango Herbarium (see **Photo 5-4**) with resources to the deposited specimens, or relying on other resources available online.

Photo 5-4: Pressing of botanical material in the field for later identification in the Herbarium.

The expert surveys of habitats and phytocenotic component on the project's route and in the area where the East Lubango and Moçâmedes substations are located took place between 14th and 18th June 2021 (dry season). For this purpose, the region was visited along the possible access routes to verify *in loco* the type of vegetation and predominant habitats, their current state, as well as to identify the main representative species of the habitats.

5.2.1.2 Vegetation Baseline in the LT route and SS sites

The dominant plant communities along the 220 kV TL Project (from Nombungo to Moçâmedes) route were assessed by path lengths and on the basis of phytocenotic characteristics, namely:

Vegetation Communities in Nombungo Substation Site (Community A)

The vegetation communities, predominant in the region of Nombungo (km 0 of the TL route – GPS: 14°47'16.73"S 13°42'15.94"E), crossed by a marginal road leading to the railway station of Tchandja. In general characterized by a dense shrub formation, with dominance of *Acacia ataxacantha*, forming stands almost impenetrable, places where human action is evident occur: *Brachystegia spiciformis*, *Combretum collinum*, *Pteleopsis anisoptera* as the main trees, while the shrub component dominated by *Gymnosporia sengalensis*, *Brachystegia lingifolia*, *Bridelia angolensis*, *still Aloe littoralis*, *Gardenia* ssp, *Euclea divinorum*, *Euclea natalensis*, *Elachyptera parvifolia* and *Securidaca longepedunculata* (see **Photo 5-5** and **Figure 5-22**). The herbaceous component is in turn dominated essentially by: *Helichrysum kraussi*, *Solanum incanum*., and *E. natalensis*.

Photo 5-5: General aspect of the vegetation in the surroundings of the Nombungo substation.

Vegetation Communities between Nombungo and East Lubango Substations (Community B)

The TL route from the km 0 in Nombungo substation site to km 17 in East Lubango substation site will pass through some vegetation communities, the main one being Mateta settlement (see **Photo 5-6** and **Figure 5-22**). The landscape is quite fragmented due to intense agricultural and pastoral activity, activities that have left the soils of the region completely bare, with only a notable grass cover. However, in the humid valleys, which are used by the population for the cultivation of horticultural crops, the presence of some medium-sized trees is noticeable, namely: *Parinari curatellifolia*, *Syzygium guineense* ssp. *macrocarpum*, *Terminalia sericea*, *Peltophorum africanum, Pteleopsis anisoptera*, *Monotes* sp., *Burkea africana* and shrubs such as – *Rhus quartiniana*, *Aloe littoralis*, *and Faurea* sp.

In the shrub layer, although under normal conditions they could reach arboreal dimensions, we can highlight - *S. guineense*, *T. sericea*, *Protea* sp, *Euclea crispa*, *Pseudolachnostylis maprouneifolia*, *Combretum platypetalum, Terminalia brachystemma* and herbaceous as: *H. kraussi*, *Annona stenophyla*, *Gymnosporia senegalensis*, *Lannea edulis*, *Parinari capense*, *Cassia singueana, Gardenia volkensii*, *Asparagus* sp. and exotic plants such as *Psidium guajava* and *Opuntia ficus-indica*.

Photo 5-6: General aspect of the vegetation in the surroundings of Mateta village.

Other species characteristic of riverine communities include *Diospyros lycioides*, *Gymnosporia buxifolia*, *Peltophorum africanum*, *P. maprouneifolia*, *C. spinarum, Faurea saligna*, *Burkea africana* and *Landolphia parvifolia* (see **Figure 5-22**).

Vegetation Community C

The 220 kV TL will pass west of the Ivantala Lake (in km 10 of the TL route – GPS: 14°51'34.75"S 13°40'13.67"E) (see **Photo 5-7** and **Figure 5-22**), the native vegetation of the area is essentially shrubby, there being few trees, as *Pericopsis angolensis*, *Lantana angolensis, Rhus quartiniana*, *Brachystegia longifolia, Faurea* sp., *Combretum collinum*, *Julbernardia paniculata*, *Dombeya rotundifolia*, *Acacia* sp. and the herbaceous plants include *Clematis villosa*, *Gymnosporia senegalensis*, *Aloe littoralis*, *Asparagus africanus* and *Bidens pilosa*. Around the lake it is notorious the practice of some agricultural activity, the cultivation of vegetables seems to be preferred, around these small fields it is common to find introduced and/or naturalized species such as: *Agave sisalana* used for fencing and other fruit trees such as *Musa* sp. (banana) and *Citrus limon* (lemon).

The riparian areas are dominated by the presence of *Phragmites mauritianus, Persicaria limbata and Polygonum decipiens* and also small shrubs *Diospyros lycioides*, Ziziphus abyssinica, *Euclea divinorum, Acacia kirkii*, *Carissa spinarum*, *Pteleopsis anisoptera*. Some scattered trees such as *Brachystegia* sp., *Pteleopsis anisoptera*, *Peltophorum africanum*, *Ficus sur* and *Diospyros kirkii* were also observed.

Photo 5-7: General aspect of the riparian vegetation of Ivantala Lake.

Table 5-11 presents the list of the main species identified north of the East Lubango substation, i.e., in the corridor between km 0 in Nombungo substation site to km 17 in East Lubango substation, and their conservation status according to IUCN criteria and LVEA. None of these species are included in the LVEA.

Table 5-11: List of plant species mapped in the corridor between Nombungo and East Lubango substations.

Family	Species	Port	Plant Communities	Status	
				IUCN	LVEA
Fabaceae	*Acacia ataxacantha*	Tree	Community A	LC	NA
Agavaceae	*Agave sisalana**	Shrub	Community C	NA	NA
Asphodelaceae	*Aloe littoralis*	Herbaceous	Community A, B, C	LC	NA
Annonaceae	*Annona stenophyla*	Herbaceous	Community B	NA	NA
Asparagaceae	*Asparagus africanus*	Herbaceous	Community C	NA	NA
Asteraceae	*Bidens pilosa*	Herbaceous	Community C	NA	NA
Fabaceae	*Brachystegia longifolia*	Tree	Community C	LC	NA
Fabaceae	*Brachystegia spiciformis*	Tree	Community A	LC	NA
Euphorbiaceae	*Bridelia angolensis*	Shrub	Community A	NA	NA
Fabaceae	*Burkea africana*	Tree	Community B	LC	NA
Apocynaceae	*Carissa spinarum*	Shrub	Community C	LC	NA
Fabaceae	Cassia singueana	Shrub	Community B	LC	NA
Ranunculaceae	*Clematis villosa*	Herbaceous	Community C	NA	NA
Combretaceae	*Combretum collinum*	Shrub	Community A and C	LC	NA
Combretaceae	*Combretum platypetalum ssp.*	Shrub	Community B	NA	NA
Ebenaceae	*Diospyros lycioides*	Shrub	Community B and C	LC	NA
Ebenaceae	*Diospyros kirkii*	Tree	Community C	LC	NA
Sterculiaceae	*Dombeya rotundifolia*	Tree	Community C	LC	NA
Celastraceae	*Elachyptera parvifolia*	Shrub	Community A	NA	NA
Ebenaceae	*Euclea crispa*	Herbaceous	Community B	LC	NA
Ebenaceae	*Euclea divinorum*	Shrub	Community A and C	LC	NA
Ebenaceae	*Euclea natalensis*	Shrub	Community A	LC	NA
Combretaceae	*Faurea saligna*	Tree	Community B	LC	NA
Rubiaceae	Gardenia volkensii	Shrub	Community A and B	LC	NA

Family	Species	Port	Plant Communities	Status	
				IUCN	LVEA
Celastraceae	*Gymnosporia buxifolia*	Shrub	Community B	LC	NA
Celastraceae	*Gymnosporia senegalensis*	Shrub	Community B and C	LC	NA
Asteraceae	*Helichrysum kraussi*	Herbaceous	Community A	NA	NA
Fabaceae	*Julbernardia paniculata*	Tree	Community C	LC	NA
Apocynaceae	*Landolphia parvifolia*	Shrub	Community B	LC	NA
Anacardiaceae	*Lannea edulis*	Herbaceous	Community B	NA	NA
Verbenaceae	*Lantana angolensis*	Shrub	Community C	NA	NA
Cactaceae	*Opuntia ficus-indica***	Shrub	Community B	DD	NA
Chrysobalanaceae	Parinari capense	Herbaceous	Community B	NA	NA
Chrysobalanaceae	*Parinari curatellifolia*	Tree	Community B	LC	NA
Fabaceae	*Peltophorum africanum*	Tree	Community B and C	LC	NA
Fabaceae	*Pericopsis angolensis*	Tree	Community B	LC	NA
Euphorbiaceae	*maprouneifolia* var., *dekinditii*	Tree	Community B	LC	NA
Myrtaceae	*Psidium guajava**	Tree	Community B	NA	NA
Combretaceae	*Pteleopsis anisoptera*	Tree	Community A, B, C	NA	NA
Anacardiaceae	*Rhus quartiniana*	Shrub	Community B and C	NA	NA
Polygalaceae	*Securidaca longepedunculata*	Shrub	Community A	LC	NA
Solanaceae	*Solanum incanum*	Herbaceous	Community A	LC	NA
Myrtaceae	*Syzygium guineense* ssp.	Shrub	Community B	LC	NA
Combretaceae	*Terminalia brachystemma*	Tree	Community B	NA	NA
Combretaceae	*Terminalia sericea*	Tree	Community B	LC	NA

Key: *introduced and/or naturalised, **invasive.

DD – Data Deficient; LC – Least Concern; VU - Vulnerable; NT – Near Threated; NA - No Assessment.

***Pteleopsis anisoptera – Diospyros lycioides* Communities**

The vegetation along the Project's route in the Poaires Muhaha, Kapandi and Lola settlements and region (km 17 of the TL route and near the East Lubango substation) is essentially shrubby, with the sporadic occurrence of some large trees (e.g., *Ficus elastica*). The presence of other shrubby species also stands out, such as: *Pteleopsis anisoptera*, *Disopyros lycioides*, *Euclea natalensis*, *Aloe littoralis*, *Strychnos cocculoides*, *S. spinosa*, *Ochna pulchra*, *Cassia singueana*, *Dichrostachys cinerea*, *Gymnosporia senegalensis*, *Peltophorum africanum*, *Elachyptera parvifolia*, *Lantana camara*, some

small trees include: *Terminalia brachystemma*, *T. sericea*, *Englerophytum megalismontanum* e *Pericopis angolensis* (see **Photo 5-8** and **Figure 5-22**).

While the herbs *Annona senegalensis*, *Emilia coccinea*, *Euclea crispa* and grasses of the genus *Melinis*, the occurrence of the latter has been related to degraded land, being an indicator of vegetation deterioration, according to the various anthropic activities observed.

Photo 5-8: General aspect of the vegetation type in the Poiares Muhaha (Arimba) area.

***Pteleopsis anisoptera – Acacia ataxacatha* Communities**

This vegetation community was identified on a field visit conducted on 17th June 2021 and does not differ much from the previous one, apart from the fact that it presents a dominance of legumes, which includes *Acacia ataxacatha*, in associations with other shrub species, namely: *E. parvifolia*, *Piliostigma thonningii*, *P. africanum*, and some *Ficus elastica* trees (see **Figure 5-9**) and exotic species such as *Eucalyptus* sp. The landscape along this stretch of the Project route in Arimba commune headquarters (km 20 of the TL route) still shows an aspect of high degradation, also characterised by the removal of soils for the purpose of exploitation of the riverbed, and also by the exploitation of inert materials in the region. On the slopes, despite its use for agricultural production, mainly of vegetables, it was possible to observe some species of native flora that include: *Dombeya rotundifolia*, *Rhus quartiniana*,

Carissa spinarum and herbaceous plants as *Vernonia* sp., *Vernonia gerberiformis* subsp., *Eriosema* sp., and *macrocyanus* as shown in **Figure 5-22** below.

Photo 5-9: General aspect of the type of vegetation in the area, highlighting *Ficus elastica*, one of the few trees present, and in the background shrub communities of *Acacia* spp. and *Pteleopsis anisoptera*.

***Pteleopsis anisoptera – Peltophorum africanum* Communities**

This plant community was observed in the region of Poaires Muhaha Village (Arimba commune, from km 17 to km 25 of the TL route), presents a dominance of shrub species with emphasis on *P. anisoptera*, generally associated with other arboreal- shrub species such as *P. africanum* (see **Figure 5-10**), *Aloe littoralis*, *Ficus sycomorus*, *D. lycioides*, *Terminalia sericea*, *Bobgunnia madagascariensis*, and *Dombeya rotundifolia*. The herbaceous species include *Barleria sp.*, *Vernonia cf. melleri*, *Lippia* sp., *Emilia coccinea*, among others. The area generally presents an aspect of greater degradation, due to a considerable increase in permanent housing construction and the presence of small industries. It is

one of the areas in Arimba with the greatest expansion, also showing strong traces of exploitation of *A. littoralis*, generally for ornamental and medicinal purposes.

Photo 5-10: Typical aspect of the vegetation in the area in question, highlighting *Peltophorum africanum*.

***Brachystegia spiciformis – Peltophorum africanum* Communities**

The TL project route continues, passing through Figueira zone (Km 14), and presents a plant community with a transitional aspect to typical lowland miombo communities due to the shallow soils, with a predominance of the species *T. sericea*, *D. lycioides*, *Carissa spinarum*, *Mucuna stans*, *P. thonningii*. Some small-medium sized trees include: *Cussonia angolensis*, *Julbernardia paniculata* and *Erythrina abyssinica* and some exotic and usually near the habitations such as *Tithonia diversifolia*, *Agave sisalana* and fruit trees such as Mango trees (*Mangifera indica*), Papaya trees (*Carica papaya*), Avocado trees (*Persea americana*) and Banana trees (*Musa* sp). The region is in great expansion with permanent

housing constructions, although some are still of a more rural nature (Tchiwaya settlement in km 21 of the TL route – GPS: 14°57'45.47"S 13°38'12.18"E).

The vegetation is essentially shrubby, with the occurrence of some herbaceous species, however without many identifying characteristics, also due to the high concentration of cattle, which gives the landscape a state of near degradation. Other activities identified in the area, is the exploitation of local species for charcoal production - in this case using as an alternative *F. elastica*, the only large tree predominant in the region (see **Photo 5-11**).

Photo 5-11: General aspect of the vegetation in the Figueira area.

***Uapaca kirkiana – Brachystegia longifolia* Communities**

In the Project's stretch between the km 14 (Figueira zone), Kapalanga and Heva de Cima settlements (km 33 of the TL route upwards) a typical miombo community of *Brachystegia longifolia* was observed with dominance of *Uapaca kirkiana* (see **Figure 5-12**), which emerges at the foot of the region's mountains, together with the species of *Parinari curatelifolia*, *Monotes* sp., *Ochna pulchra*, *Dodonaea viscosa*, *P. anisoptera*. The vegetation in this stretch acquires an essentially shrubby aspect, due to the shallow soils and the presence of huge rocky outcrops.

Photo 5-12: General aspect of the vegetation in the area, highlighting *Uapaca kirkiana*.

The main herbaceous species observed in the region include: *Helychrysum kraussi*, *Eriosema* sp., *Myrsine africana*, *Pleiotaxis rugosa*, *Crotalaria* sp., *Aloe littoralis*, *Asparagus africanus*, *Rhus natalensis* and *Justicia* sp. The main factors disturbing the vegetation include charcoal production, inert mining and the industrial growth that the region currently presents. The degradation of the region's vegetation due to biotic factors was also observed, which is characterized by the attack of some species by termites (*Aloe* spp.), a situation that is accentuated during the dry season (between the months of June, July, August and beginning of September).

***Brachystegia spiciformis – Parinari curatellifolia* Communities**

This community in the project layout occurs in stony soils, shallow in the Mumue neighbourhood region (between km 30 to km 35 of the TL route), in addition to the species that form the community, other species in the shrub stratum stand out, especially *Monotes* sp., *P. Anisoptera* (see **Figure 5-13**), *Protea* sp., *Strychnos spinosa*, *Bridelia tenuifolia*. Herbaceous species include *H. kraussi*, *Geigeria*

acicularis, *Justicia* sp., *Stoebe plumosa*, *Aloe littoralis* and *Whalteria indica*. The vegetation in this section of the project shows aspects of degradation, resulting from the exploitation of aggregates, in addition to the species mentioned above, others are equally common, especially *Julbernardia paniculata*, *B. madagascariensis*, *E. parvifolia*, *Ochna pulchra* and herbs such as *Rhus kirkii* and Dicoma elegans.

Photo 5-13: General aspect of the essentially herbaceous-shrubby vegetation in the Mumue area, the main species that stand out from the existing ones include *Brachystegia spiciformis* (always green) and *Pteleopis anisoptera*.

***Helychrysum kraussi – Stoebe plumosa* Communities**

This plant community occurs near the Heva de Cima settlement (from km 35 to 40 of TL route). However, it is not very expressive as it generally presents few trees and shrubs, only a few herbaceous species stand out in the community, especially *Eupatorium africanum*, *Helychrysum aureum*, *Solanum incanum*, *Solanum* sp., *Dodonaea viscosa* and *Stoebe plumosa* (see **Photo 5-14**). The state of degradation is so high in this region that the soils give way to opportunistic and invasive species such

as *Pteridium aquillinum* subsp., *capense* - a species characteristic of soils impoverished in nutrients and acidified.

Photo 5-14: General aspect of the vegetation near the Heva de Cima area.

***Parinari curatellifolia – Julbernardia paniculata* Communities**

This plant community is located on the project route between the Cristo Rei Historic Monument and the Calumue neighbourhood region (between km 45 to km 60 of the TL route in), it is also shrubby, composed essentially of *Parinari curatellifolia* (see **Figure 5-15**), and *Julbernardia curatellifolia* species, which occur in shallow soils in very accentuated rocky outcrops. Of region. In the same corridor, the species *Terminalia sericea, Ochna pulchra, Strychnos* sp., *B. spiciformis, Monotes cf. caloneurus, Faurea saligna, Protea cf. petiolaris* as well as herbaceous plants such as: *H. kraussi, Euclea crispa, Oldfieldia dactylophylla, Alversia rosmarinifolia, Parinari capense* and near the residences on bare soils, *Pteridium aquillinum* subsp centrali-africanum, another invasive which predominates.

The vegetation in this project layout is slightly preserved, but its proximity to an informal market, it is clear that there are some deposits of urban solid waste (essentially plastic), in addition to the exploitation of aggregates and sand.

Photo 5-15: General aspect of the vegetation in the referenced area with a predominance of *Parinari curatellifolia* and communities of *Julbernadia paniculata* in the background.

***Pteleopsis anisoptera – Carissa spinarum* Communities**

Between km 65 to km 70 of the TL route in the Tchivinguiro region, the vegetation takes on the typical appearance of thickets generally forming a dense vegetation, sometimes difficult to penetrate the ground, in addition to the other species that characterise the landscape the species of *Elachyptera parvifolia*, *Acacia ataxacatha*, *Aloe littorallis* (see **Photo 5-16**), *Cassia singueana*, *Rhus natalensis*, *Dichrostachys cinerea*, and *Canthium lactescens* were observed. The project corridor records essentially shrubby presence, while herbaceous species include: *H. kraussi*, *Kleinia fulgens*, *Rhus quartiniana*, *Combretum collinum*, *Vangueria infausta* subsp. *infausta* among others.

Photo 5-16: General aspect of the vegetation in the Tchivinguiro area (highlighting *Aloe littoralis*).

Colophospermum mopane – Sclerocarya birrea Communities

An arboreal shrub plant community of *C. mopane* (see **Figure 5-17**) was observed in Tchivinguiro zone, other tree species, include: *S. birrea*, *Spirostachys africana*, *Commiphora mollis*, *Combretum collinum*, *Terminalia prunioides*, *Balanites welwitschii*, *Adansonia digitata*. In the shrub layer, *Croton gratissimus*, *Grewia* sp, *Ziziphus abyssinica*, *Ochna pulchra*, *Euclea divinorum* and *Ximenia caffra*, while the herbaceous cover is essentially graminaceous, with some species identifiable at this time of year such as; *Eragrostis superba*, *Aristida stipitata*, *Eragrostiis rigidior*, *Bidens pilosa*, *Barleria* sp. Some anthropic actions in the region can be summed up as the production of charcoal and the exploitation of tree species to make handicrafts, considered to be an important source of local income.

Photo 5-17: General aspect of the vegetation in the Tchivinguiro area (highlighting *Aloe littoralis*).

***Colophospermum mopane – Commiphora multijuga* Communities**

In this section of the project located between Mangueiras and Caraculo (from km 85 to 140 of the TL route as shown in **Figure 5-22**) the vegetation community is dominated by *Colophospermum mopane* (see **Figure 5-18**), with the occurrence of species essentially of the shrub layer, where species such as: *Commiphora multijuga*, *Terminalia sericea*, *T. prunioides*, *S. birrea*, *Commiphora mollis*, *Catophrates alexandrii*, *Hibiscus elliottiae* stand out. The herbaceous cover is not very pronounced, with various grasses occurring, almost all unidentified, due to the absence of inflorescences.

Photo 5-18: General aspect of the vegetation in the area of Mulavango dominated essentially by *Commiphora multijuga* and *Colophospermum mopane*).

***Terminalia sericea – Colophospermum mopane* Communities**

The community is essentially shrubby in this section of the project (km 100 of the TL route), apart from the species that give the community its name, which appears to be continuous to the previous one due to the dominance of shrubs - *Catophrates alexandrii*, *Balanites welwitschii*, *Boscia* sp., and grasses such as *Aristida* sp., *Eragrostis* sp. Other species in the community are *Commiphora mollis*, *C. multijuga*, *Salvadora persica* the latter considered to have high forage value (see **Photo 5-19**). Other species identified include *Commiphora africana* and *Acacia karoo*.

Photo 5-19: *Colophospermum mopane* specimens in the Caraculo region.

***Salvadora persica – Terminalia prunioides* Communities**

Along this project's route (from km 100 to km 160 of the TL route), the shrub community is dominated by *Salvadora persica* evergreen, as well as *Terminalia sericea*, *Acacia cf. welwitschii*, *Acacia* sp. In this corridor, the plant community of *Colophospermum mopane* is becoming less abundant, although there is some grass cover with *Aristida* sp. and *Stipagrostis* sp. standing out, and in the lower areas, shrubs such as *Blepharis furcata*, *Sanseviara pearsonii*, *Phaeoptilum spinosum*, *Hoodia currori*, *Cyphostemma uter*, *Euphorbia saxicola*, *Commiphora capensis* and *Zygophylum cordifolim* (see **Figure 5-20**).

Photo 5-20: General aspect of the vegetation in the area in question, highlighting *Sterculia africana*.

***Euphorbia eduardoi – Sterculia africana* Communities**

On this stretch of the project, the arboreal vegetation is becoming rare (from the km 140 in Caraculo until de km 180 near the Giraúl River), although some species survive the adverse conditions and display specific adaptations typical of a habitat with little water, including some species of *Euphorbia eduardoi* (see **Figure 5-21**), *Sterculia africana*, *Moringa ovalifoli,* amongst others. The herbaceous species are equally rare, being registered and with some abundance - *Acanthopsis* sp.

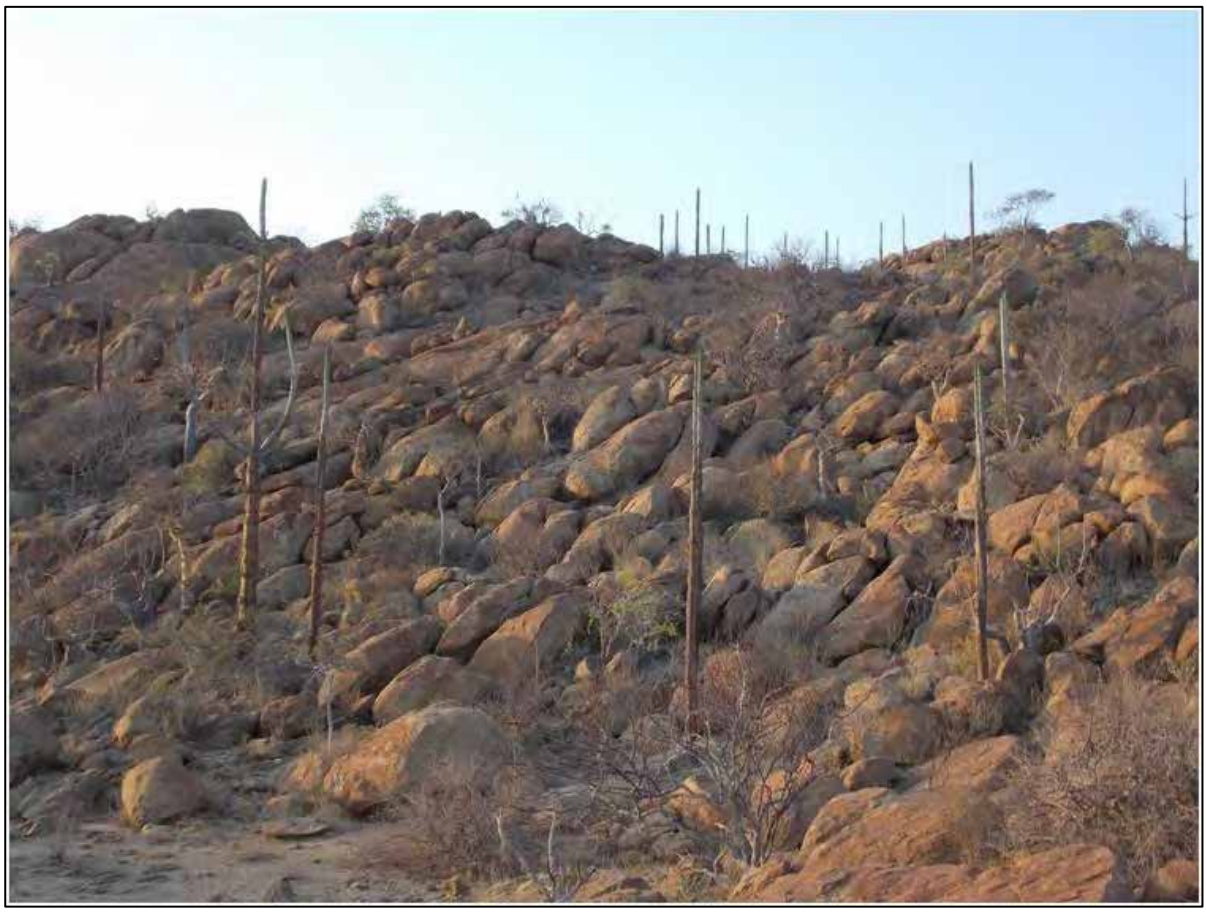


Photo 5-21: General aspect of the vegetation in the area, highlighting *Euphorbia eduardoi*.

***Euphorbia virosa var. arenicola - Hydnora africana* Communities**

Near the end of TL route (196 km), close to the area of installation of the future 220/60 kV New Namibe substation (Aída neighbourhood), the vegetation is essentially herbaceous with almost exclusive dominance of *Euphorbia virosa* ssp., *arenaceous*, *Euphorbia lignosa*, the carnivorous and parasitic widespread plan species such *Hydnora africana*, *H. abyssinica* and curiously *Crinum macrocyanus* (see **Photo 5-22** and **Figure 5-22**).

Photo 5-22: Landscape is completely dominated by *Euphorbia virosa* var. Arenicola near the Aida neighbourhood.

Figure 5-22: Vegetation photographed in Arimba region (between TL km 0 to km 36).

Figure 5-23: Vegetation photographed in Humpata – Tchivinguiro – Bruco and Kapangombe zones (between TL km 70 to km 130).

Figure 5-24: Vegetation photographed in Caraculo and close to the New Namibe Substation zone (between TL km 140 to km 196).

5.2.1.3 Endemic, Endangered, Invasive Species and Introduced

There is little scientific production on threatened species in the country, which has only one list of threatened species. Based on this work, it was possible to identify some of these species along the route (see **Table 5-12**), which also includes some invasive species and introduced and/or naturalised species, such as Agave sisalana (Sisal), *Opuntia ficus-indica* (Fig tree) and *Tithonia diversifolia* (Mexican sunflower), all of which are very common near houses and are also used to fence off ploughs. In the Angolan Species Red List (LVEA) only *Tithonia diversifolia* is indicated as an invasive species.

Table 5-12: Status of plant species observed emphasizing the invasive and introduced species.

Family	Species	STATUS	
		IUCN	LVEA
Fabaceae	*Acacia mellifera*	LC	NA
Fabaceae	*Acacia welwitschii*	LC	NA
Agavaceae	*Agave sisalana**	LC	NA
Rhamnaceae	*Berchemia discolor*	LC	NA
Fabaceae	*Bobgunnia madagascariesnsis*	Not Evaluated	NA
Capparaceae	*Boscia polyantha* (EN)	LC	NA
Fabaceae	*Brachystegia spiciformis*	LC	NA
Caricaceae	*Carica papaya**	DD	NA
Fabaceae	*Cassia singueana*	LC	NA
Fabaceae	*Colophospermum mopane*	LC	NA
Combretaceae	*Combretum imberbe*	LC	NA
Euphorbiaceae	*Euphorbia eduardoi*	Not Evaluated	NA
Celastraceae	*Elachyptera parvifolia*	Not Evaluated	NA
Sapotaceae	*Englerophytum megalismontanum*	Not Evaluated	NA
Myrtaceae	*Eucalyptus sparsa*	LC	NA
Ebenaceae	*Euclea natalensis*	LC	NA
Asteraceae	*Geigeria acicularis (en)*	Not Evaluated	NA
Bignoniaceae	*Jacaranda mimosifolia**	VU	NA
Apocynaceae	*Hoodia currori*	Not Evaluated	NA
Fabaceae	*Julbernardia paniculata*	LC	NA
Anacaediaceae	*Mangifera indica**	DD	NA
Musaceae	*Musa sp.**	Not Evaluated	NA

Family	Species	STATUS	
		IUCN	LVEA
Chrysobalanaceae	*Parinari curatelifollia*	Not Evaluated	NA
Fabaceae	*Peltophorum africanum*	LC	NA
Fabaceae	*Pericopsis angolensis*	LC	NA
Lauraceae	*Persea americana**	LC	NA
Combretaceae	*Ptelopsis anisoptera*	Not Evaluated	NA
Hypolepidaceae	*Pteridium aquillinum* subsp. *capense***	Not Evaluated	NA
Pinaceae	*Pinus sp.**	Not Evaluated	NA
Euphorbiaceae	*Spirostachys africana*	LC	NA
Loganiaceae	*Strychnos cocculoides*	LC	NA
Loganiaceae	*Strychnos spinosa*	Not Evaluated	NA
Combretaceae	*Terminalia sericea*	LC	NA
Asteraceae	*Tithonia diversifolia***	Not Evaluated	Listed
Rhamnaceae	Ziziphus mucronate	LC	NA

Legend 1: *introduced and/or naturalised, **invasive.

Legend 2: Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct in the Wild (EW) and Extinct (EX); Not Assessed (NA).

5.2.2 Fauna

This section discusses the data referring to the faunal elements present in the study area, mainly resulting from bibliography research and several ground visits undertaken between 2020 and 2021, covering both in the rainy and dry seasons. The main focus is given to birds, amphibians, reptiles, and mammals, as these constitute the faunal groups that usually are better known, more easily addressed, and considered suitable to the desired environmental baseline. The conservation status of present and potentially occurring species was based on the IUCN Red List of threatened species (IUCN, 2020 & 2021) as well as experts' list of species occurring in Huíla and Namibe Provinces. The Angolan Species Red List was also consulted (Ministério do Ambiente, 2018).

5.2.2.1 Birds

Typically, birds are a critical faunal group to characterize in faunal surveys, firstly due to their high diversity and also for being relatively common and with many species which are easy to record; secondly because birds are adequate for quantification and future monitoring; in addition, they are also sensitive indicators of biological richness by fulfilling various key ecological roles in any given site. All considered, the published knowledge on birds tend to be much more detailed, updated and accessible than the correspondent for other faunal groups, and thus more easily comparable, which often includes data on threatened, migratory, rare and endemic taxa.

On the other hand, birds consist of the most vulnerable group and most likely to be directly affected by TL projects, especially resulting from direct injuries and fatalities following flight collisions and/or electrocution. Although no studies have ever been performed in Angola looking into the risks posed by transmission lines to birds, there is extensive literature on the subject applied more globally, but particularly in South Africa, which can be applied to the present study (e.g., Jenkins *et al*., 2010; Smallie, 2011). Such hazards, however, are not uniformly distributed across avian taxonomic groups, but rather tend to have a high incidence for some, while of little relevance for others (Smallie, 2011). Specifically, large heavy-bodied species inhabiting open country are the most vulnerable (Jenkins *et al*., 2010).

5.2.2.1.1 Methodology for Bird Study

Prior to fieldwork a desktop research and literature review were conducted on the available literature for the region (Huíla and Namibe Provinces) and its potentially occurring species. Key literary sources included:

- Sinclair and Ryan (2010), primarily for distribution and taxonomic ordering but also habitat preferences and migratory status;
- Dean (2001), for information on biome-restricted species and general information on the country's birdlife;
- Mills and Melo for the national inventory upon which the taxonomy and nomenclature including Portuguese names was based; and
- The IUCN Red List of threatened species (IUCN, 2020), for the conservation status and nomenclature of the various species; and
- List of species occurring in the area which was developed by the experts involved in the study.

An attempt was made in order to produce bird lists as comprehensive as possible, yet considering that an additional desktop-based effort desktop was needed, as the field work opportunities are typically limited. As a broad baseline we produced, based on available literature (Dean, 2000; Ryan & Sinclair, 2004, 2010; Barbosa, 2009; Mills, 2018, 2019; Huntley, 2019) but also from non-published records such as previous observations done by the bird's expert on site and some online resources like the data included in the collections of IICA (Scientific Research Institute of Angola), thus leading to a list that aggregates all avifaunal species that have been recorded or are expected to occur in the whole of Namibe and Huíla Provinces. This bird list was then structured according to the five different and main ecological regions considered, and affected by the project. A somewhat subjective degree of likelihood for species presence was also included, and in cases where one species was confirmed during field work, this was reported accordingly. In addition, attention was given to species of special conservation concern.

The ornithological surveys, on the ground, were performed in three different ground visits covering all the route from km 0 in Nombungo to km 196 in Moçâmedes. These visits took place namely 1) between the 20th and 27th of November 2020 (during the rainy season), a second visit designed to coincide with

the peak of the rainy season, 2) between March 31st and April 5th, 2021, and 3) finally a dry season visit between the 20th and 24th of August 2021. The field surveys were conducted opportunistically rather than adopting a systematic methodology. The survey was made in order to visit all relevant ecoregions and to focus on various habitats and more promising sites, including in two of the most relatively areas, namely Bruco scarp (km 72 of the TL route – GPS: 15° 7'0.00"S 13°11'3.02"E as shown in **Figure 5-23** and **Figure 5-27**) and the Ivantala Lake (km 10 of the TL route – GPS: 14°52'5.68"S 13°40'5.53"E as shown in **Figure 5-26**). The three surveys were distributed across almost one year and conducted in different seasons, namely early and late rainy season, and dry season. Camping sites were made on six different locations in total, and these within all ecoregions defined. The data compiled is here presented aggregating both surveys performed so far.

During field visits, the observations were conducted by one observer, and also included trekking routes particularly in early morning and late afternoons around camping sites, and longer stays in sites with promising habitats and where species of concern have been spotted. In addition, the available paved or sand roads nearest the route of the projected transmission lines, whenever possible were driven slowly to allow recording of birds, often leading to stopping the car for proper identification. For bird observations it was used a pair of binoculars Swarovski SLC 10X42, and when necessary a spotting scope Swarovski 80 mm ATS HD on a Manfrotto tripod was also used, as this is useful to identify birds perched far away. Whenever possible birds were photographed with a Canon Eos 7D camera and Telephoto lens Canon EF 400 mm f5.6L USM.

To assist the bird identification, a number of published field guides that include Angola (Sinclair and Ryan 2003) were used as well as various papers published which addressed local bird fauna (Rosa Pinto 1983; Mills 2007, 2010; Mills *et al*. 2010; Dean *et al*. 2019).

In order to compile a more comprehensive bird list and improve the results obtained from the field surveys, the expert also took note of bird species not recorded in this study, but expected to occur in the project area, as they have been confirmed in the region and in similar habitats. These have been referred to as “L” (likely) or “P” (possible). Nevertheless, it is still difficult, to assess the likelihood of recording many species on the project route, and the possibility that species here considered as unlikely, to be recorded in the future cannot be excluded.

5.2.2.1.2 Results of Bird Study and Discussion

A total list of 603 bird species was produced for the heterogenous region that encompasses the provinces of Huíla and Namibe, which includes 162 species observed on the proposed TL Project route and in substations sites during the field surveys. A total of 41 bird species recorded were also photographed on proposed TL route Project during the three surveys (see **Figure 5-21**). A list of species of conservation concern in the TL Project area is shown in **Table 5-13**. None of the species listed in LVEA as Endangered Species (AEx) have been sighted along the transmission line. Out of the 29 species listed in LVEA as Vulnerable four have been sighted along the transmission lines.

During the field surveys held in three different times (November 2020, March/April 2021 and August 2021) a total of 72 species were confirmed to occur in the area to be crisscrossed by the TL in the **Ecoregion 1** - Angolan Highlands, roughly along the route between Nombungo and then connecting the latter with Tchivinguiro (see **Figure 5-23** and **Figure 5-27**). The team observed 58 species in the Angolan escarpment zone - **Ecoregion 2**. The effort done in **Ecoregion 3** – Mopane Woodlands recovered also 58 species observed on site. A moderately modest result was obtained in the Semi-Arid Spiny Savannas – **Ecoregion 4**, where only 35 species were observed during the various visits. Finally, in **Ecoregion 5** – Namib Desert, the lists obtained were even more modest, with only 25 birds confirmed by visual observation. A full list of bird species in the Project area is presented in **Appendix 3 – List of Birds**.

It is important to note that quite diverse and worth mentioning were the families Apodidae (swifts) and Bucerotidae (hornbills) with five species each, and the Meropidae (bee-eaters) with four species. Among the order of Passeriformes, the best represented family was that of Muscicapidae (flycatchers and chats) with eleven species, followed by Hirundinidae (swallows) and Cisticoliidae (Cisticolas) with eight species, Alaudidae (larks) and Ploceidae (weavers, bishops and widowbirds) with seven species, then Nectarinidae (sunbirds) and Estrildidae (finches and waxbills) with six species, and finally Malaconotidae (bushshrikes) with five representative species.

5.2.2.1.3 Potentially Affected Bird Species

Diurnal birds of prey are predatory species that occupy higher positions in the trophic pyramid, and for this reason are typically less abundant in number and more vulnerable to environmental impacts. In addition, they can be highly specialized to particular niches and are excellent natural indicators. In addition, the large size of some of these birds makes them often vulnerable to TL, and also for this reason they should be especially considered.

The diversity of diurnal birds of prey (families Accipitridae and Falconidae) on the study area is probably high, and were able to confirm the occurrence of 12 species. Of the species recorded, one was highly unexpected but was observed in the Project area was the osprey (*Pandion haliaetus*), as it is a fish eagle and strongly associated with aquatic habitats. The osprey was observed and photographed in the coastal desert region, having flown a few kilometres inland possible for a rest and thus was considered to be an occasional sighting.

The black-shouldered kite (*Elanus caeruleus*) is a common and widespread insectivorous species, and was recorded perched on a post in the Humpata plateau and on the escarpment zone at Tchivinguiro (km 70 of the TL route). Its presence was not unexpected and may be found across many different habitats. Yellow-billed kites (*Milvus aegyptius*) were seen east of Lubango and are common and widespread migrant species. Black-chested snake-eagles (*Circaetus pectoralis*) were observed in savanna region, and one was photographed perched on pole of existing power line near Caraculo (km 140 of the TL route). One specimen of African marsh harrier (*Circus ranivorus*) was seen and photographed hunting above Lake Ivantala (km 10 of the TL route). This is a relatively uncommon species and sensitive to pollution and habitat transformation (see **Figure 5-25** and **Figure 5-27**).

The gymnogene (*Polyboroides typus*) is a species that tends to be very common in well wooded habitats where it specializes in opportunistic predation on nests and small animals sheltering in holes. The fact that it was only observed in mopane woodlands can be easily explained by being the area where it was seen, near Bruco, being a transition zone (km 72 of the TL route). The pale chanting goshawk (*Melierax canorus*) is probably common and was seen in arid savanna, and photographed perched on a pole along the road.

One specimen of little sparrowhawk (*Accipiter minullus*) was recorded on the escarpment west of Tchivinguiro (see **Figure 5-25**) in Km 70 of the TL route.

The small species is generally common in forests and well wooded habitats. The augur buzzard (*Buteo auguralis*) is a fairly common species on the southern escarpment and coastal plain. Among the Falconidae was recorded the rock kestrel (*Falco rupicolus*) on three (3) sites in different ecoregions. This is bird of prey highly adaptable and widespread across almost all types of habitats, including degraded areas, which can prey and a large array of small animals, mostly rodents and insects. Being generally common and relatively conspicuous the observations were not surprising. Another falcon seen was the lanner falcon (*Falco biarmicus*), which proved to be quite common as it was recovered in three (3) regions along the TL route (see **Table 5-13**).

Finally, we also observed a peregrine falcon (*Falco peregrinus*) on the mopane woodlands ecoregion. It is a very widespread but somewhat uncommon species, and observations are generally rare or unpredictable outside known breeding sites. This specimen was an adult male and was photographed perched on a baobab near Kapangombe. It is possible that the species may breed nearby along the escarpment. The peregrine falcon is a highly specialized top predator that feeds mainly in birds caught in flight, and it is an excellent environmental indicator for being highly vulnerable to pollution and disruptions along the trophic pyramid.

5.2.2.1.4 Aquatic Bird Species

Aquatic birds consist of a very broad definition that includes birds from many different families and orders, often difficult to define and for this reason they were not specifically discriminated in the bird list. Also, many of aquatic species are also predominantly migrant. The importance of acknowledging the presence of aquatic birds relates not only because they are often at least partially migrant, but also because they may include vulnerable species and of their tendency to accumulate occasionally in large concentrations around water sources. Furthermore, many aquatic species may in fact pose risks of collision with the transmission line.

During the survey no marine birds was recorded, but recovered 16 aquatic species the majority of which were subsequently found to be present at Lake Ivantala (see **Figure 5-26**) (km 10 of the TL route). The list of confirmed aquatic birds includes five ducks, five herons, two rails, one goose, one grebe, one jacana and one cormorant. In this regard, the duck species and the goose consist of the ones of higher concern. The spur-winged goose (*Plectropterus gambianus*) is an aquatic bird of large size,

which is known to be involved frequently in collisions with TL in southern Africa (Smallie, 2011). In the case of the five duck species (but less so for the herons and cormorant), namely the white-faced whistling duck (*Dendrocygna viduata*), the fulvous whistling duck (*Dendrocygna bicolor*), the cape teal (*Anas capensis*), the red-billed teal (*Anas erythrorhynchus*) and the yellow-billed duck (*Anas undulata*), these also could be affected, especially because of they may aggregate in large numbers.

5.2.2.1.5 Migratory Birds

The definition of a migratory bird is not always straightforward. It refers to species that follow regular seasonal movements, sometimes covering long distances, between their breeding and wintering grounds. Nevertheless, many species make irregular movements, often unpredictable, and sometimes also concentrating in large numbers in certain sites, and in that sense, they may be at least partially or locally migrants, even though not here classified as migrants (e.g., several duck species). Finally, some of the migratory species present in Angola are Palearctic migrants while others are intra-African migrants. In this study was considered the Angolan species classified as migratory in the published Angolan checklist (Dean, 2000).

The presence of migrant birds is usually of high concern because these may include large flocks and often rare or threatened species, which increases the risk and consequences of possible collisions. Migratory birds tend to follow pre-established travelling routes that, if intersected by a barrier such as a TL on specific locations might lead to heavy losses. In addition, they may also congregate, sometimes in large numbers, in specific sites that attract many species, such as estuaries, marine lagoons, inland lakes and wetlands in general. The bird lists prepared discriminate birds that are migrant, even though it is done irrespectively of being or not species vulnerable to TL, and it should be noted that migratory behaviour is often partial or regional, and given species may have overlapping populations behaving differently, which much blurs these definitions.

Although there are no known studies to have focused on migratory routes and/or behaviour of local birds, a few hypothesis may be drawn based on anecdotal data. There are likely two important migratory routes in the overall region, both oriented in a north - south axle and roughly perpendicular to the proposed TL route. The first, and arguably more important route in number of birds and species diversity, should be located along the coast, and must be used primarily by waders and marine birds, and possibly some raptors. However, this route is expected not to extend more than a couple

kilometres inland, and it most likely will not be affected by the proposed TL route. A second likely route, and confirmed by various past anecdotal observations, will be the escarpment ridge.

Migratory birds tend to follow geographical boundaries and discontinuities along their migration paths, and the Angolan escarpment provides a suitable "road" for birds to follow. In terms of sites of expected aggregation for migratory birds, the only such place identified in the study area is the Lake Ivantala, on the eastern section of the route between Nombungo and Lubango.

The list recovered 16 migratory species confirmed along the proposed TL route (see **Table 5-13**). Of all the 16 migrant birds confirmed, only two species can be considered of concern for the TL project, for being birds of prey and could. These were the osprey (*Pandion haliaetus*) and the peregrine falcon (*Falco peregrinus*), both of which have already been discussed as birds of prey. Although these species could potentially be affected by the TL, it should be noted that the presence of osprey inland is probably an uncommon event, and their migration route most likely strictly along the coast. The peregrine falcon, on the other hand, may indeed use the escarpment as migration route. All remaining migrants observed are species of small body size for whom the power line should not pose significant risks (see **Table 5-13**).

5.2.2.1.6 Bird Species of Global Restricted Range

In terms of species of global restricted range the list has recovered the confirmed presence of four species, of which two are Angolan endemics and the other two are near endemics. None of these is expected to be impacted by the TL in any significant way.

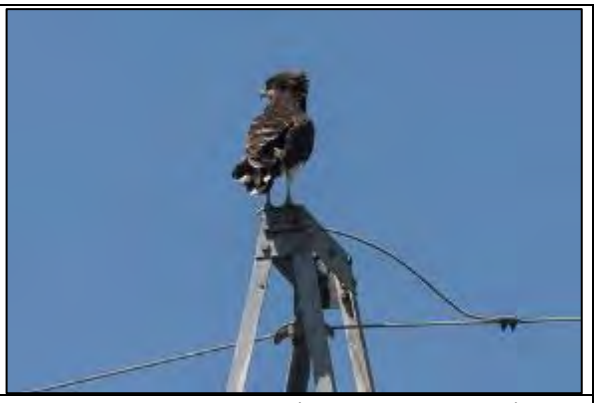
One endemic bird observed was the red backed mousebird (*Colius castanotus*) which is a species widespread in Angola and quite resilient to habitat fragmentation or loss and habitat degradation and seems to be quite common in the eastern section of the proposed route, but which was also confirmed in **Ecoregion 3**, at the base of the escarpment and subsequently also in **Ecoregion 1** near Lake Ivantala. The other endemic species observed was the Ludwig's double-collared sunbird (*Cinnyris ludovicensis*). This is mainly a montane species that may also be present on the escarpment zone. It is fairly common in suitable habitat, especially in highland grasslands and savannas and edge of Afromontane forest and proved to be common near Tchivinguiro, on the transition from the highlands to the escarpment.

Of the two near-endemic species also confirmed to be present one is, like the previous, characteristic of the Angolan highlands and extending marginally also into the escarpment, and was until very recently when a small population was found in northern Namibia, considered to be a true endemic, the Angola cave chat (*Cossypha ansorgei*). This species is very common on the Humpata plateau and edge of local escarpment. On site, the team found the cave chat west of Tchivinguiro in the deep valley descent towards Bruco, where it proved to be common. The other near-endemic species observed, and also photographed, was the Benguela long-billed lark (*Certhilauda benguellensis*), a species strictly associated to the arid environments of southwestern Angola and coastal Namibia. This lark was found to be fairly common, and recorded daily and on various sites along the route on the coastal plain, across ecoregions 3, 4 and 5.

In addition to the globally restricted-range species confirmed at the study area, we should add two endemic and seven near-endemic species, which may also occur along the proposed route and were therefore considered as possible or likely to be present. In terms of the endemic species, the Angolan waxbill (*Coccopygia bocagei*) is a fairly common species associated to the Angolan highlands, while the Swierstra's francolin (*Pternistis swierstrai*), even though the latter as a threatened species will be dealt with below. As for the seven near-endemic species not recorded but suggested to be present, these are the Finsch's francolin (*Scleroptila finschi*), a relatively uncommon montane and edge of scarp species; the Hartlaub's francolin (*Pternistis hartlaubi*), an uncommon species associated with broken terrain and rock boulders in the southwest; the rosy-faced lovebird (*Agapornis roseicollis*), a species with a patchy distribution but locally common in the southwest; the rockrunner (*Achaetops pycnopygius*), fairly common in rocky terrain in the southern escarpment (see **Figure 5-25**).

	
Chat Flycatcher (*Bradornis infuscatus*). Caraculo: S 15 01 48; E 012 39 39	Damara Red-billed Hornbill (*Tockus damarensis*). Kapangombe: S 15 05 21; E 013 08 20

	
Yellow-breasted Apalis (*Apalis flavida*). Tchivinguiro: S 15 08 41; E 013 15 04	Starck's Lark (*Spizocorys starcki*). Caraculo: S 15 00 59; E 012 32 33
	
White-browed Sparrow-Weaver (*Plocepasser mahali*). Bruco: S 15 07 35; E 013 09 44	Emerald spotted Dove (*Turtur chalcospilos*). Bruco: S 15 07 23; E 013 11 27
	
Groundscraper Thrush (*Psophocichla litsitsirupa*). Kapangombe: S 15 05 35; E 013 08 18	Malachite kingfisher (*Alcedo cristata*). Capangombe: S 15 05 35; E 013 08 18

	
Jacana (*Actophilornis africanus*). Lake NE of Lubango: S 14 52 40; E 013 39 46	Black-chested-snake-eagle (*Circaetus pectoralis*). East of Caraculo: S 15 02 58; E 012 53 39
	
Stonechat (*Saxicola torquata*). Lake NE of Lubango: S 14 52 40; E 013 39 46	Laughing dove (*Streptopelia senegalensis*). East Lubango: S 14 54 33; E 013 39 14
	
Pale chanting goshawk (*Melierax canorous*). East of Moçâmedes: S 15 02 11; E 012 32 33	Dusky Indigobird (*Vidua funerea*). East Lubango: S 14 53 16; E 013 39 28

	
Blue waxbill (*Uraeginthus angolensis*). East Lubango: S 14 53 16; E 013 39 28	White-faced whistling duck (*Dendrocygna viduata*). Lake NE of Lubango: S 14 52 40; E 013 39 46

Figure 5-25: Bird species observed in the transmission line route.

None of the restricted range species, either confirmed or considered to be present in seasonal degree of likelihood, are expected to be particularly affected by the proposed transmission line, providing that the remnant forest blocks in the escarpment near Bruco (km 72 of the transmission line route) are not further impacted.

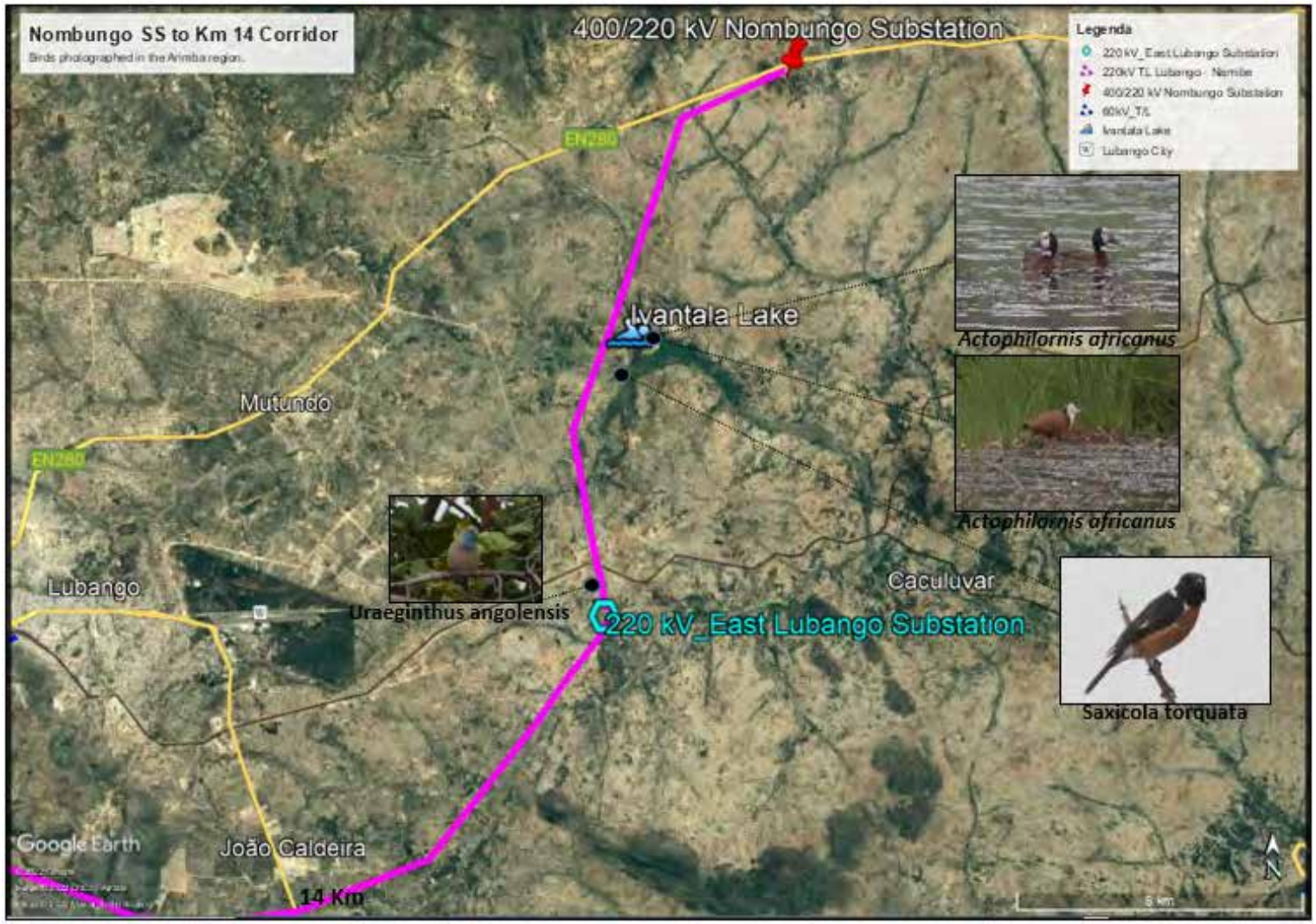


Figure 5-26: Selected bird species observed and photographed in Arimba region (between TL km 0 to km 36).

Figure 5-27: Selected bird species photographed in Humpata – Tchivinguiro – Bruco and Kapangombe zones (between TL km 70 to km 130).

5.2.2.1.7 Bird Species of Conservation Concern

In terms of the conservation status of species present, only one species classified in IUCN Red List as being at risk, was confirmed to be present on the route, namely the Ludwig's bustard (*Neotis ludwigi*), classified as endangered (EN). Currently this species appears to be at least not uncommon in a narrow strip of arid and semi-arid plains that run parallel to the Angolan coastline in Namibe province. Nevertheless, according to BirdLife International (2022) this species is projected to have undergone a very rapid population decline due to collisions with power lines.

Four (4) additional species of conservation concern were not confirmed in surveys, but are considered as possible or likely to occur in the area. The occurrence of these species is to the confirmed with additional fieldwork and monitoring programs during the construction phase. Among these is the endangered (EN) but also endemic species, the Swierstra's francolin (*Pternistis swierstrai*), two raptor species, the secretary bird (*Sagittarius serpentarius*) and the martial eagle (*Polemaetus bellicosus*) are classified as vulnerable (VU) and the bateleur (*Terathopius ecaudatus*) which is a near threatened (NT) species.

None of the seven bird species listed in the 2018 Angolan Red List Species (LVEA) has threatened species have been observed to present in the project area during the site visits.

5.2.2.1.8 Bird Species of High Risk of Impact

Based on literature and reports from both IUCN and BirdLife International, we have classified species in our lists according to the risk posed to them by transmission lines, in terms of potential harm due to collision and/or electrocution, and following what is known in literature for Southern Africa (Smallie, 2011) and as much as possible applied to the environmental conditions of the Project's area. Species were accordingly classified as being of high, medium or low risk (see **Table 5-13**). Among the taxa classified as of medium or high risk, a total of 27 species were confirmed along the TL route, five of which as being of high risk.

The most critical species of high-risk of being directly affected by the TL is also globally threatened, and was discussed previously, the Ludwig's bustard (*Neotis ludwigi*), classified as endangered (EN) in

the Red List of IUCN. Studies in South Africa, where the species is rare and marginally present, have found that Ludwig's bustards are especially vulnerable and considered to be one of the key indicator species in terms of collision hazards (Smallie, 2011).

The fact that we are dealing with an endangered species makes this more of a sensible issue. This bustard species is a heavy-bodied species, one of the heaviest African flying birds and adapted to very open landscapes on the Namib desert region, features that much contribute to its susceptibility to collision with TL. Another collision high-risk species is the spur-winged goose (*Plectropterus gambianus*), also a heavy-bodied dense species that frequently flies at medium altitude, especially in open areas near large water bodies. The route of the TL crossing the vicinity of Lake Ivantala, an area where the species was confirmed, may be hazardous for the local goose populations. On the other hand, it is a common and widespread species, and not threatened. It should be noted that the initial transmission line route was moved further west to minimize the impacts on transmission line,

The two species of sandgrouses recorded in this study may also be affected, namely the Namaqua sandgrouse (*Pterocles namaqua*) and the double-banded sandgrouse (*Pterocles bicincta*). Sandgrouses are much smaller species compared to bustards or geese, but they are quite dense birds and very fast flyers, that live in very open landscapes and make daily long flying routes, often at middle height and often forming very large flocks that fly at dusk and dawn under conditions of low visibility. As consequence they can be highly susceptible to collisions, and it was also found in South Africa, that sandgrouses can be one of the birds most affected by TL (Smallie, 2011).

Even though, the local species in southwestern Angola have not been studied in that regard, we feel at least possible that Namaqua and double-banded sandgrouses may be of high risk, and this should be considered. Nevertheless, they seem to be present in relatively low numbers along the route, and we never witnessed aggregation of sandgrouses in large flocks. Both these species are also relatively common species across the Angolan Namib and semi-arid savannas and not classified as being of conservation concern. The fifth species of high collision risk is the African marsh harrier (*Circus ranivorus*), a bird of prey that has been briefly mentioned earlier. This harrier is closely associated with wetlands and may only occur along the proposed route in the eastern section, and especially near Lake Ivantala (km 10 of the TL route - GPS: 14°52'5.68"S 13°40'5.53"E).

The remaining species of medium collision risk include three gamebirds, five ducks, two pigeons, two rails, one cormorant, two herons and seven birds of prey. The vast majority of these bird species may pose risk of collision mainly in two sites along the proposed route: one being around the vicinity of Ivantala Lake, where ducks, rails cormorants and herons congregate; and the second site is the escarpment drop between Tchivinguiro and Bruco, an area expected to be used by several of the bird prey species recorded and where the proposed project it could pose some increased collision risk for them.

Table 5-13: List of avifauna of conservation concern confirmed in the Project area.

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Numida meleagris	Helmeted Guineafowl	Pintada da Guiné	NA	LC	WS	R	M	BOTH
Scleroptila gutturalis	Orange River Francolin	Francolim-dourado	NA	LC	WS	R	M	WET
Pternistis afer	Red-necked Spurfowl	Francolim-de-gola-vermelha	NA	LC	WS	R	M	BOTH
Dendrocygna viduata	White-faced Whistling Duck	Pato-assobiador-de-faces-brancas	NA	LC	WS	R	M	DRY
Dendrocygna bicolor	Fulvous Whistling Duck	Pato-assobiador-arruivado	NA	LC	WS	R	M	DRY
Plectropterus gambensis	Spur-winged Goose	Pato-ferrão	NA	LC	WS	R	H	DRY
Anas capensis	Cape Teal	Marreco do Cabo	NA	LC	WS	R	M	DRY
Anas undulata	Yellow-billed Duck	Pato-de-bico-amarelo	NA	LC	WS	R	M	DRY
Anas erythrorhyncha	Red-billed Teal	Marreco-de-bico-vermelho	NA	LC	WS	R	M	DRY
Cypsiurus parvus	African Palm Swift	Andorinhão-das-palmeiras	NA	LC	WS	R	L	BOTH
Tachymarptis melba	Alpine Swift	Andorinhão-real	NA	LC	WS	M	L	BOTH
Apus apus	Common Swift	Andorinhão-preto-europeu	NA	LC	WS	R	L	WET
Apus bradfieldi	Bradfield's Swift	Andorinhão de Bradfield	NA	LC	WS	R	L	DRY
Apus affinis	Little Swift	Andorinhão-pequeno	NA	LC	WS	R	L	BOTH
Tauraco shallowi	Shallow's Turaco	Turaco de Shallow	NA	LC	WS	R	L	WET
Neotis ludwigii	Ludwig's Bustard	Abetarda-de-Ludwig	NA	EN	WS	R	H	WET
Centropus superciliosus	White-browed Coucal	Cucal-de-sobrancelhas	NA	LC	WS	R	L	DRY
Chrysococcyx caprius	Diederick Cuckoo	Cuco-bronzeado-maior	NA	LC	WS	M	L	WET
Pterocles namaqua	Namaqua Sandgrouse	Cortiçol da Namáqua	NA	LC	WS	R	H	DRY
Pterocles bicinctus	Double-banded Sandgrouse	Corticol de duas bandas	NA	LC	WS	R	H	WET
Columba livia	Rock Dove	Pombo-doméstico	NA	LC	WS	R	M	BOTH
Streptopelia semitorquata	Red-eyed Dove	Rola-de-olhos-vermelhos	NA	LC	WS	R	M	BOTH
Streptopelia capicola	Ring-necked Dove	Rola do Cabo	NA	LC	WS	R	L	BOTH
Spilopelia senegalensis	Laughing Dove	Rola do Senegal	NA	LC	WS	R	L	BOTH
Turtur chalcospilos	Emerald-spotted Wood Dove	Rola-esmeraldina	NA	LC	WS	R	L	BOTH
Oena capensis	Namaqua Dove	Rola-rabilonga	NA	LC	WS	R	L	WET

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Gallinula chloropus	Common Moorhen	Galinha-d'água-comum	NA	LC	WS	R	M	DRY
Fulica cristata	Red-knobbed Coot	Galeirão-de-crista	NA	LC	WS	R	M	DRY
Tachybaptus ruficollis	Little Grebe	Mergulhão-pequeno	NA	LC	WS	R	L	BOTH
Burhinus capensis	Spotted Thick-knee	Alcaravão do Cabo	NA	LC	WS	R	L	WET
Actophilornis africanus	African Jacana	Jacana-africana	NA	LC	WS	R	L	DRY
Cursorius temminckii	Temminck's Courser	Corredor de Temminck	NA	LC	WS	R	L	BOTH
Microcarbo africanus	Reed Cormorant	Corvo-marinho-africano	NA	LC	WS	R	M	BOTH
Bubulcus ibis	Western Cattle Egret	Garça-boieira	NA	LC	WS	R	L	BOTH
Ardea cinerea	Grey Heron	Garça-real	NA	LC	WS	R	M	BOTH
Ardea melanocephala	Black-headed Heron	Garça-de-cabeça-preta	NA	LC	WS	R	M	BOTH
Egretta garzetta	Little Egret	Garça-branca-pequena	NA	LC	WS	R	L	BOTH
Scopus umbretta	Hamerkop	Pássaro-martelo	NA	LC	WS	R	L	BOTH
Pandion haliaetus	Western Osprey	Águia-pesqueira	NA	LC	WS	M	M	WET
Elanus caeruleus	Black-winged Kite	Peneireiro-cinzento	NA	LC	WS	R	L	DRY
Milvus aegyptius	Yellow-billed Kite	Milhafre-preto-de-bico-amarelo	NA	LC	WS	R	M	DRY
Circaetus pectoralis	Black-chested Snake Eagle	Águia-cobreira-de-peito-preto	NA	LC	WS	R	M	WET
Circus ranivorus	African Marsh Harrier	Tartaranhão-dos-pântanos	NA	LC	WS	R	H	DRY
Polyboroides typus	Gymnogene	Secretário-pequeno	NA	LC	WS	R	M	BOTH
Melierax canorus	Pale Chanting Goshawk	Açor-cantor-pálido	NA	LC	WS	R	L	WET
Accipiter minullus	Little Sparrowhawk	Gavião-pequeno	NA	LC	WS	R	L	WET
Buteo augur	Augur Buzzard	Bútio-augur	NA	LC	WS	R	M	WET
Colius castanotus	Red-backed Mousebird	Rabo-de-junco de Angola	NA	LC	ES	R	L	BOTH
Urocolius indicus	Red-faced Mousebird	Rabo de juncos se faces vermelhas	NA	LC	WS	R	L	WET
Rhinopomastus aterrimus	Black Scimitarbill	Zombeteiro-preto	NA	LC	WS	R	L	WET
Tockus alboterminatus	Crowned Hornbill	Calau-coroado	NA	LC	WS	R	L	BOTH
Tockus nasutus	African Grey Hornbill	Calau-cinzento	NA	LC	WS	R	L	WET
Tockus monteiri	Monteiro's Hornbill	Calau de Monteiro	Vul	LC	WS	R	L	BOTH

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Tockus damarensis	Damara Hornbill	Calau-de-Damara	Vul	LC	WS	R	L	WET
Tockus leucomelas	Southern Yellow-billed Hornbill	Calau-de-bico-amarelo	NA	LC	WS	R	L	WET
Coracias naevius	Purple Roller	Rolieiro-de-sobrancelhas-brancas	NA	LC	WS	R	L	WET
Halcyon albiventris	Brown-hooded Kingfisher	Pica-peixe-de-barrete-castanho	NA	LC	WS	R	L	WET
Corythornis cristatus	Malachite Kingfisher	Pica-peixe-de-poupa	NA	LC	WS	R	L	WET
Merops hirundineus	Swallow-tailed Bee-eater	Abelharuco-andorinha	NA	LC	WS	R	L	WET
Merops pusillus	Little Bee-eater	Abelharuco-dourado	NA	LC	WS	M	L	BOTH
Merops superciliosus	Olive Bee-eater	Abelharuco-oliváceo	NA	LC	WS	M	L	WET
Merops apiaster	European Bee-eater	Abelharuco-europeu	NA	LC	WS	M	L	WET
Tricholaema leucomelas	Acacia Pied Barbet	Barbacas das acacia	NA	LC	WS	R	L	BOTH
Lybius torquatus	Black-collared Barbet	Barbaças-de-colar-preto	NA	LC	WS	R	L	BOTH
Prodotiscus regulus	Brown-backed Honeybird	Indicador elegante-de-dorso-castanho	NA	LC	WS	R	L	WET
Falco rupicolus	Rock Kestrel	Peneireiro-vulgar-africano	NA	LC	WS	R	L	BOTH
Falco biarmicus	Lanner Falcon	Alfaneque	NA	LC	WS	R	M	BOTH
Falco peregrinus	Peregrine Falcon	Falcão-peregrino	NA	LC	WS	M	M	DRY
Batis pririt	Pririt Batis	Batis de Pririt	NA	LC	WS	R	L	DRY
Lanioturdus torquatus	White-tailed Shrike	Picanço-palrador	Vul	LC	WS	R	L	BOTH
Chlorophoneus sulfureopectus	Orange-breasted Bushshrike	Picanço-de-peito-laranja	NA	LC	WS	R	L	WET
Telophorus zeylonus	Bokmakiierie	Picanço-das-acácias	NA	LC	WS	R	L	WET
Tchagra australis	Brown-crowned Tchagra	Picanço-assobiador-de-coroa-castanha	NA	LC	WS	R	L	DRY
Laniarius aethiopicus	Tropical Boubou	Picanco tropical	NA	LC	WS	R	L	BOTH
Laniarius bicolor	Swamp Boubou	Picanço-dos-pântanos	NA	LC	WS	R	L	WET
Prionops plumatus	White-crested Helmetshrike	Atacador-branco	NA	LC	WS	R	L	WET
Lanius humeralis	Northern Fiscal Shrike	Picanço-fiscal-comum	NA	LC	WS	R	L	BOTH
Lanius collaris	Southern Fiscal Shrike	Picanço-fiscal-de sobrancelha-branca	NA	LC	WS	R	L	BOTH
Oriolus larvatus	Black-headed Oriole	Papa-figos-de-cabeça-preta-oriental	NA	LC	WS	R	L	BOTH
Dicrurus adsimilis	Fork-tailed Drongo	Drongo-de-cauda-forcada	NA	LC	WS	R	L	BOTH

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Terpsiphone viridis	African Paradise Flycatcher	Papa-moscas-do-paraíso-comum	NA	LC	WS	M	L	BOTH
Corvus capensis	Cape Crow	Gralha do Cabo	NA	LC	WS	R	L	WET
Corvus albus	Pied Crow	Corvo-seminarista	NA	LC	WS	R	L	BOTH
Melaniparus carpi	Carp's Tit	Chapim de Carp	NA	LC	WS	R	L	WET
Mirafra passerina	Monotonous Lark	Cotovia-monótona	NA	LC	WS	R	L	WET
Mirafra africana	Rufous-naped Lark	Cotovia-de-nuca-vermelha	NA	LC	WS	R	L	BOTH
Certhilauda benguelensis	Benguela Long-billed Lark	Cotovia-de-bico-comprido de Benguela	Vul	LC	NE	R	L	BOTH
Calendulauda sabota	Sabota Lark	Cotovia sabota	NA	LC	WS	R	L	BOTH
Spizocorys starki	Stark's Lark	Cotovia de Stark	NA	LC	WS	R	L	WET
Chersomanes albofasciata	Spike-heeled Lark	Cotovia-esporada	NA	LC	WS	R	L	WET
Eremopterix verticalis	Grey-backed Sparrow-Lark	Cotovia-pardal-de-dorso-cinzento	NA	LC	WS	R	L	WET
Pycnonotus tricolor	Dark-capped Bulbul	Brimblau-comum	NA	LC	WS	R	L	BOTH
Pycnonotus nigricans	Black-fronted Bulbul	Brimblau-de-olhos-vermelhos	NA	LC	WS	R	L	BOTH
Chlorocichla flaviventris	Yellow-bellied Greenbul	Tuta-amarela	NA	LC	WS	R	L	BOTH
Psalidoprocne pristoptera	Black Saw-wing	Andorinha-preta-comum	NA	LC	WS	M	L	BOTH
Pseudhirundo griseopyga	Grey-rumped Swallow	Andorinha-d'uropígio-cinzento	NA	LC	WS	M	L	DRY
Hirundo angolensis	Angola Swallow	Andorinha de Angola	NA	LC	WS	R	L	BOTH
Hirundo smithii	Wire-tailed Swallow	Andorinha-cauda-de-arame	NA	LC	WS	R	L	DRY
Hirundo dimidiata	Pearl-breasted Swallow	Andorinha-de-peito-pérola	NA	LC	WS	M	L	WET
Ptyonoprogne fuligula	Rock Martin	Andorinha-das-rochas-africana	NA	LC	WS	R	L	BOTH
Cecropis cucullata	Greater Striped Swallow	Andorinha-estriada-grande	NA	LC	WS	M	L	DRY
Cecropis abyssinica	Lesser Striped Swallow	Andorinha-estriada-pequena	NA	LC	WS	M	L	BOTH
Sylvietta rufescens	Long-billed Crombec	Rabicurta-de-bico-comprido	NA	LC	WS	R	L	WET
Acrocephalus gracilirostris	Lesser Swamp Warbler	Rouxinol-pequeno-dos-pântanos	NA	LC	WS	R	L	DRY
Hippolais icterina	Icterine Warbler	Felosa-icterina	NA	LC	WS	M	L	WET
Cisticola chiniana	Rattling Cisticola	Fuinha-chocalheira	NA	LC	WS	R	L	BOTH
Cisticola lais	Wailing Cisticola	Fuinha-chorona	NA	LC	WS	R	L	BOTH

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Cisticola subruficapilla	Grey-backed Cisticola	Fuinha-de-dorso-cinzento	NA	LC	WS	R	L	WET
Cisticola aridulus	Desert Cisticola	Fuinha do deserto	NA	LC	WS	R	L	WET
Cisticola fulvicapilla	Neddicky	Fuinha-de-cabeça-ruiva	NA	LC	WS	R	L	DRY
Apalis cinerea	Grey Apalis	Apalis-cinzenta	NA	LC	WS	R	L	WET
Camaroptera brevicaudata	Grey-backed Camaroptera	Camaroptera-de-dorso-cinzento	NA	LC	WS	R	L	BOTH
Eremomela icteropygialis	Yellow-bellied Eremomela	Eremomela-de-barriga-amarela	NA	LC	WS	R	L	WET
Turdoides hartlaubii	Hartlaub's Babbler	Zaragateiro de Hartlaub	NA	LC	WS	R	L	BOTH
Lamprotornis nitens	Cape Glossy Starling	Estorninho do Cabo	NA	LC	WS	R	L	BOTH
Cinnyricinclus leucogaster	Violet-backed Starling	Estorinho-de-dorso-violeta	NA	LC	WS	M	L	BOTH
Onychognathus nabouroup	Pale-winged Starling	Estorninho de asa palida	NA	LC	WS	R	L	WET
Buphagus africanus	Yellow-billed Oxpecker	Pica-bois-de-bico-amarelo	NA	LC	WS	R	L	WET
Psophocichla litsitsirupa	Groundscraper Thrush	Tordo-de-peito-malhado	NA	LC	WS	R	L	WET
Cossypha heuglini	White-browed Robin-Chat	Cossifa de Heuglin	NA	LC	WS	R	L	BOTH
Cossypha ansorgei	Angola Cave Chat	Chasco-das-furnas	NA	LC	NE	R	L	WET
Erythropygia paena	Kalahari Scrub Robin	Rouxinol-do-mato do Kalahari	NA	LC	WS	R	L	WET
Erythropygia leucophrys	White-browed Scrub Robin	Rouxinol-do-mato-estriado	NA	LC	WS	R	L	BOTH
Saxicola torquatus	African Stonechat	Cartaxo-comum	NA	LC	WS	R	L	DRY
Oenanthe monticola	Mountain Wheatear	Chasco-montês	NA	LC	WS	R	L	WET
Oenanthe familiaris	Familiar Chat	Chasco-familiar	NA	LC	WS	R	L	WET
Emarginata schlegelii	Karoo Chat	Chasco do Karoo	NA	LC	WS	R	L	WET
Emarginata tractrac	Tractrac Chat	Chasco-pálido	NA	LC	WS	R	L	WET
Bradornis infuscatus	Chat Flycatcher	Papa-moscas-chasco	NA	LC	WS	R	L	BOTH
Muscicapa striata	Spotted Flycatcher	Papa-moscas-cinzento	NA	LC	WS	M	L	WET
Cyanomitra olivacea	Olive Sunbird	Beija-flor-oliváceo	NA	LC	WS	R	L	WET
Chalcomitra senegalensis	Scarlet-chested Sunbird	Beija-flor-de-peito-escarlate	NA	LC	WS	R	L	WET
Cinnyris ludovicensis	Ludwig's Double-collared Sunbird	Beija-flor-das-montanhas	NA	LC	ES	R	L	BOTH
Cinnyris bifasciatus	Purple-banded Sunbird	Beija-flor-de-peito-roxo	NA	LC	WS	R	L	WET

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Cinnyris venustus	Variable Sunbird	Beija-flor-de-barriga-amarela	NA	LC	WS	R	L	DRY
Cinnyris fuscus	Dusky Sunbird	Beija flor sombrio	NA	LC	WS	R	L	BOTH
Passer domesticus	House Sparrow	Pardal-dos-telhados	NA	LC	WS	R	L	BOTH
Passer diffusus	Southern Grey-headed Sparrow	Pardal-de-cabeça-cinzenta-meridional	NA	LC	WS	R	L	DRY
Passer melanurus	Cape Sparrow	Pardal-do-cabo	NA	LC	WS	R	L	WET
Bubalornis niger	Red-billed Buffalo Weaver	Tecelão de bico vermelho	NA	LC	WS	R	L	WET
Plocepasser mahali	White-browed Sparrow Weaver	Tecelão de sobrancelha branca	NA	LC	WS	R	L	WET
Sporopipes squamifrons	Scaly-feathered Finch	Tecelão-de-testa-malhada	NA	LC	WS	R	L	WET
Ploceus xanthops	Holub's Golden Weaver	Tecelão-dourado	NA	LC	WS	R	L	BOTH
Ploceus velatus	Southern Masked Weaver	Tecelão-de-máscara	NA	LC	WS	R	L	WET
Ploceus cucullatus	Village Weaver	Tecelão-malhado	NA	LC	WS	R	L	BOTH
Euplectes orix	Southern Red Bishop	Bispo de testa preta	NA	LC	WS	R	L	DRY
Pytilia melba	Green-winged Pytilia	Maracachão-d'asa-verde	NA	LC	WS	R	L	WET
Lagonosticta rhodopareia	Jameson's Firefinch	Peito-de-fogo de Jameson	NA	LC	WS	R	L	BOTH
Uraeginthus angolensis	Blue Waxbill	Peito-celeste	NA	LC	WS	R	L	BOTH
Granatina granatina	Violet-eared Waxbill	Monsenhor	NA	LC	WS	R	L	WET
Estrilda astrild	Common Waxbill	Bico-de-lacre-comum	NA	LC	WS	R	L	DRY
Lonchura cucullata	Bronze Mannikin	Freirinha-bronzeada	NA	LC	WS	R	L	BOTH
Vidua purpurescens	Purple Indigobird	Viúva-púrpura	NA	LC	WS	R	L	DRY
Vidua macroura	Pin-tailed Whydah	Viuvinha	NA	LC	WS	R	L	BOTH
Anthus leucophrys	Plain-backed Pipit	Petinha-de-dorso-liso	NA	LC	WS	R	L	BOTH
Crithagra mozambica	Yellow-fronted Canary	Canário de Moçambique	NA	LC	WS	R	L	DRY
Crithagra albogularis	White-throated Canary	Canàrio de garganta branca	NA	LC	WS	R	L	WET
Emberiza impetuani	Lark-like Bunting	Escrevedeira-cotovia	NA	LC	WS	R	L	WET
Emberiza tahapisi	Cinnamon-breasted Bunting	Escrevedeira-das-pedras	NA	LC	WS	R	L	BOTH
Emberiza flaviventris	Golden-breasted Bunting	Escrevedeira-de-peito-dourado	NA	LC	WS	R	L	DRY
Asio capensis	Marsh Owl	Coruja-dos-pântanos	NA	LC	WS	R	L	WET

SCIENTIFIC NAME	COMMON NAME	NOME COMUM	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASONALITY[4]	RISK[5]	SEASON
Uraeginthus angolensis	Blue Waxbill	Peito-celeste	NA	LC	WS	R	L	WET

Legend:

1 (**LVEA**): AEx – Threatened Species; Vul – Vulnerable; NA – Not Assessed.

2 (**IUCN**): LC - Least Concern; DD - Data Deficient; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR - Critically Endangered.

3 (**ENDEMISM**): WS - Widespread Species; ES - Endemic Species; NE - Near Endemic Species; ER – Endemic Subspecies.

4 (**SEASONALITY**): R - Resident; M – Migratory.

5 (**RISK**): H - High; M - Medium; L – Low.

6 (**TYPE**): NS - Not Specified; AQ - Aquatic Species; BP - Bird of Prey.

5.2.2.2 Mammals

Mammals constitute of one of the crucial faunal groups to inventory in any biological survey, given its high diversity, and adaptation to a large array of habitats, and the complex relationships that often are established with human populations. The fact that many species are often hunted and killed makes some highly vulnerable to population decrease. In general, most mammal families are better known and studied than amphibians and reptiles, but this may not be the case for groups that include cryptic diversity such as rodents, and especially bats. In Angola and for the whole country, close to 300 species have been listed, but many areas are poorly studied or investigated, including those in vast portions of Huíla and Namibe provinces.

The Project area occupies a large in a quite disturbed region of relatively high disturbance on flora and fauna, such as habitat fragmentation or loss, due to road construction and urban centre expansion. The species diversity and abundance expected are therefore relatively low, and most species expected will be generalist species with medium to high tolerance to human presence, which tend to be common on the Angolan escarpment, and miombo woodlands.

It is not expected for the proposed transmission line to have a significant negative effect on the most mammal populations. At least terrestrial mammals should not be directly impacted, but an exception can be raised regarding some Chiroptera (bats) which could be affected in various forms, and particularly the larger frugivore species (family Pteropopidae), as these are known to occasionally collide with transmission lines. For this reason, bats will be considered separately. Generally, and for the majority of mammal species, TL may affect their populations indirectly, and mainly by habitat loss and/or disruption of dispersal routes.

5.2.2.2.1 Methodology for the Mammal Study

The mammal survey consisted of three ground visits performed, which included a preliminary mammal survey between the 20th and 27th of November 2020, a second visit designed to coincide with the peak of the rainy season, between March 31st and April 5th, and third visit in the dry season between the 20th and 24th of August 2021. Only in the second visit we were able to conduct some nocturnal transects. The mammal species list here produced results primarily from records obtained during three visits, but in order to try to present a list as comprehensive as possible, additional desktop-based data was added.

As result, most of the entries on the list are based on available literature (e.g., Hill & Carter, 1944; Crawford-Cabral & Veríssimo, 2005; Kingdon *et al*., 2013; Beja *et al*., 2019) and on a few non-published records, leading to the final list that aggregates all mammal species that have been recorded or are expected to occur in the whole of Namibe and Huíla Provinces. Based on the available knowledge, the mammal species not necessarily recorded on the ground, but expected to occur in the project region, which may have been recorded in the region and in similar habitats, are here referred to as "L" (likely) or "P" (possible) as shown in

Table *5-14*.

Several constrains affected the mammal survey. One obvious limitation has to do with the nocturnal habits of many species or the shy nature of most diurnal mammals, making most species very hard to observe and record in the wild. In addition, some taxonomic groups are notoriously difficult to simply record or even their presence inferred from indirect evidence, including bats and small rodents.

5.2.2.2.2 Results of Mammal Study and Discussion

A total of 147 mammal species were included in a list produced for the whole of Huíla and Namibe provinces, but this is a rather extensive list that covers all mammals that have at least once been referred to occur within the boundaries of these provinces, but not reflecting their current status, nor focusing in the specific study area. This list was narrowed down to 47 species that were considered possible or likely to record in future surveys along the proposed route for the TL. Thus, a list of relevant species that can predictably occur in the study area was elaborated (see

Table *5-14*) where for each species, its global conservation status was recorded according to the International Union for Conservation of Nature (IUCN) and level of endemism for species of restricted distribution.

Ultimately, only 13 mammal species were confirmed to be present in the TL Project route, all based on visual observations, during the various field visits. This can be considered a poor result but is easily explained by the surveys being non-intensive and inevitably covering a long distance in a short period, while comparatively little time was committed to nocturnal exploration due to safety reason which was only possible in the second visit in March and April 2021. In any case, mammals were observed in every ecological unit defined. Four mammal species were also photographed on TL Project route (see **Photo 5-23**).

Of the mammal species confirmed on site, five carnivores were listed. One side-striped jackal (*Canis adustus*) was found dead as a roadkill on the road east of Lubango and near Nombungo substation site (km 0 of the TL route), thus confirming their presence. The species is relatively uncommon but quite widespread, opportunistic and not threatened and it is unlikely to be affected by the TL. A cape fox (*Vulpes chama*) was seen at night near the Giraúl canyon (km 180 of the TL route) and it is likely locally common but also not threatened and should not be negatively affected by the project.

A slender mongoose (*Herpestes ichneumon*) was seen crossing the road east of Caraculo (km 140 of the TL route). The mongoose is quite common to abundant and a highly adaptable and not threatened species. The fourth carnivore was an aardwolf (*Proteles cristata*) recorded west of Caraculo (km 140 of the TL route). Although it is often a poorly known and cryptic species, the aardwolf appears quite common in the Angolan southwest and their populations should not be affected by the TL. Finally, a common genet was also seen west of Caraculo during a nocturnal survey. The genet, a carnivore of small size, is also quite widespread, common, not threatened and highly adaptable.

The blue duiker (*Philatomba monticola*) was the only true ungulate species recorded during the preliminary survey. This species is common and widespread in central and northern Angola, but generally uncommon to rare in the south, although it was previously well-known to occur along the scarp bordering the Humpata plateau, associated with escarpment thickets and remnant forest clumps. It is not a threatened species, but interestingly, the study area, between Tchivinguiro and Bruco (from

Km 70 to 85 of the TL route), probably is the southern limit of the species distribution in western Africa. Although it is a very cryptic species, one specimen was observed and photographed.

Duikers were found to be common along the project route, and two species were observed. The rock hyrax (*Procavia capensis*) was seen and photographed on the coastal desert, but it is likely also present inland on the acacia and mopane ecological zones, although the hyraxes seen in these two ecoregions could not be confidently identified to species level. In addition, the bush hyrax (*Heterohyrax brucei*) proved to be very common in the highlands, but it is likely also common in the escarpment and coastal plain, pending to future confirmation. One scrub hare (*Lepus victiriae*) was seen near Ivantala Lake, while being chased in broad day light by a group of local kids with dogs. It is a common and widespread species on the Angolan plateau and should not suffer any detrimental effects with the proposed TL project route.

Two primates were confirmed and one species stands out for having been seen almost every day and across four of the five ecoregions: the Chacma baboon (*Papio ursinus*) (see **Photo 5-23** and **Figure 5-28**). This is a large mammal that seems to be quite common locally, and continuously distributed from the desert coast up to the mountains, foraging often in large groups. On one occasion, 20 km east of Moçâmedes, was observed one group totalling more than 50 animals. Baboons were photographed on three occasions. The species is clearly tolerant to human presence and probably benefits from some anthropic activity. The other primate was the ***Pluto monkey*** (*Cercopithecus mitis mitis*). This is an endemic race of blue monkey, a species adapted to semi-deciduous forests and mostly associated with the Angolan escarpment zone. Although quite common in western Angola, it is, and similarly to the blue duiker an excellent indicator species, as the southernmost limit global distribution range is likely found in the escarpment above Bruco.

Finally, two rodent species were also recorded, the ***Congo rope squirrel*** (*Funisciurus congicus*), observed once on the Mopane ecoregion, but likely common and widespread throughout; and the Damara ground squirrel (*Xerus princeps*), which was recorded on the coastal desert and also on the spiny semi-arid savanna, and is probably common across these two ecoregions but not further east.

Table 5-14: List of possible, likely and confirmed mammal species in Namibe and Huíla.

SCIENTIFIC NAME	COMMON NAME	PORTUGUESE NAME	CONFIRMED	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASON
Canis adustus	Side-striped Jackal	Chacal-de-flancos-raiados	Yes	Vul	LC	WS	DRY
Canis mesomelas	Black-backed Jackal	Chacal-de manto-negro	No	NA	LC	WS	
Vulpes chama	Cape Fox	Raposa-das-areias	Yes	AEx	LC	WS	WET
Felis silvestris	Wild Cat	Gato-bravo	No	NA	LC	WS	
Leptailurus serval	Serval	Serval	No	NA	LC	WS	
Atilax paludinosus	Marsh Mongoose	Manguço-dos-pântanos	No	NA	LC	WS	
Herpestes ichneumon	Egyptian Mongoose	Saca-rabos	No	NA	LC	WS	
Herpestes sanguineus	Common Slender Mongoose	Manguço-vermelho-pequeno	Yes	NA	LC	WS	WET
Ichneumia albicauda	White-tailed Mongoose	Manguço-de-cauda-branca	No	NA	LC	WS	
Proteles cristata	Aardwolf	Protelo	Yes	AEx	LC	WS	WET
Ictonyx striatus	Striped Polecat	Zorrilho	No	NA	LC	WS	
Civettictis civetta	African Civet	Civeta Africana	No	NA	LC	WS	
Genetta angolensis	Miombo Genet	Geneta de Angola	No	NA	LC	WS	
Genetta genetta	Common Genet	Geneta-comum	Yes	NA	LC	WS	WET
Genetta maculata	Large-spotted Genet	Geneta-de-malha-ruiva	No	NA	LC	WS	
Oreotragus oreotragus	Klipspringer	Cabra-das-pedras	No	NA	LC	WS	
Philantomba monticola	Blue Duiker	Seixa	Yes	NA	LC	WS	WET
Raphicerus campestris	Steenbok	Punja	No	NA	LC	WS	
Sylvicapra grimmia	Common Duiker	Cabra-do-mato-comum	No	NA	LC	WS	
Eidolon helvum	Straw-coloured Fruit Bat	Morcego-cor-de-palha	No	NA	LC	WS	
Epomophorus angolensis	Angolan Epauletted Fruit Bat	Morcego-de-dragonas de Angola	No	NA	NT	NE	
Epomophorus wahlbergi	Wahlberg's Epauletted Fruit Bat	Morcego-de-dragonas de Wahlberg	No	NA	LC	WS	
Heterohyrax brucei bocagei	Bush Hyrax	Damão de Bocage	Yes	NA	LC	ES	BOTH
Procavia capensis	Kaokoveld Rock Dassie	Damão de Welwitsch	Yes	NA	LC	WS	WET

SCIENTIFIC NAME	COMMON NAME	PORTUGUESE NAME	CONFIRMED	LVEA[1]	IUCN[2]	ENDEMISM[3]	SEASON
Lepus victoriae	African Savanna Hare	Lebre-comum Africana	Yes	NA	LC	WS	BOTH
Lepus capensis	Cape Hare	Lebre do Cabo	No	NA	LC	WS	
Pronolagus randensis	Jameson's Red Rock Hare	Coelho-das-pedras	No	NA	LC	WS	
Cercopithecus mitis mitis	Pluto Monkey	Cercopiteco-azul de Pluto	Yes	NA	DD	ER	WET
Chlorocebus cynosuros	Malbrouck Monkey	Macaco-de-cara-preta	No	NA	LC	WS	
Papio ursinus	Chacma Baboon	Babuíno-preto	Yes	Vul	LC	WS	BOTH
Fukomys bocagei	Bocage's Mole Rat	Rato-toupeiro de Bocage	No	NA	LC	NE	
Fukomys mechowi	Mechow's Mole Rat	Rato-toupeiro de Mechow	No	NA	LC	WS	
Graphiurus rupicola	Stone Dormouse	Arganaz-das-pedras	No	NA	LC	WS	
Hystrix africaeaustralis	Cape Porcupine	Porco-espinho Austral	No	NA	LC	WS	
Aethomys chrysophilus	Red Rock Rat	Rato-das-rochas-vermelho	No	NA	LC	WS	
Desmodillus auricularis	Cape Short-eared Gerbil	Gerbilho-de-cauda-curta	No	NA	LC	WS	
Gerbilliscus setzeri	Setzer's Hairy-footed Gerbil	Gerbilho de Setzer	No	NA	LC	WS	
Gerbilliscus paeba	Hairy-footed Gerbil	Gerbilho-de-pés-peludos	No	NA	LC	WS	
Mastomys natalensis	Natal Multimammate Mouse	Rato-de-mamilos-múltiplos	No	NA	LC	WS	
Micaelamys namaquensis	Namaqua Rock Rat	Rato-das-rochas de Namaqua	No	NA	LC	WS	
Cricetomys ansorgei	Southern Giant Pouched Rat	Rato-gigante de Ansorge	No	NA	LC	WS	
Dendromus melanotis	Gray African Climbing Mouse	Ratinho-das-árvores-cinzento	No	NA	LC	WS	
Petromyscus collinus	Pygmy Rock Mouse	Ratinho-das-rochas-pigmeu	No	NA	LC	WS	
Steatomys krebsii	Kreb's Fat Mouse	Rato-gorducho de Kreb	No	NA	LC	WS	
Steatomys pratensis	Fat Mouse	Rato-gorducho	No	NA	LC	WS	
Funisciurus congicus	Congo Rope Squirrel	Esquilo-de-listra-branca	Yes	NA	LC	WS	DRY
Xerus princeps	Damara Ground Squirrel	Esquilo-terrestre de Damara	Yes	NA	LC	NE	WET

Legend:

1 (**LVEA**): AEx – Threatened Species; Vul – Vulnerable; NA – Not Assessed.

2 (**IUCN**): LC - Least Concern; DD - Data Deficient; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR - Critically Endangered.

3 (**ENDEMISM**): WS - Widespread Species; ES - Endemic Species; NE - Near Endemic Species; ER – Endemic Subspecies.

Photo 5-23: Chacma Baboons (*Papio ursinus*) in transmission line region (in Kapangombe).

Photo 5-24: Rock hyrax (*Procavia capensis*) in transmission line region (near Tchivinguiro).

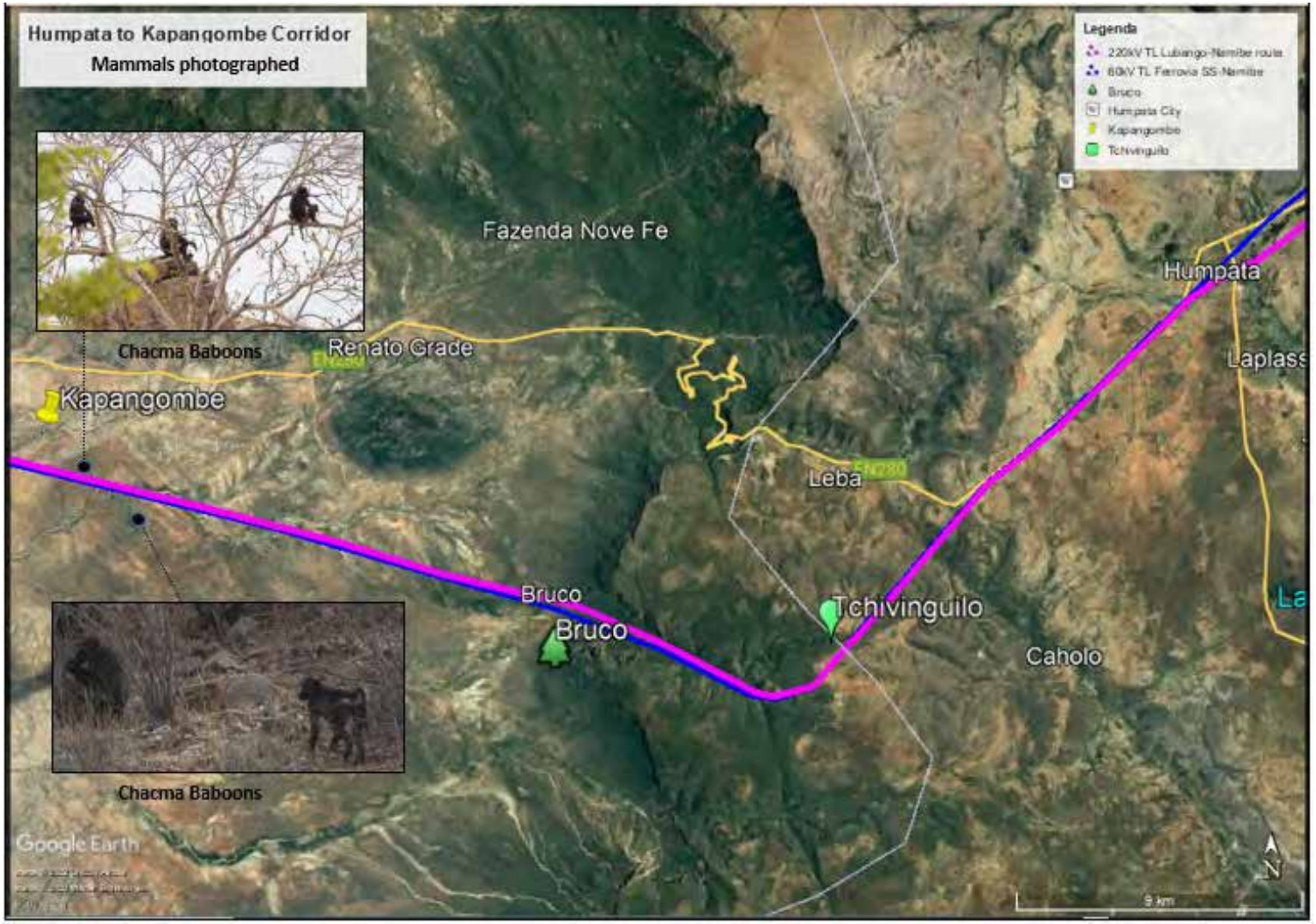


Figure 5-28: Chacma Baboons photographed in Kapangombe area (between TL Km 100 to Km 130).

Even though, none of the species confirmed or listed as highly likely to be recorded in subsequent surveys, can be considered as either threatened or of high risk in relation to the current project, a side note must be here inserted regarding the Chiroptera (bats). Few studies have focused on risks posed by transmission lines to bats and have mostly looked at the effects of wind farms (Thaxter *et al*., 2017). Within the African context, the situation is similar, but it has been suggested that especially fruit bats (family Peropodidae) are very likely prone to collision with transmission lines (MacEwan, 2018).

In addition to collision and electrocution risks, bats can be affected by roost destruction, foraging habitat loss, and even electromagnetic interference (MacEwan, 2018). Due to the lack of information on Chiroptera and impossibility to identify species during our visit, we refrained from classifying most bats known from Namibe and Huíla as likely or possible to be present. Nevertheless, here we considered the only three fruit bats listed for these two provinces, the straw-coloured fruit bat (*Eidolon helvum*), Angolan fruit bat (*Epomophorus angolensis*) and Wahlberg's fruit bat (*Epomophorus wahlbergi*) which may potentially occur along the route, and be affected by the project, even though at the moment there is not enough data to assess the precise likelihood of their presence, which much hinders our capacity to evaluate the risks.

5.2.2.3 Amphibians

Among the various vertebrate groups typically assessed during faunal inventories, amphibians are also considered important to assess, particularly as they are established as excellent bio-indicators. This results from the fact that most species depend on very specific habitat requirements and have a permeable skin that easily absorb any sort of toxic substance. These traits make amphibians very susceptible to habitat fragmentation or loss, and therefore good indicators for environmental stress.

The health of a given frog community can be seen as indicative of the health of the local biosphere. In spite of its importance as bio-indicators, there are a number of limitations relating to amphibian inventories that must be here underlined. One of these limitations results from the fact that the particular nature of the proposed TL Project route, is not expected to affect directly the amphibian communities. This being true, there might be indirect impacts affecting some sensitive habitats, and the amphibians remain important to better characterize the background habitats present. Another serious limitation derives from the almost absence of reliable historical local data making it very difficult to develop a species list.

5.2.2.3.1 Methodology for the Amphibian Study

In the absence of reliable and updated information for the region where the TL route is located, and in order to establish a base line for this study, was produced an original species list extended to the whole of Huíla and Namibe provinces, containing both old and recent, confirmed in literature (Bocage 1895; Marques *et al*. 2016; Conradie *et al*. 2019) and unpublished records. Species observed in the field were marked as "R" (recorded) while species not necessarily recorded in this study, but expected to occur in the project area, as they have been confirmed in the region and in similar habitats. These have been referred to as "L" (likely) or "P" (possible).

The highly marked seasonality displayed by most frog species, their typical irregular distribution, even locally, and the elusive nature of several amphibian general expected to be present, much constrains the results from surveys concentrated in just a few days and concentrated on few places along the Project route. The surveys were conducted opportunistically rather than adopting a systematic methodology, but efforts were dedicated at specific spots, namely where waterlines was easily reached in the highlands and escarpment.

The amphibian survey consisted of three ground visits performed, which included a preliminary mammal survey between the 20th and 27th of November 2020, a second visit designed to coincide with the peak of the rainy season, between March 31st and April 5th, and third visit in the dry season between the 20th and 24th of August 2021. However, it should be noted that the dry season visit was very poor and added no useful data. Overall, the survey was conducted opportunistically rather than adopting a systematic methodology, but was dedicated some efforts at specific spots, namely where water was easily reached in the highlands and escarpment.

The amphibian surveys were done mainly at night, as most species tend to be elusive and cryptic in day light. All five ecoregions were visited and we focused on various different habitats. However, the effort was very unbalanced because we could not detect any site that could justify a dedicated amphibian survey in ecoregions 4 and 5 due to lack of water, and in ecoregion 3, unfortunately and due to logistical constrains and safety reasons nocturnal surveys could not be conducted (particularly at Bruco stream near Kapangombe region which was the only area that promised results in this ecological unit).

5.2.2.3.2 Results of the Amphibian Study and Discussion

Results from the amphibian survey can be considered poor, as only seven species were recorded in total (species confirmed in the Project's area of influence), which broken down by ecoregion included three in the highlands, two in the escarpment zone, and one in the mopane and arid zones. Furthermore, four of these species were recorded strictly based on hearing their characteristic calls, and one was identified by observation of specimens in larval stage (tadpoles), and none of the species could be photographed on the transmission line route. The comprehensive list produced for the provinces of Huíla and Namibe, retrieved a total of 47 taxa, of which 21 were considered as being of medium to high likelihood to be recorded along the proposed TL Project route as shown in **Table 5-15**.

In terms of endemism and rarity, and as it was already mentioned, was confirmed the occurrence of two endemic species, namely the ashy reed frog (*Hyperolius cinereus*) and the Anchieta's tree frog (*Leptopelis anchietae*), plus one endemic race of a widespread species, the Angolan reed frog (*Hyperolius angolensis angolensis*). All of these species are common and not of conservation concern.

There are in fact no species listed by IUCN as threatened, in the list produced for Huíla and Namibe provinces. Furthermore, all 20 amphibian species that were either confirmed or even expected to occur along the transmission line route are considered as being of least concern (LC), with one exception, the endemic **Grandison's toad** (*Poyntonophrynus grandisoni*) which is listed by IUCN as being data-deficient (DD). Nevertheless, the species is locally common in granite inselbergs in the arid savanna zone but can easily go unnoticed and we did not confirm its presence.

Regarding species of high risk, there are no amphibian species that can considered of high risk in terms of being directly affected by the transmission line. The only factor that may be of relevance for amphibians is the possibility of habitat degradation locally. This may only be a factor of notice for the case of amphibians associated with escarpment forests or montane streams, especially the Bruco River, if these become impacted.

Table 5-15: List of amphibian species confirmed in Huíla and Namibe provinces.

AMPHIBIANS OF NAMIBE AND HUÍLA							ECOREGIONS									
							ANGOLAN HIGHLANDS		ESCARPMENT		MOPANE WOODLANDS		ARID SAVANNA		NAMIB DESERT	
N.º	*Scientific Name*	Name	SEASON	LVEA[1]	IUCN[2]	END[3]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]
1	*Xenopus petersii*	Peters' Clawed Frog	NC	NA	LC	WS	C	P	C	P	C	U	C	U	U	U
2	*Mertensophryne mocquardi*	Moccquard's Toad	NC	NA	LC	WS	N	U	N	U	N	U	N	U	N	U
3	*Poyntonophrynus dombensis*	Bocage Toad	NC	NA	LC	WS	N	U	N	U	C	U	C	P	C	P
4	*Poyntonophrynus grandisonae*	Grandison's Toad	NC	NA	DD	ES	N	U	N	U	N	U	U	P	U	U
5	*Poytonophrynus pachnodes*	Serra da Neve Pygmy Toad	NC	NA	NE	ES	N	U	U	U	N	U	N	U	N	U
6	*Sclerophys funerea*	Angolan Toad	NC	NA	LC	WS	U	U	N	U	N	U	N	U	N	U
7	*Sclerophys garmani*	Garman's Toad	NC	NA	LC	WS	N	U	N	U	N	U	N	U	N	U
8	*Sclerophrys gutturalis*	Guttural Toad	WET	NA	LC	WS	C	R	C	P	C	U	C	U	C	U
9	*Sclerophrys pusilla*	Flat-backed Toad	NC	NA	LC	WS	C	L	C	P	C	P	C	P	C	P
10	*Sclerophrys regularis*	African Common Toad	NC	NA	LC	WS	C	P	C	P	C	U	C	U	C	U
11	*Phrynomantis bisfasciatus*	Banded Ruber Frog	NC	NA	LC	WS	U	U	U	U	U	U	N	U	N	U
12	*Phrynomantis annectens*	Marbled Rubber Frog	WET	NA	LC	WS	N	U	N	U	U	P	C	R	C	P
13	*Breciceps adspersus*	Common Rain Frog	WET	NA	NE	WS	U	U	U	U	U	R	N	U	N	U
14	*Hemisus marmoratus*	Marbled Snout- Burrower	NC	NA	LC	WS	U	U	U	U	N	U	N	U	N	U
15	*Hemisus guineensis*	Guinea Snout-Burrower	NC	NA	LC	WS	U	U	U	U	N	U	N	U	N	U
16	*Hyperolius angolensis angolensis*	Angolan Reed Frog	WET	NA	LC	ER	A	R	C	L	C	U	C	U	N	U
17	*Hyperolius angolensis insignis*	Bicolored Reed Frog	NC	NA	LC	ER	A	U	U	U	C	P	C	U	N	U
18	*Hyperolius benguellensis*	Benguela Long Reed Frog	NC	NA	LC	WS	C	P	C	U	N	U	N	U	N	U
19	*Hyperolius bocagei*	Bocage's Reed Frog	NC	NA	LC	WS	N	U	N	U	N	U	N	U	N	U
20	*Hyperolius chelaensis*	Chela Mountain Reed Frog	NC	NA	DD	ES	R	U	N	U	N	U	N	U	N	U
21	*Hyperolius cinereus*	Ashy Reed Frog	WET	NA	LC	ES	C	R	C	U	N	U	N	U	N	U

AMPHIBIANS OF NAMIBE AND HUÍLA							ECOREGIONS									
							ANGOLAN HIGHLANDS		ESCARPMENT		MOPANE WOODLANDS		ARID SAVANNA		NAMIB DESERT	
N.º	*Scientific Name*	Name	SEASON	LVEA[1]	IUCN[2]	END[3]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]
22	*Hyperolius concolor*	Variable Reed Frog	NC	NA	LC	WS	R	U	N	U	N	U	N	U	N	U
23	*Hyperolius nasutus*	Large-Nosed Long Reed Frog	NC	NA	LC	WS	A	P	C	P	N	P	N	U	N	U
24	*Kasina kuvangensis*	Kuvangu kasina	NC	NA	LC	WS	N	U	N	U	N	U	N	U	N	U
25	*Kasina senegalensis*	Senegal kasina	NC	NA	LC	WS	C	P	U	P	N	U	N	U	N	U
26	*Leptopelis anchietae*	Anchieta's Tree Frog	NC	NA	LC	ES	C	P	C	R	N	U	N	U	N	U
27	*Leptopelis bocagii*	Bocage's Tree Frog	NC	NA	LC	WS	C	P	U	U	N	U	N	U	N	U
28	*Leptopelis cynnamoneus*	Angolan Forest Tree Frog	NC	NA	LC	WS	N	U	R	U	N	U	N	U	N	U
29	*Hildebrandtia ornata*	Ornate Frog	NC	NA	LC	WS	C	U	N	U	N	U	N	U	N	U
30	*Hildebrandtia ornatissina*	Angola Ornate Frog	NC	NA	DD	ES	U	U	U	U	N	U	N	U	N	U
31	*Ptychadena anchietae*	Anchieta's Grass Frog	NC	NA	LC	WS	N	U	R	U	N	U	N	U	N	U
32	*Ptychadena ansorgii*	Ansorge's Grass Frog	NC	NA	LC	WS	U	U	U	U	N	U	N	U	N	U
33	*Ptychadena bunoderma*	Rough Grass Frog	NC	NA	LC	WS	R	U	N	U	N	U	N	U	N	U
34	*Ptychadena grandisonae*	Grandison' s Grass Frog	NC	NA	LC	WS	C	P	U	U	N	U	N	U	N	U
35	*Ptychadena mascareniensis*	Mascarene Grass Frog	NC	NA	LC	WS	C	U	N	U	N	U	N	U	N	U
36	*Ptychadena oxyrhynchus*	Sharp-Nosed Grass Frog	NC	NA	LC	WS	C	U	C	U	U	U	U	U	N	U
37	*Ptychadena porosissima*	Striped Grass Frog	NC	NA	LC	WS	U	P	P	P	P	P	U	U	N	U
38	*Phrynobatrachus cryptotis*	Cryptic River Frog	NC	NA	DD	WS	C	U	U	U	N	U	N	U	N	U
39	*Phrynobatrachus mababiensis*	Mababe Puddle Frog	NC	NA	DD	WS	U	U	U	U	N	U	N	U	N	U
40	*Phrynobatrachus natalensis*	Natal Dwarf Puddle Frog	NC	NA	LC	WS	C	P	C	P	C	P	U	U	U	U
41	*Amietia angolensis*	Angola River Frog	WET	NA	LC	WS	C	P	C	R	C	U	U	U	N	U
42	*Pyxicephalus adspersus*	Giant Bullfrog	NC	NA	LC	WS	N	U	N	U	C	U	N	U	N	U
43	*Tomopterna cryptotis*	Tremelo Sand Frog	NC	NA	LC	WS	U	U	U	U	C	U	U	U	N	U
44	*Tomopterna damarensis*	Damaraland Sand Frog	NC	NA	DD	WS	N	U	N	U	C	U	C	U	U	U

AMPHIBIANS OF NAMIBE AND HUÍLA							ECOREGIONS									
							ANGOLAN HIGHLANDS		ESCARPMENT		MOPANE WOODLANDS		ARID SAVANNA		NAMIB DESERT	
N.º	*Scientific Name*	Name	SEASON	LVEA[1]	IUCN[2]	END[3]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]	ABUND[4]	LIKEL[5]
45	*Tomopterna tandyi*	Tandy's Sand Frog	NC	NA	LC	WS	N	U	N	U	N	U	N	U	N	U
46	*Tomoptera tuberculosa*	Rough Sand Frog	NC	NA	LC	WS	A	L	C	P	R	U	N	U	N	U
47	*Amnirana darlingi*	Darling's White - Lipped Frog	NC	NA	LC	WS	R	U	N	U	N	U	N	U	N	U

Legend:

SEASON NC – Not Confirmed during the site visits.

1 (**LVEA**): AEx – Threatened Species; Vul – Vulnerable; NA – Not Assessed.

2 (**IUCN**): LC - Least Concern; DD - Data Deficient; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR - Critically Endangered.

3 (**ENDEMISM**): WS - Widespread Species; ES - Endemic Species; NE - Near Endemic Species.

4 (**ABUNDANCE**): R - Rare; L – Likely; P – Possible; A – Abundance; C – Common; U – Unexpected.

5 (**LIKELIHOOD**): R - Resident; L – Likely; P – Possible; U – Unexpected.

(R) Species confirmed in the Project's area of influence.

5.2.2.4 Reptiles

Reptiles constitute an important faunal group for environmental studies as they fill in crucial niches in most ecosystems, with many species playing various roles in the food chain, often both as predator and prey. They are also ubiquitous in most regions, and tend to be highly speciose, meaning that slight changes in habitats and geographic isolation frequently lead to the evolution of new taxa, thus conferring a high informative power to reptile inventories. Nevertheless, and in sharp contrast to the relative abundance and diversity of reptiles in most areas, an important constraint derives from the lack of reliable information about reptile conservation in Angola.

The transmission line Project route has a length of approximately 196 Km and will cross different ecosystems, with areas identified as highly diverse in terms of reptiles, because of their heterogeneity and endemism. The Angolan highlands are known to hold some reptile endemism, but mostly associated to rocky landscapes and montane grassland ecosystems.

Although reptiles tend to be relatively widespread and diverse in most regions, a few problems subsist which can constrain severely the results expected from reptile surveys. The first and most obvious limitation is the cryptic nature of all but a few reptile taxa. Recording a significant or representative array of reptile species in a given study area, often requires intensive trapping methodologies and an effort sustained for a long period, which falls outside the scope of typical studies and surveys. Some specific reptile categories, like most snakes, legless lizards and burrowing reptiles, are seldom detected, regardless of methodologies used. An additional and very important constraint in our case, derives from the lack of reliable information about reptile distribution in Angola, other than outdated publications. Only recently a herpetological atlas for Angola was published (Marques *et al*., 2018), but even this work is of limited use as it is mostly based on few or outdated records.

5.2.2.4.1 Methodology for the Reptile Study

An extensive search on available information produced for the region where the study area is located, either from literature (e.g., Bocage, 1895; Ceríaco *et al*., 2016; Marques *et al*., 2018; Butler *et al*., 2019;

Branch *et al*., 2019) or unpublished data and online resources, allowed us to produce a comprehensive original list aggregating all previously known and recorded reptile species for Huíla and Namibe provinces, which is set as a baseline.

Two ground visits were conducted in the rainy season, which included a preliminary herpetological survey between the 20th and 27th of November 2020, and a second visit designed to coincide with the peak of the rainy season, between March 31st and April 5th. These two visits were later followed by a dry season survey, which took place between the 20th and 24th of August 2021.

The surveys were conducted opportunistically rather than adopting a systematic methodology, but the team dedicated some efforts aimed at specific taxonomic groups which were performed both during the day and at night, in several locations. Whenever possible reptiles were observed, identified and photographed in the wild with a Canon EOS 7D camera and Telephoto lens Canon EF 400mm f5.6L USM, or collected and then photographed upon handling with a Canon EOS 5D equipped with macro lens Canon EF 100mm f4, for close-up. We also looked for road-killed reptiles along the main road on the coastal plain, as this can be an efficient source to recover snake species.

Correct naming of species can be tricky due to lack of Angolan research and taxonomic uncertainties, however this was overcome by consulting published literature (Bocage, 1895; Boulenger, 1905; Branch, 1998; Alexander & Marais, 2007) and most of the species collected turned out to be not problematic in terms of proper identification. In addition, was also resorted to a vast array of recent research that has been published on Angolan herpetology.

5.2.2.4.2 Reptiles Results and Discussion

A total of 32 reptile species were confirmed to be present during the study, which can be considered as a very informative result, especially considering the limited baseline knowledge. The list obtained provides some useful, even if basic, indications. Obviously, a lot of the presumed diversity in terms of fossorial reptiles and cryptic and elusive forms has gone almost entirely undetected, but this is not surprising. Overall, the results indicate that the proposed route is fairly diverse in terms of reptiles, as was recovered about 21% (32/152) of all species known to occur in the whole two provinces, which is

a highly significant result. In addition, was signalled another 32 species as also possible or likely to occur along the TL route. Furthermore, the vast majority of reptile species were also photographed on site (see

Table *5-16* and **Figure 5-30**).

All records could be confidently identified down to specific level, although a couple gekkonid species are currently being taxonomically revised, yet this will be discussed below. The list is quite unbalanced, with all entries within Order Squamata (lizards and snakes), but 53% (17/32) of all species recorded being geckos (family Gekkonidae), and only two species of snake. These ratios likely don't reflect local distribution of herpetological diversity, but may be an artefact caused by the higher or lower detectability of different taxonomic groups. In contrast, the list of recorded species was relatively well balanced across ecological units, with a minimum of six species confirmed in ecoregion 1 – Angolan Highlands, but with much higher diversity found in the coastal plain, and especially in ecoregion 4 – Arid Savannas. Adding the confirmed and possible/ likely species to occur was reach about 42% (64/152) of the total species listed for the two provinces, which clearly highlights the specific herpetological richness of the area covered by the proposed TL route.

Table *5-16*Table 5-16 shows a comprehensive list of reptile species confirmed in Huíla and Namibe provinces.

Table 5-16: List of reptile species of conservation concern in the Project area.

Scientific Name	English Name	Portuguese Name	SEASON	LVEA[1]	IUCN[2]	ENDEMISM[3]	CONFIRMED
Pelomedusa subrufa	Helmeted Terrapin	Tartaruga-de-capacete	NC	NA	NE	WS	No
Pelusios nanus	African Dwarf Mud Turtle	Tartaruga-de-plastrão-articulado-anã	NC	NA	NE	WS	No
Pelusios rhodesianus	Variable Mud Turtle	Tartaruga-de-plastrão-articulado-variavel	NC	NA	LC	WS	No
Kinixys belliana	Bell's Hinge-Back Tortoise	Cágado-de-carapaça-articulada-de-bell	NC	NA	NE	WS	No
Stigmochelys pardalys	Leopard Tortoise	Tartaruga-leopardo	NC	NA	LC	WS	No
Afroedura vazpintorum	Coastal Flat Gecko	Osga-achatada-costeira	BOTH	NA	NE	ES	Yes
Condrodactylus fitzsimonsi	Button-Scaled Thick-Toed Gecko	Osga-de-escamas-de-botão	WET	NA	NE	WS	Yes
Condrodactylus pulitzerae	Pulirtzer's Thick-Toed Gecko	Osga-de-pulitzer	BOTH	NA	NE	WS	Yes
Hemidactylus mabouia	Tropical House Gecko	Osga-tropical-das-casas	BOTH	NA	NE	WS	Yes
Hemidactylus cf. benguellensis	Benguela Tropical Gecko	Osga-tropical de Benguela	DRY	NA	NE	ES	Yes
Kolekanos plunicaudus	Feather-Tailed Gecko	Osga-de-cauda-de-pluma	WET	NA	NE	ES	Yes
Lygodactylus nyanyeka	Nyaneka Dwarf Gecko	Osga-anã-diurna Nyaneka	WET	NA	NE	WS	Yes
Pachydactylus angolensis	Angolan Thick-Toed Gecko	Osga-de-dedos-grossos-de-angola	WET	NA	NE	ES	Yes
Pachydactylus caraculicus	Angolan Banded Thick-Toed Gecko	Osga-de-dedos-grossos-do-caraculo	WET	NA	NE	WS	Yes
Pachydactylus oreophilus	Kaokoland Rock Gecko	Osga-de-dedos-grossos-do-kaokoved	BOTH	NA	NE	WS	Yes
Pachydactylus punctatus	Speckled Thick-Toed Gecko	Osga-de-dedos-grossos-sarapintada	WET	NA	NE	WS	Yes
Rhoptropus afer	Namib Day Gecko	Osga-diurna-do-namibe-comum	NC	NA	NE	WS	No
Rhoptropus barnardi	Barnard's Namib Day Gecko	Osga-diurna-do-namibe-de-barnard	WET	NA	NE	WS	Yes
Rhoptropus biporosus	FitzSimons' Namib Day Gecko	Osga-diurna-do-namibe-de-dois-poros	BOTH	NA	NE	WS	Yes
Rhoptropus boultoni	Boulton's Namib Day Gecko	Osga-diurna-do-namibe-de-boulton	WET	NA	NE	WS	Yes
Rhoptropus montanus	Mountain Namib Day Gecko	Osga-diurna-do-namibe-montana	BOTH	NA	NE	WS	Yes
Rhoptropus sp.	Namib Day Gecko sp.	Osga-diurna-do-namibe sp.	WET	NA	NE	ES	Yes
Rhoptropus taeniosticus	Angolan Namib Day Gecko	Osga-diurna-do-namibe-de-angola	WET	NA	NE	ES	Yes
Heliobolus lugubris	Bushveld Lizard	Lagarto-de-bushveld	NC	NA	NE	WS	No
Pedioplanis benguelensis	Bocage's Sand Lizard	Lagarto-de-areia-de-bocage	WET	NA	NE	WS	Yes
Pedioplanis haackei	Haacke's Sand Lizard	Lagarto-de-areia-de-haacke	WET	NA	NE	ES	Yes

Scientific Name	English Name	Portuguese Name	SEASON	LVEA[1]	IUCN[2]	ENDEMISM[3]	CONFIRMED
Pedioplanis serodioi	Serodio's Sand Lizard	Lagarto-de-areia-de-huntley	WET	NA	NE	ES	Yes
Cordylus machadoi	Machado's Girdled Lizard	Lagarto-espinhoso-de-machado	NC	NA	NE	NE	No
Cordylus namakuyus	Kaokoveld Girdled Lizard	Lagarto-espinhoso-do-kaokoveld	NC	NA	NE	ES	No
Cordylosaurus subtessellatus	Dwarf Plated Lizard	Lagarto-de-placa-anão	WET	NA	LC	WS	Yes
Gerrhosaurus nigrolineatus	Black-Lined Plated Lizard	Lagarto-de-placas-de-linhas-pretas	NC	NA	NE	WS	No
Matobosaurus maltzahni	Western Giant Plated Lizard	Lagarto-de-placas-gigante-ocidental	DRY	NA	NE	WS	Yes
Panaspis cabindae	Cabinda Snake-Eyed Skink	Lagarto-de-olhos-cobra-de-cabinda	NC	NA	DD	WS	No
Trachylepis acutilabris	Wedge-Snouted Skink	Lagarto-com-focinho-de-cunha	BOTH	NA	NE	WS	Yes
Trachylepis albopunctata	Angolan Variable Skink	Lagarto-angolano-variável	NC	NA	NE	WS	No
Trachylepis hoeschi	Hoesch's Skink	Lagarto-de-hoesch	WET	NA	NE	WS	Yes
Trachylepis sulcata	Western rock Skink	Lagarto-ocidental-das-rochas	BOTH	NA	NE	WS	Yes
Varanus niloticus	Nile Monitor	Sengue	NC	NA	LC	WS	No
Chamaeleo anchietae	Anchieta´s Chameleon	Camaleão-de-angola	NC	NA	LC	WS	No
Chamaeleo dilepis quilensis	Quilo Flap-Neck Chameleon	Camaleão-comum	WET	NA	LC	WS	Yes
Agama aculeata	Western Ground Agama	Agama-do-chão	DRY	NA	LC	WS	Yes
Agama anchietae	Anchieta's Agama	Agama-de-anchieta	WET	NA	NE	WS	Yes
Agama planiceps	Namib Rock Agama	Agama-das-pedras-do-namibe	BOTH	NA	NE	WS	Yes
Agama schacki	Schack's Rock Agama	Agama-das-pedras-de-schack	DRY	NA	NE	ES	Yes
Afrotyphlops schlegeii	Schlegel's Giant Blind Snake	Cobra-gigante-cega-de-schlegel	WET	NA	NE	WS	Yes
Bitis arietans	Puff Adder	Surucucu	NC	NA	NE	WS	No
Boaedon angolensis	Angolan House Snake	Cobra-da-casa-angolana	NC	NA	NE	ES	No
Boaedon mentalis	Southern Brown House Snake	Cobra-de-casa-castanha-austral	NC	NA	NE	WS	No
Boaedon variegatum	Variegated House Snake	Cobra-de-casa-variável	NC	NA	NE	ES	No
Hemirhagerrhis viperina	Western Bark Snake	Cobra-de-casca-ocidental	NC	NA	NE	WS	No
Lycophidion multimaculatum	Spotted Wolf Snake	Cobra-lobo-manchada	NC	NA	NE	WS	No
Psammophis leopardinus	Leopard Sand Snake	Cobra-leopardo-de-areia	WET	NA	NE	WS	Yes
Psammophis mossambicus	Olive Whip Snake	Cobra-azeitona-de-chicote	NC	NA	NE	WS	No

Scientific Name	English Name	Portuguese Name	SEASON	LVEA[1]	IUCN[2]	ENDEMISM[3]	CONFIRMED
Psammophis namibiensis	Namib Sand Snake	Cobra-de-areia-do-namibe	NC	NA	NE	WS	No
Psammophis trigrammus	Western Sand Snake	Cobra-de-areia-ocidental	NC	NA	NE	WS	No
Psammophylax tritaeniatus	Striped Skaapsteker Snake	Cobra-listrada-de-skaapsteker	NC	NA	LC	WS	No
Pythonodipsas carinata	Western Keeled Snake	Cobra-ocidental-de-keeled	NC	NA	NE	WS	No
Naja anchietae	Anchieta's Cobra	Cobra-de-anchieta	NC	NA	NE	WS	No
Naja nigricincta	Western Barred Spitting Cobra	Cobra-cuspideira-ocidental	NC	NA	NE	WS	No
Crotaphopeltis hotamboeia	Red-Lipped Snake	Cobra-de-lábio-vermelho	NC	NA	NE	WS	No
Dasypeltis palmarum	Palm Egg Eater	Cobra-comedora-de-ovo	NC	NA	NE	WS	No
Dasypeltis scabra	Common Egg Eater	Cobra-comedora-de-ovo-comum	NC	NA	LC	WS	No
Dispholidus typus punctatus	Spotted Boomslang	Cobra-de-papo-às-pintas	NC	NA	NE	WS	No
Philothamnus angolensis	Angolan Green Snake	Cobra-verde-angolana	NC	NA	NE	WS	No

Legend:

SEASON NC – Not Confirmed during the site visits.

1 (**LVEA**): AEx – Threatened Species; Vul – Vulnerable; NA – Not Assessed.

2 (**IUCN**): LC - Least Concern; DD - Data Deficient; NT - Near Threatened; NE – Not Evaluated.

3 (**ENDEMISM**): WS - Widespread Species; ES - Endemic Species; NE - Near Endemic Species; ER – Endemic Subspecies.

Most of the reptile species occurring in Angola are not assessed by IUCN, and therefore do not qualify as threatened species, being instead listed as not evaluated (NE). Only three confirmed species have been evaluated, and are classified as Least Concern (LC). Even among all species included in the list for Huíla and Namibe provinces (see **Table 5-16**), the vast majority are considered as least concern (LC), the exception being one single vulnerable species (VU) and four data-deficient species (DD). None of these five species were recorded on substations sites and along the transmission line route, and only one species data-deficient is suggested to occur along the route, the Cabinda's snake-eyed lizard (*Panaspis cabindae*). However, this snake-eyed lizard is very common and widely distributed, and even if present, should not qualify as a species of conservation concern.

In terms of endemism and rarity, there were seven species of reptile recorded during the visits which are endemic to Angola, and which were in all cases photographed in the transmission line route. The coastal flat gecko (*Afroedura vazpintorum*) was only recently described (Branch *et al*. 2021). Although not yet evaluated in terms of conservation, it is however a fairly common and tolerant species, strongly associated with rocky environments where it is adapted to shelter in tight spaces among rocks and spanning in distribution from the desert coast to the highlands of Humpata plateau. It was recorded in the escarpment near Tchivinguiro (km 70 of the TL route), but it is likely present throughout the route. The Benguela tropical gecko (*Hemidactylus* cf. *benguellensis*) is a species that very recently underwent taxonomic revision (Lobón-Rovira *et al*. 2021). It is a very common gecko species, variable in morphology and highly adapted to divergent habitats in southern Angola, including ones severely impacted by anthropic activity. It has been recorded in the past from the desert coast to the highlands, and in these surveys was collected specimens foraging at night in the mopane ecoregion.

The feather-tailed gecko (*Kolekanos plumicaudus*) is a remarkable gecko and sole representative of its monotypic genus. Until recently was only known to occur in Iona National Park, but partly resulting from the current study, its global distribution was revised and expanded to reach the area in km 180 of TL route near Giraúl River (Vaz Pinto *et al*. 2021). The Angolan thick-toed gecko (*Pachydactylus angolensis*) is endemic and poorly known but relatively common in sandy substrate on the arid coastal plain. A still undescribed species of Namib day gecko (*Rhoptropus* sp.) was recorded and photographed in the escarpment (see **Figure 5-29** and **Figure 5-30**). This is also a common species that is very similar and often confused with either Barnard's Namib day gecko (*Rhoptropus barnardi*) or Fitzsimmonds' Namib day gecko (*Rhoptropus biporosus*), two sympatric species that were also recorded in survey.

This endemic species appears also fairly common and present on the escarpment, mopane and acacia zones, and was in this visit recorded above Bruco. The Serodio's sand lizard (*Pedioplanis serodioi*) was found below the escarpment on the mopane ecoregion, where it appears to be common and prefers sandy valleys in rocky and well wooded landscapes. Finally, Schack's agama (*Agama schacki*) is another fairly common diurnal lizard species, widespread in rocky landscapes across the Angolan plateau, highlands and the escarpment. It is also a very conspicuous species, and for this reason it was expected to be recorded in both the highlands and escarpment ecoregions, as our results confirmed.

Overall, and regarding species of high risk, there are no reptile species that can be considered of high risk in terms of being directly affected by the TL. The only factor that may be of relevance for reptiles is the possibility of habitat degradation locally. This may only be a factor of notice for the case of reptiles associated with escarpment forests, if these become impacted.

In this regard, one interesting taxon that should be noted for being a good indicator species, is the Gaboon viper (*Bitis gabonica*). This is a cryptic and uncommon forest viper, typical inhabitant of moist forests in central Africa but also present along the Angolan escarpment. Although the team could not record the species based on observations, witness accounts suggest their presence in the escarpment between Tchivinguiro and Bruco, which may therefore correspond to the southwestern limit of their global distribution. This case, and similarly to examples in other vertebrate taxonomic groups, highlights the importance of the last remnants of escarpment forest still present in this route section.

	
Leopard Sand Snake (*Psammophis leopardinus*). South of Kapangombe: 15° 2'39.96"S 12°30'19.90"E	Western Rock Skink (*Trachylepis sulcata*). Tchivinguiro: S 15 08 28; E 13 14 49

	
Western Rock Skink (*Trachylepis sulcata*). Caraculo: 14°58'51.15"S 12°39'56.63"E	Huntley's Sand Lizard (*Pedioplanis huntleyi*). Caraculo: 14°58'51.15"S 12°39'56.63"E
	
Namib Day Gecko (*Rhoptropus biporosus*). Caraculo: 15° 3'27.33"S 12°34'59.84"E	Coastal Flat Gecko (*Afroedura vazpintorum*). Tchivinguiro: S 15 08 50; E 13 15 12
	
Fitzimond's Thick-toed gecko (*Chondrodactylus pulitzerae*). East of Moçâmedes: S 15 01 57; E 012 54 22	Benguela's sand lizard (*Pedioplanis benguellensis*). East of Moçâmedes: S 15 01 57; E 012 54 22

Figure 5-29: Reptile species observed in the transmission line route.

Figure 5-30: Reptile species photographed in Caraculo region (km 140 of the TL).

5.2.3 Landscape (Environmental and Social Sensibility)

The landscape is characterized by different components: topography, land use and potentially sensitive areas with regards to landscape (e.g., cultural and natural heritage sites) and it has been categorised according to the presence of common elements. These include factors such as: topography; land use; built forms and/or infrastructure; and evidence on human modifications.

During the field survey (rainy and dry seasons), photographs of the site and surrounding landscape were taken from predetermined viewpoints. The landscape study area of the Project was identified as a 1 km corridor along the transmission line (500 meters each side of proposed transmission line route) where it is assumed that most of the potential impacts will occur. A detailed land cover map was extracted for a 1 km corridor along the transmission line route based on satellite imagery analysis (mostly form 2020 and 2021), and further confirmed during the environmental and social surveys undertaken in April and August 2021 (rainy and dry seasons).

Based on the satellite images, the Natural Values and Ecological-Landscape Sensitivity in the Project route were determined, and the sensitivity classification was analysed into Exceptional (A), Very High (B), High (C), Medium (D) and Low (E). **Table 5-17** describes the constraints on each of the five (5) classes of natural and landscape value in relation to the Project. This classification is done with regards to the sensitivity values within the transmission line corridor and not in relation to the values of the region as a whole.

Table 5-17: Classes of natural and landscape value.

Classes	Type	Constraints on the Installation and Operation
A	**Exceptional**	It recommends that the installation of any permanent or temporary infrastructure and equipment is done with the minimum impact possible and recommends the following: ▪ Opening of accesses such as the construction of paths or roads, of a permanent or temporary nature, in the installation or operation phase need to be limited to the strictly necessary and should be optimized by using existent access roads, transmission line corridors, national road.

Classes	Type	Constraints on the Installation and Operation
		▪ Changes of natural vegetation, in particularly cutting, suppressing or pruning the tree or shrub canopy, need to be limited to the strictly necessary and with the approval of the provincial authorities. ▪ Any modification to the natural topography is only allowed with the approval of the provincial authorities while considering issues such as erosion and habitat fragmentation. ▪ The construction ground for the tower's sitting (foundations) and/or launching of the cables should be restricted to the minimum area required without compromising the safety of the operations and using good industry sector practice. ▪ The implantation of transmission towers should be carefully undertaken to cause limited vegetation and habitat loss on the environmental aspects including the landscape. The safeguarding of the existing natural tree cover under the area where the conductor cables pass should be considered based on the elevation of the neighbouring support towers in order to maintain the normative vertical safety strip. If required, compensation measures will be recommended such as supporting a research project to identify and propose an environmental conservation area in the vicinity of the project area of influence.
B	**Very High**	In these areas it is recommended that the deployment of permanent infrastructure and equipment should be carefully considered and should adhere to the following recommendations: ▪ Opening of accesses such as the construction of paths or tracks, whether permanent or temporary, in the installation or operation phase will be limited to the minimum necessary for the installation of transmission towers, and the areas impacted by the temporary tracks and laydown areas should subsequently be re-naturalized. ▪ Allocation of transmission towers will be done to the minimum necessary. ▪ Changes in the natural vegetation cover are to be implemented only within the approved right-of-way, maintaining as far as possible the existing tree elements while the removal of the shrub cover within the right-of-way is allowed.

Classes	Type	Constraints on the Installation and Operation
		▪ Limits changes on the natural tree vegetation within the right-of-way in areas corresponding to the foothills and slopes along the Bruco Valley, or whenever intercepting riparian tree galleries in compliance with the national legislation. ▪ Any modification to the natural topography is only allowed with the approval of the provincial authorities while considering issues such as erosion and habitat fragmentation.
C	**High**	Limited to the deployment of permanent infrastructure and equipment, namely: ▪ Opening of accesses, such as the construction of paths or tracks, of a permanent or temporary nature, in the installation or operation phase will be limited to what is necessary for the installation of transmission towers, and the areas impacted by the temporary tracks should subsequently be re-naturalized. ▪ Allocation of transmission towers will be done without specific constraints. ▪ Changes in the natural vegetation cover only within the right-of-way, maintaining the existing tree elements whenever possible, and the permanent suppression of the shrub cover within the right-of-way and in alignment with national legislation. ▪ Any modification to the natural topography is only allowed with the approval of the provincial authorities while considering issues such as erosion and habitat fragmentation.
D	**Medium**	Conditional Implantation of permanent infrastructure and equipment, namely: ▪ Changes in the natural vegetation cover only within the right-of-way, maintaining the existing tree elements whenever possible, and the permanent suppression of the shrub cover within the right-of-way. ▪ Limited where possible to modification to natural topography to prevent soil erosion and habitat fragmentation.
E	**Low**	The implantation of any permanent or temporary infrastructure and equipment related to the transmission line is allowed, safeguarding, whenever possible, the existing topographic characteristics and in alignment with the national legislation.

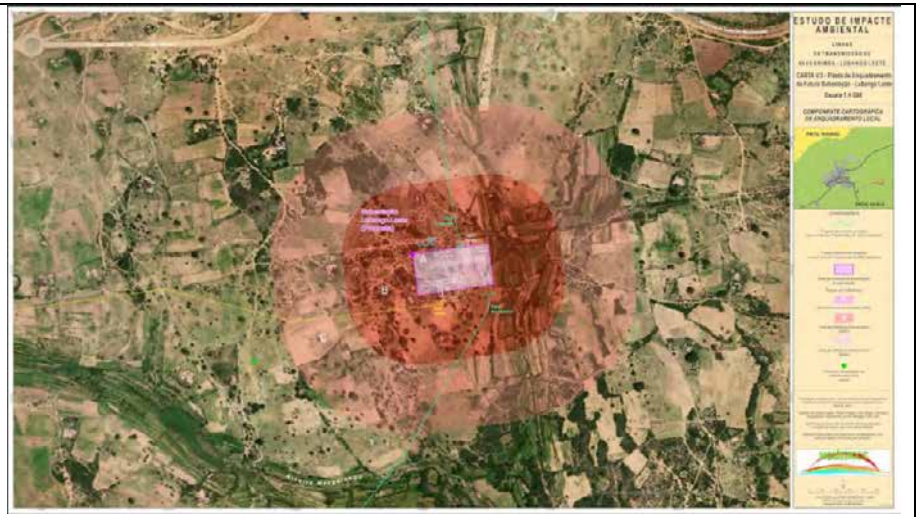
During the desktop baseline review and fieldworks (rainy and dry seasons), the following national and international protected areas have been considered:

- BirdLife International Important Bird Areas and Endemic Bird Areas;
- IUCN Protected Areas;
- RAMSAR Wetlands of International Importance;
- UNESCO Man and Biosphere (MAB) Reserves;
- World Heritage Sites;
- World Commission on Protect Areas; and
- WWF Global Ecoregions.

Based on the outcomes of the desktop review and the field survey campaigns performed in April 2021 (rainy season) and August 2021 (dry season), the transmission line route corridor does not intersect any conservation area in terms of landscape (analysis based on environmental legislation in force and existing conservation areas network). However, as the proposed route covers areas with relatively good habitat and landscape (e.g. Bruco Valley area) a number of mitigation and compensation measures have been proposed in the Environmental and Social Management Plan. It should be noted that although these areas are relevant in the geographic context of the project no endemic species of fauna and flora with restricted range in the region have been identified.

Table 5-18 to **Table 5-22** present the natural values and landscape values of selected different points along the transmission line route, including their environmental and social sensitivity in relation to Project implementation

Table 5-18: Landscape Character Unit in Nombungo (Km 0) to East Lubango substation site (Km 17).

<table>
<tr><td colspan="2">  </td><td>  </td></tr>
<tr><td colspan="2">Ivantala Lake (14°51'34.75"S 13°40'13.67"E)</td><td>Framework map of East Lubango substation region.</td></tr>
<tr><td rowspan="3">Municipality: Humpata.

Distance from the above photo to the East Lubango Substation: 6 Km.

Settlements near the proposed TL route: Mateta, Poaires Muhaha and Kapandi.

Distance from the above photo to the proposed TL corridor: 308 m.

Altitude of the above photo: 1,609 m.</td><td>Social Sensibility

• Predominant agricultural and livestock areas.
• Small-scale fishing area on Lake Ivantala.
• Zone with several cattle pens.</td><td>Environmental Sensibility:
• Landscape: Shrubby and riparian vegetation.</td></tr>
<tr><td>• Infrastructure:
• Houses along the Mateta and Poaires communities
• Two primary schools.</td><td rowspan="2">Environment:
• Watercourses (Ivantala Lake).
• Vegetation is essentially shrubby.</td></tr>
<tr><td>• Houses: few buildings are located along the TL 500m buffer.</td></tr>
<tr><td colspan="3">Note. The project route in the region of the Nombungo to East Lubango substation site will cross several agricultural lands and livestock areas, including a small lake known as Ivantala and used for local fishers. Near the Ivantala Lake, there is a forest patches along the corridor with high natural and landscape value.</td></tr>
</table>

Table 5-19: Landscape Character Unit in Poaires to Kapalanga TL corridor – Map II.1.A.1.

<table>
<tr><td>  </td><td colspan="2">  </td></tr>
<tr><td>East Lubango substation area (Latitude: 14°48'20.04"S Longitude: 13°40'55.09"E)</td><td colspan="2">Map of Natural Values and Ecological and Landscape Sensitivity. Sheet II.1.A.1</td></tr>
<tr><td rowspan="4">Municipality: Lubango.

Distance from the above photo to the East Lubango Substation: 5 Km.

Settlements near the proposed TL route: Poaires Muhaha, Kapandi and Tchiwaya.

Distance from the above photo to the proposed TL corridor: 400 m.

Altitude of the above photo: 1,217 m.</td><td>Social Sensibility
• Area of East Lubango substation.</td><td>Environmental Sensibility:
• Landscape: Savannah tree with agricultural patches.</td></tr>
<tr><td>Infrastructure:
• Existing 60 kV transmission live: visible.
• Unpaved road network within the TL route corridor and East Lubango substation site.</td><td>Environment:
Shrubs and glass.
Watercourse.</td></tr>
<tr><td>• Industrial area: near the East Lubango substation there is an industrial area (Omatapalo Quarry);</td><td rowspan="2">Vegetation along the Project's route in the Poaires region is essentially shrubby, with the sporadic occurrence of some large trees.</td></tr>
<tr><td>• Houses: there are buildings located along the TL 1 Km buffer.</td></tr>
<tr><td colspan="3">Note. Notes: The project route in the region of the East Lubango substation and Poaires Muhaha and Kapandi settlements will cross watercourses, agricultural fields and livestock areas, industrial and residential areas. The natural and landscape value of the region is classified as mostly low (E), however, there are also forest patches along the corridor with medium natural and landscape value (marked in the map as D).</td></tr>
</table>

Table 5-20: Landscape Character Unit in Humpata to Tchivinguiro TL corridor - Map II. 1.B.1.

<table>
<tr><td colspan="2">  </td><td colspan="2">  </td></tr>
<tr><td rowspan="4">Municipality: Humpata.

Distance from the above photo to the East Lubango Substation: 53 Km.

Settlements near the proposed TL route: Jamba, Camponês and Onculuvala.

Distance from the above photo to the proposed TL corridor: 500 m.

Altitude of the above photo: 1,902 m.</td><td>Social Sensibility

• Predominant agricultural and livestock areas.</td><td colspan="2">Environmental Sensibility:
• Landscape: Miombo woodlands, and thickets species (highlighting Aloe littoralis).</td></tr>
<tr><td>• Infrastructure:
• Existing 60 kV transmission line: visible.
• Jamba, Pinheiro and Trifrutas Farms.
• Boer cemetery (15° 0'32.82"S 13°24'36.19"E).
• Chela factory and paved road (National Road No. 280).</td><td colspan="2" rowspan="3">Environment:
• Mountain zone.
• Watercourses (mostly dry).
• Vegetation is essentially miombo.</td></tr>
<tr><td>• Industrial area: Handcrafted sausage and frankfurter factories.</td></tr>
<tr><td>• Houses: few buildings are located along the TL 500m buffer.</td></tr>
<tr><td colspan="4">Note. The project route in the region of the Humpata to Tchivinguiro several agricultural lands (including four farms) and livestock areas, industrial and residential areas. The natural and landscape value of the region is classified as Low (50%), Medium (35%) and High (15%), however, there is a forest patches along the corridor with high natural and landscape value (marked in the map as C).</td></tr>
</table>

Table 5-21: Landscape Character Unit in Tchivinguiro to Caraculo TL corridor – Map II.1.C.1.

<table>
<tr><td>  </td><td colspan="2">  </td></tr>
<tr><td>Caraculo region (Latitude: 15° 2'56.82"S Longitude: 12°51'32.01"E)</td><td colspan="2">Map of Natural Values and Ecological and Landscape Sensitivity. Sheet II.1.C.1</td></tr>
<tr><td rowspan="2">Municipality: Bibala.

Distance from the above photo to the East Lubango Substation: 116 Km.

No settlements near the proposed TL route.

Distance from the above photo to the proposed TL corridor: 500 m.

Altitude of the above photo: 369 m.</td><td>Social Sensibility
• Predominant livestock areas.
• Transhumance space.
• Temporary settlement of the Mucubais ethnolinguistic communities.</td><td>Environmental Sensibility:

• Landscape: Savannah (transition zone to the Namib Desert).</td></tr>
<tr><td>• Infrastructure:
• Existing 60 kV transmission line: visible.
• Informal market (Mangueiras market).</td><td>Environment:
• Escarpment zona.
• Watercourses (mostly dry).
• Vegetation is essentially shrubby (Colophospermum mopane specimens).
• Presence of birds, reptiles and mammals of high ecological importance.</td></tr>
<tr><td colspan="3">Note. As it is an area of escarpment with several watercourses, the region of the Project route has been classified as having Exceptional (A) natural and landscape value (marked in the map as A), and Very High (B) to High (C) natural and landscape value.</td></tr>
</table>

Table 5-22: Landscape Character Unit in Caraculo to Moçâmedes TL corridor – Map II.1.C.J.

<table>
<tr><td>  </td><td colspan="2">  </td></tr>
<tr><td>Caraculo to Moçâmedes (Latitude: 15° 4'31.36"S Longitude: 12°18'38.12"E)</td><td colspan="2">Map of Natural Values and Ecological and Landscape Sensitivity. Sheet II.1.C.J</td></tr>
<tr><td rowspan="2">Municipality: Moçâmedes.

Distance from the above photo to the East Lubango Substation: 174 Km.

Settlements near the proposed TL route: Aída neighbourhood.

Distance from the above photo to the proposed TL corridor: 300 m.

Altitude of the above photo: 185 m.</td><td>Social Sensibility
• Aída Settlement.
• Predominant livestock areas.
• Transhumance space.
• Temporary settlement of the Mucubais communities.</td><td>Environmental Sensibility:

• Landscape: herbaceous (Namib Desert zone).</td></tr>
<tr><td>• Infrastructure:
• Existing 60 kV transmission line: visible.
• Houses (Aída neighbourhood).
• Agricultural lands.
• Moçâmedes Railway.</td><td>Environment:
• Mountain zone.
• Giraúl and Bero Watercourses (mostly dry).
• Vegetation is essentially herbaceous, and arboreal along the river courses.
• Presence of birds of high ecological importance.</td></tr>
<tr><td colspan="3">Note. The project route in the region of the Moçâmedes has several agricultural lands (along Giraúl and Bero rivers), livestock areas, and residential (Aída Settlement). The natural and landscape value of the region is classified as Low (50%), Medium (35%) and High (15%). the forest patches along the corridor with high natural and landscape value (marked in the map as C).</td></tr>
</table>

Table 5-23: Landscape Character Unit in New Namibe substation site (Km 196).

<table>
<tr><td>  </td><td colspan="2">  </td></tr>
<tr><td>New Namibe Substation Site (Latitude: 15° 9'43.06"S Longitude: 12°12'48.98"E)</td><td colspan="2">Framework map of New Namibe Substation site. Sheet 1.</td></tr>
<tr><td rowspan="2">Municipality: Moçâmedes.

Distance from the above photo to the East Lubango Substation: 5 Km.

Settlements near the proposed TL route: Aída neighbourhood.

Distance from the above photo to the proposed TL corridor: 0 m.

Altitude of the above photo: 90 m.</td><td>Social Sensibility
• Aída Settlement.
• Predominant livestock areas.</td><td>Environmental Sensibility:

• Landscape: herbaceous (Namib Desert zone).</td></tr>
<tr><td>Infrastructure:
• Houses (Aída neighbourhood).
• Agricultural lands.
• Amélia Farm.</td><td>Environment:
• Mountain zone.
• Giraúl Watercourses (mostly dry).
• Vegetation is essentially herbaceous with almost dominance of Hydnora africana plant, and arboreal along the rivers courses.
• Presence of birds of high ecological importance.</td></tr>
<tr><td colspan="3">Note. The project route in the region of the New Namibe Substation Site has some agricultural lands (along Giraúl river), livestock areas, and residential (Aída Settlement). The natural and landscape value of the region is classified as Low (50%) and Medium (35%).</td></tr>
</table>

5.2.4 Environmental Conservation Areas

Angola is a party to the Convention on Biological Diversity, the World Heritage Convention, the Convention to Combat Desertification and the Convention on Climate Change, and is a member of the FAO Plant Genetic Resources Commission. Of the fourteen (14) environmental conservation areas recognized by the Angolan legislation, only the Namibe Partial Reserve is located in the vicinity of the proposed Project route and surroundings. Both Iona and Bicuar National Parks are located quite far to the south and east from the proposed TL route, in Namibe and Huíla provinces (see **Figure 5-31**).

Therefore, there are no formally designated protected areas along the TL Project route and East Lubango and New Namibe substations sites. The closest formally designated protected area is the Namibe Partial Reserve, but it starts about 50 km to the south of the western section of the future TL route. Iona National Park further south in Namibe province, is arguably the most important Angolan protected area in terms of reptile conservation, given its remarkable herpetological diversity and richness, but lies at least more than 100 km away on the western section of the route, and therefore no negative effect is to be expected from the transmission line. These protected areas are also important in terms of avifauna and big cats' conservation.

On the other hand, one area which has been proposed to the Government for future inclusion in the conservation area network, to the Ministry of Culture, Tourism and Environment, is Tundavala Gorge in Huíla province. The area in and around Tundavala has been highlighted as important in terms of geological, biological and cultural aspects. Tundavala was proposed by Huntley & Matos (1994) as a Nature Reserve, and it is mentioned in the Angolan National Biodiversity Strategy and Action Plan (NBSAP, 2020) as a protected area for future proclamation. Tundavala Gorge is also classified as Important Bird and Biodiversity Area (IBA, Birdlife International 2017), due to its diversity of species and its particularity for habitat-specific species. Among the 23 Important Bird and Biodiversity Areas (IBAs) which have been recognized for Angola (see figures below from Birdlife.org), covering 73 850 Km^2, equivalent to 5.9% of the land-surface area of the country, being one of them (IBA AO023 Tundavala) in Huíla (see **Table 5-24**), located near the Project area of influence (approximately 15 km). Two other IBAs listed for the region are Bicuar National Park (IBA AO001) and Iona National Park (IBA AO012), but both are far and will not be affected by the proposed TL route.

Table 5-24 and **Figure 5-32** shows the Angolan IBAs and their respective location, including IBA AO023 Tundavala. No population data are available for any bird species in Angola and the importance of sites is judged entirely on the occurrence of species at particular sites.

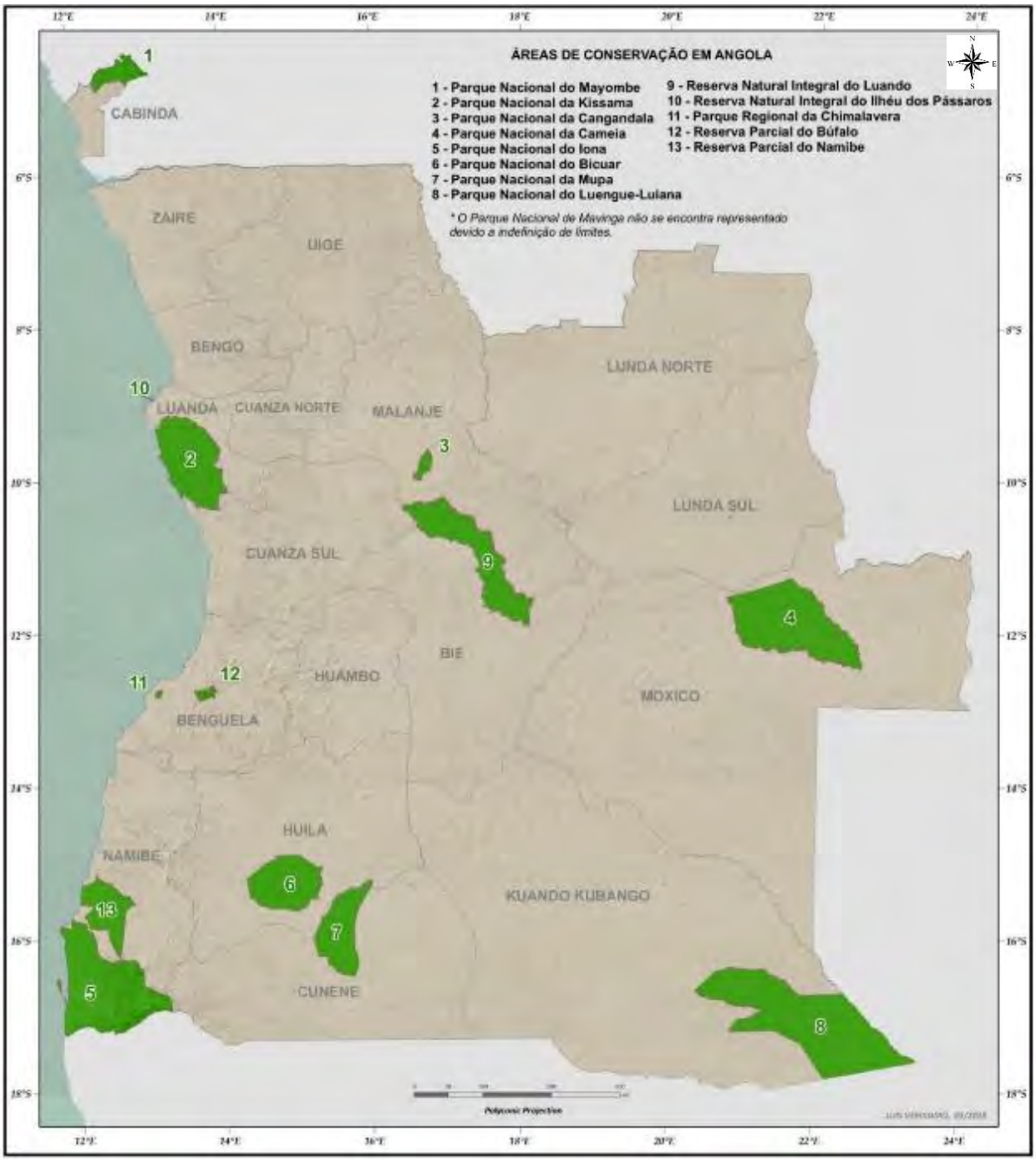


Figure 5-31: Environmental conservation areas in Angola and their location.

Source: Holísticos, 2019.

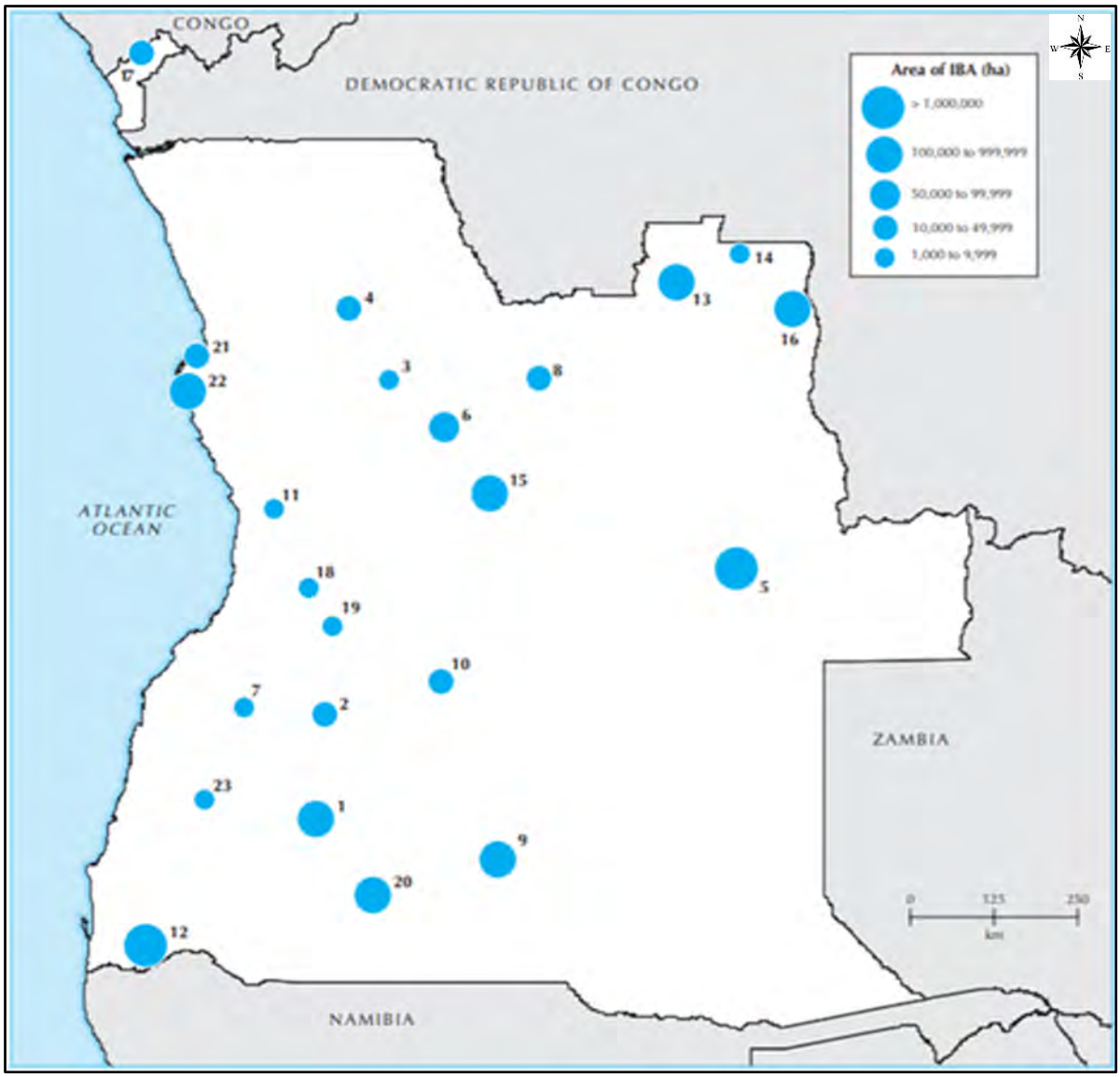


Figure 5-32: Important IBAs in Angola (23 is in Huíla and 12 in Namibe).

Source: Birdlife.org.

All but one of Angola's 17 restricted-range species occur at one or more of the 23 IBAs, and nine sites together hold all but one of the species, in relatively good numbers, thus meeting the A2 criterion (see **Table 5-24**).

Table 5-24: Angolan IBAs and respective classification criteria.

No.	IBA Name	IBA code	Criteria	GPS	Region
1	Bicuar National Park	A0OO1	A3	-15.13 14.93	Huíla
2	Caconda	AO002	A3	-13.73 15.06	Huíla
3	Calandula	AO003	A1,A2,A3	-9.1 15.95	Malanje

No.	IBA Name	IBA code	Criteria	GPS	Region
4	Camabatela	AO004	A1,A2,A3	-8.18 15.83	Cuanza-Norte
5	Cameia National Park	AO005	A3	-11.72 20.8	Moxico
6	Cangandala National Park	AO006	A3	-9.78 16.68	Malanje
7	Chongoroi	AO007	A1,A2,A3	-13.56 13.95	Benguela
8	Cuango	AO008	A3	-9.13 18.05	Lunda-Norte
9	Cuelei	AO009	A1,A3	-15.71 17.45	Cuando Cubango
10	Cutato	AO010	A3	-13.21 16.51	Huambo, Huila, Bié
11	Gabela	AO011	A1,A2,A3	-13.56 13.95	Cuanza-Sul
12	Iona National Park	AO012	A1,A2,A3	-16.91 12.58	Namibe
13	Lagoa do Carumbo	AO013	A1,A3	-7.81 19.95	Lunda-Norte
14	Luachimo river	AO014	A3	-9.78 16.68	Lunda-Norte
15	Luando strict Nature Reserve	AO015	A1,A2	-7.36 20.83	Malanje
16	Luia	AO016	A3	-8.16 21.55	Lunda-Norte
17	Maiombe	AO017	A3	-4.66 12.51	Cabinda
18	Mombolo	AO018	A1,A2,A3	-11.92 14.85	Cuanza-Sul
19	Mount Moco	AO019	A1,A2,A3	-12.41 15.18	Huambo
20	Mupa National Park	AO020	A1,A3	-16.18 15.75	Cunene
21	Mussulo	AO021	A1	-9.31 13.15	Luanda
22	Quiçama	AO022	A1,A2,A3	-9.31 13.15	Bengo
23	Tundavala	AO023	A1,A2,A3	-14.83 13.41	Huíla

Source: Important Bird Areas in Africa and associated islands – Angola.

Note: A1: Globally threatened species; **A2:** Restricted range species; **A3:** Biome restricted species.

The IBA AO023 Tundavala site lie about 15 km north-west of the town of Lubango. Tundavala is located on the Angolan escarpment in southwestern Angola and its outstanding landscape makes it one of the most important tourist destinations in the country. Apart from the spectacular scenery, with sheer cliff-faces hundreds of metres high, the area includes patches of relict Afromontane forest in a mosaic of undifferentiated montane communities. Patches of Podocarpus *milanjensis* occur in deep humid ravines and at altitudes above 1800 m (Huntley & Matos, 1994), and there is open *Protea* savanna and montane grasslands, quartzite formations and bracken *Pteridium* on the top of the escarpment, thickets along streams, poorly drained grassy patches in valleys, and dry woodlands at the bottom of the altitudinal gradient, providing a large range of bird habitats within a relatively small area.

Tree genera include *Podocarpus*, *Pittosporum*, *Olea* and *Ilex* on the higher elevations, with such species as *Adansonia digitata* and *Acacia welwitschii* at the bottom of the escarpment. There are small patches of miombo woodland (dominated by *Brachystegia* and *Julbernardia*) on sands on the plateau at the top of the escarpment.

Because of its proximity to Lubango and the bird and small-mammal collections at the former IICA, the IBA AO023 has been relatively well studied (in terms of species occurrence), but poorly studied in terms of the biology of the species that occur there. Among species of global conservation concern, *Xenocopsychus ansorgei* is common on rocky outcrops, *Estrilda thomensis* is frequent to locally common in dry woodlands below the escarpment, and *Francolinus swierstrai* probably occurs on the top of the escarpment (Pinto, 1983), but no specimens have been collected. Two other restricted-range species, *Dioptrornis brunneus* and *Nectarinia ludovicensis*, are both common in the area, and probably breed (Huntley and Matos, 1994). It should be noted that the Cinderella waxbill (*Estrilda thomensis*) is presented on the 2018 Angolan Red List Species as Threatened.

Several poorly known species occur, including *Bradypterus lopezi* (Pinto, 1970) and *Apalis cinerea* in higher altitude forest patches. There are a number of species, including *Apus bradfieldi* and *Apalis flavida* that are restricted to dry woodlands at the bottom of the escarpment. Other species of interest include *Falco peregrinus*, *Lybius leucocephalus*, *Anthus lineiventris*, *Myrmecocichla nigra* and *Monticola brevipes* (one of the few sites in Angola where this species occurs). Two species of the Kalahari–Highveld biome have been recorded at this site, as has one species of the Guinea–Congo Forests biome (Huntley & Matos, 1994).

According to Baptista *et al* (2018) despite its social and biological importance, the region lacks official national protected status and is threatened by progressively increasing human activities, especially logging and burning for charcoal production and the harvesting of natural resources such as medicinal plants and rocks for building purposes. Increasing numbers of villagers inhabit the region with their livestock (cows and goats) and plant crops. Other threats include man-made fires and the dumping of rubble and domestic, commercial, and even medical waste.

Tundavala sits in Humpata Plateau which forms a structure corresponding to the Serra da Chela, ending in the west in imposing cliffs standing 128 about 1,000 m high (e.g., Bimbe and Leba in the south) that define the boundaries of a volcanic-sedimentary intracratonic basin from the Paleo-Meso-Proterozoic era. According to a paper by Henriques *et al* (2013) the inner part of this so-called Angolan Block of the Congo Craton (e.g., Carvalho et al., 2000; Delor et al., 2008) has remained stable since the Limpopo-Liberian (c. 2680 Ma to c. 2820 Ma) and Eburneano and/or Tadilian (c. 2100 Ma to c. 2000 Ma) orogenic cycles, unlike the peripheral zones, which have been reactivated during the Maiombian (1300±200 Ma), Kibarin (1300±100 Ma) and Pan-African orogenic cycles (c. 975 Ma to c. 550 Ma) (e.g., Carvalho, 1983;

Carvalho and Alves, 1993; Ferreira da Silva, 2009; Lopes et al., 2012). The edge of the Humpata Plateau has very rugged facets alternating between NW-SE and NE-SW orientations. They form small polygons in the west and south-west, whereas towards the north-east their appearance is dendriform (Lopes et al., 2012). These features are represented by fractures and deep canyons opening westwards, of which the Tundavala Gorge, standing more than 2,200m high, is a particularly good example. The resulting impressive landscape is a natural resource that incorporates the geological elements of 'form and process' which, if combined with elements of tourism such as attractions, accommodation, tours, activities, interpretation and planning and management, can boost geotourism, a sustainable form of tourism that focuses primarily on experiencing the earth's geological features in a way that fosters environmental and cultural understanding, appreciation and conservation, and is beneficial to the local area.

In addition to the IBAs, there are also Key Biodiversity Areas (KBAs) which are the most important places in the world for species and their habitats. In the Huíla province there is the Tundavala KBA which lies about 15 km north-west of the town of Lubango and thus it is not affected by the Transmission Line Project.

Conservation issues

Clearing of woodland (using fire) for subsistence agriculture at the bottom of the escarpment still being done, the forests in the steep ravines are unlikely to be cleared, but the avifauna of the forest patches may be threatened by hunting (with dogs) and by runaway fires. No information is available on the mammal fauna.

There are also no wetlands declared as Ramsar Sites in the Project's area of influence. Angola acceded to the Convention on Wetlands of National Importance by Resolution No. 27/16 of July 22nd and in its accession process Angola proposed a set of eleven wetlands (MINAMB, 2018) to be considered as candidates for sites Ramsar. However, none of them are in the Project's area of influence or near the proposed TL route. The proposed Ramsar sites are listed below in **Table 5-25**.

As result of this study, two areas were identified that must be considered as especially sensitive in relation to the TL project. These are Bruco and Ivantala Lake. The Bruco area corresponds to the narrow and short descent connecting Tchivinguiro and Bruco. It is an escarpment zone that drops in a short distance from around 1700 m down to about 600 m of elevation, with a few remnants of escarpment

and montane forest present in deep ravines and gullies. This type of habitat is currently very disturbed and highly threatened in the region. Although most of the local biodiversity may have been likely lost in recent years, it still corresponds to the southernmost limit in distribution of several faunistic species, some of which endemic.

The escarpment may also be used locally as migration route for birds, although this assertion lacks proper studies and documentation. Bruco can also be related to Tundavala, as it is geographically close and observes similar geological and biogeographic settings (see **Figure 5-33**). However, and unlike Tundavala, Bruco witnesses a much less precipitous decline and contains almost no true Afromontane botanical elements, while this is compensated by a richer component of mid-altitude escarpment forest pockets. Unfortunately, very little has been published focusing on the biodiversity of the section of the scarp, making it harder to assess its real importance.

Figure 5-33: Selected photos of Bruco Valley area.

Ivantala Lake (see **Figure 5-34**), on the other hand, corresponds to an inland natural lake situated a few kilometres east of the city of Lubango. During the site visit, which occurred at the peak of the dry season, the Ivantala lake was about 1 km long and covered approximately 10 hectares. This was later confirmed by looking at satellite imagery. Based on the same imagery, it should be noted that during the peak of the rainy season the take does not increase significantly except for the edges of the margins that are more wet. Even though the area surrounding Ivantala Lake is highly disturbed, with a high density of human presence and agricultural activity, nevertheless the vegetation was quite diverse and

formed extensive marshes around the margins, which translated into a remarkably high diversity and abundance of birdlife, including migratory species.

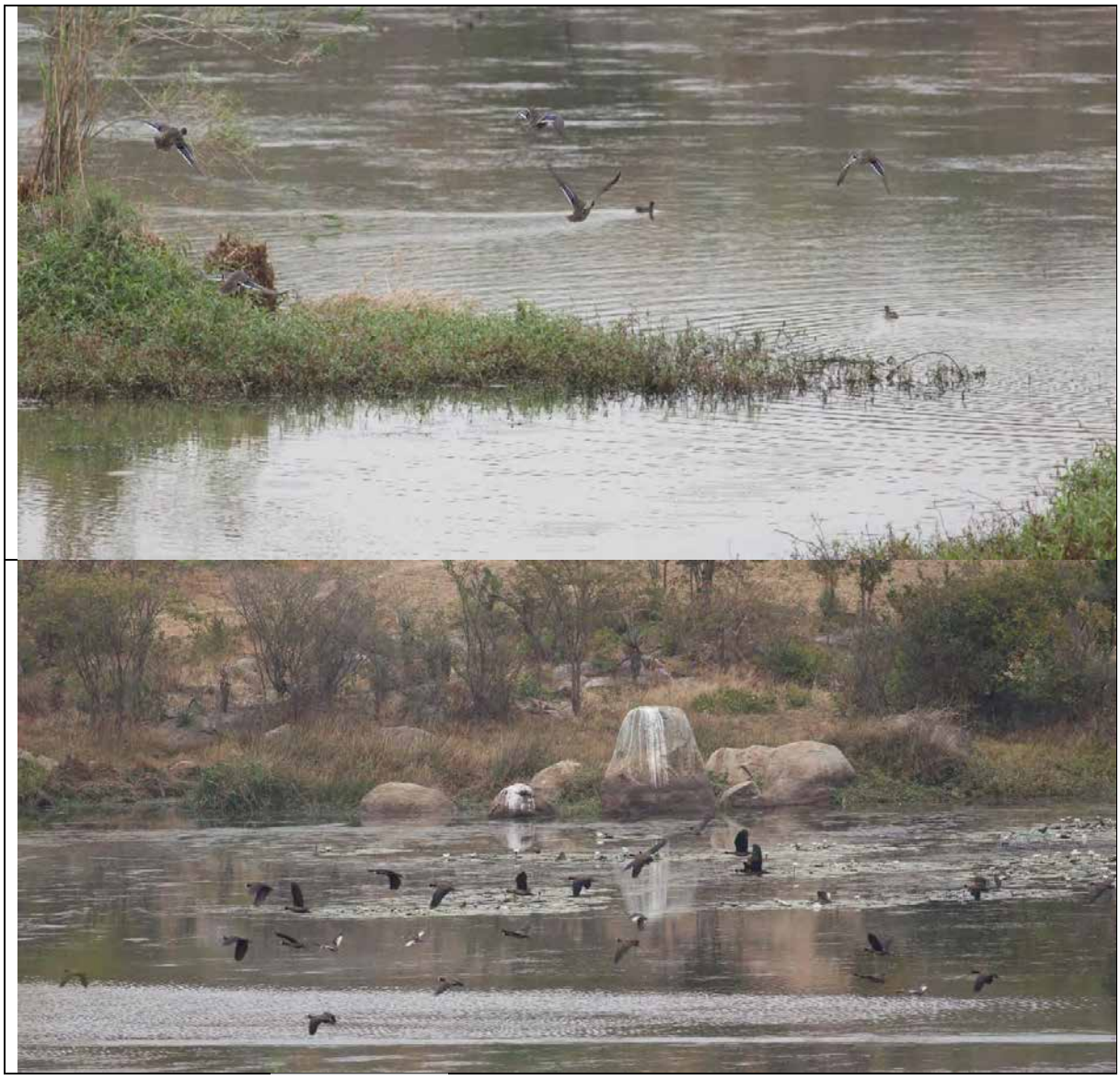


Figure 5-34: Selected photos of the Ivantala Lake.

It should be stressed that neither of these two areas are not formally protected, nor are there any known plans to recognize them as such. They are, nevertheless, important for biodiversity at the very least locally, but possibly also at national level, and this should be taken into account by adjusting the proposed transmission route accordingly.

Table 5-25: Proposed Ramsar sites in Angola.

No.	Proposed Ramsar Site	Area (hectares)	Ramsar Criteria	GPS Coordinates	Location (Province)
1.	Lagunas do Mangal do Lobito	259	1-3-8	12º 21´ 45´´S 13º 32´ 43´´E	Lobito (Benguela)
2.	Saco dos Flamingos	1616	2-3-4-8	9º 05´ 03´´S 13º 00´15´´E	Ramiros (Luanda)
3.	Lagoa do Arco	7568	1-3	15º 46´ 01´´S 12º 03´ 47´´E	Tômbwa (Namibe)
4.	Parque Nacional da Cameia	1 445 000	1-2-3	11º 57´32´´S 21º 40´31´´E	Cameia (Moxico)
5.	Complexo das Zonas Húmidas da Lagoa do Carumbo	200 000	2-3	7º 48´S 19º 57´E	Lunda-Norte
6.	Lagoa do Calumbo	1000	2-3	9º 10´ 07´´S 13º 24´ 43´´E	Icolo e Bengo
7.	Lagoa da Quilunda	5111	2-8	8º 53´05´´S 13º 36´01´´E	Icolo e Bengo
8.	Complexo de Lagunas de Santiago-Saurico	3763	2-4	8º 43´ 37´´S 13º 24´ 49´´E	Panguila (Bengo)
9.	Lagoa do Mangal do Chiloango	3097	1-3-4	5º 10´37´´S 12º 07´35´´E	Cacongo (Cabinda)
10.	Baixo Kwanza	97 200	2-3	9º 20´45´´S 13º 09´04´´E	Luanda
11.	Complexo das Zonas Húmidas de Kumbilo-Dirico	11 743	2-3	17º 59´18´´S 20º 46´53´´E	Dirico (Cuando Cubango)

Source: MINAMB, 2018.

5.3 Socioeconomic Baseline

This section presents the social, economic and cultural profile of the provinces of Huíla and Namibe, including the constraints on the route design of the transmission line Project from a social, economic and cultural point of view.

5.3.1 Huíla and Namibe Provinces Profiles

The Political and Administrative Division (DPA) of Angola has three (3) hierarchically ordered levels of disaggregation: Province, Municipality, and Commune or District. The provinces are divided into smaller territorial units that are the municipalities, which in turn are divided into smaller areas that are the communes or districts. Administratively Angola is divided into 18 provinces, and 164 municipalities. The municipalities are further divided into 559 communes (townships).

Huíla is a province of Angola, with a geographical area of 79,022 km^2. The province of Huíla is administratively divided into 14 municipalities, namely: Caconda, Cacula, Caluquembe, Chiange, Chibia, Chicomba, Chipindo, Cuvango, Humpata, Jamba, Lubango, Matala, Quilengues e Quipungo, 54 communes, 112 neighbourhoods in urban areas and 3,318 villages (in rural areas). Huíla has a high agricultural, industrial and tourist potential that can give it a decisive role in the development of Angola, having recently been pointed out as a potential region of attraction of cadres and development, and can help to decompress the province of Luanda. Capital-intensive agriculture, whether in irrigation or dry land perimeter, is in excellent condition in Huíla, and this province can become a barn for the constitution of the country's food reserves.

In Huíla province the 220 kV transmission line will pass through Lubango and Humpata municipalities. Currently, the design work for the line and the choice of the best option of equipment, material, analysis of the best route for the installation of the towers, and the passage of the lines from an economic, social and cultural point of view are being carried out.

Namibe is a province of Angola located in the south of the country, with a geographical area of about 57,091 km^2. It is bordered to the north by the province of Benguela, to the east by the province of Huíla, to the west by the Atlantic Ocean, to the south by the Cunene River and the Republic of Namibia. It has an Atlantic maritime border of about 480 km. It has the city of Moçâmedes as its capital.

According to the results of the 2014 Census, administratively, the province of Namibe is divided into five (5) municipalities, namely: Namibe (Moçâmedes), Bibala, Tômbwa, Camucuio and Virei, and has 15 communes, 44 neighbourhoods in urban areas and 353 villages in rural areas. Moçâmedes is administratively constituted by the commune of Moçâmedes (capital), Lucira and Bentiaba. Within the

commune of Moçâmedes there are four (4) urban districts, namely the Urban District of Forte de Santa Rita (project region), Sacomar, Aida and the Center, divided into four (4) geographical areas:

- **Sacomar Urban District** (North Zone): is the second largest area and the third most inhabited place in Moçâmedes and its main neighbourhoods are Sacomar, Cambongue, Juventude, Giraúl de Cima, as well as small neighbourhoods that are emerging at random.
- **Urban District of Forte de Santa Rita** (South Zone): it is the largest in area and the most inhabited, it is composed of the neighbourhoods of Forte de Santa Rita, 5 de Abril, Airport, Praia Amélia, Mandume Ya Ndemufayo, Cassange and many other smaller neighbourhoods.
- **Urban District of Aida** (East Zone): is the smallest district in area and population, due to its proximity to the river that cuts through the area and the unevenness in the land. It is composed of the neighbourhoods of Aida and Giraúl-de-Baixo and small agglomerations, which are emerging in the region at random.
- **Urban District of the Center** (Central Zone): it is the third largest district in area and the second in population, where most of the public buildings are located, the historical part of the city. Its neighbourhoods are Torre do Tombo, Platô, Saíde Mingas, Facada, Espírito Santo (or Heróis de Mucaba), Bairro dos Corações, Muinho and Eucaliptos.

5.3.1.1 Huíla Demography

Population is the primary element in any country. It is upon the population that the concerns of the government fall, i.e., knowing the size of the population, its location, composition, welfare needs, etc. The General Census of Population and Housing conducted from 16th to 31st May 2014, abbreviated referred to as "RGPH 2014" or "Census 2014," was the first in the 38 years of Angola Independence.

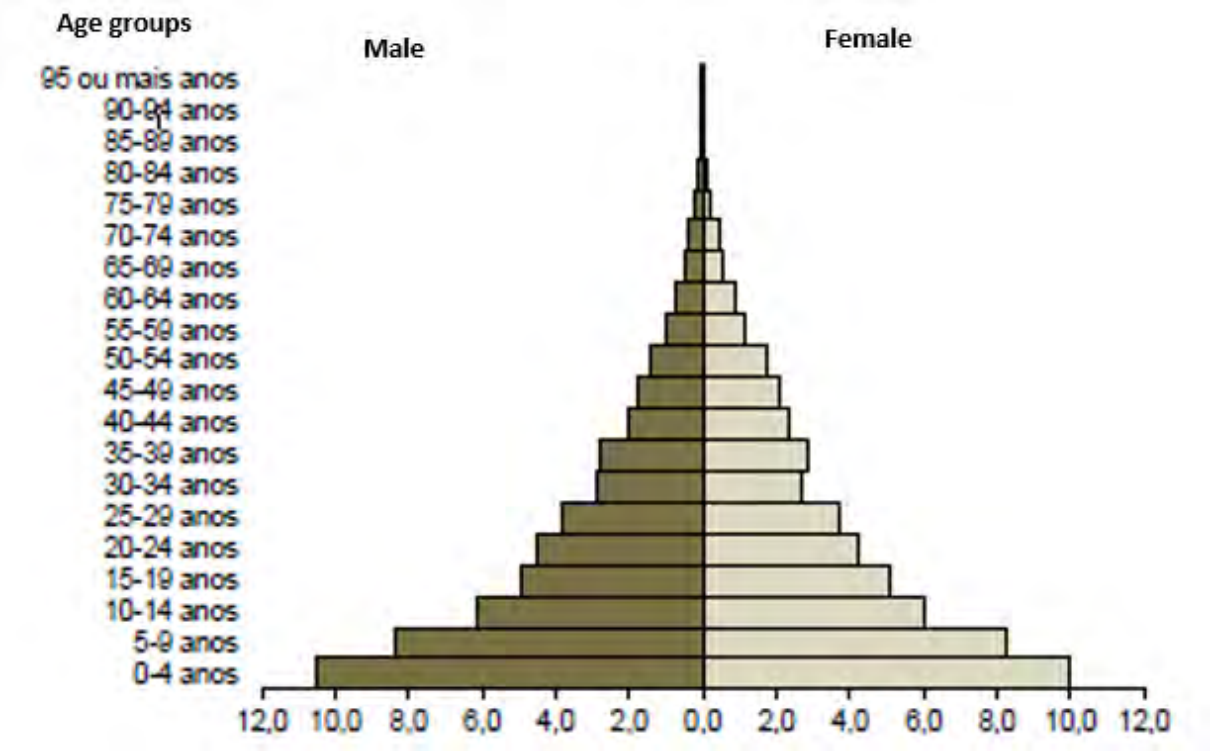
According to Census 2014, the resident population of Huíla province is estimated in approximately 2,497,422 inhabitants, and 32.2% reside in the urban area and about 67.3% in the rural area (INE, 2014) (see **Table 5-26**). The population density in Huíla province is about 33 people per square kilometres. The Lubango municipality has the highest population density of the province with 279 inhabitants per square kilometres, about 8 times higher than the province average (INE, 2014).

Table 5-26: Resident population by area of residence in Huíla, considering gender.

Province	Total		
	Total	Men	Women
Huíla	2,497,422	1,186,589	1,310,833
Urban Area	817,039	390,816	426,223
Rural Area	1,680,383	795,773	884,610

Source: INE, 2014.

The Lubango municipality is the most populous with 776,249 people, representing about a third (31%) of the population of the province. With less than 100,000 each appear the municipalities of Humpata (89,144), Gambos (79,462), Cuvango (78,543), Quilengues (75,334) and Chipindo (64,714). The age structure of the resident population in 2014 shows marked differences between age groups. Profiled by a wide base of the pyramid, which corresponds to the younger population and a top of the narrow pyramid representing the older population (See **Graphic 5-1**).



Graphic 5-1: Population distribution in Huíla.

Source: INE, 2014.

The Portuguese is spoken by more than half of the population (54%) with higher predominance in the urban area, where 85% of the population speaks the Portuguese language, while in the rural area are 39%. Umbundu is the second most spoken language with 32%, followed by Nyaneka-Humbi and Muhumbi with about 24% and 11%, respectively (INE, 2014).

5.3.1.2 Namibe Demography

According to the results of the Census 2014, the population of Namibe province is estimated at about 495,326 inhabitants, living in the urban area about 64% and in the rural area 36% (INE, 2016). Among the resident population, 255,182 are female, corresponding to approximately 51.5% of the total, while the male population is slightly lower with 240,144 men, representing 48.5% of the total population living in the province (see **Table 5-27**). The population density is about 9 people per square kilometres (32 inhabitants/km^2 in Moçâmedes), and at the opposite extreme are the municipalities of Virei and Tômbwa with less than 4 inhabitants/km^2.

The resident population of Namibe province is 495,326, being 20.2 % of whom Umbundu inhabitants that reside in the urban area (INE, 2016a). The masculinity rate at the province level is 94, i.e., there are on average 94 men per 100 women.

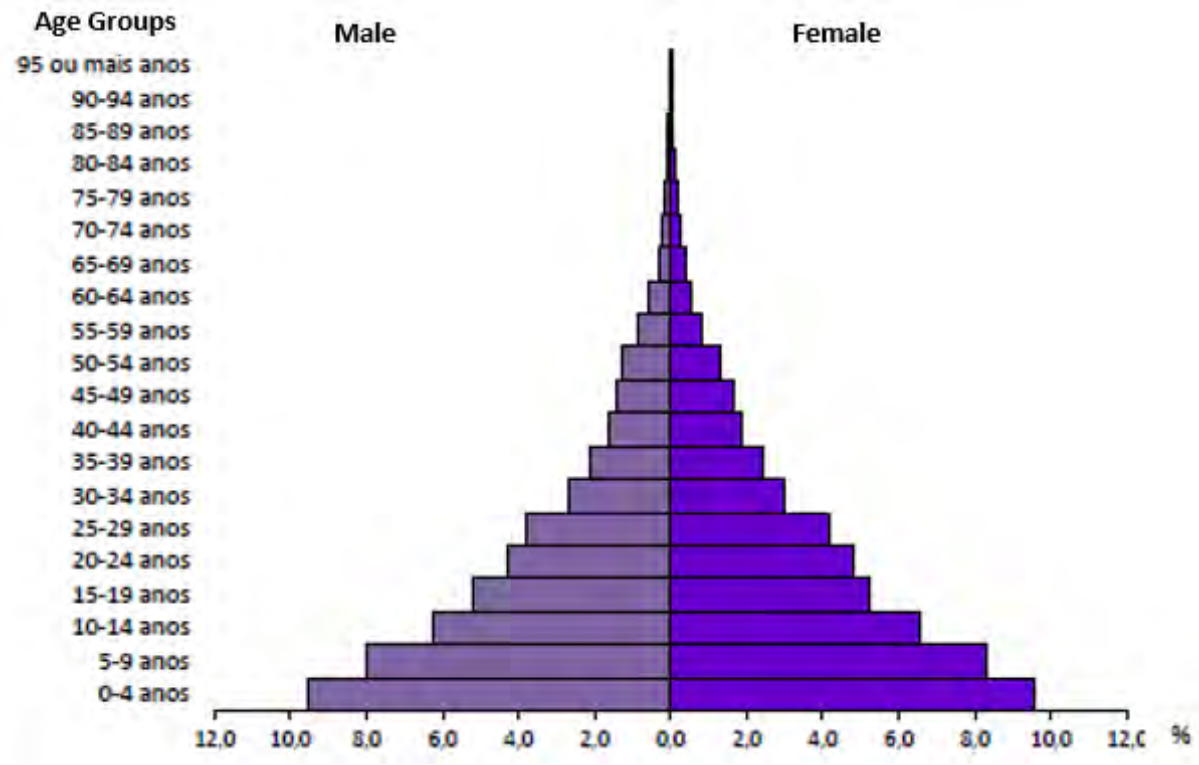
Moçâmedes municipality has the highest population density of the province with 292,535 inhabitants, 59% of the total population in the province (INE, 2016a). Next, the municipalities of Bibala and Tômbwa with 12% each and Camucuio 11%. The municipalities of Moçâmedes and Bibala concentrate about 72% of the total population residing in the province. The municipality of Virei registered the lowest number of residents with 6% of the total population of the province.

Table 5-27: Resident population by area of residence in Namibe, considering gender.

Area of residence	TOTAL RESIDENTS		
	Total	Men	Women
Namibe	495 326	240 144	255 182
Urban Area	315 656	153 333	162 323
Rural Area	179 670	86 811	92 859

Source: INE, RGPH 2014.

According to the population projections of 2018, prepared by the INE, Namibe has a population of 568,722 inhabitants. The age structure of the resident population in 2014 shows marked differences between age groups. Profiled by a wide base of the pyramid, which corresponds to the younger population and a top of the narrow pyramid representing the older population (See **Graphic 5-2**).



Graphic 5-2: Population distribution in Namibe. **Source:** INE, 2014.

The average age of the population of the province is about 20 years, being the median of 15 years. The average age is 20 years for both women and men.

The age structure of the population is characterized by a young population, the population aged 0-14 years is 238,763 people, representing 48% of the total resident population. The population of 0-24 years of age corresponds to about 68% of the resident population, which means that the province of Namibe is mostly made up of an extremely young population. The gap between young and old is huge, only 10,357 people are 65 years or older (about 2% of the population of the Namibe province). The working-age population (population aged 15-64 years) is 246,206 people, representing 50% of the province's population (INE, 2016a).

The Portuguese is spoken by more than half of the population (68%) with greater predominance in urban areas, where 88% of the population speaks the Portuguese language, against only 32% in the rural area. As detailed in **Table 5-28**.

Table 5-28: Population 2 years of age or older who speak Portuguese by area of residence.

Province and area of residence	Portuguese	
	Nº	Percentage (%)
Namibe	**310,941**	**67,9**
Urban	257,719	87,9
Rural	53,222	32,3

Source: INE, 2014.

Umbundu is the second most spoken language in Namibe (Moçâmedes) with 20%, followed by the Nyaneca and Muhumbi languages with 12% and 11% respectively (see **Figure 5-35**).

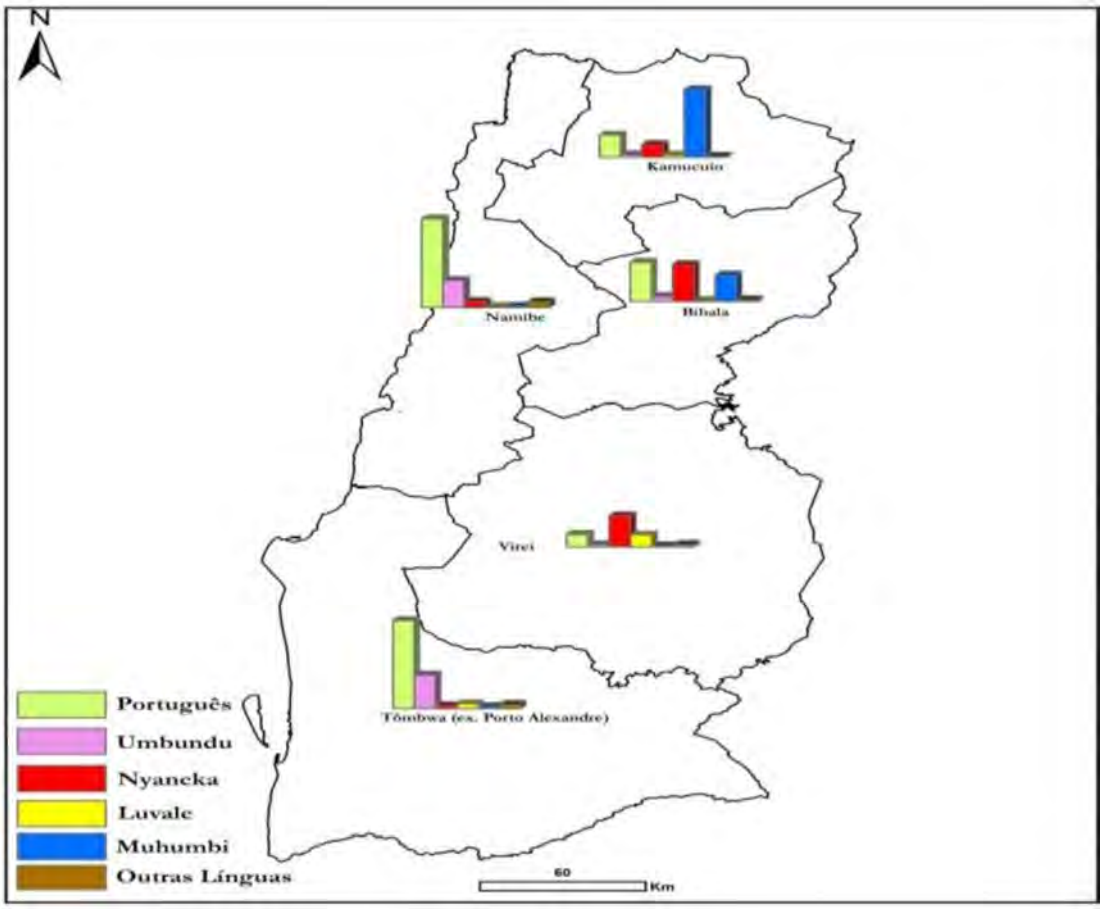


Figure 5-35: Main spoken languages in Namibe province. **Source:** INE, 2014.

5.3.1.3 Electricity and Water Distribution in Huíla

Energy consumption plays a central role in the sustainable development of a country, in its social (fight against poverty), economic (security of supply), and environmental (environmental protection) dimensions. The accelerated process of urbanization leads to a growing supply of electrical energy, through models based on increasing supply to meet an equally growing demand. The consumption of electricity has, therefore, an expressive participation of the residential segment due to population growth. Between 2001 and 2009 access to grid electricity almost doubled in the country (INE, 2015).

According to the 2014 Census results, only 16% of Huíla households have access to electricity from the public grid (INE, 2016b), as shown in **Figure 5-36**. According to the Provincial Directorate of Energy and Water (DPEA), in the province of Huila the main sources of electricity production are: the Matala Hydroelectric Dam, with three (3) turbines of 13.6 MW each, for a total of 40.8 MW; the Arimba Thermal Power Plant, with 28 generator sets, for a total of 40 MW; and the Thermal Power Plant attached to the electrical substation of Lubango, with eleven generator sets for a total of 40 MW. These sources of production ensure the supply of electricity to the municipalities of Lubango, Humpata, Chibia, Matala and Quilengues (DPEA, 2015).

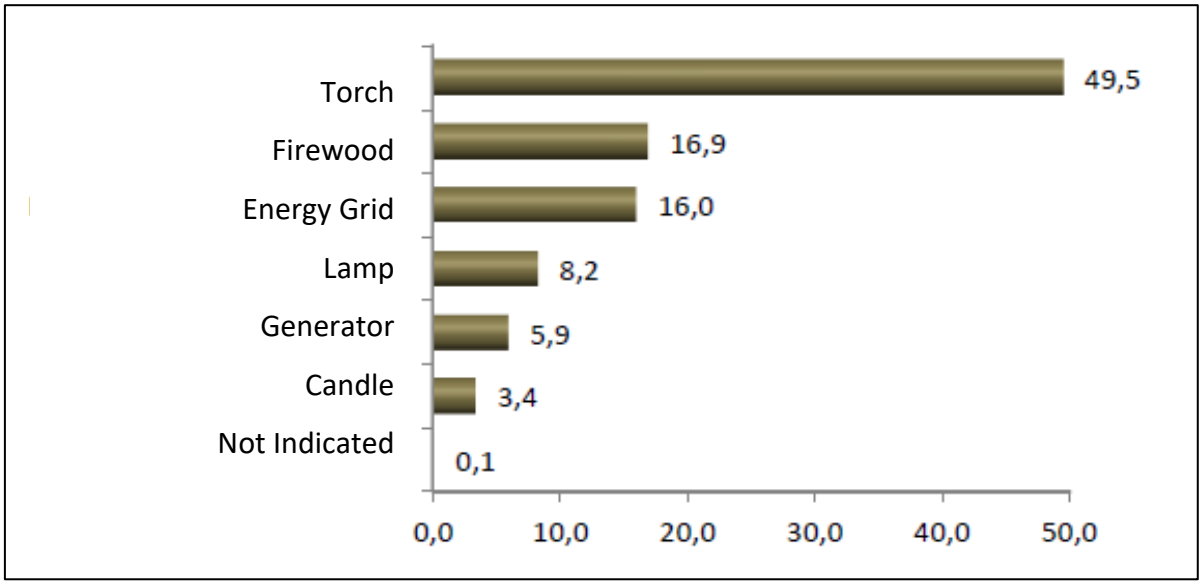


Figure 5-36: Main type of energy source in Huíla Province (INE, 2016b).

At the level of municipalities further away from the electricity production points and in rural areas, the electricity supply is guaranteed with the use of generator sets with variable power from 20 to 1,000 KVA, working only 5 hours a day, and small photovoltaic plants with capacities of 5 KVA (DPEA, 2015).

The major urban centres in the province have overhead and underground networks, metal poles, concrete poles, wooden poles, and 125 Watts mercury vapour, 150 and 250 Watts sodium vapour luminaires. The management of public lighting poles in the Lubango city is done by the Provincial Government through the Provincial Directorate of Energy and Water (DPEA), and in the municipalities by the respective Municipal and Communal Administrations.

Water supply, in quantity and quality, besides causing the improvement of the living conditions and welfare of a population, allows the control and prevention of diseases, the practice of hygienic habits, increases life expectancy and economic productivity of the country's citizens. In accordance with international standards, the following are considered appropriate sources: a tap connected to a water supply network, a neighbour's or building's tap, a public fountain, a pumped borehole, and a protected waterhole or spring. Access to water suitable for drinking is still low, covering only 42% of the country's population (INE, 2015).

In Huíla province only 35.5% of households have access to appropriate sources of drinking water, and the urban population is the most benefited. Cacimba (manually excavated water point) is the most widely used source of water by the population (mostly in rural areas). Alternative sources of energy are used by most of the population, include lantern, firewood, lamp, particular generator and candle. Among the municipalities there are significant differences in access to drinking water.

The Lubango municipality presents the highest value in relation to the other municipalities with 62% of households with access to water suitable for drinking from public. There are three (3) Water Treatment Plants in the region, namely Nossa Senhora do Monte, Tundavala and Calumue. Despite the operation of the three (3) stations, the region still experiences restrictions in the supply of water to all consumers. The municipality of Cacula has the lowest value with 11.9% (INE, 2016b).

Although there has been a 10% increase in the use of toilets connected to the sewer system, and 4% connected to a septic tank or well, however, between 2001 and 2009 there was no improvement at the national level, probably due to the fact that in rural areas more than 50% of the population

defecates in grass, bushes, or in the open air. At Huíla provincial level, 26.4% of households use an appropriate location to defecate. However, this figure is only 7.1% in the rural area against 68.1% in the urban area (INE, 2016b). Appropriate sanitary facilities sink or toilets, installations connected to septic tanks or well "*roto*" or in a dry latrine shall be considered (see **Figure 5-37**).

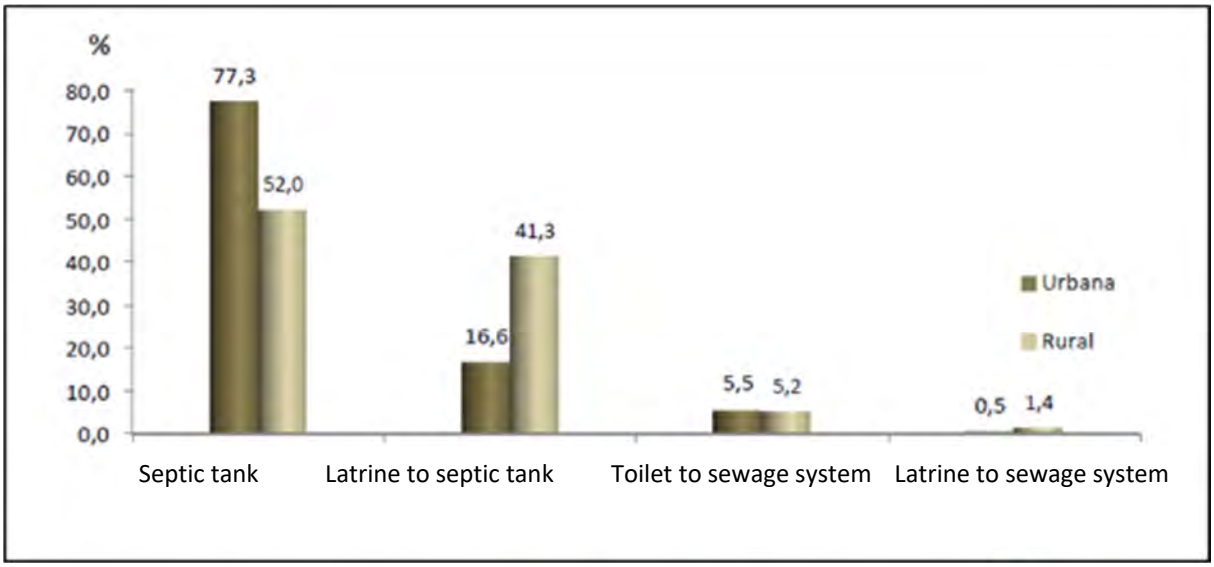


Figure 5-37: Households using appropriate sanitary facilities by area of residence (INE, 2016b).

5.3.1.4 Electricity and Water Distribution in Namibe

According to the 2014 Census results, less than half (49%) households in Namibe province have access to electricity from the public grid. Only 48% of households have access to appropriate sources of drinking water. The urban population is the most benefited (INE, 2016b). Cacimba (manually excavated water point) is the most widely used source of water by the population. Alternative sources of energy are used by most of the population, include lantern, firewood, lamp, generator and candle.

At the level of the urban centres of the Moçâmedes and Tômbwa cities, the electricity supply is made through the Matala Hydroelectric Dam (Huíla province), and the Xitoto I and II Thermal Power Plant (Moçâmedes), and by the Tômbwa Thermal Power Plant. Recently, two (2) turbines TM2500 GEN8, 28 MW each, and auxiliary systems required, including two (2) transformers 35 MVA were installed at the Thermal Power Plant Xitoto II (see **Photo 5-25**). At the level of the Moçâmedes urban centre, the service is in the order of 75%, also registering deficit in public lighting, while in Tômbwa is at 100%.

In other municipal and communal offices, the supply is guaranteed through community generator sets managed by local administrations.

Photo 5-25: Xitoto thermal power plant with the operation of the TM 25000 GEN turbine.

As far as the water sector is concerned, there are still difficulties in accessing drinking water, either due to lack of infrastructure or also due to the low rainfall and long periods of drought that the province generally faces, despite the investments made by the Provincial Government to improve conditions. Only 48% of families have access to adequate sources of water for consumption, with the urban population being the most benefited (INE, 2016b). Water well (manually excavated water point), rivers and streams are the alternative sources of water for consumption used by populations.

In Moçâmedes the supply of drinking water is ensured by three (3) underground catchments (Benfica, Boa Vista and Cussi) water coming from the Bero River, pumped by electropumps to the reservoirs.

In view of the SARS-Cov-2 pandemic and COVID-19 for the municipality of Moçâmedes, a water distribution plan has been implemented for areas with water scarcity, with the support of 80 tanker steamdrivers and 26 tanker trucks. Among the municipalities of the province of Namibe, there are differences in access to drinking water. The municipality of Tômbwa has the highest value in relation to the others with a coverage of around 83%. The municipality of Camucuio has the lowest value, with about 11% (INE, 2016b).

The urban centre of the Moçâmedes city has a good urban planning, namely: roads, street lighting and the presence of urban furniture, green belt (in some places), etc. In terms of the management of municipal solid waste, the Local Municipal Administration has the services of a sanitation company that cleans the city and collects and transports solid waste, including and adjacent neighbourhoods.

The collection is mainly done during the day and has helped in improving basic sanitation at the level of the urban centre. The burial and disposal of outdoor waste is part of the final destination in all localities of the province. In the urban centre most of the residences built definitively have septic tank, and others are connected to the city's domestic sewage network. In the peri urban areas, sanitation is still poor, although there are several public containers distributed throughout the neighbourhoods for municipal solid waste. It is thus possible to find foci of solid waste in different areas.

At provincial level about 41% of households use an appropriate location to defecate. However, for residents in the rural area the value is only 5% and 63% for residents in the urban area. Different realities are observed between the municipalities regarding the use of appropriate sanitary facilities. The municipality of Namibe has the highest value with 62%. The municipalities of Camucuio, Bibala have the lowest values with 3% and 5% respectively. Municipal solid waste at the province level is deposited in open-air dumpsters, without any environmental and public health measures (**Photo 5-26**).

Photo 5-26: Dump site in Moçâmedes city.

5.3.1.5 Education in Huíla Province

Since 2001, literacy has increased in Angola, reaching 76% at the national level. In 2001 there was a national level value of 66.8% and in 2008/2009, for this indicator the value increased to 76%. Urban areas recorded a higher percentage in relation to rural areas in both years, in 2001 the urban area recorded a value of 74.2% while in the rural area a value of 50.1% and in 2008/2009 the urban area had a record of 88.5%, while the rural area was 56.3%.

Regarding gender, the male population has a higher percentage than the female population in both years, men reached 82.1% while women reached 53.8%. In 2008/2009 85.1% and 67.8% were registered for males and females respectively.

Regarding education, the literacy rate expresses the relationship between the population, 15 years or older who can read and write, and the total population aged 15 years or older. The literacy rate in Huíla province is 51%, 80% in urban area and 36% in rural area. At the gender level, 64% of men can read and write, compared to 40% of women (INE, 2016b).

In 2014, only 7% of the population aged 18 and over had completed the Second cycle of secondary education (they had completed the 12th or 13th grade). On the other hand, 16% of the population aged 18 years or older had completed primary education (they had completed 6th grade) (INE, 2016b). The analysis by age groups shows that only 7% of the population aged 18-24 completes the II cycle of secondary education, and for the population aged 25-64 years it is also 7% and for the population aged 65 or more 1% (INE, 2016b). About 28% of the population aged 5-18 years (INE, 2016b) is outside the education system. In all age groups there is a significant predominance of girls outside the education system, the difference between boys and girls is 10 percentage points in the 15-18 age group.

The province of Huila has approximately 1,835 schools, corresponding to 7,439 classrooms, of which 3,056 are definitive and 4,383 provisional, being currently enrolled about 770,873 pupils in the initiation, primary education, First and Second Cycles of Secondary Education. A total of 334,840 citizens, among children, youth and adolescents are outside the education system, due to the reduced number of schools, classrooms, and teachers. In rural areas, additionally, cultural issues prevent adolescent girls from studying, favouring instead their traditional roles taking care of the home.

In many villages of Namibe province is remarkable cases of teenage girls who stop attending school due to the cultural norms, and pressure to start a family early in life. Absenteeism is also identified as a problem, with the main causes being: poverty, migration of parents, limited locations and insufficient educational resources, and transhumance for livestock activities.

Regarding the institutions of secondary education, the highlight goes to the Instituto Médio Agrária do Tchivinguiro, the Instituto Médio Politécnico da Humpata, and Instituto Médio Politécnico do Lubango. In the context of private education, the region has several colleges from primary to secondary education, and two (2) private universities (Instituto Superior Politécnico Tundavala and Instituto Superior Politécnico Independente). In the public higher education sector, there are two universities in the region; ISCED and the Instituto Superior Politécnico da Huíla.

5.3.1.6 Education in Namibe Province

The Education system in the Namibe province begins with the services of care and early childhood education (from 0 to 5 years), followed by preschool education or "Initiation" (5 years), primary education from 1st to 6th grade and secondary education to 12th grade. Subsequently, there are the technical or university aspects for higher education. The Basic Law of the Education System (2015) establishes that Primary Education is compulsory and free. Responsibility for early childhood care (day-care) is shared between the Ministries of Social Action, Family and Promotion of Women and the Ministry of Education, as established by Law No. 13/01 of December 31st (Angop, 2020).

At the level of the education sector, the province of Namibe is struggling with the lack of infrastructure and qualified staff, despite the implementation of specific programmes that have brought improvements, such as the 7% increase in qualified teaching staff. The available data report the existence of 158 schools and four higher education institutions, three public and one private, where the Fisheries Academy stands out, with a wide range of courses. In this school year, more than 140,000 students were enrolled in schools in the province of Namibe (Angop, 2020).

The Academy of Fisheries and Sea Sciences in Namibe (APCM) has about 1,200 students, 250 teachers and has a home with capacity to accommodate about 120 students. APCM has three organic units, the Faculty of Fisheries (with the courses of navigation, administration and management of fisheries and naval mechanics), the Faculty of Exploration of Aquatic Resources (with aquaculture and marine

resources courses), and the Faculty of Fish Processing (with the courses of technology and organization of sin processing) (Angop, 2020).

5.3.1.7 Health Sector in Huíla Province

There is limited availability of health data in Angola, especially at provincial and municipal levels. Therefore, this section presents a provincial and regional view of the health system for Lubango and Humpata Municipalities, and the affected areas where possible.

The prevention and combat of major epidemics such as malaria, and other diseases, observed in the country, are fundamental concerns of the sector to ensure the well-being of the population. In this sense, the health system has invested in building, rehabilitating and equipping health units and train health professionals. In the last 5 years, Angola has registered significant improvements, even though there are territorial differences (INE, 2015).

Huila province has one general hospital, four provincial hospitals, 14 municipal hospitals, 19 reference health centres, four maternal and child centres, 39 health centres and 195 medical posts. In addition to these public units, other private health units provide services, totalling seven clinics, 45 medical centres, 61 nursing posts, three ophthalmology offices, one physical therapy centre, and five stomatology offices. The private health network also includes seven naturalistic medical centres, and a health school (Angop, 2021). All reference health units, public and private, are located in the Lubango urban centre, as it is the capital of the province.

In Huíla province, the main health programmes include children's healthcare, the Immunisation Expansion Programme, nutrition, malaria control, HIV/AIDS, reproductive health, tuberculosis, blood services and physical medicine and rehabilitation. Many of these programmes are promoted by international donors such as USAID, WHO, UNDP, UNICEF and the European Union. The HIV/AIDS and malaria programmes receive the greatest support from donors and have the highest capacity and functionality. In view of the situation of the COVID-19 pandemic, a field hospital was built in the Lubango municipality. Meanwhile, health professionals remain aligned to the National Development Plan (PND), with primacy for maternal and childcare and nutrition, as well as the fight against major endemics (e.g., malaria, acute diarrheal diseases and respiratory diseases, etc.).

In Lubango (capital) the health situation is considered stable, in spite of the lack of consumable materials such as syringes, needles, gloves and pharmaceuticals in some hospitals and health centres. The situation is quite complex in the interior of the province where there is a shortage of everything from health professionals (doctors and nurses), expendable materials, ambulance for transporting patients, and medical assistance. The main diseases recorded in the region are: malaria, acute diarrheic diseases (ADD), acute respiratory diseases (ARD), typhoid fever, intestinal parasitosis, urinary tract infections, schistosomiasis, geohelminth infections, and HIV/AIDS. Malaria, ADD, schistosomiasis, and ARD are the main causes of infant mortality in the region. These diseases are fought by programmes which are monitored by the Ministry of Health and managed by the Provincial Health Directorate.

According to the 2015-16 Angola Multiple Indicator and Health Survey (IIMS), 26% of children aged 12-23 months in Huíla province had received all basic vaccinations; 1% of children aged 6-59 months tested positive for malaria by rapid diagnostic test (RDT); and 1% of women and men aged 15-49 were HIV positive (Angola Government, 2015).

5.3.1.8 Health Sector in Namibe Province

Namibe has 100 health units, including three provincial hospitals (see **Photo 5-27**), five municipal hospitals, eleven health centres and 81 health posts. In these units are available the services of general practice, paediatrics, maternity, dermatology, cardiology, orthopaedics, stomatology, physiotherapy, emergency bank and external consultation services. In terms of human resources, it has more than 60 physicians from different specialties, 1,232 nurses and 507 therapeutic diagnostic technicians, and daily health units serve more than 50 patients with different issues (Angop, 2021).

The most frequent diseases in Namibe region are malaria, acute diarrheal diseases (ADD), acute respiratory diseases (ARDS), urinary tract infection, hypertension, gastritis, typhoid fever, yellow fever, sexually transmitted infections (HIV/AIDS and gonorrhoea), malnutrition. There are also health issues caused by road accidents, mostly accidents involving motorcycles and big trucks.

The 2012-2025 National Health Development Plan (*Plano Nacional de Desenvolvimento Sanitário*) identifies the following main health needs and problems in region faced by the National Health System (NHS): i) insufficient health coverage and poor maintenance of health units; ii) weak reference and

counter-reference system among the three levels in the NHS; (iii) limited capability of staff, and poor distribution of staff in rural and peri-urban areas; iv) weaknesses in the NHS, including the information, logistics and communication system; v) insufficient financial resources and inadequacy of the current financing model; and vi) inadequate access to drinking water, sanitation and energy.

To respond to these issues, the 2012-2015 National Health Development Plan includes, among others, a Program for Diseases Prevention and Control, which is subdivided into 20 Projects. Among the diseases highlighted are polio, malaria, HIV/AIDS, syphilis and tuberculosis. At the end of 2016, it was estimated that 280,000 people were living with HIV/AIDS in Angola, which corresponds to a prevalence percentage of approximately 2.2% among adults aged 15–49 years old. The estimated number of people newly infected with HIV has dropped from 2010 to 2016.

Photo 5-27: Provincial Hospital of Ngola Kimbanda in Moçâmedes.

5.3.1.9 Huíla Land Use and Territorial Planning

This section will give a detailed explanation of land use and territorial planning at the Lubango and Humpata municipalities' level focusing in particular on the transmission line route. The Lubango city has grown with each passing day, but in addition to being not uniform, it is still a little disordered, coexisting with precarious and conventional modern constructions.

The Lubango city, witnessed a population invasion due to the war that ravaged the country and people were building disorderly given the pressure that was placed on them that was the posting in a territory without war (Administração Municipal do Lubango, 2014). Thus, some houses were built on the margin of the Law, because the process of legalization of land is quite time consuming, which leads people to build on weekends, without any technical guidance.

With the aim of improving the quality of life of the population and especially those living in risk areas, new housing areas have been identified where after urbanization some plots have been ceded to the population, the growth of Lubango municipality in the north direction, but the construction of the residences in these new areas differ from each other for economic and financial reasons, although new urban centralities are being built by the Central Government, confirming a "new" Lubango is being born (Administração Municipal do Lubango, 2014). Near the transmission line proposed route in Lubango and Humpata municipalities the use of land is essential for agriculture propose, where the subsistence production of isolated peasants and others grouped into associations, and cooperatives predominates. The most significant production is concentrated in the crops of corn, *massango*, *massambala*, beans and basking beans (Administração Municipal do Lubango, 2014). However due to its zootechnic station, Humpata has also its activities focused on livestock.

5.3.1.10 Namibe Land Use and Territorial Planning

This section will give a detailed explanation of land use and territorial planning at the Namibe province focusing in particular on the Moçâmedes municipality level, and also for being the capital of the province and the region with information available on urban planning and territorial planning.

In general, the Namibe province, except the municipal and communal headquarters where you can find infrastructures from the colonial time (houses, buildings, museums, hospitals, different centres, schools, etc.), has the characteristics of a peri-urban or rural area. The houses mainly display precarious characteristics and are made out of adobe and zinc plates while some are constructed from cement blocks, with two or more divisions according to the number of family members.

About twenty years ago, the cities of Namibe were not surrounded by suburbia. But the end of the war and the stability of the country since 2002 have stimulated urban growth, with the strong demand for space to inhabit, leading to the appearance of disordered neighbourhoods around the cities.

Thus, with the high demand and land demand, the municipal administrations were making streets and allotments of new surfaces. For example, a few years ago occurred the extension of the main commune of Namibe, The Santa Rita Fort, gave rise to the eucalyptus neighbourhood, with narrow streets, without conditions of mobility and accessibility, informal commerce dominates its interior, the appearance of neighbourhoods like 5 de Abril, Comandante Valódia, Plató and Praia Amélia are other examples (Aldino Francisco, 2013).

In Namibe and Tômbwa (the province's only urban centres) most of the building dates back to the colonial period, but many of the buildings are in a state of advanced degradation. Today is visible in the city centre of Namibe a mixture between the new and the old, often the new comes to occupy the place of the old buildings without respecting the previous architecture or the parameters of volumetry required in the paste (Aldino Francisco, 2013).

Clandestine constructions and settlements in at-risk areas are social, cultural, environmental and economic problems. These neighbourhoods have no water, no basic sanitation, which provides the spread of diseases, are built on water lines and protection against desert areas. Resolution measures that are mainly applied to these situations are palliative associated with a weak institutional capacity for supervision. There is no objective/practical orientation on the spatial planning of the province, and so instead of finding urbanized sites the team found street areas (without equipment and infrastructure of bases), which do not take into account the concepts of urbanization.

This growth of the urban spot occurred mainly along the main access roads (re) built in recent years (National roads connecting the city of Moçâmedes to the provinces of Benguela and Huíla) and also with the construction of some specific housing projects such as the centrality of Namibe. This resulted in a greater enlargement/beaching of the city and consequently a decrease in the density of the city.

There are two possible ways to acquire a plot of land in the Namibe province (depending on the size of land required): first, contact the Municipal Administrations or the Provincial Government and second, contact the Geographical and Cadastral Institute of Angola. The land at the level of the province of Namibe is used for agrarian development, livestock (pasture), housing construction and industrial development. National Development Plan 2018-2022 points out several priority sectors as the focus of the development of the national economy. With regard to the organization of the territory

of the Namibe province, the strategy focuses on transforming the region into an agro-pastoral area and on exploring the great potential of tourism.

5.3.1.11 Huíla and Namibe Security

The World Bank defines Gender-Based Violence (GBV) as: "violence that is directed against a person based on gender. It constitutes a breach of the fundamental right to life, liberty, security, dignity, equality between women and men, non-discrimination and physical and mental integrity" (World Bank, 2018). GBV does not only refer to violence against women and girls. It also can impact men and boys, particularly men who challenge or do not adhere to traditional male stereotypes.

GBV can include a range of different forms of violence, including intimate partner violence, female genital mutilation, child marriage, and child exploitation. According to the prevalence data on different forms of violence against women by the UN Women, in Angola 35% of women have suffered from lifetime physical and/ or sexual intimate partner violence, 26% have suffered physical and/or sexual intimate partner violence in the last 12 months and there is a 30% rate of child marriage.

However, there are no official national statistics regarding lifetime non-partner sexual violence. The Global Gender Gap Index rank for Angola, which benchmarks national gender gaps on economic, political, education and health criteria, is 117 (out of 144 countries) (World Economic Forum, the Global Gender Gap Report, 2016). Furthermore, the United Nations Committee on the Elimination of Discrimination against Women's seventh report of Angola stated that "there had been 529 cases of domestic violence in 2017, which probably did not reflect the realities due to the non-reporting of cases. Many victims of domestic violence did not want to leave their homes and live in shelters".

On the other hand, the Ministry of Social Action, Family and Women Promotion (Masfamu) in 2017 said that at least 6097 domestic violence cases were reported in the country. Angola passed the Law on Domestic Violence (Law No. 25/11 of June 14th), an instrument to combat this social issue, which also allows a third person to report such a situation. However, Angola remains highly influenced by patriarchal norms shaping social perceptions about the subordination of women in spousal and family life (Nzatuzola, 2005). At the level of the Huila and Namibe provinces highlight the crimes of voluntary manslaughter, grievous bodily harm, rape, robbery and theft as the main crimes.

Given the situation of public calamity, part of the police force is working to guide compliance with the measures against Covid-19, while another group is in charge of its normal activity, which is the maintenance of order and public safety (Angop, 2021).

5.3.1.12 Ecosystem Services in Huíla and Namibe Provinces

At the level of Huíla and Namibe provinces, ecosystem services are the benefits that ecosystems provide to people (mainly in rural areas), including many resources that underpin basic human health and survival needs, support economic activities and provide cultural fulfilment. This section describes these services identified as important for populations in the Huíla and Namibe provinces. Considering the rural setting of both provinces, it is likely that local communities highly rely on the use of natural resources for their livelihoods. These activities may be for self-consumption as well as for selling in front of National Road no. 280, 100 and others.

Hunting, although prohibited nationally, is an activity carried out in both provinces by a minority of people. Bushbuck, warthogs, monkeys and Grey Duiker are the main hunted species. Forestry also provides the population with a variety of different resources. The main forest products include coal, fire wood, wood, wild fruits, and medicinal plants, which are traded on the side of the roads. In Huíla and Namibe there are important areas for ecosystem services delivery, particularly close to the river. The riverbanks and associated vegetation provide a wide range of ecological, political, economic, social and cultural services which include the following:

Provisioning Services

People's livelihoods in Huíla and Namibe are dependent mainly on agriculture services to supply protein for local communities. Timber is used for construction and other timber products are used for charcoal and wood fuel, including stumps and roots, and harvesting residue; non-timber forest products such as food products derived from plants; water-supply services through the provision of surface water; and habitat for a number of biodiversity species.

Regulating Services

Regulating climate by means of carbon capture and storage as well as maintaining the quality of air and soil, providing flood and disease control, or pollinating crops are some of the 'regulating services' provided by ecosystems. Protection from soil erosion in certain areas of both provinces are key,

particularly along the watercourses. They are often invisible and therefore mostly taken for granted. When they are damaged, the resulting losses can be substantial and difficult to restore.

Cultural Services

The non-material benefits people obtain from ecosystems are called "cultural services". They include aesthetic inspiration, cultural identity, sense of home, and spiritual experience related to the natural environment. Cultural services are deeply interconnected with each other and often connected to provisioning and regulating services: small-scale agriculture is mostly for subsistence.

Supporting Services

Benefits for people living near the forested areas and the existence of cultural and spiritual associations between the people and the surrounding environment. In Huíla and Namibe provinces people used to meet under large trees during day.

Ten distinct livelihood zones are depicted in Huíla and Namibe provinces, namely: urban zones, coastal fishing, ephemeral river crop farming, western pastoralism, hunting, gathering and pastoralism, central plateau agro-pastoralism, western agro-pastoralism, eastern crop farming, Cuvelai agro-pastoralism and commercial farming (see **Figure 5-38**). Some are large, covering huge swathes of both provinces, while others are concentrated in small patches of towns, fishing villages and along rivers that flow only from time to time.

Not everyone lives the same way in each zone. Rather, each zone encompasses an area where most people live in comparable ways: growing similar crops, with roughly the same kinds of livestock, selling more or less similar goods, or having related enterprises (John & Stephie Mendelsohn, 2018).

The zones are often called agro-ecological zones because many of their characteristics come from agricultural practices, such as types of crops and livestock, which, in turn, are direct or indirect consequences of soil types, geology and geomorphology, vegetation and climate (see **Figure 5-38**). There are also linkages between livelihood zones and types of houses and ethnic-linguistic groups (John & Stephie Mendelsohn, 2018).

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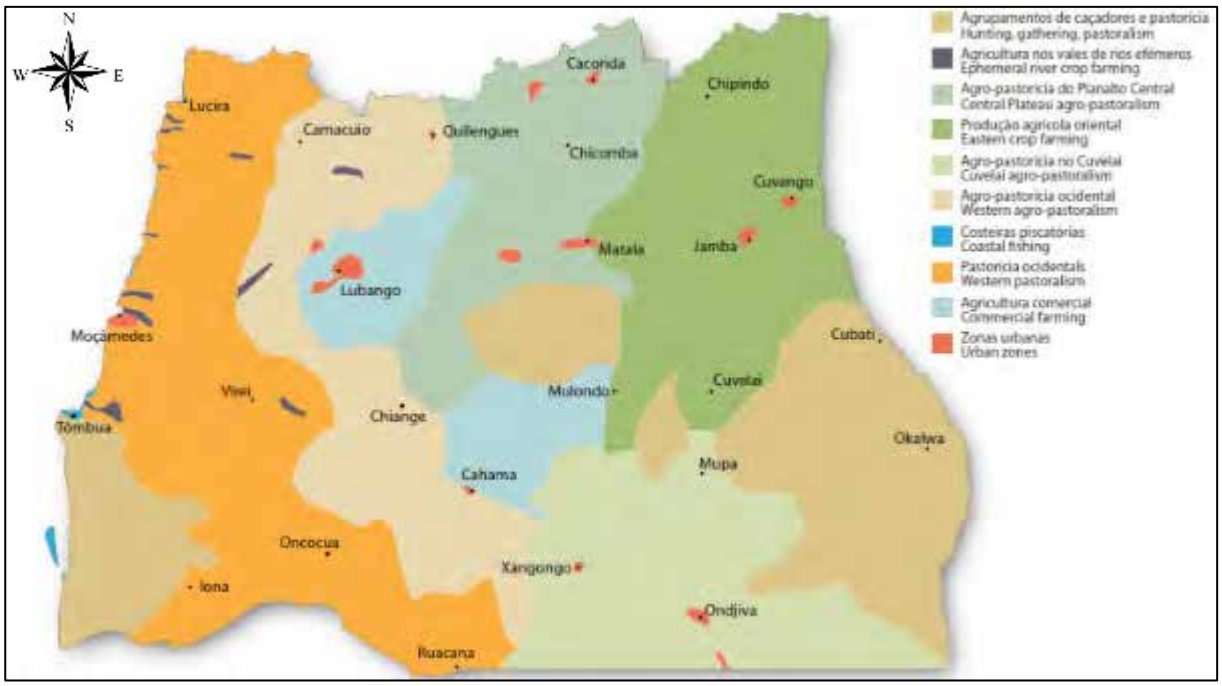

Figure 5-38: Distinct livelihood zones in Huíla and Namibe provinces.

Source: John and Stephanie Mendelsohn, 2018.

5.3.1.13 Economy and Livelihoods in Huíla and Namibe

The economy of Huíla and Namibe provinces are based on subsistence agriculture, livestock, artisanal (as shown in **Figure 5-38**) and industrial fishing, the processing industry, tourism, formal and informal trade. Agriculture and artisanal fishing are the main economic activities in the region.

Agriculture

Agricultural activity plays a prominent role in the socio-economic life of the people of the Huila and Namibe provinces, representing in conjunction with the livestock, the main source of income and resources of rural communities. The agricultural situation in the Huila and Namibe provinces is characterized essentially by a rudimentary agriculture and subsistence, being developed by small traditional family producers and small farmers. This presents itself with low yields, reflecting the absolute dependence on rainfall, predominantly scarce and irregular. This dependence is aggravated by the fact that the soils are extremely permeable and the water reserve infrastructure is insufficient.

The agricultural occupation is of the business type, is quite prominent in most of the area and manifests itself more incisively along the rivers and main water lines, with concern for using the soils of the naturally drained and more fertile marginal lowlands (see **Figure 5-38**). The dry farming is always unviable due to the irregularity of the rains except in the northern part of Huíla province, hence the great use of the existing rivers with the construction of dams in Tundavala (Lubango) and Neves (Humpata). The main crops produced in both provinces are: maize, millet and sorghum, melons, beans, cowpeas, nuts, sweet potatoes, cassava, tomatoes, cabbage, peppers, carrots, garlic, spinach, corn, beans, sweet and reindeer potatoes, vegetables, bananas, mango and citrus (see **Photo 5-28**). The crops are mainly used for domestic consumption and limited sales. However, most of crops are produced during the rainy season only.

In terms of annual production, maize, millet and sorghum are the main crops planted, representing more than 90% of the cultivated area in the provinces of Huila and Namibe; reindeer potatoes, sweet potatoes, cassava, peanuts, vegetables, cucurbits and fruit trees are the types of crops with less productive expression, since they are irrigated crops. In this sense, the development of irrigated systems allied to a business farm are factors that enhance production, diversifying the type of species, as well as the number of harvests per year. It is noteworthy that horticultural crops, sweet potato and manioc represent the highest production in relation to the area cultivated per hectare, about 13.5, 8.0 and 7.6 (ton/ha) respectively (Angola Government, 2016).

Huíla and Namibe provinces also covers two other types of farming that also focus largely on the sale of agricultural produce. The first manly surrounds Lubango municipality and the major roads that lead in and out of this metropolitan area. The high demand from buyers in this city and along the roads makes commercial farming viable. A great variety of fruit (apples, strawberries, peaches, plums, apricots, and citrus) and vegetables dominate the produce. Most farms are small-holdings, run informally without major capital investments. Some of the other, more formal enterprises were established many decades ago.

At the level of Huila province, for the agricultural year 2020/2021 at least 219,800 families were involved in activity, residents in 876 villages, with 2,758 families receiving support from the provincial office of Agriculture, and from Non-Governmental Organizations. The families are part of 835 associations and 224 cooperatives (Angop, 2021).

Photo 5-28: Example of a field of family agricultural production in Moçâmedes city.

Livestock

Livestock is one of the main sources of income in the Huila and Namibe provinces, and the most representative species of activity are cattle and small ruminants (goats), accumulating more than half the total production of the region. Domestic stock are an integral part of the lives of most rural people in Huíla and Namibe Provinces. Many young people grow up surrounded by animals, often tending them from an early age. Young men may later inherit, or be lent animals by family members to start their own livestock holdings.

Cattle herders and owners may be away from home for months, shifting their animals hundreds of kilometres between grazing areas, often on a regular, seasonal basis. And livestock provide food, income, savings, transport and traction, as well as family bonds and measures of wealth and social status. These are some of the ways that poultry, pigs, goats and sheep, donkeys and cattle shape the lives and opportunities of people. In short, domestic animals are fundamental to Southwest Angola's socio-economic landscape. One reason for this is that much of the region has a dry, warm environment which provides for good grazing and browse to support low intensity farming and rearing of livestock. Much of the region is also poorly suited to crop plant, and so investing in livestock is more of a success.

Livestock are dominated by cattle (see **Photo 5-29**), goats and chickens, but many homes also keep sheep and some pigs, donkeys, horses and ducks. Sheep mainly occur in southern Namibe, where they are included as part of the statistics given for goats. The two breeds are normally shepherded together, and used for similar purposes. Many families in Huíla and the northern parts of Namibe have pigs, but they are largely absent from the driest areas in southern Namibe (John & Stephie Mendelsohn, 2018).

Photo 5-29: Raising cattle in the Kapalanga settlement.

There is considerable variation in the ownership of livestock: in the number and types of animals kept from one area to another, and from one home to another. The most favourable conditions are in the semi-arid western and southern parts of the region where the quality of forage is relatively high and diseases are less troublesome than in the northern and eastern areas of Huíla. Here, in its more tropical wet climate, grass is often tough, unpalatable and lacking in nutritional value, and various diseases further limit the health and numbers of livestock.

Cattle and other livestock are moved when necessary, especially in arid and semi-arid areas. This might happen in most years. In one assessment of the frequency of transhumance, farmers in the Tômbwa, Moçâmedes and Bibala areas moved their cattle in about 6 of every 10 years. In drier areas further south, cattle are moved almost every year. From eastern Namibe, many cattle shift west to sparsely populated areas nearer the coast, where grazing has not been depleted. The herds move back towards

the more densely settled east once the rains begin, generally in November. Some cattle from eastern areas in Namibe are also moved further east and north before the summer rains begin to produce enough local grazing (John & Stephie Mendelsohn, 2018).

At the level of rural areas in Huíla and Namibe provinces, the livestock produced are essentially used for self-consumption, as suppliers of derivative products such as milk and eggs, as well as to be traded or to serve as a means of exchange for other goods. However, this exchange inevitably leads to the aging and annihilation of the genetic heritage of their livestock, with adverse consequences on their economic performance, since the animals traded are primarily young males and occasionally poorly productive adults and females for retirement, making the selection of older cattle.

The cattle work as a savings account that guarantees interest (birth of animals) and generates a flow of income (exchange or sale of animals). It is through the exchange/sale of animals that families obtain the goods they need, including cereals to supplement their food needs.

Fish and Coastal Artisanal Fishing

Fish resources are an important source of income for the provinces of Huila (river fishing) and Namibe (sea fishing), which has an extensive maritime border (420 km), extremely rich in biodiversity. The main marine resources to be exploited for domestic consumption and for export correspond to the various species of fish, crab, clam, mussels, oysters, among others. Currently most of the captured fish are destined for direct consumption, salting, and drying, and the rest are channelled to freezing, canning, and flour (Angola Government, 2015).

Fish are harvested in significant numbers in two areas: along the Namibe coast (see **Photo 5-30**) and in the Chana Drainage of small rivers or watercourse between Namibe and Huíla Provinces. Marine fishing is largely for commercial purposes, most of the harvests being sold elsewhere in Angola or the world. By contrast, fish from the chanas are used mainly for domestic consumption and some cases are marketed in front of the main roads.

Marine fishing takes place on three scales: largescale fishing on the high seas by foreign vessels which catch, process and directly export their harvests; local industrial fishing run by a variety of registered

companies; and small-scale artisanal fishing by fishermen living in villages and towns along the coast (John & Stephie Mendelsohn, 2018).

A variety of ships and boats are used by local industrial operations, some of the larger trawlers being registered in other countries but landing their harvests in Tômbwa and Moçâmedes where bigger companies have processing factories. About 90% of all the fish harvested by local fishing operations are sold elsewhere in Angola as frozen fish (55%), fish meal (33%) or as salted and dried fish (2%). The remaining 10% are consumed locally. The industrial sector focusses largely on sardines (Sardinella species), Atlantic chub mackerel, horse mackerel, hake and crab, while a much greater variety of fish species are harvested by artisanal fishermen. Artisanal fish harvests are normally salted and dried (John & Stephie Mendelsohn, 2018).

Most artisanal fishermen operate from Lucira, Carunjamba, Inamangando, Praia das Salinas, Bentiaba, Chapéu Armado, Baía do Baba, Mucuio, Baía das Pipas, Saco Mar, Baía do Namibe, Praia Amélia, Rocha Magalhães, Cabo Negro and Tômbwa. In the whole province of Namibe there was a total of 312 artisanal fishing boats in 2016. Fish harvested by these boats supported 5,027 families (John & Stephie Mendelsohn, 2018).

Virtually everyone living in the smaller fishing villages makes a living from fishing, cleaning, salting, drying, packing and selling fish. Fish is their core business, the boat owners, fishermen and local buyers often work loose in co-operatives or associations. Motorboats between 4 and 6 metres in length are predominantly used for fishing, while gill nets, long lines of baited hooks and baited cages for crabs are the main types of fishing gear. Their catches are sold directly to local buyers or to traders from large towns further away (John & Stephie Mendelsohn, 2018).

The fisheries sector in Namibe presents oscillating fish capture results. In 2009, the fish catches were 15,855.6 tons and in 2010 they were 29,374.5 tons, resulting in a growth of approximately 80%. However, in 2011, the results were 21,654.5 ton, which translates to a decrease of 24%. In 2012, the amount caught reached the minimum of the period under review, 11,323.1 tons, reflecting significant weaknesses such as: unsatisfactory state of the fishing fleet, high number of boats inoperative, lack of skilled labour and also the influence of external factors such as the problem of seals.

Photo 5-30: Some boats used in artisanal fishing in the Namibe Bay.

Poverty and Misery

In general terms poverty in Angola is quite serious, the statistics on poverty and misery of the rural population in Angola are generally considered unreliable and underestimated and the more specific socio-economic data, as a result of the financial crisis that has plagued the country since the fall in the price of a barrel of oil on the international market in 2014, climate change (severe droughts, and desertification) indicate an even more serious situation.

According to data from the National Institute of Statistics (2009), poor people live primarily from subsistence agriculture (76%) although they are more likely to be self-employed (83%). In 2009 poverty in rural areas across the country was 58.3%. Angola's Multidimensional Poverty Index is calculated using the Alkire-Foster method (Alkire & Foster, 2011). This method has several applications around the world, including the Global Multidimensional Poverty Index (Global MPI), published in the Human Development Report since 2010 and the National Multidimensional Poverty Index of several countries in Africa, Asia, Latin America and the Caribbean. Following this method, the Multidimensional Poverty Index for Municipalities (MPI-M) in Angola combines the proportion of the population living in poverty and the intensity of poverty suffered by multidimensionally poor people.

The Multidimensional Poverty Index presented by the National Statistical Office (2019) is composed of four (4) dimensions (health, education, housing quality and employment). The measure uses the same weighting for each dimension and the same relative weight for each indicator. The Education, Housing Quality and Employment dimensions have three indicators each, so each has a weight of 8.33%. The Health dimension has only two indicators and each has a weight of 12.5%.

The multidimensional poverty line was established at 35% of the weighted indicators. This multidimensional poverty line corresponds to a situation where a person or a household suffers deprivation equivalent to one dimension plus one indicator with average weighting. The results of the municipal estimates for the MPI-M, as well as for poverty incidence and poverty intensity, show that 13 municipalities in the provinces of Huila and Namibe present an incidence of poverty above 90%, i.e. at least 9 out of 10 people in these municipalities are multidimensionally poor. These municipalities with high levels of multidimensional poverty are distributed as follows:

- **Huíla Province** – 10 municipalities out of 14: Cacula (97%), Chibia (94%), Caconda (90%), Caluquembe (91%), Quilengues (94%), Cuvango (94%), Quipungo (93%), Chicomba (97%), Jamba (94%) and Gambos (96%).
- **Namibe Province** – 3 municipalities out of 5: Virei (94%), Bibala (91%) and Camucuio (96%).

5.3.1.14 Tourism and Cultural Heritage in Huíla

The culture sector of Huíla province has carried out work to survey, study, protect and enhance the cultural heritage, within the framework of its strategic program. Provincial Directorate of Culture of Huíla has inventoried 180 monuments and historical sites, as well as 121 Ombalas (villages of sobas) that need to be classified. They are part of these monuments and local sites of civil, military, religious, funerary architecture, historical site, historical, landscape and natural areas. The natural areas have attracted many domestic and foreign tourists are among others, the following:

- Catholic Mission of Huíla municipality;
- Building where the Provincial Directorate of Culture of Huíla operates;
- Statue of Cristo Rei;
- Chapel of Nossa Senhora do Monte;
- Building of the core of the National Assembly;

- Huíla Regional Museum;
- Catholic Mission of Jau (in Chibia municipality);
- Tundavala Gorge;
- The Hungueria waterfalls.

Besides its cultural importance, the Tundavala Gorge is also an important area in terms of biodiversity, mostly in relation to flora and avifauna. The Tundavala Gorge, which offers stunning views of the Huila plateau and Namibe, is often describe as a place to visit in the south of Angola, because of its touristic potentiality. It is located in edge of Humpata, 20 km from Lubango urban city.

Huíla province has a high concentration of hotel establishments and the like, due to the various leisure options it offers with the natural resources it holds. The Province had 799 hotel units and complementary services, until the 3rd quarter of 2013, distributed by the 14 municipalities (Angola Government, 2014). In the last ten years, this number has increased significantly due to more investments in tourism. In fact, the province has natural, cultural and socio-economic resources that, in essence, constitute values of a high tourist potential, which can be dedicated to rural areas or to tourism for cultural and urban leisure, especially in Lubango, which competes as a World Heritage Site by UNESCO (Angola Government, 2014).

The cultural and natural heritage existing in Huíla deserves a particular attention, because it has a dimension and importance that allow a very specific tourist attraction. The increasing influx of tourists from all over the world, including from Namibia, South Africa and some European countries, highlights the potential of the province, whose development of this sector is oriented towards the sustainable exploitation of resources. Stand out as tourist areas of interest of the province, the Tundavala gorge in Lubango city. From the top of the mountain it is possible to have a total and magnificent view of the rifts and part of the province.

The architectural monument known as Cristo Rei (see **Figure 5-39**), located in the Chela Mountain range in Lubango city, is 14 meters high, having a privileged view over the Lubango city. In terms of religion, the Catholic religion, is the predominant religion in the province of Huíla, practiced by 61% of the resident population, followed by the Protestant religion with 25%.

The religious institutions are integrated into the local society and continue to play a positive role in the communities of the Lubango and Humpata municipalities, in areas such as evangelisation, spirit pacification, education, religious awareness amongst local youngsters and fostering of family harmony. Churches also participate in other social events in the Huíla province.

Figure 5-39: Cristo Rei Monument in Lubango city.

The most visited cultural and tourist attractions in Huíla province are presented in **Table 5-29**. At the level of the province of Huila, more than 50 carnival groups are registered, including children, adults, and entertainment blocks.

Table 5-29: The most visited cultural and tourist attractions in Huíla province.

Municipality	Cultural and tourism sites
Huíla	
Lubango	Tundavala gorge
	Chapel of Nossa Senhora do Monte
	Cristo Rei monument

Municipality	Cultural and tourism sites
Humpata	Humpata Zootechnic Station waterfall
	Humpata mouth viewpoint
	Boers cemetery

5.3.1.15 Tourism and Cultural Heritage in Namibe

The southwestern part of Angola is one of most diverse in terms of cultural heritage. The Namibe Province includes several areas of cultural importance from north throughout the south in Namib Desert. Some of these areas are well-known and have a potential for ecotourism such as the Serra da Leba (see **Figure 5-40**), the Arco, the Piambo, Amelia, Bentiaba and Soba beaches, Iona dunes and many other important areas.

The native peoples of the Namibe province belong to the Cuvalis, Himbas, Nyaneca Humbi and Kimbaris ethnic groups, which continue to preserve their cultural traits through music, dance, rock paintings, sculpture, among other habits and customs. The Portuguese language is spoken by more than half of the population of the province (68%) with higher predominance in urban areas, where 88% of the population speaks the Portuguese language, against only 32% in rural areas. Umbundu is the second most spoken language with about 20% speakers, followed by Nyaneca and Muhumbi languages with 12% and 11% respectively.

The province of Namibe has a rich cultural heritage inherited from the peoples who inhabited the region throughout the ages, represented by paintings and rock carvings, often grouped in archaeological stations and historical sites. In the field of historical and cultural heritage, the Provincial Office of Culture, Tourism, Youth and Sports controls 39 monuments and historical and cultural sites, eight of which are classified as national heritage, namely the Fortress of St. Fernandes, Parish of St. Adrião, Government Palace, Customs Building, Tombo Tower Historical Site, Kapangombe Fort, Chitundu-Hulu and Makahama Archaeological Station.

The rock paintings stamped on Tchitundu-Hulo station, located in the municipality of Virei, were recently proposed to raise the world heritage site at UNESCO. The main cultural and religious manifestations of the province are the *Peregrinação da Igreja Nossa Senhora da Quipola* e as *Festas do Mar* which are promoted by the Government of Namibe and the Diocese of Namibe.

The Namibe Museum brings together anthropological pieces of Cuvale culture, Hereros and Coissãs (Khoisan) people, as well as the colonisation process itself, among others as articles and pieces, the space is open to visitors throughout the year.

Figure 5-40: Serra da Leba in Namibe Province.

With regard to natural heritage, in the Namibian desert can be seen the *Welwitschia mirabilis*, a symbol plant of the province, found mainly in the perimeters of the Iona National Park. In the Iona Park region there are also fossils of sharks, turtles, mosasaurs, plesiosaurs and sauropods from the upper Cretaceous, as well as the rock paintings of Chitundo-Hulu.

5.3.1.16 Ethnolinguistic Groups in Huíla and Namibe

Huíla and Namibe provinces are home to a variety of people belonging to different ethnic groups, who can be distinguished linguistically, genetically and/or tribally. Broadly, between Huila and Namibe provinces there are four major ethno-linguistic communities, namely: Nyanyeka Humbe, Ganguela, Herero and Mbundu. The following is a description of the ethnolinguistic communities.

Ganguela and Mbundu

The Ganguela and Mbundu tribes (see **Figure 5-41**) are confined to the east of Huila province. The people are traditionally farmers who also do some small animal husbandry.

In addition to the Nganguela proper, this ethnographic category includes the Lwena (Luena), the Luvale, the Mbunda, the Lwimbi, the Camachi and others. The peoples called "Ganguela" have been known to the Portuguese since the 17th century, when they became involved in the commercial activities developed by the colonial bridgeheads of Luanda and Benguela which existed at that time. On the one hand, many of the slaves bought by the Portuguese from African middlemen came from these people. On the other hand, in the 19th and early 20th century the "Ganguela" peoples furnished wax, honey, ivory and others good for the caravan trade organised by the Ovimbundu for the Portuguese in Benguela (Angop, 2022).

The Mbundu tribe (also known as Ambundos or Quimbundos) are a Bantu ethnic group that are mostly confined to the municipality of Caconda in the province of Huíla. The Mbundu speak Kimbundu and are a dominant people in the region of the Angolan capital and interior, more precisely in the provinces of Bengo, Cuanza-Norte, Malange and northeastern Cuanza-Sul (José Redinha, 1975).

Although the Portuguese engaged in trade relations with the Mbundu soon after their arrival in the Kongo kingdom, from the time they established a permanent colony in Luanda in 1576 as a base for the slave trade, there were constant revolts against the Portuguese occupation of the region, the most famous being that headed by Queen N'Jinga. The vast majority of the more than 4 million slaves trafficked abroad between the 16th and 19th centuries (especially to Brazil) were Mbundu, as this was the only ethnic group to be fully controlled by the Portuguese (José Redinha, 1975).

Nyanyeka Humbe

The Nyaneka-Humbe probably migrated to Angola around the 16th century, leaving from the southern part of the country to settle in various locations on the plateau of Huíla. The Nyanekas (represented mainly by the Mumuíla, description of which is given below), the largest subgroup of the family, are thought to have settled in the large urban centres of the northern and central sectors of Huíla province,

traditionally organized according to a matriarchal social system (under the guidance of a chief). They speak the Nyaneka language and are traditionally engaged in agro-livestock farming. A significant part of this group has lost the traditional rites, habits and customs of their culture, living nowadays according to a lifestyle of modern society, although it is still possible to identify some notable focuses of the Nyanyeka humbi tradition, in specific places in Chibia, Gambos, Humpata and Lubango.

Hereros

The Hereros emerged from a long migratory process (coming from Botswana, passing through Namibia and settling in the southwest of Angola, especially in Namibe province as shown in **Figure 5-41**) and have resulted in several subgroups, which share the same language Otjihehero. They are known as cattle breeders and herders par excellence. Their peculiar modus vivendi, very resistant in preserving the millenary cultures transmitted by their ancestors, makes this people identify themselves and be considered by the international community as indigenous people.

The Hereros are generally distinguished by their unusual appearance, which may vary due to geographical settlement and/or acculturation: they walk half-naked, covering only their most intimate parts with animal skin garments, wearing necklaces, bracelets and other adornments; women can be easily identified by their bodies covered with a mixture of animal fat (extracted from milk) and red ochre clay, leaving their skins with a reddish tinge. By tradition, hairstyles and adornments may change as the children grow and acquire different statuses; their rituals mark various stages of development (from birth, to puberty, to marriage and death), all revolving around the act of sacrificing the ox.

Khoisan Group

In the south of the Namibe province and north of the Huíla province (see **Figure 5-41**) are found in small numbers people linked to the ethnolinguistic group Khoisan (non-Bantu families), one of the oldest ethnic groups to inhabit the southwest of Africa). This is a group of hunters also known as Bushmen, who still preserve nomadic habits, customs and habits of hunters and gatherers of wild fruits. Like the Hereros in Iona National Park, the Khoisan are also considered by the international community as indigenous peoples.

Figure 5-41: Ethnolinguistic communities in Angola. **Source:** José Redinha (1975).

Important sub-groups of the Nyanyeka Humbe and Hereros ethnic groups, below is a description of the Mumuílas and Mucubais tribes. It is important to note that a large part of the residents (people) of the Huíla and Namibe provinces belong to these two ethnic sub-groups (Muílas and Mucubal). The Mucubais tribe are found mostly in the Namibe province while the Mumuílas are in the Huíla province (Lubango, Chibia and Humpata municipalities).

Mumuíla Tribe

The Mumuíla tribe are people stemming from the Nyaneka-Nhkumbi ethnolinguistic group spread throughout Huíla province. In the 16th century, the Nyanekas were shared into two important kingdoms: the Kingdom of Huila and the Kingdom of the Humbi, which were part of the famous "Kingdom of Mataman", which comprises the history of all the peoples who inhabited, what are now the provinces of Huila and Namibe (Angop, 2021). They are peoples of solid culture and extremely firm ideology with immeasurable cultural resistance. The Mumuílas still maintain the ancient customs and traditions of their ancestors, are also the main source of sustenance (Angop, 2021). Women in general have the part of the body adorned with *samakala* cloths, typical braids of the tribe, the neck surrounded with beads of various colours, which also serve to adorn the head, the trunk, where the necklaces are placed forming the mathematical sign of times (X), as well as bracelets representing the local transcendental cultural wealth, to be preserved and valued (see **Photo 5-31**). With little clothing on the body, due to cultural imperative, these women attract the eyes of most tourists, some unaware of the uses and customs of the Nyaneka-Nhkumbi ethnolinguistic group (Angop, 2021).

Photo 5-31: Mumuíla tribe. **Source:** Ugo Pereira, 2021.

Mucubal Tribe

The Mucubal tribe, also known as Mucubai, Mucubale or Mugubale, are people stemming from the Subgroup of Herero of the Southern Namibe Desert, are semi-nomadic depending essentially on family agricultural subsistence and cattle. Administratively its territory is located in the Namibe desert, bounded to the north by the mountains of the Serra da Chela and to the south by the Cunene River (Angop, 2021). The Mucubais practice a nomadic life due to the constant demand for water that the Namibe desert lacks, due to lack of rain. This community is undoubtedly, like the Nyaneka-Nhkumbi of Huíla province, a reference of perseverance and faith.

It is an unmistakable people, which differs from civilized peoples with their typical bracelets, beads and sheepskin turban, which are indispensable ornaments in women (see **Photo 5-32**). Men, on the other hand, have different types of hair, each with its meaning, and during pasture they carry knives and spears. In the clothing aspect, the Mucubal tribe has a culture similar to the Mumuilas, Mucuissis, Muihimba, and mohacahonas peoples (Angop, 2021).

The search for water and food depends on a transhumance process, which can lead them to travel more than 50 km a day, facing with ancestral wisdom any eventual danger of the desert. From the animal's skin derives the bed, from milk to food, from faeces mixed to clay, the support of houses and carcass to homage to the dead (Angop, 2021). The funeral ceremonies are done with the transport of the corpse on a skin and after burial is placed on the cross more than five horns of oxen, which symbolizes wealth.

In the Mucubal community, the higher the number of cattle, more respectable will be the owner, hence the whole social organization revolve around this animal species. Since its earliest generations, cattle have become a currency of exchange and monetary transaction. Each Mucubal has a small village (*kimbo*) (several vats arranged in circles, where the patriarch brings together all women and family, living in harmony and working in the field). They marry within the same group, since they do not allow crossings with other groups, they are polygamous. The house is made of sand, with ox manure, complemented by sticks that make the door paper. Despite the rudimentary material, the spaces are safe and, according to reports, can resist the rain, without any infiltration.

Photo 5-32: Mucubal family in front of the National Road No. 280 (transhumance space).

5.3.1.17 Transhumance in Namibe and Huíla

In Huíla and Namibe provinces there are some routes used by ethnolinguistic communities during periods of transhumance[8]. In general, between the months of June, July and August, communities of Hereros, Mumuílas and Mucubais tribes during the transhumance phase use these routes to graze cattle, sheep and goats (see **Figure 5-42**).

During transhumance, the choice of grazing fields depends on where the best grass, pasture and water are available. In good years, when water and local grazing last longer in the dry season, movements to other grazing areas may be for short periods and involving short distances. In very dry years, however, animals may use pasture and water in distant places and for many months.

[8] Transhumance is not an economic activity. It is carried out during drought periods, when cattle herders look for places with water and green grass to feed their animals (e.g., cattle, sheep, goats, etc.).

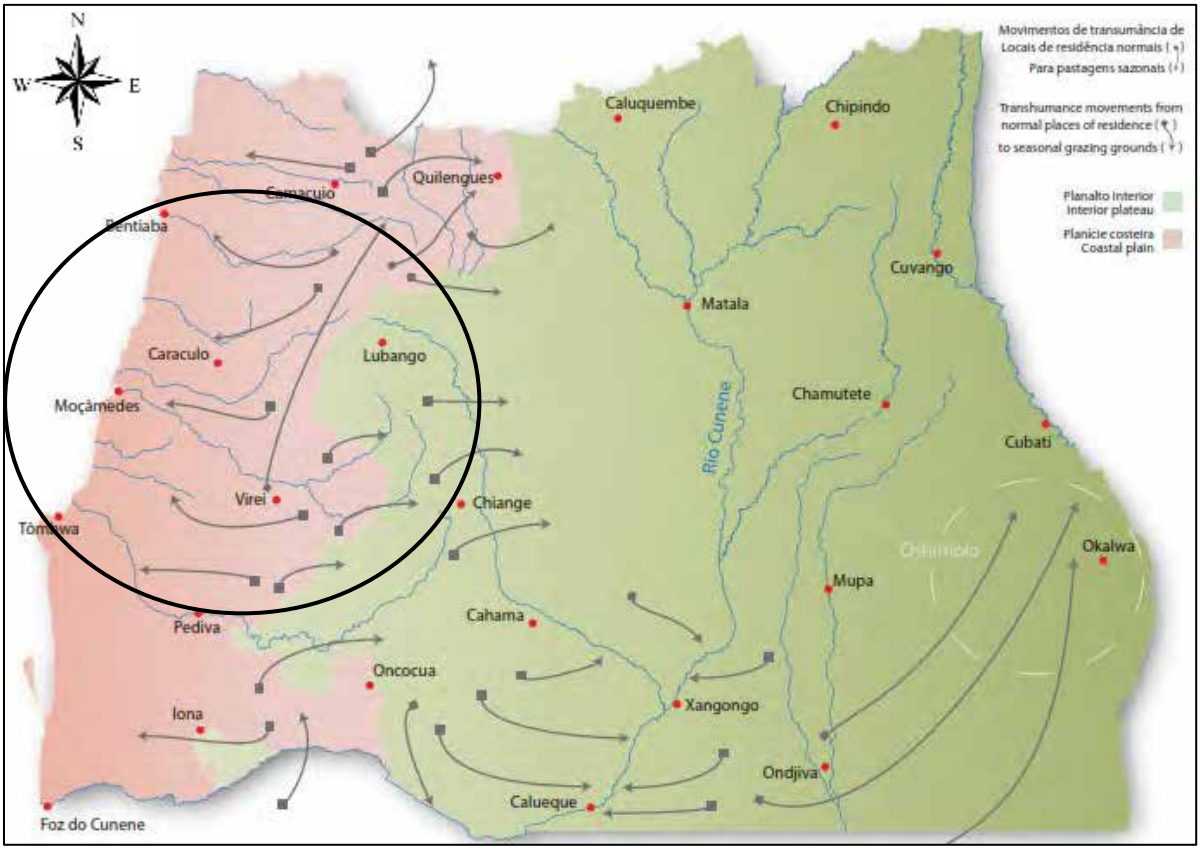

Figure 5-42: Transhumance movements in Huíla and Namibe provinces.

During the transhumance period, the shepherds spend the night in the open air in the small wood fenced areas, in the small caves and in *cubatas* or grass houses, whose height does not exceed 1.5 metres (see **Photo 5-33**).

Photo 5-33: Houses used during periods of transhumance.

5.3.1.18 Palaeontology and Archaeology in Huíla and Namibe

The palaeontology of Angola has received slightly more attention than its archaeological record, mainly as a spin-off from the geological investigations, driven by the energy and mining sectors, especially the petroleum industry. Angola has recently been the centre of attention within the palaeontological world with the discovery of very rich fossiliferous Cretaceous deposits along its south-western coastline of Namibe province. This area has also seen the discovery of the agreeably named Cretaceous Mosasaur *Angolasaurus*, and its much bigger and later compatriot *Angolatitan*, *Angolasaurus bocagei*, recovered only from the *Tadi Beds Formation*, and sharing its habitat with the *tylosaurine* species *Tylosaurus* (formerly Mosasaurus) *iembeensis* and the shallow-water turtle *Angolachelys*. Indeterminate *halisaurine* and *plesiosaur* remains have also been recovered in Huíla and Namibe provinces.

Of particular interest to this study, is the discovery of hominid remains in the 1940s, 1960s and 1990s, at the Leba Caves, which have been used commercially for the mining of limestone since the early 1940s, approximately 20 km west of Lubango. The palaeontologist Dr. Raymond Dart reported on a possible find of several hominid skulls here as early as the 1950s (see **Figure 5-43**).

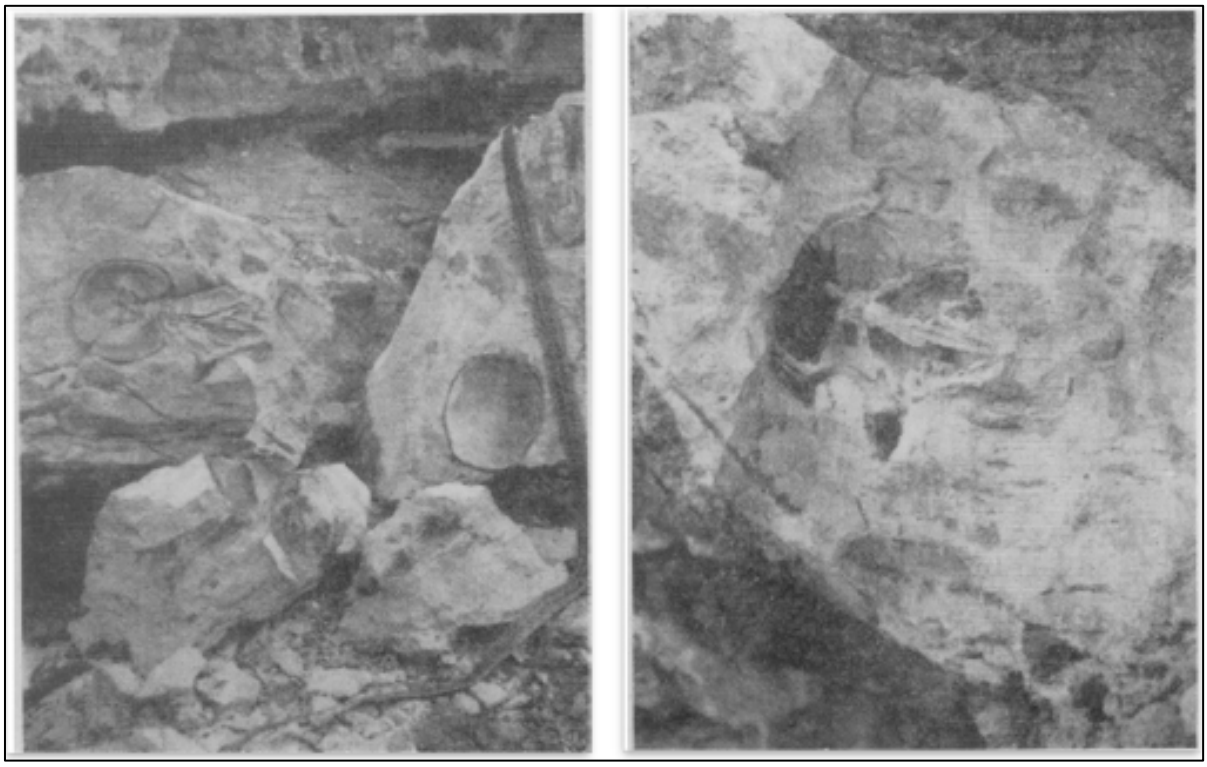

Figure 5-43: Leba Cave deposits.

Source: R. Dart, 1950.

There is more information available for the southern Angolan inhabitants and archaeology. The southern Angolan people were called the Khwe and were part of the Khoe language group. Research has shown that the Khwe people developed as a distinctive group approximately 2,000 years ago and are estimated to have adopted a pastoralist existence somewhere between 1,000 Before the Common Era (BCE) and 500 BCE. The Khoe people were a fairly isolated group.

Much of the information currently available can be attributed to the 1960s work of Desmond Clark in Angola. Clark shows that after the beginning of the Late Pleistocene (126 000 +/- 5 000 YBP), three distinct cultural zones began to appear in Angola. The earlier Stone Age populations tended to live on the edges of the humid forest country. In the middle and later Stone Age, a tripartite cultural variability is found with a Lumpemban and Tshitolian tradition using core axes and projectiles in the Congo Basin. Stillbay/Pietersburg and later, Wilton, toolmakers lived in the Zambezi basin, while desert industries of broadly Namibian type is found in the southern arid regions.

The above is a very short synopsis of the Stone Age of Angola. The well-known archaeologist and celebrated author Brian Fagan (1966) comments on the work of Clark and states the following: "*But Clark's preliminary surveys serves to show the enormous gaps in the archaeological record awaiting investigation by survey and excavation. Angola was one of the most important areas of prehistoric Africa and as such merits more attention from archaeologists than it has hitherto received*".

During fieldwork in July and August 1971, G. D. Gibson collected a few hundred Middle Stone Age (MSA) artefacts in the immediate vicinity of the Munhino Mission (Kapangombe region), Huila Province, Angola. Although this sample consists entirely of disturbed surface remains, it is of some interest since it represents, to the best of our knowledge, by far the largest collection of MSA material from south-western Angola. Gibson states" …*With the possible exception of Humpata Cave* (Franga, 1964)*, we are not aware that any such assemblage has been uncovered in a sealed stratigraphic context, and for this reason the MSA of south-western Angola remains very poorly understood. The abundant surface remains around the Munhino Mission suggest that a systematic survey of this region might prove rewarding*…" (Gibson, G.D., *et.el*., 1971). From the above, it is obvious that a verdict regarding the

heritage sensitivity in terms of Stone Age deposits of any area in Angola, cannot be based on the scant information available at present.

5.3.1.19 Infrastructure of Transport in Huíla and Namibe

In the context of southern Angola, Huila holds a relevant strategic position, enhanced by its air, railway, and road connections. The improvement of these systems contributes decisively to the development of a local and regional economic base. The road network in Huila province is in a poor state of conservation (see **Figure 5-44**). Of the more than 1,600 km of roads belonging to the so-called core network, by 2009 only 553.8 km had been upgraded and partially asphalted.

Regarding the airport network, the province of Huila has an operational infrastructure and in perfect conditions for landing and take-off that provides the frequency of flights. The international airport of Mukanka, presents a national and international passenger terminal, with an area of 6,500 m^2, with a Control Tower, a cargo terminal with 4,000 m^2, an auxiliary runway with 2,800 m by 30 of width and a main runway with 3,300 m. This airport also has an aircraft parking apron with 375 m by 125 m, a Building for Firefighting Service and parking for 200 vehicles and road access.

Regarding the rail network, there is the Moçâmedes Railway, which connects the provinces of Namibe, Huila, and Cuando Cubango. With a length of 907 kilometres, the gauge 1,067 m. It has three (3) special stations in the cities of Namibe, Lubango and Menongue.

Figure 5-44: Road network of Huila province.

Source: Estudo de Mercado da Província da Huíla, 2018.

Namibe has some transport infrastructures that serve to connect it to the other provinces of the country, the most used being the highways, which are concentrated in two main trunks: the National Road (EN) 100, north-south, connecting Namibe to Benguela province and the Republic of Namibia, and the EN-280 road, west-east, which connects it to Huíla. There is also the Tômbua Provincial Road, the EN-104 (Bibala region), EN-105 (Bibala region) and the EN-292, the latter serving the city of Virei, interconnecting it with Huíla.

Another fundamental means is the Moçâmedes Railway, a very safe transport route that transports passengers and cargo on the stretch to Cuando-Cubango, with the Port of Namibe as its exit, the logistical facility that forms the province. Another port that exists, although smaller, is the Port of Saco.

Built in 1957, with the aim of ensuring imports and exports from the south of the country, serving the provinces of Namibe, Huila, Cuando-Cubango and Cunene, the Commercial Port of Namibe is one of the province's major infrastructures. It has a surface of 135,000 m^2 and has 875 m of continuous pier, divided into zones, according to its depths. It operates 365 days a year and 24 hours a day. It has been significantly improving its productivity levels. The time spent by ships in Porto has been experiencing a sharp reduction, and their accessibility is maritime, without restrictions, due to the effect of tides. The area of the port enclosure is served by 15 km of railways that connect them to the railway line of Moçâmedes (Angola Government, 2021).

The province also has the Welwitschia Mirabilis International Airport, popularly known as the airport of Moçâmedes, is the main airport in the province of Namibe and of great importance for the region due to its strategic position. It is located in the city of Moçâmedes at a distance of 7 km from the centre.

5.3.1.20 Telecommunications

Regarding the telecommunications sector, the information and communication access services in operation in the city of Lubango and Moçâmedes are: telephone services provided by the two main mobile telephone operators in the country, namely Unitel and Movicel; radio stations with Radio Lubango/Moçâmedes radio station; and Television with the Public Television of Angola (TPA), with emission of channels 1 and 2 with the signal captured by satellite and the Private TV channels TV Zimbo and ZAP. There is also a delegation from the Angola Press Agency and the circulation of the Angola newspaper, sports and private forum newspapers.

5.3.1.21 Industrial Sector in Huíla and Namibe

Huíla province has been undergoing changes that create the conditions for a new business dynamic, namely due to improved accessibility, tourism development and the emergence of logistics platforms

and the production of agricultural equipment and utensils. Most of Huila's land area is devoted to agriculture and livestock, and these are two of the most propitious sectors for the development of industry. The geological and mining sector in the province has been gaining prominence in almost all the municipalities due to the strong pressure that the real estate market, civil construction and individual housing construction exerts on both mechanised and artisanal exploration.

According to the Provincial Directorate of Industry, Geology and Mines, there are 41 companies operating in this branch in the province, with Ornamental Rock exploration being the most representative, with 15 companies in activity, followed by the crusher branch with 13 companies.

The province's industrial park is concentrated in areas close to the city of Moçâmedes, working with the processing of meats, skins and milk products, in addition to the semi-processing of fruits, oils and products from the land. Other items produced are beverages, dry foods and vessels' inns. Industrial mineral extraction is highlighted in the following minerals: gold, copper, manganese, chromium, tin, lignite and marble (Angop, 2020).

The mineral resources available to the Province can be used to obtain foreign exchange for the country and in the development of other activities in the internal market, namely civil construction and manufacturing. Marble (Caraculo and Virei) and other base metals such as nickel, cobalt, fluorite, platinum, gold, uranium, copper and zinc (Curoca) correspond to a priority in the award of exploration concessions. These resources could contribute in the medium and long term to the socio-economic development of the country and in particular the province of Namibe. The construction materials of mining origin (gypsum, sand, limestone and clay) can be explored in the province, reducing the lack of these materials for civil construction and paving of streets.

5.3.2 Socio-economic Profile in the Transmission Line Route

The TL route will cross mostly rural regions with the probability of existence in the easement strip (45 m) or surrounding area of ethnolinguistic communities and/or floating communities (e.g., the Mumuílas, Mucubais and Hereros tribes), houses of different types, ploughs with the presence of products, grazing areas, transhumance points of the ethnolinguistic communities, cultural sites and landscapes and public and private infrastructures of high interest and commercial value. A varied

methodology was used to map the social, economic and cultural issues along the boundary of the Project's route and the surrounding area (during rainy and dry seasons):

- Conducting formal interviews with key informants from rural settlements and managers of public and private infrastructure mapped on the Project route in order to understand the opinion and behaviour of the interviewees in relation to the Project;
- Stakeholder engagement meetings with the settlements along the transmission line 1 Km buffer to define the social profile of each (from Nombungo substation site to Aída settlement);
- Mapping and characterisation of the main socio-economic activities along the route, namely: identification of agricultural areas, livestock areas, fishing areas, transhumance points, as well as the existence of commercial infrastructures, especially farms;
- Mapping of ethnolinguistic communities and places designated as historical and cultural heritage in the provinces of Huila and Namibe (e.g., settlements with the presence of Mumuílas, Mucubais and tribes, churches, kings' cemeteries, rock paintings, spaces, buildings or infrastructures, etc.);
- Mapping of the essential infrastructures of each settlement: schools, hospitals, medical centres, drinking water collection, and electricity distribution points, etc.
- Mapping of the main points of ecosystem service provision: rivers, lakes, ponds, collection points for wild fruits, timber and medicinal plants, etc.

The procedures carried out for the mapping and characterisation of the social profile of each settlement were done by combining techniques for quantitative (data) and qualitative indicators (information collected *in situ*), as well as direct observation of the communities' livelihoods, the recording of photographic images and geographical coordinates of points deemed sensitive and of interest along the Project's route.

The social survey and mapping of existing infrastructure on the Project route was carried out during 26th to 30th April 2021 (rainy weather), where 12 rural settlements and/or residents close to the easement area of the proposed preliminary route were visited and interviewed or interviewed in core or key informant groups. The open interviews aimed to collect information on the social baseline of the settlement to build a social profile of the communities. All interviews were conducted orally in Portuguese. To get a good idea about the social baseline of the rural settlement available reports, data and statistics of the region were also used.

Table 5-30 presents the list of traditional leaders and other keys informants interviewed in key group meetings in the respective rural settlements during 26th to 30th April 2021. In all the meetings with the key groups (traditional authorities, farmers, traditional birth attendants, vulnerable women, religious leaders, nurses, teachers, youth, and local government representatives, etc.) women and elders were always invited to participate.

Table 5-30: List of individuals interviewed.

Name	Function	Settlement
João Manuel Mulimbi	Poaires settlement coordinator	Poiares
José Luís Kalapo	Deputy settlement coordinator of Poiares	Poiares
Ntembele Kapakata	Poiares resident	Poiares
Luís Manuel Malumani	Kapalanga settlement coordinator	Capalanga
António Joaquim Sapalo	Heva settlement coordinator	Heva
António Francisco Camati	Jamba I settlement coordinator	Jamba I
Artur dos Santos	Jamba I, Jamba 2 and Camponês traditional authorities (Soba)	Camponês
José Manuel Kolela	traditional authorities (Soba)	Jamba I
José Emílio Paulo	Jamba II settlement coordinator	Jamba II
Raimundo Tavares	Jamba I settlement coordinator	Jamba I
José Mateus Kassauto	Calumue settlement coordinator	Calumue
Geraldo Cambinda	Aida sector 18 settlement coordinator	Bairro Aida sector 18
Fernando Rafael	Aida headquarters coordinator	Aida headquarters
José vitate	Palanca traditional authorities (Soba)	Palanca headquarters
Domingos Seculo	Tchiwaya resident	Tchiwaya
Belinha Faria	Tchiwaya resident	Tchiwaya
Agostinho Tchiputo	Onculuvala settlement traditional authorities (Soba)	Onculuvala
Yuri Chivanja	Communal Administrator of Palanca	Palanca headquarters
José Hequele	Communal Administrator of Humpata	Humpata
Carlos Xavier	Deputy Municipal Administrator of Humpata	Humpata
Maria Maio	Director of Social Services of the Communal Administration of Arimba	Arimba
João Chissingui	Deputy Communal Administrator of Arimba	Arimba

The 15 settlements interviewed in key informant groups from an administrative point of view seven belong to the municipality of Lubango (Nombungo, Mateta, Mavanda, Poiares Muhaha, Poiares Kapandi, Tchiwaya and Kapalanga), seven belong to the municipality of Humpata (Calumue, Heva, Kamba, Palanca, Jamba I, Camponês and Onculuvala), and one belongs to the municipality of Moçâmedes (Aida neighbourhoods). Except for the peri-urban neighbourhoods consulted (Calumue, Palanca, Camponês and Aida), the other communities are living on the verge of extreme poverty due to the severe droughts in the centre-south region of the country. However, they face poverty with a smile on their face and hope in family farming, livestock, exchange of goods and the promises of various government institutions, non-governmental organisations, and church institutions.

5.3.2.1 Demography

The Project, as already mentioned several times, will cross the territorial limits of two provinces (Huíla and Namibe), passing through four municipalities (Lubango, Humpata, Bibala and Moçâmedes) and at the level of municipalities it should cross the administrative division of eight communes (Hoque, Arimba, Lubango, Palanca, Humpata, Kapangombe, Bibala, and Moçâmedes). From a demographic point of view, according to the General Census of Population and Housing data 2014, the Project route region has an estimated population of approximately 1,060,169 inhabitants (509,802 male and 550,367 female) as illustrated in **Table 5-31**.

Table 5-31: Demographics of the population present in the Project route by commune.

Communes along TL route	Total		
	Total	Men	Women
Hoque	64,475	30,837	33,638
Arimba	46,084	22,206	23,878
Lubango	581,180	278,659	302,521
Palanca	20,413	9812	10,601
Humpata	35,687	17,091	18,596
Kapangombe	14,316	6827	7489
Bibala	25,416	11,974	13,442
Moçâmedes	272,598	132,396	140,202
TOTAL	**1,060,169**	**509,802**	**550,367**

Source: INE, 2014.

According to the social survey carried out (rainy and dry seasons), the 15 rural settlements have an estimated total population of approximately 53,340 inhabitants, 25,710 male and 27,846 female (see **Table 5-32**), with an estimated population density of approximately 450 inhabitants per km^2 for the settlements in the municipality of Lubango, 80 inhabitants per km^2 for the settlements and neighbourhoods of the municipality of Humpata, and 21 inhabitants per km^2 for the Aida neighbourhood in Moçâmedes city. The masculinity rate at the level of rural communities is approximately 93%, there are on average 93 men for every 100 women.

Table 5-32: Demography of the rural settlements in the area of influence.

SETTLEMENTS/NEIGHBOURHOODS	MALE SEX	FEMALE SEX	TOTAL
Nombungo settlement	843	908	**1,751**
Mateta Settlement	1,070	1,246	**2,316**
Mavanda	1,138	1,178	**2,316**
Poiares Muhaha and Kapandi Settlement	2,389	2,741	**5,130**
Tchiwaya Settlement	4,557	4,975	**9,532**
Kapalanga Settlement	476	558	**1,034**
Calumue neighbourhood	113	118	**231**
Heva and Kamba Settlements	2,702	2,930	**5,632**
Palanca neighbourhood	4,800	5,200	**10,000**
Jamba I Settlement	871	940	**1,811**
Camponês neighbourhood	4,800	5,280	**10,080**
Onculuvala Settlement	470	517	**987**
Aida neighbourhood	1,200	1,320	**2,520**
TOTAL	**25,710**	**27,846**	**53,556**

Source: Holísticos, 2021.

Being mostly sub-groups of the Nyanyeka Humbe and Hereros ethnic groups, the communities of the Huila and Namibe provinces mapped along the Project corridor have the same age structure. The age structure is profiled by a broad base of the pyramid, which corresponds to the younger population and a narrow top of the pyramid which represents the older population. According to information provided by the traditional authorities (Sobas), the average age of the population is around 20 years, the median being 15 years. The average age of women is 21 years while the average age for men is 20 years.

The age structure of the population in the Project corridor is in general characterised by an extremely young population; the population aged 0-14 years constitutes more than 50% of the total resident population. The combination of the age groups 0-14 years old and 15-24 years old represents an extremely young population, accounting for 67% of the resident population. The gap between young and elderly is enormous, where only 2.7% of the population is aged 65 or over.

According to the analysis, it was concluded that the age structure of the communities mapped on the Project route is similar to that presented for rural communities at the level of Huila and Namibe provinces as illustrated in **Graphic 5-1** and **Graphic 5-2**.

Despite the migration of youth from rural settlements in the Lubango, Humpata and Moçâmedes region for school, cultural (transhumance to livestock), social and economic reasons (lack of land to cultivate, family conflict, lack of essential infrastructure, search for formal and informal employment and social welfare for the family), the age structure of the population is still characterised by a mostly young population, with the presence of many children in the settlements. The gap between young and old is quite huge, with very little presence of people above 65 and above in rural settlement. In order of preference, young people from the settlements studied migrate to the cities of Lubango, Ondjiva, Moçâmedes, Benguela, Lobito and Luanda.

However, the key groups interviewed reported that people over 65 years of age are often invited by family members (sons, brothers, nephews, grandchildren, etc.) to leave the settlements due to the need for support to address physical and emotional health issues. This also reinforces the surprising fact that during the interviews there was a greater representation of males in the older age groups, as they are more resilient in terms of leaving the area of origin, contrary to the women. The greater number of men in the older age group is especially surprising, as many are integrated in the council of traditional authorities (e.g., Sobas, Seculos, Secretaries, Councillors, etc.).

5.3.2.2 Ethnicity and Religion

The settlements and neighbourhoods belonging to the municipalities of Lubango and Humpata (Nombungo, Mateta, Mavanda, Poiares Muhaha, Poiares Kapandi, Tchiwaya, Kapalanga, Calumue,

Heva, Kamba, Palanca, Jamba I, Camponês and Onculuvala), the populations are predominantly of ethnic Nyaneca-Humbi, although due to some cultural similarity there are groups belonging to ethnic Ovimbundu to a lesser extent.

The language most spoken in these settlements is Nyaneca-Humbi. Attracted by the edaphoclimatic conditions of the region, considered sustainable for agriculture and pastoralism, in some settlements and neighbourhoods the team found people belonging to the Muílas, Mucubal, Nganguela, Cuanyama, Tchokwé and Bakongo ethnic groups, although in extremely reduced numbers. Many os them have adapted to the cultural and lifestyle of Nyaneca-Humbi group.

The resident population of the Aida neighbourhood in Moçâmedes city is predominantly of Ovimbundu ethnicity, with a mixture of ethnicities of Nyaneca-Humbi, Mucubal, Ambundu, Nganguela, Fyote, Tchokwé and Cuanyama origin due to its geographical proximity to the urban centre of Moçâmedes (capital of the province of Namibe). The ethnic groups mentioned in the region (Nyaneca-Humbi, Muílas, Ngangela, Cuanyama, Tchokwé, Fyote, Ambundu, and Bakongo) have the same customary habits, are essentially dedicated to subsistence family agriculture, livestock (raising cattle, pigs, goats and chickens), forestry (in the manufacture of coal), alcoholic drink production, poaching and informal trade. Except for the Mucubal ethnic group (see **Photo 5-32**) that is exclusively dedicated to livestock (cattle breeding) and the activities inherent therein such as the production of sour milk.

There are several religious sects, integrated in the rural communities near the Project route, namely: Catholic Church, Bom Deus Church, Seventh Day Adventist Church, and several dependents of the Pentecostal Church and the Evangelical Congregational Church in Angola (IECA) (Protestants). The Catholic and the Seventh-day Adventist Churches are present in all settlements. The Catholic, IECA and Seventh-day Adventist churches congregate the largest number of believers and all of them have fulfilled their role of evangelising the local population, pacifying spirits, controlling the anxieties of young people, donating clothing and various food products, including necessities, and raising the state of consciousness of the population through education and social mobilisation. In some villages, the churches have also given up their space for the installation of literacy centres for adults, marriage counselling and the provision of space for the creation of classrooms for beginners and primary school.

5.3.2.3 Housing

Figueira (Tchiwaya settlement region), Calumue, Kamba, Camponês and Aída neighbourhoods are probably the fastest growing neighbourhoods in the provinces of Huila (Lubango and Humpata cities) and Namibe (Moçâmedes city). The houses are mostly made of permanent construction material (blocks and bricks), plastered, painted and with roofs of zinc sheets, tiles, fibre cement sheets and other materials (see **Photo 5-32** above). In the Calumue, Palanca and Camponês neighbourhoods the emergence of houses with the building typology of one to two storey buildings was observed.

In the settlements of Nombungo, Mateta, Mavanda, Poiares Muhaha, Poiares Kapandi, Tchiwaya, Kapalanga and Onculuvala, the team observed mostly houses built with zinc sheeting material (sheet-metal houses) and others with adobe material burnt with grass, some with zinc sheeting and others with straw, followed by cubata houses (straw houses with a height of no more than 1.5 metres) (see **Photo 5-34** below). The rudimentary structures that serve as dwellings reflect both the poverty and misery that plague the region and the nomadic lifestyle of many people.

The houses have on average two divisions (a bedroom and living room) the kitchen and the latrine are always outside and slightly away from the houses for cultural reasons. As there is no electricity from the public grid in the communities, most of the houses do not have domestic appliances (e.g., refrigerators, television, radio, air-conditioners, etc.). The average household is composed of four to five people, including the couple and minor children.

In some settlements (Nombungo, Mateta, Mavanda, Poiares Muhaha, Poaires Kapandi, Tchiwaya, Kapalanga and Onculuvala), men with larger numbers of cattle and wives opt to build *quimbos* or *ombalas* (several dwellings in a single enclosed space with a fence), some occupied by other wives, married children and their wives, or perhaps other relatives. In some cases, groups formed by several houses and housing large extended families become settlements also. The man (or a direct descendant) who built the first *ombala* or *quimbo* is usually the leader of the settlement and extended family. The houses and *quimbos* in the rural areas do not possess any documents, namely: urban land registry, land title for construction, nor do they pay taxes to the State.

The Palanca, Calumue and Camponês neighbourhoods, for presenting peri-urban characteristics, some houses and land, including farms, have titles of surface issued by the Municipal Administration of Humpata and other houses have licenses or authorizations for the construction of houses.

Photo 5-34: Typologies of houses in the villages studied.

5.3.2.4 Land Use and Occupation

The habitability conditions and land use along the settlements close to the TL Project route is characterized by definitive constructions (Calumue, Palanca, Camponês and Aída neighbourhoods) and

rudimentary constructions (Nombungo, Mateta, Mavanda, Poiares, Tchiwaya, Kapalanga, and Onculuvala settlements), with an area with strong urban growth in the Calumue and Palanca neighbourhoods, and industrial growth in the Figueira region (Tchiwaya settlements region).

There are two regimes for land acquisition or occupation applicable to the region, namely the legal regime and the traditional regime. The legal regime to access land ownership for housing construction and implementation of agro-livestock projects is done through an application addressed to the Municipal or Communal Administration, although the consent of traditional authorities is required. In terms of land reserves, there are two areas awarded for such, namely: Humpata land reserve (agrarian zone) and Figueira land reserve (Industrial Development Pole of Lubango).

Under the traditional regime (managed by traditional authorities), most of the residents of the settlements Nombungo, Mateta, Mavanda, Poiares, Tchiwaya, Kapalanga and Onculuvala acquired the land by family inheritance, based on customary law (in which the son or nephew inherits a part of the family's plot of land, which may be from the grandfather or grandmother, progenitors or uncles, etc.). For natives and other interested parties there is also the practice of requesting land from the traditional authorities, if it is for building houses or creating ploughs. The legalisation of the land granted by the traditional authorities is the entire responsibility of the applicant, so the Sobas only issue a declaration of cession, however, this does not confer any type of possession to the beneficiary, nor does it mean that the plot is already legalised. The declaration must be taken to the Municipal Administrations (Humpata, Lubango, Bibala and/or Moçâmedes) to legalize the land transferred, however, most locals do not follow this practice.

The function of traditional authorities in land management is directly related to the system of social representation, namely: they preserve the right of all communities members to have access to the plot of land to cultivate; they ensure for members of the communities who are absent, the right to return to cultivate and the houses when they return, this applies also to their heirs; they give land to non-native people of the settlement, provided that the interested parties build their houses, ploughs or projects respectively. However, in some settlements due to lack of space to cultivate, only the natives have access to land for agrarian production, and the others have to negotiate with landowners to practice agriculture or grow livestock.

On the project route, people have a preference to acquire land near roads, places with health and education services, areas subject to flooding, near rivers, and groundwater that provide them with water and spaces to grow food and graze their animals. In the region of Aida neighbourhood, people prefer occupying spaces along the Giraúl and Bero rivers, where they grow and sell their produce in front of the National Road no. 280. During the fieldwork for the rainy and dry seasons, it was noticeable to observe that some settlements (Mateta, Mavanda, Poiares Muhaha, Calumue, Heva, Kamba, Palanca, Jamba I, Camponês and Onculuvala) were growing, in terms of size and emergence of housing, and two (Kapalanga and Tchiwaya) were shrinking due to the access roads, which are degraded.

5.3.2.5 Livelihoods and Health

The 15 rural settlements studied (see **Table 5-32**) from a socio-economic point of view are extremely poor. According to interviews in key groups (traditional authorities, nurses and teachers), poverty indicators related to employment, financial status, education, and access to basic services are quite critical and seriously alarming (see **Photo 5-34**).

The quality of life and social well-being of the 15 settlements near the East Lubango site, New Namibe site and transmission line Project route depends directly on the income from agricultural production and the ability to sell their produce to the cities of Humpata, Moçâmedes, Bibala and Lubango. In this context, due to the low purchasing power of most of the residents and because they all produce the same products, it is observed that all housing is precarious, generally made of burnt cob and grass, with the exception of the Calumue, Palanca, Camponês and Aida neighbourhoods. Furthermore, the residents demonstrated that they lack the economic power to acquire the products in the food basket, due to the rising prices of products in the formal and informal markets in the cities of Lubango, Humpata and Moçâmedes.

Communities have their well-being and social comfort enhanced by essential public services such as education, medical and medication assistance, access to appropriate water and electricity. However, these services are practically non-existent in almost all settlements.

All interviewed communities are essentially dedicated to subsistence family farming, pastoralism, forest exploitation (charcoal, wood and wild fruits), artisanal exploitation of inert materials and retail

trade, where foodstuffs, alcoholic beverages and industrial and artisanal soft drinks and agricultural products are sold (see **Photo 5-36**). The cultivated fields (ploughs) are in the areas adjacent to the residences and are characterised by being essentially family subsistence ploughs, where the size of the ploughs is quite varied. Although they are mainly booty production (rain dependent), it is also notable the presence of vegetable gardens or *naca* (dry season) near the rivers that cross the locality.

The main agricultural products grown in the region are corn, cassava, sweet and reindeer potatoes, millet, sorghum, cabbage, cabbage, lettuce, pumpkins, peas, carrots, onions, beans, sugar cane, aubergines, garlic, spinach, peppers and various legumes, among others (see **Photo 5-28** above). Alongside these crops, they also produce fruit such as oranges, lemons, tangerines, guavas, melons, strawberries, bananas, pears and mangoes. Farmers who cultivate in naca can produce most of the agricultural crops throughout the year, and with guaranteed financial return.

The basis of the population's diet is corn cassava with beans, beef and game and sour milk. The products of fishing and hunting, although on a very small scale, complement the diet.

Photo 5-35: Main economic activities developed in the villages studied.

About livestock, in the settlements studied there are some families with a strong potential for raising cattle, goats, pigs, sheep and chickens, cattle being the main wealth of the ethnic group Nyaneca-Humbi and Mucubal peoples. The existence of corrals in each of the *quimbos* was evident, which suggests that cattle breeding is one of the main traditions of these peoples (see **Photo 5-29** above), with animals providing food, income, financial savings, transport, as well as wealth and social status.

The project route may cross transhumance spaces (from Kapangombe to Caraculo in Namibe province), the choice of grazing fields in the region depends on the availability of the best grass, pasture and watercourse quality. In good years, when water and local grazing last longer in the dry season, movements to other grazing areas may be for short periods and involving short distances. In very dry years (July and August months), however, animals may use pasture and water in distant places and for many days. Cattle herders travel distance of over 100 Km.

Trade in agricultural products, livestock products, forestry products (mushrooms, exotic fruits, and charcoal), aggregates (stones, rocks and sand for construction, etc.) and cosmetics (*Ximenia* oil or simply *mumpeque* oil) also constitute another means of subsistence for the 15 communities present along the route of the Project's transmission line. In many cases, producers also go directly to the informal markets, in particular the Mutondo market in the north of Lubango and the Mangueiras market below Serra da Leba (see **Photo 5-36**).

Photo 5-36: Mangueiras Market (below Serra da Leba).

Poaching activity is registered in the settlements of Nombungo, Mateta, Mavanda, Poiares Muhaha, Poaires Kapandi, Tchiwaya, Kapalanga and Onculuvala, although the number of resident hunters is extremely small and they resort to the activity only during the dry season (June, July, August and September), when agricultural production is drastically reduced. The main species of animals captured in the region are cane rat, monkey, golungo, paca and porcupine. Products are used for food and sold on the main roads in the region (EN 280).

Some residents present in the Mavanda settlement and Aída neighbourhood are dedicated to river fishing and artisanal fishing, undertaken in the Moçâmedes bay in the Sacomar region. The main fish species caught in the region are *cacusso*, tilapias (see **Photo 5-37**), horse mackerel, cape mackerel, grouper, sardine, shrimp, cuttlefish, catfish, etc. Fish products are used for food and sold on the main roads in the region.

Photo 5-37: Ivantala Lake and its fish diversity.

5.3.2.6 Health and Education

Health services in the project's area of influence are provided on three main levels: hospitals, health centres and health posts. The Calumue, Kamba, Palanca, Jamba I, Camponês and Aida neighbourhoods (see **Photo 5-38**), being in a peri-urban area, benefit from the medical centres and health posts installed in their respective regions. The medical centres generally have vaccination, pharmacy, paediatric, general medicine, clinical analyses, obstetrics and hospitalization services.

The settlements Heva de Cima, Onculuvala and Poaires Muhaha, due to their rural characteristics, have one health post each, however, in many cases, they serve only for first aid and less serious cases, because complex clinical situations are transferred to the medical centres of the respective headquarters communes. The Nombungo, Mateta, Mavanda, Tchiwaya and Kapalanga settlements do not have any medical and medicinal assistance unit, and in case of illness the residents resort to the existing ones in the settlements and neighbouring localities, with emphasis on the medical centres of the Toco and Cristo Rei region for treatment and obtaining medical guide in more serious cases to the reference hospitals at Lubango urban centre level.

In general, the public health situation in the 15 communities close to the project route is considered unstable, with medical centres and posts frequently lacking expendable materials such as syringes, needles, gloves, pharmaceuticals, face masks, oxygen cylinders, and malaria rapid test kits, including the absence of specialized technical staff (doctors, nurses, laboratory technicians, etc.). Other factors such as staff attendance, accommodation and training have contributed to the provision of a poor-quality medical service. Having no drugs, after consultations, users receive prescriptions and must spend a lot of money to buy the drugs, depending on the diagnostic disease.

There is no patient transport (ambulance), and because of the cost of purchasing medicines (drugs), many residents often prefer to resort to traditional treatment and medicines.

Photo 5-38: Medical centre in Palanca neighbourhood, Humpata.

The main diseases recorded in the region are essentially: malaria, acute diarrhoeal diseases, respiratory diseases, skin infections, measles, typhoid, malnutrition, rheumatic diseases and other pathological illnesses. Of all the diseases reported by the key groups, malaria was by far the most common health problem reported in all settlements. A surprising finding was that HIV/AIDS was not mentioned as a health problem in the region. And the surprise was due to the proximity of the provinces of Huila and Namibe to Cunene province. Cunene province is the region of the country with high rates of people carrying the HIV/AIDS virus.

The public education system in the Project region consists of four levels, namely: primary schools (1st to 6th grade), mixed schools (integrating primary and 1st cycle of secondary education), 1st cycle of secondary education (7th to 9th grade), and 2nd cycle of secondary education (10th and 12th grade, some with integration of professional technical education, schools for the training of teachers and nursing technicians, etc.). In the 15 communities studied, the Nombungo, Calumue, Palanca, Camponês and Aida neighbourhoods have primary, 1st and 2nd cycle secondary schools, while the settlements of Poaires Muhaha, Kapalanga, Heva, Kamba and Onculuvala only have primary schools (1st to 6th grade), see **Photo 5-39**.

The Mateta, Mavanda and Tchiwaya settlements have no school unit, the children of school age must go to the Arimba commune (headquarters) and Figueira neighbourhood, and a distance of almost 3 km. In some settlements the children study in improvised classrooms set up in the churches.

The level of academic education of the young residents of the settlements, particularly in the Mateta, Mavanda and Tchiwaya settlements, are in general relatively low, and most of them have only concluded primary education, and many can neither read nor write correctly, generating an additional complex and inconvenience to request an Identity Card from the competent authorities. After the conclusion of primary education, the students of the studied settlements in most cases are forced to abandon their places of living and family conviviality moving to the peri-urban areas in order to continue their studies and others forced to travel long distances due to the lack of 1st and 2nd cycle secondary schools in the settlements.

In addition, cultural issues prevent adolescent girls from studying by favouring their traditional roles as housewives and peasants. Absenteeism was also identified as a problem in the settlements and the main reasons cited include poverty, constant migration of parents, limited location of schools, lack of attendance of pupils or students and lack of sanitary conditions in schools, many girls during their menstrual period stay at home due to lack of water in schools.

Other problems faced by the education system in the region are related to the lack of training of head teachers in school management, teachers' non-compliance with the timetable established by the Ministry of Education, teachers' late arrival to classes and the lack of decent housing in the settlements to accommodate teachers, late payment of salaries and other performance bonuses, etc.

Photo 5-39: Primary school in Poiares Muhaha settlement.

5.3.2.7 Water, Electricity and Sanitation

Although the 15 settlements are near to the urban areas of the Lubango, Humpata and Moçâmedes cities, however, only three (3) neighbourhoods (Palanca, Camponês and Jamba I) have drinking water supplied by fountains and the public distribution network. The other rural settlements (Mateta, Mavanda, Poaires Muhaha, Poaires Kapandi, Tchiwaya and Kapalanga) do not have water suitable for human consumption and resort to alternative sources (raw water), in some cases deemed inappropriate for human consumption, such as unprotected waterholes, small streams and rivers. However, many streams, rivers and small watercourses generally fill with water in the rainy season, and generally dry up in the dry season between the months of June, July and August.

In dry weather, rural settlement resort to water sources that are further away or less suitable for human consumption. Although water for domestic use is often unsafe for consumption, surprisingly many households do not treat their water before consuming it. In some cases, households only treat water when they feel the need, for example because someone in the family was ill, or when an outbreak of a disease such as cholera or dysentery has been reported in the area.

Only the neighbourhoods of Calumue, Palanca and Camponês have electricity available from the public network, although with inequitable distribution, irregular supply and with several complaints from consumers. The other settlements studied do not have electricity from the public grid, nor are there any plans or programmes for their electrification. In this phase, the residents resort to alternative sources such as private generators (a minority), diesel lamps (the majority), battery lanterns, candles and firewood for lighting at night. In some settlement such as Poaires and Onculuvala, public lighting was compromised because batteries and solar panels were vandalised.

The 15 settlements studied do not have any basic sanitation infrastructure, namely: drainage network for sanitary, domestic and rainwater, containers for waste disposal, etc. They do not produce large quantities of solid domestic waste and the majority of it is biodegradable waste, characterised essentially by the remains of agricultural produce, with some addition of waste from products in the basic food basket such as cans, oil bottles, plastics, packaging and others.

In terms of solid waste management, in all settlements domestic solid waste is buried and sometimes burnt, causing soil and air pollution in the region. Except for the houses in the peri-urban neighbourhoods, in the rural areas, most of the houses do not have latrines so the people carry out their physiological needs in open spaces and the excrements are sometimes buried or left in the open. In the few houses that do have latrines (septic tanks with open wells), there is no cleaning or removal of sanitary effluents (black, grey or soapy water), and it was found that when the septic tanks are full some of them are closed while others are opened.

5.3.2.8 Ethnolinguistic Settlement

Along the proposed transmission line route, it is possible to meet or cross, during long periods of transhumance, with approximately four ethnolinguistic communities, namely: Nyaneca-Humbi (including Mumuíla), Herero (including Mucubal), Mbundu and Khoisan. However, on the TL Project route there is not and was not observed during the field survey works (rainy and dry seasons) a settlements or communities with the specific or exclusive residence of ethnolinguistic communities. In the settlements of Poaires Muhaha, Tchiwaya, Kapalanga and Onculuvala some members belonging to the Mumuílas and Mucubal tribes were found, who migrated to the settlements in search of better living conditions (water, energy, market, transport, etc.).

As mentioned in **Section 5.3.1.16**, the members of the Mucubal ethnic group have an exclusive way of life, known to present a nomadic dynamic, according to their customs and traditions inherited from their ancestors and which will perpetuate from generation to generation, motivated by different factors, namely; the drought, the search for grazing areas and transhumance, the search for markets to trade, with emphasis on essential goods such as food, handmade and industrial alcoholic beverages, cloths and others as illustrated in **Photo 5-40** below**,** and **Photo 5-32** above.

Photo 5-40: Livelihood of the Mucubais communities.

The ethnolinguistic communities Muílas, who predominate the highlands of Chela, specifically in the municipalities of Lubango and Humpata, taking into account their habits, customs, traditions and way of life, characterized mainly by being sedentary and arranged in *Quimbos* (*ehumbo*), whose predominant economic activities are essentially traditional agriculture and cattle ranching, and reside prominently in the villages of Poiares Muhaha, Tchiwaya, Kapalanca, Calumue, Heva and Onculuvala. **Photo 5-29,** and **Photo 5-31** above illustrates the way of life of the Mumuíla communities in the region.

5.3.2.9 Infrastructures on the Project Route

During April and again in September 2021 (due to the change of route) several infrastructures were mapped along 1 km buffer of the new proposed TL route. The mapped infrastructures include quarries, manufacturing units, cemeteries, agricultural farms, etc. Close to the East Lubango substation, in the corridor between Poaires Muhaha settlement and Km 14, the quarry and crusher of the OMATAPALO (see **Figure 5-45**), the Catholic Church, Primary School No. 24, and the railway station were mapped.

Figure 5-45: Major economic infrastructure mapped on the route between Poiares and Tchiwaya settlement in Arimba commune.

Table 5-33 presents the geographical coordinates of each of the mapped infrastructure close to the Project route in the corridor between Poaires Muhaha and Km 14.

Table 5-33: Main infrastructures mapped in the RoW and within a 500 m radius of the Project route in the Poiares Muhaha until Km 14.

Infrastructure	Name	Geographical coordinates
Quarry and Crusher	Omatapalo Quarry and Crusher	14°56'1.64"S 13°38'22.57"E
Primary School	Primary school nº 24 Muhaha-Poiares	14°55'1.42"S 13°39'25.1"E
Railway station	Poaires station	14°54'59.87"S 13°38'57.16"E
Informal market	Poaires informal market	14°54'59.15"S 13°39'3.29"E
Religious	Kapandi Catholic Chapel	14°56'07.4"S 13°39'10.3"E

The corridor of the project route between Km 14 in Lubango, Heva de cima, the communal headquarters of Palanca and the municipal headquarters of Humpata probably constitutes the areas that have seen the most demographic growth in recent years. In addition to extensive residential areas with permanent dwellings, the mapping carried out included various social infrastructures, large and medium industries with emphasis on the Chela Water Factory, the Veterinary Research Laboratory of Huíla, the ENDE installation, the Jamba farm facilities, the Youth House, the residence of the Redemptorist Fathers, the Primary School of Jamba 1, among other infrastructures (see **Figure 5-46**).

The region between Heva de Cima, Palanca and Humpata (headquarters) is by excellence an Agro-Industrial Development Pole due to the soil and climate characteristics suitable for the practice of many different crops, among others of great value and commercial interest. The microclimate has attracted numerous investors in the field of agriculture and livestock to the region.

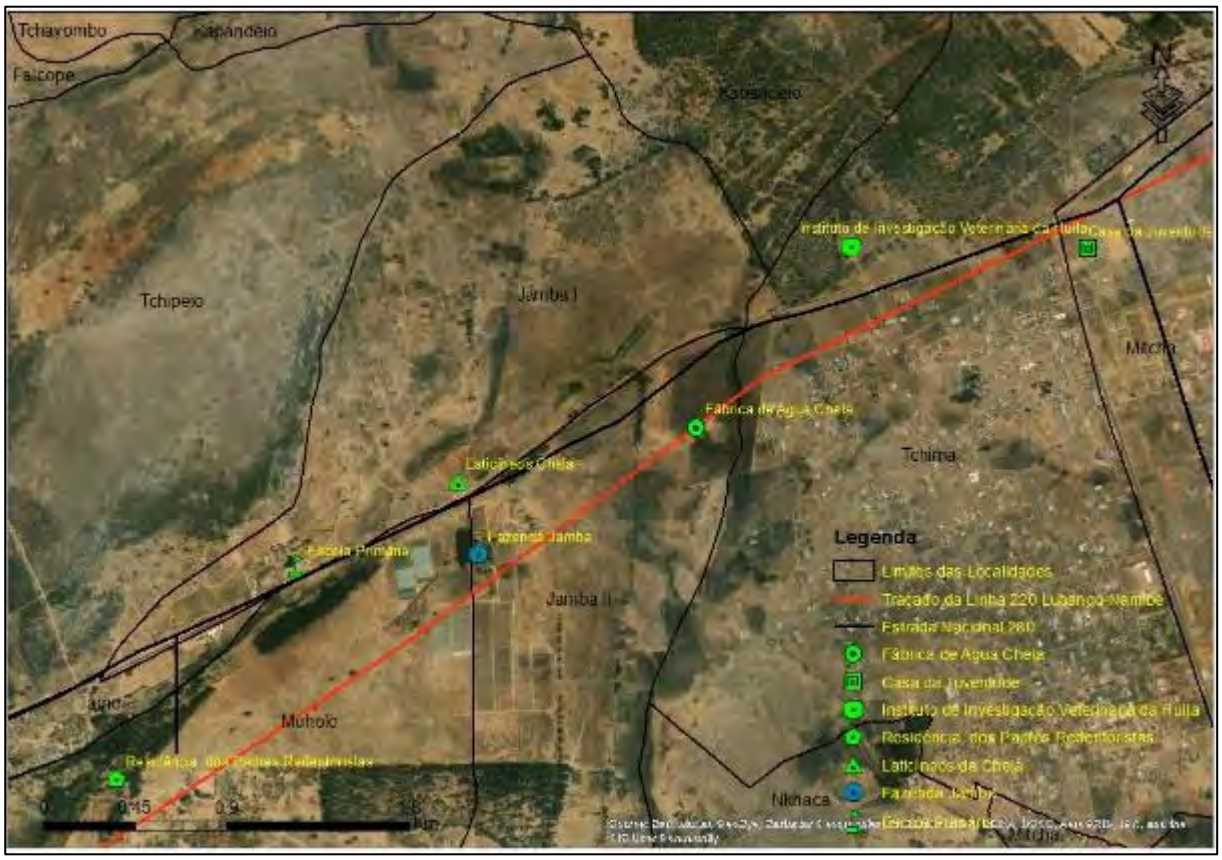

Figure 5-46: Main socio-economic infrastructure mapped in the Heva de Cima, Palanca, Jamba and Humpata route.

Table 5-34 presents the geographical coordinates of each of the infrastructures mapped near the Project route in the corridor between Heva de Cima, the communal headquarters of Palanca and the municipal headquarters of Humpata. It is also noteworthy that the route crosses areas whose historical and cultural value is immeasurable due to the existence of a Bôer cemetery, thus constituting an important milestone in the history of colonisation of Angola.

Table 5-34: Main socio-economic infrastructures mapped on the Palanca and Humpata route.

Infrastructure	Name	Geographical coordinates
Agricultural	Jamba Farm	15° 0'17.13"S 13°24'36.57"E
Water Factory	Chela Water	14°59'57.19"S 13°25'11.27"E
Residential	Redemptorist Fathers' Residence	15° 0'58.10"S 13°23'40.16"E
Slaughterhouse	Chela meats	15° 0'29.95"S 13°23'53.93"E
Agricultural	Farm Tchissola III	15° 2'39.38"S 13°21'27.10"E
Agricultural	Pinheiro Farm	15°02'27.5"S 13°21'51.2"E
Agricultural	Trifrutas Farm	15° 3'22.78"S 13°21'23.53"E
School	Jamba Primary School nº 464	15° 0'19.97"S 13°24'7.48"E
Dairy Products	Chela dairy products	15° 0'5.64"S 13°24'33.50"E
Research	Veterinary Research Institute of Huila	14°59'28.24"S 13°25'35.91"E
Cemetery	Boer Cemetery	15° 0'32.82"S 13°24'36.19"E

In the Palanca region some socio-economic infrastructures are also worth mentioning, which are mainly dedicated to citrus production, namely: Tchissola III, Trifrutas, Pinheiro farms, among others. This prominence is since they are located within the servitude strip of the transmission line as illustrated in **Figure 5-47**.

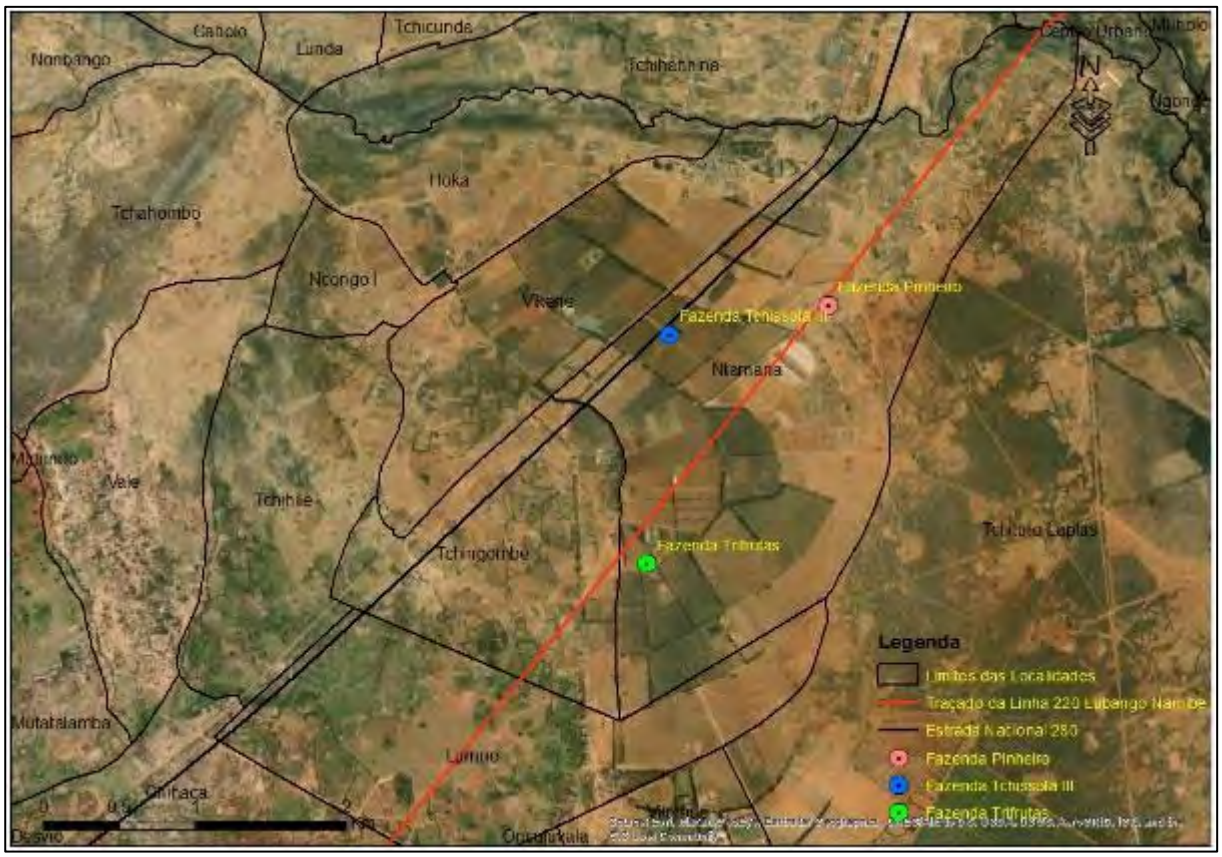

Figure 5-47: Farms crossed by the transmission line in the Humpata region.

In the Onculuvala village region, close to the project route, a local cemetery, a primary school, an agrarian farm (Fazenda Yambi), a church, a medical post and a secondary school were mapped (as shown in **Figure 5-48**). **Table 5-35** presents the geographical coordinates of each of the infrastructures mapped near the Project route in the corridor of Onculuvala region.

Table 5-35: Main socio-economic infrastructures mapped in the Onculuvala region.

Infrastructure	Name	Geographical coordinates
Sanitation	Onculuvala Medical Post	15° 3'30.15"S 13°20'38.51"E
School	Primary School	15° 3'29.48"S 13°20'39.45"E
Agricultural	Fazenda Yambi	15° 2'36.91"S 13°21'09.44"E
Church	Church	15° 2'53.73"S 13°20'15.99"E
School	secondary school	15° 3'44.20"S 13°20'26.16"E

Figure 5-48: Major economic infrastructure mapped in Onculuvala locality. **Source:** Holísticos, 2021.

5.3.2.10 Historic and Cultural Heritage along TL Route

During the fieldwork (rainy and dry seasons) important historical, cultural and anthropological heritage from the history of Angola were mapped, and existing in the region of the project's route, namely; a secular cemetery with 20 graves of the first Bôers as illustrated in **Figure 5-49**, preserved inside the Jamba farm in the municipality of Humpata. An important vestige of the presence of this community in Angola, who came from South Africa, which certainly constitutes one of the important milestones in the history of colonisation of the southwestern region of the country, with great influence on the development of agriculture in the province of Huíla (Medeiros, 1976).

The vestige of the presence of this community in the high lands of Chela (Huíla province) naturally constitutes a historical and cultural heritage of the region and deserves attention with a view to its preservation. However, the space is not officially recognized as cultural heritage by the Ministry of Cultural, Tourism and Environment (MCTA) and by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Figure 5-49: Bôers cemetery inside the Jamba-Humpata farm. **Source:** Hélder Bahu, 2020.

Fortress of Kapangombe, also known as "Fortaleza do Kapangombe" and "Fortaleza da Bibala" implanted in 1861 in the strategic passage of the foothills of Serra da Chela, classified by ordinance nº 6713 (Official Bulletin No. 21 of 25.05.1945) as Historical Heritage-Local and national cultural, constituting a milestone in the history of colonisation in the province of Namibe and in the municipality of Bibala in particular, the old Vila Arriaga. A walled structure, with an elongated rectangular plan, with an access portal to the interior, where the ruined support buildings stand, for which the government of Namibe is currently forecasting its recovery and adaptation to a pedagogical boarding school, for training technical-professional, for about three hundred students, as can be seen in **Figure 5-50**.

Figure 5-50: Kapangombe Fortress.

It should be noted that the Fortress of Kapangombe is outside the boundary of the Project route, which implies that it will not be directly affected. The statue of Christ the King, a monument which is the representative symbol of the community of Huíla, the affirmation of Christianity in the plateau region of Chela is in the region of Kamba. It was built at an altitude of 2,130 m in the Chela Mountain range, opposite the Lubango city (see **Figure 5-39**), classified as Historical Heritage since the year 2014. The statue of Christ the King has been designated as a Historic-Cultural Heritage Site (Executive Decree no. 29/14 of 10th February). It is therefore imperative to scrupulously observe all precautions in order to prevent the Project from having a direct impact on these structures, under penalty of a crime against the national historical, cultural and artistic heritage.

In addition to the historical and cultural heritage sites mentioned above, from the area where the Arimba substation will be installed (Poiares) to the Moçâmedes substation, approximately two (2) cemeteries were mapped, namely: Bôers Cemetery on the Jamba farm and the Onculuvala cemetery. All are along the proposed Project route and are used by local people (see **Table 5-36**). Despite not being classified as an *akôkôtos*' cemetery (cemetery of sovereigns, nobles or kings) the space has an enormous sentimental value for the many families that have their loved ones buried there, so it is of interest to preserve them.

Table 5-36: Historical and cultural heritage.

Historical and cultural heritage	Location	Geographical coordinates
Bôer Cemetery	Jamba 1-Humpata (Jamba Farm)	15° 0'32.82"S 13°24'36.19"E
Onculuvala Cemetery	Humpata	15°04'15.3"S 13°20'31.1"E
Monument of Cristo Rei	Lubango	15° 0'32.82"S 13°24'36.19"E

Source: Holísticos, 2020.

5.3.2.11 Criminality

About criminality, the traditional authorities and other residents of the region along the Project's route reported thefts of animals (cows, chickens, ducks, goats, pigs, sheep, etc.) and agricultural products from the fields by young people. It was noted in several rural settlements that the traditional authorities (Sobas, Séculos and Regedores) have lost the respect and appreciation they once had among young people, after they have had many difficulties in dealing with young criminals.

The Police and the Municipal Administrations are the only institutions to which recourse is made about justice. The most frequent cases of denunciation to the police have been those of bodily and moral offences, robberies and thefts and paternity escape. However, crime rates are very low, around 5%. Complex cases such as homicides, rapes, assaults and other similar cases are transferred to the Provincial Directorate of Criminal Investigation in Lubango and/or Moçâmedes for judicial treatment.

5.3.2.12 Vulnerability and Social Support

Apart from Calumue, Palanca, Jamba I, Camponês and Aida where public and private employees reside, and essential infrastructures (water distribution, energy and solid waste collection), the other settlements (Poaires, Tchiwaya, Kapalanga, Kamba, Heva and Onculuvala villages) do not have any essential infrastructures and the houses are mostly built of cob material, with a roof of ash sheets and in some cases straw. All the villagers depend essentially on agriculture, livestock and trade in the roadside and informal markets of the region.

Residents aged 65 and over are still involved in subsistence farming, others for health reasons receive food and emotional support in families (children, nephews, brothers, daughters-in-law, and other parents, etc.), from the community through the intervention of traditional authorities, people of good faith and churches based in the communities. Widowed, separated or divorced women are also linked to subsistence farming, bartering produce from the field, they have ensured the food balance of the families (children). However, women in general are the most vulnerable as they do not know who to turn to when they are abandoned by their husbands or assaulted. In the Poaires Muhaha settlement many cases of single-parent families were reported, with women taking on the responsibility of raising children whose fathers have run away or simply refused to assume paternity. In general, poverty levels are higher among the elderly and widowed women.

For cultural reasons, some rural settlements reported that there are no chains of help and the elderly and other vulnerable people (widows) even have to work to guarantee the self-support of their families, including the ethnolinguistic communities Muílas and Mucubais who migrated to the settlements studied. In many cases they work as plough helpers, in others they give their land in exchange for benefits (a percentage of agricultural produce during the harvest). At community level, the team found very few people with physical disabilities or disabilities for other reasons (deafness, dumbness, illness or traffic accidents), orphans or elderly people left to their own devices.

During the meetings with the key informants, the traditional authorities of the rural communities showed a lack of knowledge about any social project initiatives for their regions of jurisdiction, despite the establishment of a National Programme for Poverty Reduction and Fight against Hunger for rural areas at national level. Rural settlements are clamouring for employment opportunities for young people, access to electricity and potable water, road repairs to improve mobility, schools and health posts. In addition, they demand food support, support for agricultural production and tractor support for farming. Ease of access to identification services to obtain identity cards and cards that are indispensable for employment.

5.4 Stakeholder Engagement Meetings

It is important to note that this is a public project not an Independent Transmission Line Transport project. This Project will be built for the MINEA in Angola as a public infrastructure project and will be owned and operated by the governmental energy transport company RNT.

The transmission line project, as a public infrastructure project on public land owned by Huíla and Namibe Provincial Government, the procedures regarding this project and interaction with Angolan citizens and businesses are governed by internal Angolan laws using where necessary JICA Guidelines, and international best practices. The substation site is owned by the Namibe Provincial Government and by Angolan laws the Provincial Government is in charge of dealing with communication with any outside persons or business entities. Similarly, RNT as a state owned electricity transport company, has policies and personnel to deal with outside persons and business entities.

5.4.1 Stakeholder Engagement Strategy

During the development of the Scoping Report, stakeholder engagement meetings were held in the four municipalities, and in the Arimba commune affected by the project implementation, phase 1 (see **Table 5-37**). These meetings were organized to be in line with JICA guidelines that requires sufficient consultations with local stakeholders, such as local residents, must be conducted and that the results should be incorporated in the Project's management plans. Participants of these meetings included Huíla and Namibe Vice-Governors for Technical Services and infrastructures, Provincial Directors, Municipal and Communal Administrators, Administration Representatives, Associations Members,

Religious Entities, Public Authorities' Representatives, Traditional Authorities, NGO's, Businessman and general Population. The objectives of these meetings were four-fold, namely a) present the Project to the governmental institutions and traditional authorities, b) obtain feedback on issues of concern, questions and expectations of the participants, c) identify potential stakeholders, and d) social baseline collection.

Table 5-37: Stakeholder meetings with the five (5) places.

Municipality (Places)	Date	Numbers Attendees	Stakeholders
Huíla			
Lubango	23/02/2021	15 13 male / 2 female	Huíla vice-governor for technical services and infrastructures, provincial directors, Members of the Municipal Administration of Lubango, businessman, Members of the RNT Huíla and **via Zoom**: INAVIC, JICA, RNT Luanda and the Executive Demining Commission (CED) representatives.
Humpata	24/02/2021	17 13 male / 4 female	Members of the Municipal Administration of Humpata, Traditional leaders, Committee of Residents of Humpata Neighbourhood and ADRA representatives. Via Zoom: JICA, RNT and INAVIC representatives.
Arimba commune	24/02/2021	42 36 male / 6 female	Members of the Communal Consultation Committee of Arimba, including representatives of communal administration, traditional leaders, religious leaders and Committee of Residents of Arimba Neighbourhood.
Namibe			
Moçâmedes	25/02/2021	48 39 male / 9 female	Namibe vice-governor for technical area and infrastructures, provincial directors, Members of the Municipal Administration of Moçâmedes, Members of the PRODEL and ENDE Namibe, local and traditional leaders, religious leaders, local business association, private companies, teachers and students and via Zoom: INAVIC, JICA, Ministry of Agricultural and Fisheries and RNT Luanda representatives.

Municipality (Places)	Date	Numbers Attendees	Stakeholders
Bibala	25/02/2021	**48** 45 male / 3 female	Members of the Municipal Consultation Committee of Bibala, including representatives of municipal administration, communal administration, traditional leaders, religious leaders, teachers and students, women and young group.

The five (5) stakeholder engagement meetings were organised by RNT, and were attended by 170 participants. Women attendance to the stakeholder engagement meetings was low, with less than 20% of the participants in five (5) meetings. To present the Project information a presentation was carried out in Portuguese, and in addition to the presentation a Background Information Document (BID) was produced and distributed to all participants. In order to guarantee a massive participation, the meetings were announced in Angola Newspaper between 18th and 20th February, there was also an announcement for those who wanted to follow the meeting via Zoom during two (2) weeks.

For the second phase, based on Google Earth, and social preliminary field survey performed in March 2021 approximately twelve settlements are physically located inside or close proximity to the 1 Km buffer (500 meters each side from the proposed transmission line route). From 19th to 23rd of Abril of 2021 to cover the rainy season, Holísticos social team performed stakeholder engagement meetings with all settlements mapped along the 1 Km buffer area (see **Table 5-38**)

Table 5-38: Stakeholder Engagement held with settlements along 1 km 220 kV TL Buffer.

REF.	DATE/TIME	MEETING PLACE	PARTICIPANTS	STAKEHOLDERS
1	19-04-2021 (Monday) 09h00	Poaires Settlements (Kapandi and Muhaha) in Lubango.	77 39 male / 37 female	Residents of the Poaires Kapandi and Muhaha villages. Residents' Committee. Civil society. Traditional authorities.
2	19-04-2021 (Monday) 14h00	Tchiwaya Settlement in Lubango.	30 12 male / 18 female	Residents of the Tchiwaya village. Residents' Committee. Civil society. Traditional authorities.
3	20-04-2021 (Tuesday) 08h30	Kapalanga Settlement in Lubango.	42 28 male / 14 female	Residents of the Kapalanga Settlement. Residents' Committee. Civil society. Traditional authorities.

REF.	DATE/TIME	MEETING PLACE	PARTICIPANTS	STAKEHOLDERS
4	21-04-2021 (Wednesday) 09h00	Heva, Kamba Cristo and Palanca Settlements in Humpata.	52 44 male / 8 female	Residents of the Heva, Kamba Cristo and Palanca Settlements. Residents' Committee. Civil society. Traditional authorities.
5	21-04-2021 (Wednesday) 14h00	Jamba Settlement in Humpata.	64 45 male / 19 female	Residents of the Jamba Settlement. Residents' Committee. Traditional authorities.
6	21-04-2021 (Wednesday) 16h00	Camponês Settlement in Humpata.	56 35 male / 21 female	Residents of the Camponês Settlement. Residents' Committee. Civil society. Traditional authorities.
7	22-04-2021 (Thursday) 08h30	Kalumue Settlement in Humpata.	36 30 male / 6 female	Residents of the Kalumue Settlement. Residents' Committee. Civil society.
8	22-04-2021 (Thursday) 10h30	Onculuvala Settlement in Humpata.	72 41 male / 31 female	Residents of the Onculuvala Settlement. Residents' Committee. Civil society. Traditional authorities.
9	23-04-2021 (Friday) 08h30	Aida Settlement (Moçâmedes).	49 39 male / 10 female	Residents of the Onculuvala Settlement. Residents' Committee. Civil society.

The stakeholder engagement meetings were all held in their respective settlements. However, at the request of Soba and the Humpata Municipal Administration, was joined the Soba and the key informants of three neighbourhoods (Heva de Cima, Kamba Cristo and Palanca) because the three settlements belong to the same “Kingdom”, and have a single soba and a single president of the residents' committee, assisted by deputies from each neighbourhood.

As in the stakeholder engagement meetings held for **Phase 1**, for **Phase 2** the following documents will be also prepared by RNT with Holísticos support: update of Background Information Document (BID) for the phase, banners with relevant schemes about the Project to share with the settlements, announcement in Angola Newspaper, and attendance list, etc. A presentation was carried out in Portuguese, the national official language and where possible and necessary had simultaneous translation from Portuguese into Nyaneca-Humbi language in order to ensure understanding of the

Project for all participants. Banner was prepared with relevant information about the Project, and BID was also produced and distributed to all participants.

The meetings were announced in Angola Newspaper between 15th and 17th Abril 2021. At the same time, letters about the meetings will be sent to the Governments of the Province of Huíla and Namibe. The Governments of the Provinces of Huíla and Namibe had the responsibility to communicate the settlements and the traditional authorities within their respective jurisdictions.

In general, women attendance to the stakeholder engagement meetings (**Phase 2**) was low, with less than 30% of the participants in nine meetings, except in Poiares, Tchiwaya and Camponês villages where women's participation was massive, and above 40%. Holisticos social team called women, and encouraged them to join the meetings, but it was up to them if they join or not. They mostly follow Soba's request to join the meetings at village level, but urban women decide by themselves if they join or not. They are busy with various domestic works for a whole day.

5.4.2 Summary of the Stakeholder Meetings

Currently, stakeholder engagement meetings have already been held with the administrative authorities of the provinces of Huíla and Namibe, **Phase 1** (the meeting was attended by 170 people, 146 male and 24 female), and with the 12 communities located within a radius of 1 km buffer from the proposed transmission line route (**Phase 2**). **Table 5-39** presents a summary of the key issues raised by the participants in **Phase 1**. The Photographic evidence of the stakeholder meeting is presented below.

Table 5-39: Summary of key questions from five stakeholders in Huíla and Namibe Provinces.

Questions raised	Responses and Clarifications
Mr. Rosário Ima Panzo - What kind of training do you have in mind for workers who will be hired during the construction phase of the Project? - What is the scope of equipment that will be used during Project implementation at the various construction sites? - What is planned regarding technical assistance?	The hiring of national staff, both skilled and unskilled, is planned and that training will be provided before the Transmission Line (TL) construction phase. Because the Project is still in the technical feasibility pre-study phase, exactly what equipment would be needed is unknown.

Questions raised	Responses and Clarifications
Ms. Lídia Amaro Suggested that during field work, experts from the Namibe Academy of Fisheries and Marine Sciences be invited to participate, as well as technicians from the Provincial Office of Environment, Solid Waste Management, and Community Services (GPAGRSEC), in order for all to gain more experience and be able to monitor future developments.	The Project is in the Environmental Pre-Feasibility Study and Scoping Report phase (EPDA), which is required by law for all category A projects. In terms of the integration of technicians from higher education institutions and GPAGRSEC, was stated that including them in teams that will conduct the social and environmental surveys would be considered.
Mr. Estanislau Paulo Inquired whether the compensation process regarding parties affected by the Project in terms of losing agricultural land, as well as whether electricity will be provided to the people living along the line's path?	A list would be developed detailing current infrastructure along the Project's route that is prone to being affected, with the goal to determining that which will be truly impacted, thus avoiding potential opportunism on the part of local communities. Was mentioned that the compensation for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Was proposed the creation of working committees between RNT, the Huíla and Namibe provincial directorates and the four (4) municipals administrations, including the traditional authorities. The planned TL route will not allow for electricity distribution and that the National Electricity Distribution Company (ENDE) should promote satellite expansion and distribution projects in the future.
Ms. Ana Domingos Mentioned that in the recent past, some locations along the Project route had been used for military operations and suggested contacting the Executive Demining Commission (CED) regarding verifying that no undetonated explosive devices are present in the area.	The CED had already been contacted regarding verifying that no unexploded ordnances are present in the proposed TL route and area. During 2019 the CED team had met with the JICA and RNT teams on several occasions to conduct an extensive survey of the TL route area. The number of technical meetings has decreased as a result of the SARS COVID-19 pandemic, however,

Questions raised	Responses and Clarifications
	the Lubango demining brigade is ready to implement the work of checking the Project route for undetonated explosive devices. Was stated that Project works would only begin following confirmation that the proposed route is free of mines and unexploded ordnance devices, and a certificate has been issued stating the same.
Mr. Cecílio Elindo Suggested the ability to consistently listen to all interested and affected parties and that all understand how to interpret information from people who are directly affected by the Project. Suggested that background project information be developed in a simpler way so that all parties understand the same. At the end ask for information whether the Nombungo substation will be situated in Hoque and when will the ESIA be concluded and who are the main partners involved in its elaboration?	Ongoing meetings would be held in order to update all concerned parties regarding environmental and social surveys that have yet to be implemented, and that all provided information originated from literature, papers, and electronic portals. The exhaustive surveys will be implemented during April 2021, with the full schedule set to be completed by December following the realization of the EPDA and ESIA Report. After this, public consultation will be held to present the ESIA final report. In terms of collaborators, the team is multidisciplinary and broad. Regarding the province of Huíla, have collaborated with universities and have carefully selected lecturers. Lídia Amaro, the GPAGRSC Provincial Director, made herself available regarding appointing a field survey technician. Details provided to the impacted communities will always be consistent and transparent. The Project Financier has prepared a compensation package that will be negotiated with RNT. RNT already has previous experience with compensation-related programs.
Mr. Mateus Baptista Questioned the sizes of each tower and how will they affect the population?	The towers will cover an area of 15x15 meters and there will be electrical signalling along the entire route that includes distance indicators, as per the Financier's specifications.

Questions raised	Responses and Clarifications
Mr. Edson Chipal Inquired whether employment opportunities and how positions would be filled.	The Public Procurement Act requires the use of locally sourced labour and mentioned that the contractor would need to recruit through newspaper advertising, in compliance with RNT and JICA rules and regulations. Was also explained that the company that wins the bid for Project construction must recruit local talent and implement a training program, as per JICA and RNT criteria.
Ms. Elizandra Soma Questioned with a long the TL route there are any endangered species?	The Tundavala area is well known and is home to several endangered bird species that are important in terms of biodiversity, as well as the area being classified as an IBA 14. Painstaking surveys will be conducted during April 2021 to identify biodiversity (vegetation and all fauna species), resulting in the team being able to confirm whether any endangered plant and fauna species are present in the area.
Mr. Carlos Xavier Questioned the capacities of the future Arimba and Namibe substations? Said also that there are communes that have never received electricity along the TL route and if will be the possibility of an extension to enable these communities to have electricity access?	The current 60 kV TL does not have the capacity to supply the demand of the city of Namibe. Therefore, there would be a need to install a 220 kV TL to the north and central system of Laúca that is connected until Huambo, which would also reinforce the future industrial hub of Sacomar. Regarding capacity, studies are still being implemented.
Mr. Venâncio Paulo Stated that the Humpata landscape is characterized by irregular relief and the TL will pass through a mountainous region of approximately 2,000 meters in altitude that divides Lubango and Namibe. For example, if an aircraft is flying over the area at an altitude of 20,000 feet (8 km) when arriving in this area it will be close to the towers. The concern is to	The height of the towers at the airport entrance has been discussed and that as a result of work implemented with INAVIC technicians, the substation site was moved further away from the airport entrance. The height of the towers varies between 18, 24 and 30 meters, with the towers becoming shorter as relief rises; adequate signalling is guaranteed regarding aviation safety.

Questions raised	Responses and Clarifications
know if the height of the towers will cause any damage during the operations of landing and taking off of the planes.	RNT collaborated with INAVIC during 2019 to determine the location of the Aida substation and worked with a local technician. Was informed that, in addition to RNT's communication with INAVIC, there are technical norms in force in Angola as well as internationally that stipulate a safety distance from an airport approach. This distance ranges from 5 to 15 kilometres. And that the airport approach is safeguarded in theory and that the team have been working with INAVIC in Luanda, which is regularly contacted for their opinion regarding similar projects in order to guarantee aviation safety.
Ms. Ana Domingos Inquired whether the communities in the Nombungo and Arimba substation's vicinity would be considered for electricity supply.	The sole purpose of the Project is to facilitate the transportation of electricity between the Arimba and Moçâmedes 220/60 kV substations but added that there are projects underway that should guarantee the supply of electricity to the communities of Nombungo, Oke and Toco. Regarding providing electricity to Arimba's other districts, was informed that the suggestion had been taken into consideration and that details would be shared with RNT Huíla management.
Mr. Domingos Sapalinha Requested clarification regarding the involuntary relocation and compensation process, asking what would happen in the event of infrastructure damage caused by third parties (housing, agricultural areas, etc.).	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed in compliance with the Agency's regulations and standards. Was emphasized that TL to be installed cannot pass over houses, schools, hospitals and large trees. Was mentioned that during the stakeholder engagement meetings and social field surveys, which will take place between March and April 2021, a social team will be mapping all infrastructure and economic activities present in the Project's direct area of influence, so as it can be avoided during Project implementation. However, was explained that there would be cases where this would not be feasible,

Questions raised	Responses and Clarifications
	whereby JICA has very specific rules, and as a result a Resettlement and Compensation Plan (RCP) would be elaborated to ensure that families affected by the Project have equal or better conditions than those that were present prior to Project development.
Mr. Miguel Savazuca Suggested that the TL's proposed route pass through Bibala's municipal headquarters in order to exploit the region's mining and industrial sectors, and that it also pass through Kapangombe's communal headquarters, which is set to become a municipality. Concluded by asking for clarification regarding the Project's timeline and start date.	The chosen route for the TL excluded the municipal headquarters of Bibala and Serra da Leba regions due to geomorphological and physiographic complications and that the proposed route is feasible from a technical and economic point of view. Was added that there are other active projects regarding the supply of electricity to other municipalities of the province, citing the Arimba substation in Lubango as an example, which will support Bibala and Humpata cities. It was also added that the implementation of a TL project is divided into phases; high voltage lines are initially installed together with substations that enable the voltage to be lowered, after which the distribution of electricity to potential consumers in the cities of Bibala, Moçâmedes and Tômbwa can be implemented. Was said that in order for energy to reach houses, ENDE would have to propose lower voltage line installation and connection projects. The proposed global construction schedule for the Project is 30 months, but that the process will only begin after the Project Financier (JICA) and the Ministry of Culture, Tourism, and Environment have completed and approved the Environmental and Social Impact Assessment (ESIA). And with that, the Project's construction phase could begin during 2030 if funding is secured.

Questions raised	Responses and Clarifications
	There is not yet an EPC for the Project and that the Japanese company TEPSCO is preparing the engineering studies. RNT would hold a public tender to find an EPC with the necessary experience and expertise in order to complete the Project in a timeframe shorter than that proposed in the specifications.
Mr. Mendes de Carvalho Inquired whether the existing towers could be used for the 220 kV TL and asked about the Project's budget.	The current 60 kV TL and towers would not be able to support the 220 kV TL Project. Was also drew attention to the fact that accessibility makes the initiative unfeasible and that a Project of this nature may pose serious risk to populations situated near the Project's route. The Project's costs are typically divided into two (2) categories, the first being associated with substation construction and the second with TL construction, and that the cost of a TL varies depending on its the type and length, and that a single kilometre can cost up to 0.12 million USD. The costs are defined according to types of materials used, weather conditions, and any complications that may be encountered along the route, mentioning that the Project will cost over 90,000,000 USD.
Mr. Pedro Joaquim Inquired whether the Project team intends to replant forest biomass that will be removed along the proposed length of the TL inside the 45-meter buffer. Recommended that the ESIA Report incorporate the Forest and Wild Fauna Framework Law.	JICA has budgeted for all possible negative impacts related to the Project such as involuntary resettlement, reimbursement for environmental losses, and compensation for damage to the environment or the property of third parties, etc. Was mentioned that biomass that will be lost along the route will be replaced by native plant species or those adapted to the region's climatic conditions. In cases where the repopulation of vegetation is not feasible, the Namibe Provincial Office of Culture, Tourism, and Environment would recommend alternative sites regarding compensation. Was proposed the creation of working committees

Questions raised	Responses and Clarifications
	between RNT - EP, the Moçâmedes and Bibala municipal administrations and the Huíla provincial directorates.
Mr. Edmilson Gama Inquired whether any electromagnetic effects that may occur due to the operation of the 220 kV high voltage line.	Regarding any electromagnetic effects it was stated that the towers would be 30 to 35 meters tall and that any electromagnetic fields would be negligible at these heights. Was also explained that all efforts would be made that the TL does not cross residential areas
Mr. Fernando Solinho Questioned why the TL would not continue to the municipality of Tômbwa and which company would be responsible for maintaining the system during the Project's operational phase.	ENDE is working on interconnection projects and that a 60/15 kV substation will be installed in the city of Tômbwa. Was said also that the Tômbwa will be actually electrified using a set of generators. The maintenance of the electricity transmission system would be the sole responsibility of RNT and that training would be provided to the line's maintenance technicians.
Mr. Wedeirgue Hach Suggested that the Government of Namibe Province urgently start working on the preparation of Land Management Plans and Municipal Master Plans, and that, if the province suffered from environmental and social problems related to the Project, these plans would help alleviate such problems.	The Moçâmedes Municipality Master Plan is approaching completion and will include projects promoted by ENDE, RNT and PRODEL. RNT engineering team held several meetings in Namibe province at the start of the Project (2015) to ensure the passage of the TL could be successfully implemented.
Mr. António Pombo Stated that there had been many cases of power cable theft reported in the media recently and inquired whether security measures would be implemented in order to prevent future theft or vandalism.	The Project would not utilize copper cables that can be a target for theft. On the other hand, the towers would be of considerable height and the voltage used would not allow anyone to access the 220 kV TL. Was also explained the risks associated with people vandalizing the towers and high voltage cables.
Mr. Carlos Cambango Thanked RNT for the initiative of developing the Project in the area and listening to locals long before the construction phase began. Proposed that the Project's proponents use more modern equipment, mentioning that the existing 60 kV TL and towers	The Project is in its technical feasibility pre-study phase and that several studies would be conducted to ensure that natural phenomena occurring in the region would not affect the Project's high voltage towers. The Project will make use of new technology that is more durable and only utilize equipment that can withstand the region's climatic conditions, as well as mentioning that

Questions raised	Responses and Clarifications
between the Lubango and Moçâmedes substations are affected by heavy gusts of wind.	the towers will be of considerable height. Concluded by stating that the new TL would run parallel to the existing 60 kV TL in certain areas in order to minimize impacts on populations and infrastructure.
	
Photo 1: Stakeholder engagement meeting organized in Moçâmedes.	
	
Photo 2: Stakeholder Meeting in Bibala.	**Photo 3:** Participants in stakeholder meeting in Arimba.
	
Photo 4: Mr. António asking question about Project.	**Photo 5:** Project presentation in Lubango.

As said above, between the 18th and 23rd of April, 2021, stakeholder engagement meetings, for rainy season, **Phase 2** (the meetings were attended by 478 people), were held with the 12 communities

located within a radius of 1 km (500 meters on each side of the line or towers of the proposed transmission line route). **Table 5-40** presents a summary of the key issues raised by the participants in **Phase 2**. Photographic evidence of the stakeholder meeting is presented below.

Table 5-40: Summary of key questions from stakeholders held in 12 settlements along the TL route.

Questions raised	Responses and Clarifications
João Cangola (JC) - Poiares Settlement resident. JC requested clarification regarding the involuntary resettlement and compensation process, asking what would happen in the event of damage to third party infrastructure (housing, agricultural and livestock areas, etc.). Informed that in the past they already had a project in which part of the population was affected (cultivation fields) and has not been compensated until today.	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed, in compliance with the agency's regulations, and standards. The line to be installed cannot pass over houses, agricultural land, cemeteries and large trees. However, would be cases where this would not be feasible, whereby JICA has very specific rules, and as a result, a Resettlement and Compensation Plan (RCP) for affected parties would be elaborated to ensure that families affected by the Project have equal or better conditions than those that were present prior to Project implementation.
Mário Chivia (MC) - Poiares settlement resident. MC questioned whether the Project would deliver electricity to all areas where the transmission line passes or only to the Namibe province.	There are three (3) companies with responsibility in the electricity sector in the country, namely: PRODEL (Production), RNT (Transmission) and ENDE (Distribution). RNT will implement the transmission line between Lubango - Moçâmedes during the first phase of the Project. This will be followed by the implementation of the distribution phase, during which ENDE, in collaboration with the Huíla and Namibe Provincial Governments and municipal administrations, will evaluate energy demand and develop alternative distribution options from the Moçâmedes substation. However, it was emphasized that currently, the Project will only facilitate the transportation of electricity between the Arimba 220/60 kV substations in Lubango and the new 220/60 kV substation to be installed in the Aida neighbourhood, Moçâmedes.

Questions raised	Responses and Clarifications
Tchaquenda Tchilombo (TT) - Poiares resident TT reported that staffs from previous projects carried out near the settlement harassed the girls and many were left with their children and the parents fled. Showed enormous dissatisfaction with the constant escapes of paternity.	The Project contractor (EPC) will be obliged to present a policy that includes training programs on health, safety, hygiene and the environment. Staff will be informed regarding the prohibition of harassment women in the settlements, about respecting community customs and traditions, the prohibition of unethical practices and of working when under the influence of alcohol or other illicit substances.
Tchimone Tchaunga (TT) - Tchiwaya resident. **Mpeyo Tchimongua (MT) - Tchiwaya resident.** TT and MT praised the government's initiative regarding Project implementation but mentioned that the local population is currently suffering from famine as a result of recurrent droughts in the region. They also requested food support and the installation of infrastructures such as fountains, schools, medical posts, etc.	Angolan Government has policies requiring companies that execute state projects to create Social Responsibility Programs in order to safeguard communities. These concerns have been raised and will be forwarded to the Project contractor as soon as the public tender is held. RNT will advise the future contractor to implement the Social Responsibility Program in accordance with social needs and conditions identified by communities along the Project's route.
Domingos Século (DS) - Tchiwaya resident. DS praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. Requested clarification regarding the involuntary relocation and compensation process, asking what would happen in the event of damage to third party infrastructure (housing, agricultural and pastoral areas, etc.).	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed, in compliance with the agency's regulations, and standards. The line to be implemented cannot pass over houses, agricultural land, cemeteries and large trees. However, would be cases where this would not be feasible, whereby JICA has very specific rules, and as a result, a Resettlement and Compensation Plan (RCP) for affected parties would be elaborated to ensure that families affected by the transmission line Project have equal or better conditions than those that were present prior to Project implementation. The compensations for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per

Questions raised	Responses and Clarifications
	square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Proposed the creation of working committees between RNT, TEPSCO, JICA, the Lubango Municipal Administration and the Huíla Provincial Directorates. Should a house be affected by the Project, it will be assessed and the affected parties may receive a house of equivalent or better specification. The 220 kV TL route is not the final, may be changed, and several studies such as geographical, topographical, environmental, social and cultural studies are required to identify the final route and ensure that it does not affect the population's well-being, or if it does, that it is kept to a minimum. A thorough registration process regarding any affected agricultural land, housing and other infrastructure along the proposed length of the Project route would be conducted in order to prevent any opportunism, which would result in a Resettlement Action Plan being elaborated.
Filipe Sacula (FL) - Tchiwaya settlement resident. FL praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. Expressed his concern regarding the lack of identity (ID) cards among the youth of the settlement and how this would affect employment opportunities.	The Tchiwaya settlement coordinators and traditional authorities must ensure that young people obtain ID cards. Employment opportunities would be available to all young people in Tchiwaya settlement and along the transmission line corridor and the substation site, however, for the sake of compliance with the law in force in Angola, and international best practices, everyone must present their respective ID cards. All salaries must be bank-based, there will be contributions to Social Security and the payment of Withholding Tax (depending on the salary) and the absence of ID card can be an obstacle to obtaining a job.
Manuel Cateva (MC) - Tchiwaya settlement resident.	The objective of the 220 kV TL Project is to facilitate the transportation of electricity between the Arimba 220/60 kV

Questions raised	Responses and Clarifications
MC thanked the government for implementing the Project and stated that he would like to see benefits in terms of the growth of the Huíla and Namibe region.	in Lubango and the 220/60 kV substations to be installed in Moçâmedes. ENDE may establish future energy distribution projects in collaboration with the Huíla and Namibe Provincial Governments for the communities.
Francisco Kalupe (FK) - Kapalanga resident. FK praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. Enquired about the Project schedule.	The proposed timetable for the global project construction is 30 months, however, the construction phase will start only after the conclusion and approval of the Environmental and Social Impact Assessment by the Project financier (JICA) and the Ministry of Culture, Tourism and Environment (MCTA). If the financing is guaranteed, implementation phase could begin during 2023. Currently, the project is undergoing a Technical Pre-Feasibility Analysis phase, RNT experts are studying the best alternatives options for the Project's route and technology. After determining the transmission line route, work will begin during the second quarter of 2022 to map the terrain's topography, geomorphology and locate any possibly unexploded ordnance. A contractor for the Project has yet to be identified, while engineering studies are being prepared by the Japanese firm TEPSCO. Subsequently, RNT will hold a public tender to identify a contractor that has the necessary experience to implement the Project, as well as the ability to do so in less time than stipulated in the requirements.
Luís Manuel (LM) - Kapalanga resident. LM praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. LM requested clarification regarding the involuntary resettlement and compensation process, asking	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed, in compliance with the agency's regulations and standards. The line to be installed cannot pass over houses, hospital, schools, agricultural land, cemeteries and large trees. However, would be cases where this would not be feasible, whereby JICA has very specific rules, and as a

Questions raised	Responses and Clarifications
what would happen in the event of damage to third party infrastructure (housing, agricultural and livestock areas, etc.). LM requested employment opportunities for young people in the Kapalanga settlement in order to improve their social and economic conditions.	result, a Resettlement and Compensation Plan (RCP) for affected parties would be elaborated to ensure that families affected by the transmission line Project have equal or better conditions than those that were present prior to Project implementation. The compensations for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Was proposed the creation of working committees between RNT, TEPSCO, JICA, the Lubango Municipal Administration and the Huíla Provincial Directorates. Should a house be affected by the Project, it will be assessed and the affected parties may receive a house of equivalent or better specification. The 220 kV TL route is not the final, may be changed, and several studies such as geographical, topography, environmental, social and cultural studies are required to identify the final route and ensure that it does not affect the population's well -being, or if it does, that it is kept to a minimum. The Project budget will take into account any negative impacts that the Project may cause. A thorough registration process regarding any affected agricultural land, housing and other infrastructure along the proposed length of the Project route would be conducted in order to prevent any opportunism, which would result in a Resettlement Action Plan being elaborated.

Questions raised	Responses and Clarifications
	It was proposed the creation of multidisciplinary working committees between RNT, TEPSCO, JICA, the Humpata and Lubango Municipalities Administrations and the Huíla Provincial Directorates in order to ensure a fair process regarding compensation for damage to agricultural land and potential displacement along the Project's route. A public tender will be launched to find the contractor company that will implement the 220 kV Project and 220/60 kV substation in Moçâmedes. In the specifications, the EPC will be required to contract up to 40% of local labour. The contractor must disclose these job opportunities in Jornal de Angola, local radios stations with the highest ratings, safety displays on the workers' camps, integrated professional training centres in Huíla and Namibe capital cities, among other means or platforms for dissemination, so that everyone can have access to information.
Francisco José (FJ) - Palanca resident. FJ asked for clarification regarding risks the 220 kV transmission line could pose to nearby communities.	In terms of safety, the towers would be 30-35 meters above ground level and any effects of electromagnetic fields at these altitudes would be negligible. A concerted effort will be made to avoid the lines crossing residential areas. As a safety precaution, people should not perform any activities near the towers' designated location. Smart safety, warning, and emergency sensors will be mounted on power transmission lines and the transmission system will be automatically interrupted if the cables become damaged or weather conditions become extreme. It is recommended that no permanent infrastructure, such as homes, schools, hospitals or churches be constructed within the vicinity of the transmission line (45 meters).
Mbwale Tchilola (MT) – Palanca resident. MT questioned whether the route of the 220 kV transmission line would run parallel with the 60 kV line or whether a different crossing point would be	The 220 kV transmission line would run parallel to the 60 kV line wherever possible. The route may be changed and several studies, such as geomorphological, topography, environmental, and social studies are required to identify the final route and ensure that it does not affect the

Questions raised	Responses and Clarifications
established. He reiterated that the armed conflict in the country ended more than 15 years ago and that the campaign to identify unexploded ordnance explosives could delay the project's execution schedule.	population's well-being, or if it does, that it is kept to a minimum. Demining process is critical regarding the Project as Angola has been through several years of violent conflict and the transmission line route will pass through areas that are yet unused by the population. There will be an international public tender to select the Project contractor and several firms will refuse to send bids unless the National Executive Commission for Demining inspects the area and issues a demining certificate, thus alleviating concerns regarding property and the safety of personnel. It was highlighted the importance of this process. Currently, the project is undergoing a Technical Pre-Feasibility Analysis phase, RNT experts are studying the best alternatives options for the Project's route and technology. After determining the transmission line route, work will begin during the second quarter of 2022 to map the terrain's topography, geomorphology and locate any possibly unexploded ordnance. A contractor for the Project has yet to be identified, while engineering studies are being prepared by the Japanese firm TEPSCO. Subsequently, RNT will hold a public tender to identify a contractor that has the necessary experience to implement the Project, as well as the ability to do so in less time than stipulated in the requirements. Meanwhile, stakeholder engagement meetings with residents of villages and neighbourhoods near the transmission line proposed route will be held continuously throughout the implementation phase of the Project and a Stakeholder Engagement Plan will be developed.
João Chivangulula (JC) - Jamba resident.	The current 60 kV line towers would not be able to support the 220 kV TL. He also drew attention to the fact that

Questions raised	Responses and Clarifications
JC inquired whether the existing 60 kV towers could be used for the 220 kV transmission line Project and asked about the Project's budget.	accessibility makes the initiative unfeasible, and that a Project of this nature may pose serious risk to populations situated near the Project's route.
Tchongolola Culengalenga (TC) - Onculuvala Resident. TC mentioned that the Food Aid Program provided to some communities in the region should also take into consideration the Onculuvala neighbourhood residents.	There are several Projects for the improvement of infrastructures within the scope of PIIM, which will be developed in Onculuvala settlement (including other settlements around the Humpata headquarters), gives an example of the Water Hole Project for the benefit of local communities. However, the other social complaints were noted. He invited residents of Onculuvala to visit the Administration to learn more about the various projects that have been recommended for the region under PIIM. The Government of the Province of Huíla is only providing food support to communities in the Bata-Bata region in order to work on the migration of young children to Lubango, who are constant targets of sexual exploitation.
	
Photo 1: Stakeholder engagement meeting organized in Jamba settlement.	
	

Questions raised	Responses and Clarifications
Photo 2: Questions about Project during the meeting in Camponês settlement.	**Photo 3:** Participants in stakeholder meeting in Kapalanga settlement.
	
Photo 4: Female group present in the stakeholder engagement meeting in Camponês settlement.	**Photo 5:** Female group present in the stakeholder engagement meeting in Onculuvala settlement.

5.4.3 SHM during the Preparation and Completion of the ESIA

As part of the Project disclosure and social baseline data collection for the ESIA, extensive stakeholder engagement was undertaken. Engagement activities included Project disclosure engagement meetings with municipalities and commune officials, and potentially affected communities' members undertaken between the 23rd to 25th of February 2021 (**Phase 1**) and the 18th to 23rd of April 2021 (**Phase 2**) as well as social baseline data collection engagement activities.

In order to present the preliminary results of the ESIA, with the aim of clarifying the potential environmental and socio-economic impacts of the Project and the Resettlement Process in the event that private properties are affected due to the implementation of the Project, stakeholder engagement meetings (**Phase 3**) were held with the communities mapped in the right-of-way (45 m) of the transmission line. **Phase 3** took place from 13th to 17th September 2021 (dry season) and the communities engaged were: Poaires Muhaha, Figueira, Heva de Cima, Jamba 2, Camponês, Sames and Onculuvala. The objectives of these meetings will be four-fold, namely a) present the potential environmental, social and cultural impacts of the Project to the all settlements near by the route (45 m – 22.5 m each side of towers implementation position) b) obtain feedback on issues of concern, questions about the potential environmental impacts, resettlement and compensation for damage to house, land and crops, livestock and transhumance space and expectations c) safety risks associated

with the preparation, implementation and operation of the 220 kV transmission line and d) additional social baseline collection for the ESIA Report.

The all meetings were held in the respective settlements and appropriate engagement practices and tools was adopted to ensure adequate access to information and understanding of the Project potential environmental, social and cultural impacts to all participants. **Table 5-41** presents a summary of the key issues raised by the participants in **Phase 3** (the meetings were attended by 191 people, 132 male and 59 female). Photographic evidence of the stakeholder meeting is presented below.

Table 5-41: Summary of key questions from stakeholders held in **Phase 3**.

Questions raised	Responses and Clarifications
José Isaac (JI) – Poiares Muhaha resident. JI requested clarification regarding the resettlement and compensation process, asking what would happen in the event of damage to third-party infrastructure (housing, agricultural and livestock areas, etc.).	**Eduardo Ferdinand (EF)** – Holísticos JICA takes resettlement and compensation process extremely seriously and will not provide financing until such issues are properly addressed by RNT and implemented in accordance with current national legislation and JICA requirements. The line to be installed cannot pass over houses, agricultural land, schools, hospitals, cemeteries and large trees over 8 m in height. However, would be cases where this would not be feasible, for which both current Angolan legislation on resettlement and JICA guidelines have very explicit rules/guidelines, and that a Resettlement and Compensation Plan (ARAP) for potentially affected parties is currently being developed in order to ensure that families affected by the transmission line Project have equal or better conditions than those that were present prior to Project implementation. During the initial phase, only infrastructures located within a 45 m of the Project buffer or right-of-way (RoW) will be compensated, meaning that anyone located outside of this zone will not be compensated. The compensations for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square

Questions raised	Responses and Clarifications
	meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Between October and November, a team would map the Project's route, survey private infrastructure within a 45 m of the Project buffer, and conduct a census of the entire community, including its socioeconomic profile. Should a house be affected by the Project, it will be assessed and the affected parties may receive a house of equivalent or better specification. The 220 kV TL will be developer to ensure that it does not affect the population's well-being, or if it does, that it is kept to a minimum. **Catarino Cosmo (CC)** – RNT Should a house be affected by the 220 kV Project, it would be evaluated and the affected parties may receive a house of equivalent or better specification. Drew the participants' attention to acts of opportunism, noting that only affected and previously registered parties would be compensated for the affections of their houses, agricultural land, and other structures. If a house is completely or partially affected, the form of negotiation or compensation would only involve a single house. The financial compensation for house resettlement will be avoided as a result of lessons learned from other RNT supported projects, citing an example of how some people preferred to acquire electrical appliances and consumer goods and later found themselves unable to build a house. Urged those present to widely publicize the meeting in order to keep absent residents informed.
Ernesto Kiluke (EK) – Nambungula resident. EK mentioned the region's current social problems. He discussed experiences related to projects developed in the region, highlighting promises of	**Catarino Cosmo (CC)** – RNT The Angolan Government has policies requiring companies that are awarded public sector projects to develop Social Responsibility Programs in order to safeguard communities in areas of influence. As well as this, JICA takes resettlement and

Questions raised	Responses and Clarifications
community support that have yet to be fulfilled. He indicated that the community is not opposed to the Project, but he pleaded for sincerity during the resettlement process in light of the local authorities and businesspersons' repeated acts of dishonesty.	financial compensation for any damages extremely seriously and will not provide financing until such issues are properly addressed by RNT and implemented in accordance with current national legislation and JICA requirements. RNT is a public company responsible for the high voltage electricity transmission line as well as the improvement of the transportation system and all associated infrastructure, and urged those in attendance not to associate RNT or the stakeholder engagement meeting's objectives with promises made by other political leaders and businesspersons. Sought examples of similar projects undertaken by RNT in other parts of the country in order to reassure those present regarding concerns related to the Project's right-of-way through the Figueira region. PRODEL (Production), RNT (Transmission) and ENDE (Distribution) are the three (3) companies responsible for the country's energy sector. RNT will install the Lubango-Moçamedes 220 kV electricity transmission line during the first phase of the Project. This will be followed by the implementation of the distribution phase, during which ENDE, in collaboration with the Huíla Provincial Government and municipal administrations, will evaluate energy demand and develop alternative distribution options from the Arimba substation. However, it was emphasized that the Project will only facilitate the transportation of electricity between the 220/60 kV East Lubango substation to 220/60 kV New Namibe substation to be installed in Moçâmedes. **Eduardo Ferdinand (EF)** – Holísticos RNT, JICA and Holísticos are not affiliated with any political party and make no promises regarding infrastructure implementation in the community. Was expressed regret that promises had remained unfulfilled. A 45 meters (RoW) buffer

Questions raised	Responses and Clarifications
	free of obstructions will be required along the proposed transmission line route, and this buffer of RoW will contain the towers and high-voltage lines, but would not contain any permanent infrastructure such as houses, churches, schools, hospitals, etc. The farmers would be able to return to their cultivation areas following the construction of the towers and lines, as long as they do not cultivate near the towers or plant fruit trees taller than 8 m.
Maria da Piedade (MP) – Camponês resident. MP requested additional information about the Project's route in order to determine whether it will pass through any of the neighborhoods represented at the meeting.	**Eduardo Ferdinand (EF)** – Holísticos The Project's route will pass near the Jamba 2, Camponês and Sames settlements invited to the meeting, but was not specify the precise location of the high-voltage towers position. The final TL route only will be presented after topography and geology work had been completed, and the geomorphologic and pedology conditions studied.
Mongalipe Chico (MC) – Heva de Cima Soba. MC praised the Project promoters for the initiative. Regarding the resettlement and compensation processes, he stated that each affected party has the right to negotiate in their own way or in the manner they believe is just. He pleaded with the community to maintain calm, emphasizing that compensation will be limited to houses and farms within a 45 meter Project buffer or those that may be impacted by other activities. Others who are unaffected will be able to maintain their normal ways of life.	**Eduardo Ferdinand (EF)** – Holísticos The Project team was grateful for the contribution of Mongalipe Chico, Soba of the Heva de Cima neighbourhood.
Raimundo Belo (RB) – Heva resident. RB alluded to the region's current social problems. He discussed his experiences with projects developed in the region that included promises of community support that were never fulfilled, including farmers whose fields were impacted by	**Catarino Cosmo (CC)** – RNT The Angolan Government has policies requiring companies that are awarded public sector projects to develop Social Responsibility Programs in order to safeguard communities in areas of influence. As well as this, JICA takes resettlement and financial compensation for any damages extremely seriously and will not provide financing until such issues are properly

Questions raised	Responses and Clarifications
the 30 kV transmission line project that received no compensation. He stated that one of the transmission line poles is located within his property and that he has not been consulted by the Project managers, nor does he benefit from the electricity that the lines supply. He stated that the community is not opposed to the RNT promoted project, but he pleaded for sincerity during the resettlement process due to the local authorities' repeated acts of dishonesty.	addressed by RNT and implemented in accordance with current national legislation and JICA requirements. RNT is a public company responsible for the high voltage electricity transmission line as well as the improvement of the transportation system and all associated infrastructure, and urged those in attendance not to associate RNT or the stakeholder engagement meeting's objectives with promises made by other political leaders and businesspersons. Sought examples of similar projects undertaken by RNT in other parts of the country in order to reassure those present regarding concerns related to the Project's right-of-way through the Figueira region. **Eduardo Ferdinand (EF)** – Holísticos RNT, JICA and Holísticos are not affiliated with any political party and make no promises regarding infrastructure implementation in the community. Was expressed regret that promises had remained unfulfilled. A 45 meters (RoW) buffer free of obstructions will be required along the proposed transmission line route, and this buffer of RoW will contain the towers and high-voltage lines, but would not contain any permanent infrastructure such as houses, churches, schools, hospitals, etc. The farmers would be able to return to their cultivation areas following the construction of the towers and lines, as long as they do not cultivate near the towers or plant fruit trees taller than 8 m.
	

Questions raised	Responses and Clarifications
Photo 1: Stakeholder engagement meeting organized in Poaires Muhaha settlement with female group.	
	
Photo 2: Questions about Project during the meeting in Nambungula settlement.	**Photo 3:** Participants in stakeholder meeting in Heva de Cima settlement.
	
Photo 4: Female group present in Heva stakeholder engagement meeting.	**Photo 5:** Female group present in Camponês stakeholder engagement meeting.

Following the conclusion of the Project's Environmental and Social Impact Assessment (ESIA) and the census of the population present in the Project's Right-of-way, five (5) stakeholder engagement meetings (**Phase 4**) were held with the authorities of the provinces of Huíla (three meetings) and Namibe (two meetings) between 7th to 10th June, 2022, to present the main results (see **Table 5-42**).

Participants of **Phase 4** meetings included Namibe Vice-Governors for Technical Services and infrastructures, Bibala Municipal Administrator, Deputy Humpata Municipal Administrator for Social Area, Deputy Lubango Municipal Administrator for Technical area, Provincial Directors, Arimba Communal Administrator, Municipal and Communal Administrations Representatives, Associations Members, Public Authorities' Representatives, Traditional Authorities, NGO's, members of civil society, Businessman and general Population.

The objectives of these meetings were four-fold, namely **a**) present the main results of ESIA (The potential environmental, social and cultural impacts associated with the construction and operation of the Project on the defined route), **b**) Present the results of the census of the existing population in the Project ROW (demography, number of families and potentially affected infrastructures) **c**) obtain feedback on issues of concern, questions and expectations of the participants, **d**) Obtain additional mitigation measures, suggestions and technical recommendations for the possible resettlement process in the future and in order to enrich the ARAP under preparation.

The five (5) stakeholder engagement meetings were organised by RNT and were attended by 217 (175 male and 42 female). Women attendance to the stakeholder engagement meetings was low, with less than 15% of the participants in five (5) meetings.

To present the Project information a presentation was carried out in Portuguese, the national official language. This presentation was delivered to stakeholders during stakeholder meetings. In addition to the presentation a Background Information Document (BID) was produced and distributed to all participants, even several copies were left to administrations for later distribution to interested parties. At the meeting held at Arimba commune and Humpata municipality, there were simultaneous translation from Portuguese into Nyaneca-Humbi language in order to ensure understanding of the Project for all participants. In order to guarantee a massive participation, and the meetings were announced in Angola Newspaper between in June.

Table 5-42: Summary of key questions from stakeholders held in **Phase 4**.

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
Mahini Mapole (MM) – Residing in Jamba II neighbourhood. Mahini Mapole commended RNT's initiative for the implementation of the Project and pointed out its benefits for the future. He said that special attention should be given to the conservation of the Boers cemeteries that located inside Jamba Farm.	**Eduardo Ferdinand – Holísticos.** EF mentioned that the two (2) cemeteries mapped along the TL Project route will be scrupulously avoided. He spoke of the sentimental and cultural value that the Boers and Onculuvala cemeteries represent for the people who have their beloved ones buried there, and of the historical value of the Boers cemetery. He mentioned these cemeteries are

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	outside the current project right-of-way and thus will not be affected. For future projects and RNT will take measures to prevent the lines from passing through the spaces of cemeteries. He stressed that the exhumation processes are very difficult to follow because it is extremely complex under current Angolan legislation, as it involves the creation of multidisciplinary teams including the involvement of administrative authorities, traditional authorities, family members of the deceased and church entities, etc. **Catarino Cosme – RNT** He mentioned that the route of the transmission line is not definitive and that a set of studies will be carried out to define the final route. He said that the Project promoter wants the negative impact to be minimized as much as possible, and has presented technical solutions, such as the installation of bypass towers, etc. However, he stressed that in the future if the cost-benefit analysis shows that it is feasible to place one or two towers inside the perimeter of the cemeteries, a work committee will be created between RNT, the Humpata Municipal Administration and the provincial directorates of Huíla, in order to facilitate the process of exhumation and transfer to another cemetery to be indicated by the local authorities. However, this is not the case of this project.
Agostinho Tchiputo (AT) – Onculuvala Village Head. AT commended the Project initiative and pointed out that the youth of the Onculuvala neighbourhood have been putting pressure on the issue of employment. He suggested that stakeholder engagement meetings	**Eduardo Ferdinand – Holísticos.** He thanked the Head Agostinho Tchiputo from the Onculuvala Village for his suggestions. He explained in detail the route of the transmission line from Arimba to Moçâmedes, and that the same

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
should be held with the families identified as potentially affected by the Project (farmers, property and land owners, etc.). The aim is to provide a better clarification of the Project and its potential negative and positive impacts before the implementation of the reconfirmation work of the affected people and the beginning of possible compensation. AT clarified that he is not against the placement of one or two towers within the perimeter of the Onculuvala village cemetery, as long as the traditional authorities and families are previously consulted and the exhumation occurs in accordance with local tradition and other legal rules in force in Angola. He requested that RNT to share the final layout of the Project so that the traditional authorities can avoid possible defrauders, who choose to build houses in order to be compensated.	route will not pass through densely populated regions and pointed out that in the municipality of Humpata, from the commune of Palanca bypass, the route of the 220 kV transmission line will always be parallel to the existing 60 kV transmission line, thus avoiding social conflicts related to the occupation of habitable and agricultural land. He explained in detail the registration work of the potentially affected parties carried out in November 2021 along the route of the presented Project. He also said that for safety reasons and in order to comply with international standards, houses, schools, hospitals, church and other permanent infrastructures cannot be permitted on the 220 kV Project easement (45 m). He emphasized that the presented route is not definitive and a set of studies will be carried out to determine its final route. He highlighted the studies of soils, geology, topography, geomorphology, etc. He stressed that before the implementation of the Project, RNT, JICA and TEPSCO will also take into consideration the cost-benefit effect before the compensation decision, in order to avoid making the Project extremely expensive, due to the compensation and physical resettlement process.
Manuel Mandante (MM) – Resident of the Jamba II neighbourhood. Manuel Mandante questioned about the resettlement and compensation process should the tower be installed on his land with potential affectation to his home.	**Catarino Cosme – RNT** He mentioned that only the physical infrastructures (for example houses) that are within the Project 45-meter easement will be compensated. Therefore, people whose property is not located within this area will not be compensated.

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	In case a house is relocated by the Project, a registration and a value assessment (benchmark) based on the market price will be carried out. The affected people will be entitled to receive a house that will be built within the safety limits. It will have the same or even better conditions than the property currently existing along the Project route. Eduardo Ferdinand – Holísticos. The Project is being funded by JICA and it takes very seriously the issues of involuntary resettlement (due to damage caused to other people's infrastructure and property relocation), as such, fair compensation shall be paid. Failure to address these issues properly, and compensate people, under the Angolan Legislation in force, and where applicable, JICA's requirements, shall imply the full funding not be provided. He indicated that the 220 kV electricity transmission line planned to be installed between the substations of Nombungo, Lubango East and New Namibe cannot overhead houses, schools, hospitals and large trees, always in compliance with the recommendations from the national legislation. However, he explained that there will be situations where this cannot be avoided, so the RNT and JICA have very explicit technical standards for these situations. An Abbreviated Resettlement Action Plan is being developed for potentially affected people to ensure that families affected by the Project will have the same or better living conditions and social welfare than prior to the Project development in the region.

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	The compensation due for lost farms and fruit trees will be according to crop price table per square meter or hectare released by the then Ministry of Agriculture and Fisheries (National Agriculture Directorate), and all the terms will be duly agreed upon, signed and executed in a transparent and honest manner. In order to ensure that the potentially affected parties shall compensated accordingly. However, the value to be paid for the farms mapped to be affected will depend in the agriculture produce per species that they present and not on the annual produce. At the end of all registration process in connection with the affected farms and compensation, the monetary amount of the agricultural produce will be provided to the farmer (owner of the farm), and the deadlines for the collection of the production shall be established. In case a house is relocated by the Project, a registration and a value assessment based on the national market price (benchmark) shall be carried out and the affected parties may receive a house with the same or even better conditions than the house currently existing along the Project route. During the construction of houses, the recommendations or requests of the affected families in terms of finishing and adjustment of the rooms will also be taken into consideration.
Alexandre Kalupia (AG) – Onculuvala Resident. AG asked about the issue of employability of people of said community.	**Catarino Cosmo – RNT.** He informed that during the public tender for the Project, the RNT will include in the specifications the clause of hiring at least 40% of the local labour force for the Project corridor in order to promote

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	employability and professional training to the youth of said region. He highlighted that it is required to hire qualified and non-qualified labour, and the opportunities for non-qualified work will all be provided for the youth, as long as they meet the minimum qualifications to provide the work Eduardo Ferdinand – Holísticos. He sought examples of similar projects implemented by RNT in other parts of the country to reassure those present regarding the creation of job opportunities for young people within the scope of the Project implementation in the region.
Dário Tomás (DT) – ADPP "Ajuda de Desenvolvimento de Povo para Povo". DT questioned the safety distances of the Project in relation to houses, ploughs, schools and if the route of the Project should cross the area of the Fenda da Tundavala. He also questioned if Bibala Municipality will benefit from the Project. **Bernar Aleluia (BA) – Advisor.** BA requested the interconnection between the very high voltage electricity transmission and distribution Projects. He questioned whether the communities near the Project route will benefit from that electricity. **Remidor Nanga (RN) – Municipal Fire Chief.** RN requested possibility of power distribution to the communities living in the Project route be analysed.	**Catarino Cosme - RNT.** He mentioned that only physical infrastructure (e.g. houses and schools) that are within the Project 45 meter easement will be compensated, so infrastructures that are not within this area will not be compensated. If a house is relocated by the Project, there will be a registration and evaluation of its market value, and the affected parties will be able to receive a house that will be built within safety limits, with the same or even better conditions than the displaced person's house living along the Project route. He stressed that the Project is exclusively for the transport of electricity between the 220/60 kV Lubango East Substation and the New Namibe 220/60 kV Substation to be built in Moçâmedes. He clarified that under the Transformation Program of the National Electricity Sector three Angolan companies are responsible for providing power production and distribution services in the country,

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	namely: PRODEL (Production), RNT (Transmission) and ENDE (Distribution). In the first phase RNT will build the Lubango-Moçâmedes electricity transmission line. Then it will move to the distribution phase, in which ENDE in collaboration with the Provincial Government of Namibe and municipal administrations will analyse the demand for energy and create alternatives for its distribution from Moçâmedes Substation. However, it was emphasized that the project is exclusively for the transport of electricity between the Lubango East 220/60 kV Substation and New Namibe 220/60 kV Substation to be built in Moçâmedes. **Eduardo Ferdinand – Holísticos.** He explained in detail the route of the transmission line from Arimba to Moçâmedes. He said that it will not pass through the region of Fenda da Tundavala or Serra da Leba. He also highlighted the importance of the two (2) regions from the environmental point of view (IBA0023 of Fenda da Tundavala) and the historical-cultural heritage and tourism.
Amélia Camunheira (AC) - Bibala's Municipal Administrator. AC questioned the technical viability of the municipal seat of Bibala and the regions of Muinho and Caraculo benefiting from the energy transported by the Project.	**Catarino Cosme – RNT.** He said that the funding requested from JICA by the Angolan government includes only the power transport from the Nombungo and Lubango East substations (in the province of Huila) to New Namibe Substation in Moçâmedes (in the province of Namibe). Subsequently, additional funding will be requested for satellite projects for electricity distribution to other municipalities in Namibe. **Manuel Domingos – RNT.** The Angolan government, through the Ministry of Energy and Water, has drawn up a program for the

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	electrification of all the country's municipalities and some nearby communes using hybrid and photovoltaic plants. Experimental projects are underway in the Province of Cabinda.
Marília Inácio (MI) – Community Administrator of Aida Neighbourhood. MI stressed the concern regarding the resettlement of the population. He asked about the registration, so that the Communal Administration could begin to raise awareness among the potentially affected population. How long it will take the construction phase considering the air quality change**.**	**Eduardo Ferdinand – Holísticos.** He explained in detail the registration of potentially affected parties that was carried out in November 2021 along the route of the Project. He informed that for safety reasons and to comply with international standards, houses, schools, hospitals and other permanent infrastructure cannot be permitted in the 220 kV (45 m) and 60 kV (24 m) Project easement. He emphasized that the route presented is not the final one and that a set of studies will be carried out to determine the final route. He highlighted the studies of soils, geology, topography, geomorphology, etc. He stressed that before the Project execution, the project promoters will also take into consideration the cost-benefit effect prior to the compensation decision with regard to relevant compensation and physical resettlement process. In the EIAS report a series of mitigation measures were presented for the developer in the construction phase of the Project, in order to be taken into consideration
Jorge de Sousa (JS) – President of the Namibe Fishing Association. JS suggested that the final report of the Project should be focused on the people to be affected. And special attention should be given to the ethno-linguistic	**Catarino Cosme – RNT.** This is the 4th time what that is being carried out the stakeholder engagement meetings RNT and Holísticos have been working with the communities so that all the parties may be aware of the Project, and may know how they will be potentially affected

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
communities of the region. He also said that he expects that the implementation of the project would not make the life of the affected population more difficult (the rural aspect, the cattle traffic, the precariousness of intermittent rivers). At this stage it is necessary to make an inventory of the grazing areas of the communities that will be affected.	by it, and have their feedback on the Project implementation. The Project will only compensate all the infrastructure (houses, farms, stores, etc.) that are within the 45 meters right-of-way along the line, and that all the issues are being addressed by the Government, RNT and funding entity as well.
Carlos Cruz (CC) – Moçâmedes' resident. CC questioned the measures that will be implemented to avoid opportunism. An awareness campaign should be conducted for the people living along the route and within the 45-meter perimeter of the Project. CC asked RNT to also request JICA to provide funding for the construction of an electricity transmission line between the Novo Namibe substation and Tômbwa.	**Catarino Cosme – RNT.** Regarding the actions guided primarily by self-interested motives, only the affected and previously registered parties will receive the compensations for the relocation of their houses, farms, and other structures. He emphasized that in case of total or partial relocation of a house, the form of negotiation or compensation will only take the house into consideration. He stressed that the financial compensation in case of resettlement of houses will be avoided due to the lessons learned in other projects promoted by RNT, an example some people preferred to acquire electrical appliances and consumer goods, and later no longer had conditions to build the houses. **Manuel Domingos – RNT.** RNT is seeking funding through the African Development Bank for the electrification of the Tômbwa city. The funding will enable a transmission line to be built between the Novo Namibe substation and a future substation in the Tômbwa.

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	
Photo 1: Stakeholder engagement meeting organized in Humpata.	
	
Photo 2: Traditional authorities in Bibala Meeting.	**Photo 3:** Questions about project in Bibala.
	
Photo 4: Vice-Governor of the Namibe Province.	**Photo 5:** Women in Moçâmedes SHM.

The **Phase 1** and **4** meetings were held in the amphitheatres of the Governments of the Provinces of Huíla and Namibe, and in the meeting rooms of the Municipal Administrations of Humpata, Bibala and Arimba. **Figure 5-51** illustrates the communities engaged in **Phase 2** and **3** of the stakeholder engagement meetings. These communities will be the subject of a census within the framework of the Abbreviated Resettlement Action Plan.

Figure 5-51: Communities engaged in phases 2 and 3 of the stakeholder meetings.

The stakeholder engagement programme is designed to cover all phases of the Project. However, RNT, JICA, TEPSCO and EPC will hand over the Project to RNT once the construction of the transmission lines and substation are completed. JICA, TEPSCO and EPC will have no responsibilities during the operation phase. In this regard, all engagement activities during the operation will be managed and promoted by RNT. The general objectives of stakeholder engagement meetings are outlined in **Figure 5-52** as well as the Project activities.

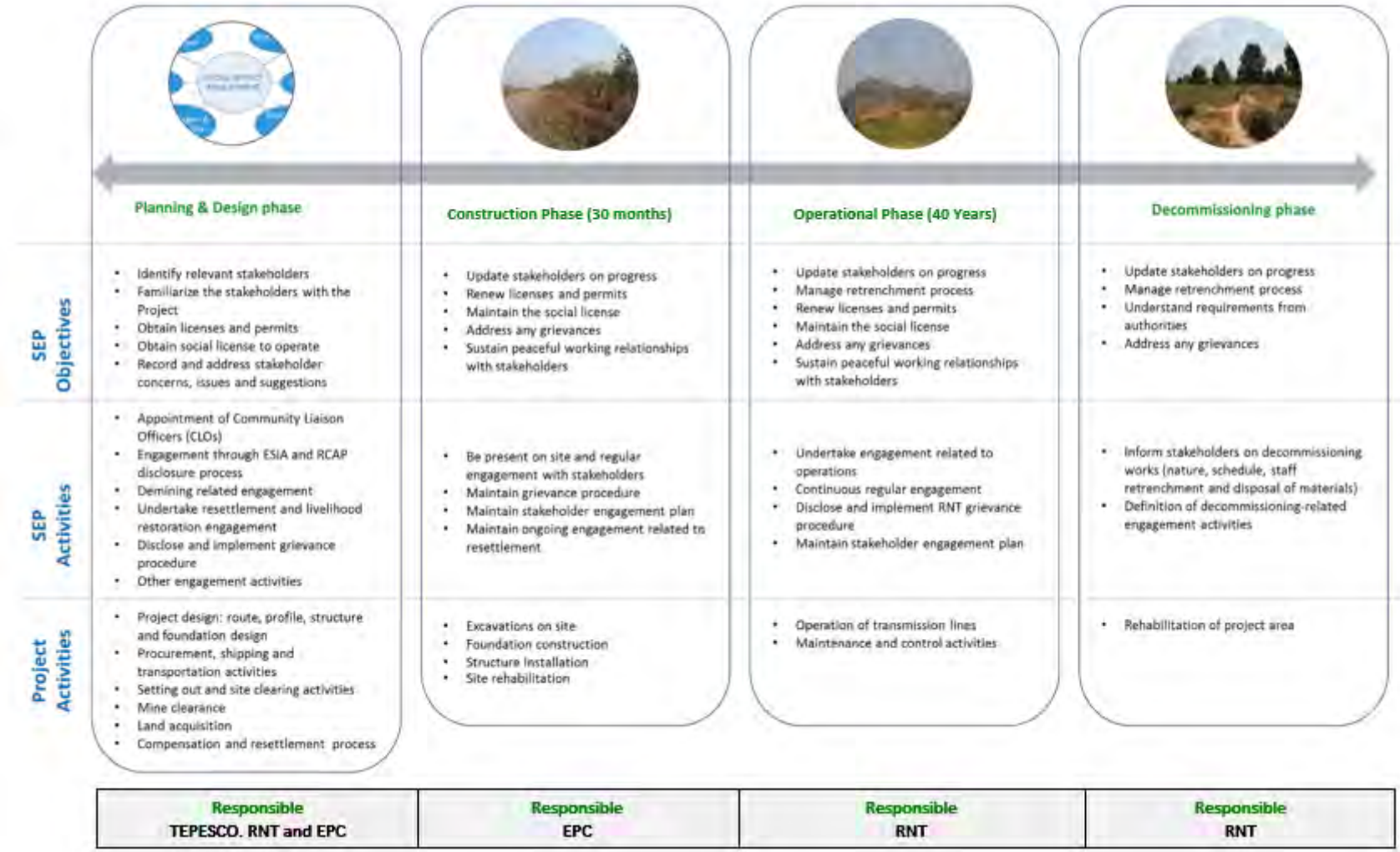

Figure 5-52: Stakeholder Engagement Objectives and Activities for each Project Phase.

Specific planning and engagement activities will be necessary at each Project phase. These are presented in Project's Stakeholder Engagement Plan (See **Appendix 2**). The activities that will be ongoing throughout the entire Project cycle and are therefore common to the different phases include the following:

- Regular update of the Project Background Information Document (BID) as the Project moves forward and activities, schedules and milestones evolve.
- Regular update and revision of the stakeholder register including stakeholder analysis and re-evaluation as necessary throughout the different Project phases.
- Addressing comments, questions, and grievances regularly and through appropriate channels, and issuing information to stakeholders. This includes regular refreshers to stakeholders about the Grievance Mechanism, and related processes.
- Regular reporting to the different stakeholders as appropriate.
- Regular Project Monitoring reports (in particular during Implementation and Operations).

Additional information about grievance mechanism procedure, monitoring and reporting stakeholder's procedure consult the Project's Stakeholder Engagement Plan (See **Appendix 2**).

After holding several stakeholder engagement meetings with the administrative authorities of the provinces of Huíla and Namibe and communities living in the right-of-way of the transmission line Project, the next step will be public consultation on the project. After the submission of the ESIA for the 220 kV transmission line Project in Ministry of Culture, Tourism and Environmental (MCTA), a public consultation will be organised as part of the EIA process for the Development Project, in compliance with the requirements set by the Executive Decree No. 87/12 of February 24th. According to the national legislation public consultation should take place during the Environmental Impact Assessment process undertaken during the first 30 days after submission. However, in practical terms public consultations are usually organized between 60 to 90 days after the submission of the ESIA report to MCTA.

Chapter 6

IMPACT ASSESSMENT AND MITIGATION MEASURES

6 IMPACT ASSESSMENT AND MITIGATION MEASURES

This chapter presents the assessment of potential environmental (physical, and biological), social, community health and cultural impacts associated with the construction and operation of the Project. Unplanned events and cumulative impacts are also covered. The chapter also describes the methodology used to assess the potential environmental and socioeconomic impacts that result from the 220 kV TL Project. It also describes the mitigation measures required to minimize, attenuate and/or reduce the potential identified impacts.

It should be noted that, as the exact route of the 220 kV transmission line has not yet been defined, including the workers' camps sites, it will not be possible to fully assess the potential impacts arising from the implementation of the Project, particularly with regard to impacts on the population's crops, vegetation and potential resettlement.

6.1 Methodology for Assessment of the Environmental and Social Impacts

This section outlines the proposed method for assessing the significance of the potential environmental and social impacts. The assessment of the significance of impacts for a proposed development is by its nature uncertain, and a matter of judgement. To deal with the uncertainty associated with judgement and to ensure repeatable results, Holísticos specialist team rates impacts using a standardised and internationally-recognised methodology adhering to International Organization for Standardization (ISO) 14001 and World Bank/IFC requirements. This methodology aligns with the Angolan ESIA Regulations (Presidential Decree No. 117/20 of 22nd April).

For each predicted impact, criteria are ascribed. These include the magnitude (size or degree scale) which also includes the type of impact (either positive or negative), the duration (temporal scale) and the extent (spatial scale), as well as the probability (likelihood). The methodology is qualitative, whereby professional judgement is used to identify a rating for each criteria based on a seven-point scale (see **Table 6-1**), and the significance is auto-generated quantitively using a spreadsheet through application of the calculations shown in **Figure 6-1**. The significance ratings are shown in **Table 6-5.**

Calculations

For each predicted impact, certain criteria are applied to establish the likely significance of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **magnitude** (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (magnitude + duration + extent).

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

Figure 6-1: Calculation of significance.

Table 6-1: Assessment criteria for the evaluation of impacts.

Criteria	Numerical Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately.
	2	Brief	Impact will not last longer than 1 year.
	3	Short term	Impact will last between 1 and 5 years.
	4	Medium term	Impact will last between 5 and 10 years.
	5	Long term	Impact will last between 10 and 15 years.
	6	Ongoing	Impact will last between 15 and 20 years.
	7	Permanent	Impact may be permanent, or in excess of 20 years.
Extent	1	Very limited	Impacts very limited, felt in isolated areas of the study area.
	2	Limited	Impacts limited to specific parts of the study area.
	3	Local	Impacts felt mostly throughout the study area.
	4	Municipal area	Impacts felt outside the study area, at a municipal level.
	5	Regional	Impacts felt outside the study area, at a regional/provincial level.
	6	National	Impacts felt outside the study area, at a national level.
	7	International	Impacts felt outside the study area, at an international level.

Criteria	Numerical Rating	Category	Description
Magnitude	1	Negligible	Natural and/or social functions and/or processes are negligibly altered.
	2	Very low	Natural and/or social functions and/or processes are slightly altered.
	3	Low	Natural and/or social functions and/or processes are somewhat altered.
	4	Moderate	Natural and/or social functions and/or processes are moderately altered.
	5	High	Natural and/or social functions and/or processes are notably altered.
	6	Very high	Natural and/or social functions and/or processes are majorly altered.
	7	Extremely high	Natural and/or social functions and/or processes are severely altered.
Probability	1	Highly unlikely/None	Expected never to happen.
	2	Rare/Improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere.
	3	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.
	4	Probable	Has occurred here or elsewhere and could therefore occur.
	5	Likely	The impact may occur.
	6	Almost certain/Highly probable	It is most likely that the impact will occur.
	7	Certain/Definitive	There are sound scientific reasons to expect that the impact will definitely occur.

When assessing impacts, broader considerations are also considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in **Table 6-2**, **Table 6-3** and **Table 6-4** respectively.

Table 6-2: Definition of confidence ratings.

Category	Description
Low	Judgement is based on intuition.
Medium	Determination is based on common sense and general knowledge.
High	Substantive supportive data exists to verify the assessment.

Table 6-3: Definition of reversibility ratings.

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified.
Medium	The affected environment will only recover from the impact with significant intervention.
High	The affected environmental will be able to recover from the impact.

Table 6-4: Definition of resource irreplaceability ratings.

Category	Description
Low	The resource is not damaged irreparably or is not scarce.
Medium	The resource is damaged irreparably but is represented elsewhere.
High	The resource is irreparably damaged and is not represented elsewhere.

Table 6-5: Significance ratings.

Significance	Negative	Positive
Negligible	Negligible – Negative	Negligible – Positive
Minor	Minor – Negative	Minor – Positive
Moderate	Moderate – Negative	Moderate – Positive
Major	Major – Negative	Major – Positive

6.2 Identification of the Project's Main Actions Generating Impacts on the Environment

The main impacts generated by the TL and substations Project under study occur in the construction phase, where the main interference in terms of soil occupation and the potential affections to existing natural, landscape and socio-economic values occur.

Thus, there is a direct affectation of the area to be occupied in the construction of the supports - more extensive and temporary during the construction phase and more localized and permanent in the

operation phase - as well as its surrounding area, corresponding to the protection RoW of the line and support areas allocated to the implementation of workers' camps and temporary access to activities under development. During construction and to minimize impacts when possible construction will take place within the RoW of the existing 60 kV line as well as existing access roads (including EN 280). During the operation phase, there is the maintenance of the impacts occurred in the previous phase, regarding permanent land occupation, landscape, interference with land use planning and socio-economic component. It should be noted that for the estimates for removal natural vegetation (excluding crops) is of approximately 10% of the entire line (196 km x 45 meters ROW). This is a maximum of 88 hectares for the entire line. However, when considering a maintenance road of 5 meters wide (maximum) during operation the total of 10 hectares will be directly affected.

Considering the greater significance of the interferences introduced by the Project during the construction phase, the main activities of the 220 kV transmission line Project likely to cause environmental impacts are systematised below:

- Construction of East Lubango and New Namibe substations, and installation of workers' camps;
- Machinery and vehicles circulation;
- Establishment of temporary accesses, which will be converted to maintenance roads after construction;
- Deforestation and earth moving;
- Definition of the protection RoW, in which trees likely to interfere with the operation of the transmission line are felled or cut down;
- Implantation of supports, with a temporary affectation of soil occupation during the construction phase, in a relatively large area of about 15m x 15m around each support, and an irreversible change in land use in the exact location of the support's implantation;
- Digging of holes and construction of the foundation blocks, involving excavation and concreting (5 meters deep).

Although the works camps locations are subject to approval by the Project Owner/Superintendent and are obliged to comply with the recommendations of the ESIA Report. It is foreseeable that their implantation and operation may cause negative effects on the environment, namely:

- Dust production as a result of earth moving and temporary storage on workers' camps, as well as other land preparation operations;
- Noise emission as a result of workers' camps preparation activities, the movement of vehicles accessing the site and the unloading of equipment and materials;
- Temporary compaction and impermeabilization of the soil, during the period that the workers' camps are in operation;
- Local alteration of the landscape, also during the period of its operation.

The project will have the following estimate footprint:

Characteristics	Construction	Operation
Temporary right-of-way for lines (45 meters corridor)	882.00 hectares	-
Permanent right-of-way for lines (45 meters corridor)	-	117.60 hectares
Temporary towers' sitting (25 m x 25 m)	30.94 hectares	-
Permanent towers' sitting (15 m x 15 m)	-	11.14 hectares
East Lubango Substation	4.05 hectares	4.05 hectares
New Namibe Substation (in-door type)	1.43 hectares	1.43 hectares
Total	918.42 hectares	133.96 hectares

6.2.1 Physical Environment

For the Physical Environment and taking into account the specific nature of the TL route and substations (East Lubango and New Namibe) sites, some changes in the status quo are anticipated in both phases of the Project, mainly during construction phase. Minor to medium potential negative impacts are anticipated, associated with the dispersion of particulate matter, the emission of gases resulting from the traffic of vehicles (mainly heavy vehicles), as well as noise generation, vibrations, waste generation and non-ionizing radiation, being the latter only during the operational phase.

6.2.1.1 Climate

- **Potential Impacts**

The New Namibe substation will be installed in a desert area and the East Lubango substation in an area with little vegetation. The footprint of the New Namibe Substation is 1.43 ha for the outdoor option while for the indoor option is 1.17 ha. The 220 kV Transmission Line (TL) between Lubango -

Moçâmedes will pass through regions with specific microclimates along its route, namely: areas with a high-altitude tropical climate with a dry season (Cw), areas with a desert climate (BW) and areas with a semi-arid steppe climate (BS) (see **Section 5.1.1** in **Chapter 5**). During the phase of easement preparation, construction of the substations, foundations and installation of the towers, the vegetation removal, demining (mechanical and/or manual), excavation and installation of the workers' camps will not be able to alter the parameters of the various microclimates of the region, namely: air temperature, relative humidity, wind, precipitation, and heat island formation (see **Figure 5-1**, **Figure 5-2**, **Figure 5-3** and **Figure 5-6** in **Chapter 5**).

The removal of vegetation exclusively in RoW of 45 metres wide along the TL route (in a maximum of 882 hectares during construction) and the maintenance of the indigenous ecological landscape of the region combined with the different altitude variations in the region may also ensure thermal balance for the region. The effect of the incidence of solar rays on the ground along the 45 m wide earthworks will be negligeable. In general terms, the physical presence and operation of the TL and the East Lubango and New Namibe substations are not likely to cause any change in the local and regional climate, so the impact is negligible.

- **Environmental Impact Assessment and Mitigation Measures**

No impact is expected for this descriptor; therefore, no measures are proposed.

- **Residual and Cumulative Impacts**

There are no Residual impacts for this descriptor. There are also no expected Cumulative impacts as there are very few activities that will occur under the project that could result in climate change.

6.2.1.2 Geology and Geomorphology

- **Potential Impacts**

No significant negative impacts are anticipated on Geology and Geomorphology (see **Section 5.1.2** and **5.1.3** in **Chapter 5**). Only minor superficial changes in the geomorphology within the construction areas

(in some spaces in TL route and substations sites), associated with the construction and improvement of access roads (which will be converted into maintenance roads after construction), excavations, earthworks along the RoW (limited to the strictly necessary), terrain modelling and ground levelling for the installation of equipment including the foundations for the towers, workers' camps and substations installations. This impact will only occur exclusively during the construction phase, no relevant impacts are expected during the operational phase. It should also be noted that potential explosive devices removed from the TL Project route, as a result of demining services, will not be detonated on site. Suitable locations will be found by the demining Agency. In addition, and when possible demining will be done manually to reduce impacts.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-6 outlines the Impact Assessment anticipated for the Geology and Geomorphology, and its mitigation measures.

Table 6-6: Impact Assessment and Mitigation Measures for Geology and Geomorphology.

Phase	Construction	
Impact description	Earthworks are not expected to be required on a large scale, should only take place along the 45 m of the easement, in the support workers' camps, and in the area of installation of the Moçâmedes substation. Considering the smaller volume of material expected to be moved, which will cause few geomorphological changes in the landscape. Digging holes for the tower's foundations will produce rock waste material for which a suitable destination must be found.	
Mitigation measures	The removal of vegetation and maintenance of the access roads created along the transmission line will be ongoing and fundamental to the safety and sustainability of the project. There are no mitigation measures applicable for the anticipated impacts, however, RNT and EPC should consult with the Provincial Directorates of Environment of Huila and Namibe provinces, with the aim of creating synergies to offset the potential impacts. It is recommended that the rock waste from excavations for the towers' foundations should be reused as far as possible and the remainder should be deposited near the excavation area.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Ongoing	Immediate
Extent	Regional	Local
Magnitude	Very Low	Very low
Significance	Minor Negative	Negligible
Probability	Almost certain	Unlikely
Confidence	Low	High
Reversibility	High	High
Resource irreplaceability	Low	Low

Phase	Construction
Comment on significance	Impacts are expected to be very few and mitigation potential is high.

- **Residual and Cumulative Impacts**

'There are no known positive impacts relating to the Geology and Geomorphology environment, and the impacts are dominantly related to the construction phase. Cumulative geomorphological impacts related to other projects planned for the surrounding regions are not considered significant, as the impacts of this project are minor and easily mitigated.

6.2.1.3 Soils

- **Potential Impacts**

Impacts on the soil are expected during the construction phase, such as the soil compaction, pavement for equipment installation and soil contamination (spills of contaminants and incorrect waste disposal). These will result from the cleaning and ground levelling activities, vehicles and machinery traffic between the workers' camps and the sites where the equipment (towers) will be installed, as well as where the workers' camps will be settled (i.e., Lubango, Humpata, Caraculo and Moçâmedes regions).

The locations to be paved will be where the new equipment should be installed (mostly foundations for the towers). The paved area for the foundations will occupy an area of approximately 15m x 15m (approximately 11 hectares for the 495 proposed towers). Another potential impact is soil contamination, being this associated with potential spills of contaminants (hydrocarbons and other contaminants). The spills may occur when filling fuel tanks and reservoirs of machines and equipment, or during the maintenance of vehicles and machinery.

As for the New Namibe and East Lubango Substations sites, their implementation implies the permanent occupation of the land where they will be located, in an irreversible manner in a total of approximately 5.5 hectares maximum. The areas to be occupied differ according to whether one considers the construction phase (in which the areas used cover, in addition to the substations implementation areas, entire surrounding areas affected by the construction processes involved) or

the operation phase (in which only the substations areas are permanently affected) (see **Section 2.5** in **Chapter 5**).

Soil Degradation

During the construction phase, the construction of access roads, vegetation clearance in the RoW (it is expected that approximately 882 ha of vegetation areas will be removed) and in East Lubango substation site, earthworks, and excavations for tower foundations are the main activities likely to affect soil structure and to cause soil compaction. Excavation work, earthworks, and removal of vegetation, especially on steep slopes, will render soils unstable and more vulnerable to erosion. The line's RoW is mostly on a medium to moderate erosion risk class due to the rugged topography of the Humpata region, with high-risk areas between Km 14 and Heva de Cima settlement. As a vegetation cover stabilizes the soils and ensures resistance to erosion, the removal of vegetation should be restricted to a minimum possible. The herbaceous and ligneous species that do not represent a risk for the Project should be retained in place and will contribute to maintaining the natural soil stabilization.

During construction and to minimize impacts when possible construction will take place within the RoW of the existing 60 kV line as well as existing access roads (including EN280). This will reduce significantly the impacted area.

At the East Lubango and New Namibe substations sites, workers' camps, parking areas for machinery, or other support structures as well as temporary accesses, a progressive compaction of soils will occur as a result of repeated vehicle movements. The primary impacts of soil compaction are that it alters drainage characteristics, namely; reduces aeration levels, which may cause anaerobic or waterlogged conditions to develop; and may cause surface run-off and localized flooding. Compaction can also have secondary impacts on ecology, as it reduces the ability of vegetation to re-establish.

Potential Contamination of Soils Resources

Soils can be contaminated during the construction phase by soil mixing during the excavation of foundation pits or by accidental hydrocarbons spills from heavy machinery at storage workers' camps. For all activities involving the use of potential pollutants or hazardous materials, there will be a requirement to ensure that material such as concrete, fuels, lubricants and hydraulic fluids will be

carefully handled and stored to avoid spillages. A Waste Management Plan will be implemented during the construction phase, which should reduce the probability of this type of contamination occurring.

During the East Lubango and New Namibe substations operation, the risk of soil contamination from accidental hydrocarbons spills from maintenance vehicles, backup generators, and machinery cannot be completely discarded. Moreover, specific attention must be given to the proper management of hazardous waste, particularly waste oil. 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 the soil's properties, if improperly managed.

As mentioned above, the Waste Management Plan (WMP) will be developed for both phases (construction and operation) to ensure the various types of waste produced (sanitary, non-hazardous, and hazardous) are adequately recovered, stored, treated, valued and/or correctly disposed of. The WMP also outlines measures to prevent or eliminate possible risks associated with waste.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-7 and **Table 6-8** outlines the Impact Assessment anticipated for the Soils (soil degradation and contamination), and its mitigation measures.

Table 6-7: Impact Assessment and Mitigation Measures for Soil Degradation.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Immediate
Extent	Regional	Local
Magnitude	Low	Very low
Significance	Minor Negative	Negligible
Probability	Likely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Impacts are expected to be very few and mitigation potential is high.	
Mitigation measures	• Minimize soil exposure during excavations and earth moving in particular during periods of heavy rain to decrease water erosion and transport of solids, concentrate earthworks in the dry season, whenever possible; • Vegetation must be cleared only immediately prior to construction works commencing to minimise the chance of exposing the soils to wind erosion;	

Phase	Construction
	• The removal of vegetation should be kept to a bare minimum. Trees should be pruned to size, where exclusively necessary, and not removed (no de-stumping); • Prepare and implement erosion and sediment control plans, particularly in areas with high erosion potential; • Accelerated erosion from storm events during construction shall be minimised through managing stormwater runoff (e.g., velocity control measures); • Handling of chemical products should always be carried out in such a way as to minimise the risk of spillage onto the ground, in accordance with the procedures defined in the environmental management plan for the site; • The washing of concrete mixers should preferably be carried out at the concreting plants, thus preventing soil contamination; • In the case of the electricity line, whenever the construction activities result in surplus soil, namely from the opening of hollows, this should be used to cover the foundations or spread on the ground, after the installation of the foundation blocks, thus minimising the impacts associated with the destruction of soil for the implantation of supports.

Table 6-8: Impact Assessment and Mitigation Measures for Soil Contamination.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Immediate
Extent	Regional	Local
Magnitude	Moderate	Very low
Significance	Moderate Negative	Negligible
Probability	Unlikely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Impacts are expected to be minor and mitigation potential is high.	
Mitigation measures	• Develop and implement an Emergency Response Plan, including recovery techniques for contaminated soils (to be prepared by the contractor); • Fuel and other hazardous substances must be stored in aboveground storage tanks or sealed containers, contained within a bunded area and with sump drainage to capture spills and leaks; • Perform the maintenance of equipment and machinery in appropriate waterproofed sites. The waste that results from this process should be duly stored and forwarded to an environmentally adequate destination; • The area affected by an accidental spill (a portion of the soil) must be secured in spill containment kits, and be forwarded to an environmentally adequate destination; • Waterproof the storage and fuel supplying facilities, and generators zones, according to the legislation, and build settling ponds/basins to contain potential accidental spills of lubricants and fuels; • Certify the Waste Management Plan by the National Waste Agency, and comply with it. • Select a site adequate for the disposal of construction waste. These should be adequately managed, and in compliance with the national legislation, namely	

Phase	Construction
	Presidential Decree No. 17/13 on Construction and Demolition Waste, and Presidential Decree No. 190/12 on the Regulation of Waste Management.

- **Residual and Cumulative Impacts**

The cumulative impact of soil degradation and contamination during the construction and operation phases of similar projects is not considered to be a significant impact within the region because, in general, not all vegetation is expected to be removed from the RoW and access roads are designed in a manner so as to avoid erosion. The activities likely to cause such negative effects will be concentrated mostly at workers' camps and towers' locations which are located at intervals of 400 m apart and are very easily to mitigate.

The overall footprint of impact within the soil resource presented in the project region, is considered to be Negligible, with full compliance with the proposed mitigation measures and plans, including training for workers involved in refuelling motor vehicles, generators, mixing chemicals, etc.

6.2.1.4 Air Quality

- **Potential Impacts**

The construction phase of the 220 kV TL and 220/60 kV New Namibe and East Lubango substations will include a wide range of civil works necessary for the establishment of the substations' equipment, right-of-way, towers, and other associated infra-structures (see **Chapter 2**). Project activities that have potential to impact air quality would be associated with construction from emissions of air pollutants from temporary power generators, equipment installation, vehicles and machinery traffic. Construction activities (vegetation removal, earthworks, excavation, soils modelling, and borrow pits) will also generate the emission of particulate matter (dust).

Each of these operations has its own duration and potential for dust generation and therefore the extent of dust emissions would vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions along the project areas. It is expected that towers' locations, where most of the earthworks will take place, are 400 meters from each other, and will be excavated sequentially.

The following emissions would be expected during construction, namely: emissions of nitrogen oxides (NO_2), carbon monoxide (CO), carbon dioxide (CO_2) and sulphur dioxide (SO_2), mainly from construction-related vehicles (and to a lesser degree from construction generators and other hydrocarbon powered equipment); and dust and particulate matter (as $PM_{2.5}$ and PM_{10}) created by construction-related vehicle traffic on unpaved roads.

Once the transmission line is built and operational and the RoW reinstated, no significant effects on air quality are anticipated. The maintenance activities, and in particular the continued vegetation control along the RoW[9], will result in some dust emissions and gaseous emissions, due to fuel consumption of light-duty equipment and vehicles used for those maintenance operations, however, the expected air pollutant emissions are to be intermittent and of low intensity. As such, air quality impacts during operations are considered negligible. The eight particulate matter measurements taken along the TL Project route showed very low values for $PM_{2.5}$ and PM_{10} when compared to the pollution limit values set by the International Finance Corporation (see **Figure 5-17**, **Table 5-1** and **Table 5-2** in **Section 5.1.7** in **Chapter 5**).

Regarding any electromagnetic effects, the 495 towers will have 45 to 55 meters in height and that any electromagnetic fields would be negligible at these heights (see **Section 2.4.4 in Chapter 2**), particularly in areas which are uninhabited.

During the operation phase of the East Lubango and New Namibe substations, emissions of Sulphur Hexafluoride (SF_6) to the atmosphere may occur. This gas is used in the cutting chambers of circuit breakers in the substations because of its exceptional dielectric behaviour. In fact, SF_6 has a dielectric strength three times greater than that of air and, at the same pressure, has an arc extinction capacity three or four times greater than that of air. In terms of its properties, SF_6 has no reactive properties and is considered an inert gas. It is also characterised by being an odourless, colourless, non-flammable and non-poisonous gas. In the atmosphere SF_6 contributes to the greenhouse effect and its release should be avoided. Given the nature of the pollutants emitted and the expected concentrations of the emissions in question, no impacts on human health are expected during the operation phase of the East Lubango and New Namibe substations.

[9] Control of vegetation regrowth is extremely necessary to avoid disruption to the transmission line and towers.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-9 outlines the Impact Assessment anticipated for the Air Quality, and its mitigation measures. Despite the low significance expected in air quality of project area, dust emissions may promote some degree of annoyance to the surrounding settlements. As such, mitigation measures are recommended to reduce efficiently the potential nuisance effects caused by dusts on nearby receptors.

Table 6-9: Impact Assessment and Mitigation Measures for Air Quality.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Immediate	Immediate
Extent	Local	Local
Magnitude	Moderate	Low
Significance	Minor Negative	Negligible
Probability	Likely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Impacts are expected to be very few and mitigation potential is high.	
Mitigation measures	• Fuel and other hazardous substances must be stored in aboveground storage tanks or sealed containers, contained within a bunded area and with sump drainage to capture spills and leaks; • Speed limits should be set for construction heavy vehicles. This speed limit should not exceed 40 km/h in critical segments, such as when near residential areas; • All internal combustion machinery and equipment should be kept in good maintenance status to minimize tailpipe emissions. This should include preventive maintenance of machines, equipment, and vehicles, and operator training, as well as internal monitoring program of proper maintenance of vehicles; • Vegetation clearing and earthworks should be minimized as much as possible and limited to the strictly needed areas; • All unpaved surfaces where vehicle movement is to be expected near residential areas should be kept moist (e.g., through a water sprinkler truck), particularly during dry and windy conditions, to minimize the dust emitted by vehicle entrainment; • Heavy trucks transporting granular construction materials (such as sand, soil, and gravel, etc.) should not be loaded to full capacity. A free edge of approximately 0.2 m should be kept, to avoid spills during transportation; • Trucks carrying dusty materials should have the load conveniently covered, preventing the emission of particulate matter and fugitive dusts; • In workers' camps stockpiles of granular materials should be regularly sprinkled with water, to minimize windborne dusts;	

Phase	Construction
	• Prohibit the incineration/burning, and the disposal on the soil of any type of waste or flammable material in the region where the project should be implemented; • Prior to construction activities undertake an air quality baseline survey to set the benchmark for gases (NOx, CO, CO_2, and SO_2) and particulate matter ($PM_{2.5}$ and PM_{10}). This is to be part of an ongoing monitoring programme throughout operation; • Covering internal circulation routes and the area allocated to the construction site with non-powdery material (gravel, gravel, concrete or other); • Defining circulation routes that are as short as possible (taking into account the priority given to distance from residential areas, hospitals, schools, etc.).

- **Residual and Cumulative Impacts**

Minor residual impacts are anticipated for this descriptor (air quality), as a result of the emission of combustion/exhaust gases from vehicles and machinery, and due to the normal road traffic along transmission lines routes (especially on unpaved roads).

6.2.1.5 Sound Environment, Vibration and Radiation

- **Potential Impacts**

During the construction phase, noise will be mainly generated by the operation of construction vehicles and machinery and from the activities carried out in each specific work front, as discussed in sections above. All these construction activities and equipment operation will result in temporary noise emissions with potential annoyances to the community when the construction activities take place in the vicinity of existing settlements. Of the construction activities with the potential to generate impacts on ambient noise, some are clearly noisier, such as demining, earthworks and vegetation clearance. Other activities, such as transportation of materials and the movement of heavy vehicles from the workers' camps to the work fronts and back, will still generate noise, but of lower levels.

It is also worth noting that some activities are very limited in time and space (such as earthworks and excavation at each tower location) while others will be more continuous (such as the movement of machinery). Low ambient noise levels are expected due to the rural location of the overall corridor. Thus, the noise levels during this phase will also depend on several factors, such as the type, quantity and state of repair of the equipment to be used, construction methods, and workers' camps locations.

The values recorded during the nine noise measurements confirm that the TL route is an area with high anthropic interference on the sound framework, with values exceeding 50 dB (Leq) at some points (see **Table 5-6** and **Table 5-7** in **Section 5.1.8** in **Chapter 5**).

During the operational phase of the Project different types of noise can be produced, namely: wind induced noise, due to certain wind conditions acting over the transmission line components; noise emissions due to the corona effect, which will only occur under specific meteorological conditions; and induced traffic and noise during maintenance activities to be performed in the RoW of the powerlines.

Construction activities and equipment are not expected to result in significant levels of vibration. Equipment that might generate high levels of vibration (such as impact piling or vibratory compaction) will not be used. Project construction will also entail some temporary, localized, ground works that will generate very low vibrations. Depending on the soil characteristics and on the distance to the nearest building, these activities could produce vibrations for houses in the vicinity always with small magnitude. Therefore, vibration effects have been scoped out of further assessment.

When the transmission line is fully operational, an occasional potential disruption of the local sound environment can be caused by a phenomenon called corona discharge[10]. Under ideal conditions (for corona discharges), the noise generated by this effect can reach relatively high sound levels (approximately 30 dB (A)), which are noticeable to the human ear and therefore may generate annoyances to people who live in the vicinity of high voltage overhead lines. Taking into consideration that the TL will have a protection RoW of 45 metres and the towers will be more than 45 metres above ground level, is not likely that the corona discharges will generate high enough noise levels to produce any kind of annoyance over the populations residing in the vicinity of the transmission line. The associated noise levels are weather related and the transmission lines are normally quiet during dry weather with corona noise sometimes occurring during wet weather conditions. However, ambient noise levels also increase significantly during periods of rain. This increased ambient noise level is

[10] In certain conditions, such as rain and fog, when very high voltage values pass through the transmission lines conductors there is some current leakage to the air. The air, which when dry is a perfect insulator but when moist becomes a conductor itself, is then ionized. In this situation, the electric field turns higher and a bright effluvium, producing a light crackle, begins to appear, presenting sharp edges or protrusions. Above a given tension level, and when observed in the darkness, all the driver appears surrounded by a bluish light halo, which produces noise. This phenomenon is called the corona effect or corona discharge.

expected to mask effects from corona discharge noise and this impact has been scoped out of further assessment.

Operation maintenance activities will comprise the use of 4X4 vehicles and the use of occasional heavy vehicles responsible to perform vegetation control along the corridor. These vehicles will generate noise emissions, but it is anticipated that the additional road traffic generated as a result of the Project would be minimal and sporadic in nature as there will be very few visits made by maintenance staff.

Generally, all equipment emits non-ionizing radiation (electromagnetic radiation). The problem lies in the definition of distances and levels from which this radiation can affect the well-being of living organisms. There is still no consensus within the scientific world, since some articles claim that the exposure limits proposed by various institutions/organizations are not acceptable. This ESIA took into consideration the threshold limits of exposure defined by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (ICNIRP, 1998) (Health Physics Society, 1998) (see **Section 3.6**).

During the operation phase, only a slight increase in noise should be perceptible within the premises of the East Lubango and New Namibe Substations, resulting from the operation of the transformers. The equipment (transformers) and the overhead powerlines and some East Lubango and New Namibe Substations equipment will emit electromagnetic non-ionizing radiation, and it is expected the emission of this radiation, or a higher diffusion radius with the installation of new equipment. However, complying with safety distances and correct equipment installation and operation, the nonionizing radiation levels will not represent any danger to people and other living forms.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-10 outlines the Impact Assessment anticipated for the noise environment, vibration and radiation, and its mitigation measures during the construction phase. Despite the minor significance expected in noise environment of project area, the drilling of soils for the construction of foundations to support the towers may occasionally cause vibrations that could affect nearby houses.

Table 6-10: Impact Assessment and Mitigation Measures for noise environment and vibration.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Immediate	Immediate
Extent	Local	Local
Magnitude	Low	Low
Significance	Minor Negative	Negligible
Probability	Likely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Impacts are expected to be very few, and mitigation potential is high.	
Mitigation measures	• Speed limits should be set for construction heavy vehicles. This speed limit should not exceed 40 km/h in critical segments (specially near residential, schools, and hospital areas); • Construction activities, in particular the noisier ones, should be limited to the daytime period only (between 07:00 and 22:00) and to working days, avoiding working during the night-time and on weekends; • The location of the workers' camps should be carefully defined, considering the location of sensitive receptors (houses, hospital, schools, etc.); • Inhabitants of local communities nearby the construction locations should be previously informed by the contractor regarding the upcoming construction activities, including information on the planned start of activities, their nature and duration. This communication should also include information regarding the project nature and goals; • Develop and implement a Grievance Redress Mechanism (GRM), to address complaints related with noise and vibration impacts; • Perform noise monitoring campaigns during the construction phase of the project in the vicinity of the identified settlements located inside the 100m transmission line and Moçâmedes substation buffer area. This is to be part of an ongoing monitoring programme throughout operation; • Use soundproof generators or renewable sources, as an alternative to electricity for energy-efficient equipment; • For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order, also that the doors close properly against the seals.	
Observation	See mitigation measures presented for descriptors geology and geomorphology (section 6.2.1.2), soils (section 6.2.1.3), and air quality (section 6.2.1.4).	

Table 6-11 outlines the Impact Assessment anticipated for the corona discharge, radiation, and its mitigation measures during the operation phase.

Table 6-11: Impact Assessment and Mitigation Measures for corona discharge and radiation.

Phase	Operation	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Immediate	Immediate

Phase	Operation	
Extent	Local	Local
Magnitude	Very Low	Very Low
Significance	Minor Negative	Negligible
Probability	Unlikely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Impacts are expected to be very few, and mitigation potential is high.	
Mitigation measures	• Regular maintenance of the transmission line and Moçâmedes substation components such as insulators, conductors, etc. • Perform a survey of the intensities of the electromagnetic radiation (kV/m), and the magnetic fields (A/m) generated by the SS equipment; comparing the results with the exposure limits defined by the ICNIRP, that limits the exposure to electric, magnetic, and electromagnetic fields (up to 300 gHz): a. the event that radiation values area found outside the intervals that are considered safe, consider the implementation of protective measures, such as the installation of shielding with specific alloys (only effective to reduce exposure to the electric field, not exposure to magnetic field).	
Observation	See mitigation measures presented for descriptors geology and geomorphology (section 6.2.1.2), soils (section 6.2.1.3), and air quality (section 6.2.1.4).	

- **Residual and Cumulative Impacts**

Residual impacts are anticipated for this descriptor, even with the implementation of mitigation measures in the operation phase of the Project, as a result of the emission of non-ionizing radiation, however of low significance for the current condition of the status quo. Since the TL route in some zone will be parallel to the existing 60 kV TL, cumulative impacts should also be expected.

6.2.1.6 Landscape

During the field survey, photographs of the site and surrounding landscape were taken from predetermined viewpoints. The landscape Study Area of the Project was identified as a 1 km corridor along the TL. Based on the satellite images, the Natural Values and Ecological-Landscape Sensitivity in the Project route were determined, and the sensitivity classification was analysed into Exceptional (A), Very High (B), High (C), Medium (D) and Low (E) see **Table 5-17** in **Section 5.2.3**, **Chapter 5**.

- **Potential Impacts**

In general, it can be said that the impacts on the landscape, caused by the construction of this type of infrastructure, are felt with greater intensity in the construction phase. In the operation phase, they

are attenuated, as a result of the implementation of mitigation measures, which although they may be minimized, cannot eliminate visual or landscape impacts, given the large dimensions of the equipment to be installed as part of the project.

Thus, the impacts are generally considered as permanent and irreversible. As a general rule, over time, observers will become accustomed to the new structures but their significance will not be annulled. The more significant impacts on landscape will occur during the construction phase as a result of the East Lubango and New Namibe substations built, vegetation clearance in the RoW (mainly between Tchivinguiro and Bruco corridor – from TL Km 70 to 90 as shown in **Figure 5-23**), presence of temporary workers' camps and associated equipment, construction and machinery traffic, earthworks, infrastructures assembly and installation. This impact is a combined effect of several aspects, including:

- Localized alteration of the topography, as a result of the implantation of the supports, which are considered to be of little significance although permanent;
- Occurrence of discontinuities in terms of soil occupation, with negative impact, due to the destruction of vegetation cover and earth movement. These impacts are considered temporary;
- Disruption of the current continuity of the landscape in places where construction activities will take place, of temporary duration;
- Reduction of visibility, even if only temporary, especially during dry season, caused by the increase of dust emissions and its deposition in the areas surrounding the workers' camps, due to soil movement, considered to be of temporary duration;
- Introduction of external elements to the existing landscape (e.g., construction materials, prefabricated structures, etc.) of temporary duration.

During the construction phase for both the TL and the substations, the different impacts already arising from the construction phase are considered, since they cannot be totally annulled. Globally, the visual impact of the Project will be little significant because, most of the TL in many areas will be parallel to the existing 60 kV transmission line between Lubango – Moçâmedes, near the National Road no. 280 (EN280), and will cross a desert area where the height of the vegetation usually does not exceed 5 or 10 meters (see **Section 5.2.1.2** in **Chapter 5** and **Figure 5-22**, **Figure 5-23** and **Figure 5-24**), so, in some cases, there will be no need to remove the vegetation (between Tchivinguiro, Bruco, Kapangombe, Caraculo and Moçâmedes corridor). When possible, construction will take place within the RoW of the existing 60 kV line as well as existing access roads

During the operation phase, the overall aesthetic effect of a transmission line and East Lubango and New Namibe substations are likely to be negative to most people, especially where proposed lines would cross natural landscapes and some areas without infrastructure (see **Section 5.2.3** in **Chapter 5**). The tall steel structures may seem out of proportion and not compatible with agricultural landscapes, vast plains, or hills. This impact can be described as a permanent alteration to the landscape, resulting from several aspects including:

- Landscaping quality reduction;
- Visual intrusion;
- Change in tranquillity of the surrounding landscape;
- Changing wilderness character and creating dominant visual elements.

The reduction of landscape quality, visual absorption capacity, and spatial disorganization generate relevant impacts that will remain in the operation phase (transmission line, East Lubango and New Namibe substations). In places with potential for visualization, identified in the baseline, the perception of alterations in the landscape resulting from the infrastructure will be higher and the visual impacts may become more significant. Research and experience show that reaction to aesthetic of TL and substations sites differ. In some settlements near the existing 60 kV, residents do not notice them or find them objectionable from an aesthetic perspective.

To some, the 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.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-12 outlines the Impact Assessment anticipated for the landscape, and its mitigation measures during the construction and operation phases.

Table 6-12: Impact Assessment and Mitigation Measures for landscape.

Phase	Construction and Operation	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Short term
Extent	Regional	Local
Magnitude	Moderate	Minor
Significance	Moderate Negative	Minor negative
Probability	Certain and Definitive	Certain and Definitive
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Impacts associated with landscape will be noted only between Arimba settlements to Tchivinguiro zone, after this will cross a desert zone until Moçâmedes substation.	
Mitigation measures	• Speed limits should be set for construction heavy vehicles. This speed limit should not exceed 40 km/h in critical segments (specially near residential, schools, and hospital areas); • Vegetation clearing, topsoil removal, and earthmoving activities should be minimized as much as possible and limited to the strictly needed areas; • All temporary construction sites, such as borrow pits and landing areas, and any other areas disturbed by construction, will be revegetated immediately following the completion of the construction activities. Use native species for the rehabilitation works; • Only areas that are already highly disturbed should be used for the establishment of workers' camps and/or laydown areas; • Workers' camps, laydown areas and machinery parks should be located as far as possible (minimum distance of 300 m) from any areas of sensitive use (residential areas, schools, and health units); • Limit disturbance on landscape outside site boundaries; • Tree planting or other forms of screening where it might be feasible to mitigate impacts on visual receptors at specific viewpoints/routes. Other compensation programmes are to be discussed with the authorities.	
Observation	See mitigation measures presented for descriptors geology and geomorphology (Section 6.2.1.2), soils (Section 6.2.1.3), and air quality (Section 6.2.1.4).	

- **Residual and Cumulative Impacts**

No Residual impacts are anticipated for this descriptor. Minor cumulative impacts are expected since new equipment will be installed, adding to the existing one. After the decommissioning of the construction support workers' camps, if applicable, the EPC should examine the possibility of donating the prefabricated facilities built into them to the administrations of the region for the creation of schools and medical units.

6.2.1.7 Water Resources

- **Potential Impacts**

The transmission will cross two major rivers (Giraúl and Bero), despite being dry rivers during the most part of the year, flooded only during the rainy season, and small surface water bodies (see **Photo 5-1**, **Figure 5-15** and **Figure 5-16** in **Section 5.1.6**, **chapter 5**). No towers will be constructed in the rivers nor within 30 meters of the riverbanks. No permanent water courses with physical expression were identified in the vicinity of the locations planned for the implementation of the substations, and the New Namibe substation will be installed in an area with desert soil characteristics. However, there are some possible impacts that may occur mainly during the construction works, which are listed below.

Project activities that will have a direct effect on the surface water include clearing of vegetation and excavation of foundations near surface water bodies. In addition, if vegetation and soils clearing are not properly managed, there is the potential for soils to run into water bodies and increased sediment load. This in turn may have a detrimental effect on water quality and effect surface water users. However, it should be noted that the TL will cross mostly desert areas with very little surface water.

During construction activities, water will be required (e.g., cement mixing for the foundations and potable water for workers). At this stage the exact locations where the water will be sourced from it is not known, although it will most likely be sourced from local subcontractors with valid permits for water extraction from the rivers. Abstraction will be done at rates (daily water consumption is expected in the order of 44.04 m^3) which do not adversely affect ecological functions and do not impede access to water of existing users. Once the RoW is reinstated, no direct change on water flow of surface water bodies is anticipated. No impacts on the water resources in the Project area (transmission line and substations areas) are expected during the operation phase.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-13 outlines the Impact Assessment anticipated for the water resources, and its mitigation measures during the construction phase. As referred above, no impacts on the water resources in the Project area are expected during the operation phase.

Table 6-13: Impact Assessment and Mitigation Measures for water resources.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Brief	Short term
Extent	Local	Local
Magnitude	Moderate	Minor
Significance	Minor negative	Negligible
Probability	Unlikely	Certain and Definitive
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	The potential for effective mitigation is high with the implementation of water resource management measures, particularly with regards to the extraction from watercourses or working near them.	
Mitigation measures	• The oily layer that is stored in a suitable container must be sent to an authorized waste operator, who must ensure that the oil's destination prevents contamination of the water environment; • Hydrocarbon separators should be visually inspected weekly, and maintained by removing the oil layer and storing it in an appropriate container whenever it reaches equipment safety level limits, which when a loss of efficiency in the separation of hydrocarbons is detected; • All wastewater from workers' camps activities will be collected and removed from the site for appropriate disposal at a licensed municipal facility; • Installation of watertight septic tanks (or equivalent) to collect wastewater from the site, including effluent from washing vehicles and machinery; • Mobile chemical toilets are to be installed on site if no other ablution facilities are available. These chemical toilets should be installed away from watercourses and provided by an accredited company; • The impermeable surface that forms the basis of the concrete plant should be slightly raised above the surrounding terrain to minimize the entry of clean runoff water into the construction area; • The quality and quantity of effluent streams discharged to the environment including stormwater will be managed and treated to meet the applicable effluent discharge guidelines; • It is forbidden to deposit waste and hazardous materials directly on the ground or on the banks and beds of water courses, the perimeters for protection of water catchments, flood areas, agricultural areas and near dwellings; • Heavy machinery involved in the improvement of access routes should be up to date with services ensuring it is mechanically sound, thereby minimizing the likelihood of oil and/or fuel leaks; • Comply with Angolan legislation regarding concentration limits of discharges into natural water bodies (Annex VI of Presidential Decree no. 261/11 of October 6th); • The dumping and/or storage of construction materials and construction waste which may release particles should be protected from wind and rain (e.g., by blanketing containers or storage areas for materials and/or waste) and should be located as far away as possible from sensitive areas, particularly areas near water courses.	

Phase	Construction
Observation	Mitigation measures proposed in descriptors geology and geomorphology (**section 6.2.1.2**), soils (**section 6.2.1.3**), and air quality (**section 6.2.1.4**) is applicable.

- **Residual and Cumulative Impacts**

This project is not expected to require a large quantity of surface water. The most significant water requirements will be confined to the construction phase, i.e. they will be temporary. No residual and cumulative impacts are anticipated on this descriptor.

6.2.2 Biotic Environment

For the Biological and Ecologic component some negative impacts on habitats, vegetation, flora and fauna are anticipated. According to data from the survey carried out, the major ecosystems to be crossed by the transmission line are of a considerable biodiversity, particularly within the dense humid forest (Humpata region) and miombo ecosystems (Lubango region), which is considered a fragile ecosystem, sensitive to profound changes to its components. To clear a RoW for the Project infrastructure, it will be necessary to remove native vegetation. This will cause impacts, such as loss of biodiversity, fragmentation of habitat, changes in light conditions and possible invasion by invasive exotic species, whose competitiveness and growth rate are considered high.

For fauna, the main expected negative impacts are related to the destruction of feeding and shelter areas, and the risk of electrocution of birds and other animals (e.g., climber animals). For the substation installation areas no major changes in their status quo are expected, the New Namibe substation will be installed in a desert transition zone and the East Lubango substation will be installed near the Poaires village with several alterations in its natural ecosystem due to various anthropic activities.

6.2.2.1 Habitats, Vegetation and Flora

- **Potential Impacts**

The 220 kV Project is expected to cross several ecoregions between Nombungo substation (Lubango) to New Namibe substation (Moçâmedes city) with unique habitats and a diversity of endemic and

endangered plant species (see **Chapter 5**, **Section 5.2.1**). The project will be also near the IBA AO023 Tundavala, the area includes patches of relict Afromontane forest in a mosaic of undifferentiated montane communities, open Protea savanna and montane grasslands, and small patches of miombo woodland that support sensitive species, and are very important for wildlife maintenance, highlighting also important wetland near the Nombungo substations and Bruco area (see **Chapter 5**, **Section 5.2.1**).

However, vegetation loss in the TL route and in East Lubango and New Namibe substations sites are inevitable as a result of the new development footprint, site impermeabilization, including several equipment, tower's installation, new access roads where possible along sections of the TL route, temporary installation of workers' camps, and clearing or cutting of trees within the RoW beneath the lines (see **Chapter 2**). This will result in the loss of vegetation and habitat for fauna. Ecosystem services may also be affected, along with the communities that are directly reliant on the environmental resources for their subsistence, due to improved access that was once inaccessible. The loss of forested area due to tree felling can be compensated by developing offset programmes which should be discussed with the authorities.

Fragmentation or loss of flora and habitats

The Project construction will result in the loss and/or fragmentation of flora through the clearing or cutting of vegetation in the RoW (45 m), construction workers' camps, access roads and East Lubango and New Namibe substations, and may cause fragmentation or loss to vegetation outside the work areas through negligent behaviour of contractors, such as driving off roads, and lighting fires, etc. The earthworks, and circulation of vehicles will allow the dispersion of air pollutants (particulate matter). The dust is deposited on the surface of plant leaves, covering them and preventing the absorption of solar energy, as well as the absorption of carbon dioxide (CO_2) and the release of oxygen (O_2), thus limiting their photosynthetic capacity and threatening their survival.

The impacts associated with the construction of the towers' infrastructure are not expected to be detrimental to flora, i.e., areas to be affected are very small (30 ha during construction and 11 ha during operation) considering the full length of TL and localised/confined (besides, the towers will be at a distance of 400 m from each other). The footprint of the access routes is larger than for the actual 60 kV towers footprints, but still limited, and not expected to impact potentially-unique flora or critical habitat negatively if the proposed mitigation measures are implemented. On the other hand, the

Project in some areas (where possible) will run parallel to the existing line and will use existing maintenance access routes, and the creation of new ones will be only wherever necessary.

Between Humpata, Tchivinguiro, Bruco, Kapangombe, Caraculo and Moçâmedes corridor (from TL Km 70 to Km 196) there will be no removal of any vegetation after their height does not represent any obstacle for the project (vegetation does not exceed 10 or 15 m and the towers will vary between 45 and 55 m in height) as shown in **Figure 5-22**, **Figure 5-23** and **Figure 5-24** in **Chapter 5** (see **Section 5.2.1.2**). The impact from the development of the 220/60 kV New Namibe substation is not expected also, because the substation will be placed in a desert region without any vegetation cover, and footprint is relatively small (approximately 1.43 ha).

Indirect degradation of vegetation units and habitats

In construction and operation phases, maintenance operations include vegetation control in the RoW, which will limit the recovery of vegetation within this corridor. Frequent maintenance operations will also contribute to expansion of ruderal and invasive flora species. Due to the need to maintain the service strip under the line (6 m) there will be habitat fragmentation due to the presence of the RoW. Access roads to the corridor and towers can also increase natural resources exploration by local people, both of flora (e.g., wood and charcoal) and others (e.g., quarries). This can lead to vegetation degradation though unmanaged vegetation clearance of new areas.

The potential removal of vegetation in Tchivinguiro and Bruco areas (see **Photo 5-16**, **Photo 5-17** and **Figure 5-23** in **Section 5.2.1**, **Chapter 5**) will modify the structure of habitats, the fragmentation caused by construction activities will generate a series of new environmental stress factors for plants, which may affect phytosociological parameters and alter the structure and dynamics of the ecosystem. However, this indirect impact will occur along the entire length of the TL, particularly in wetland and forest areas crossed by the line, and the cascading impacts will be felt for an indefinite period, creating a new relationship between the environment and the animal and plant communities.

Construction activities and transportation of equipment and workers potentially facilitate the introduction of exotic and/or invasive species. The implementation of behaviours that avoid this introduction, such as checking and cleaning the transport vehicles and machinery that will carry out the work so that they do not transport plant material between the various regions where the project

is implemented, can minimise and prevent the introduction of invasive alien species. Construction and operation works have the potential to result in negative impacts on unique floral and/or faunal species in sensitive habitats (e.g., rocky ridges, and inselbergs near Project route).

Although habitat fragmentation is difficult to mitigate, during the vegetation removal process, some mitigation measures should be applied, such as minimizing vegetation removal, small readjustments on the transmission line route and planting trees campaigns, only indigenous species, throughout project areas. Offset programmes to compensate the impacts of vegetation loss are to be discussed with the national and provincial authorities. The construction activities, transportation of equipment and workers, has the potential to facilitate the introduction of exotic and/or invasive species, especially in Humpata, were have a lot of farms. The implementation of preventive behaviours that avoid the introduction of exotic species, such as checking and cleaning transport vehicles and machines that will be used during construction work, can prevent and/or minimizing the probability of its occurrence.

Concerning to edge effect, its effects can be very unpredictable, for some vegetation species it can be very advantageous, however, these edges may not be suitable for other species, for example for dispersal of interior species (those that avoid edges) and may increase the impact of predators, parasites, competitors or diseases.

In general, the impacts on habitats, flora and vegetation during the operation phase will result from the line's maintenance works. It is foreseeable that, in the medium and long term, there may be occasional negative impacts resulting from the felling of trees that have grown in the safety and maintenance strip or in the protection zone next to the supports, and which, due to their size, put the line at risk by violating safety distances.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-14 outlines the Impact Assessment anticipated for the Habitats, Flora and Vegetation, and its mitigation measures during the construction and operation phases.

Table 6-14: Impact Assessment and Mitigation Measures for Habitats, Flora and Vegetation.

Phase	Construction and Operation	
	Without mitigation	With mitigation

Phase	Construction and Operation	
Nature	Negative	Negative
Duration	Ongoing	Short term
Extent	Local	Local
Magnitude	High	Minor
Significance	Moderate to Major Negative	Minor negative
Probability	Highly probable	Certain and Definitive
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	The contractor's commitment to applying recommended measures reduces impacts, but this requires monitoring procedure to ensure that such measures are implemented. The influx of people along the route as an indirect impact of the presence of the line could exacerbate the fragmentation or loss to flora. However, the existing access route will be used as far as possible so as not to create additional access routes.	
Mitigation measures	• Limit the movement of machines and vehicles to work areas. Limit habitat fragmentation or loss outside site boundaries, mainly in Tchivinguiro and Bruco areas; • Vegetation clearing should be minimized as much as possible and limited to the strictly needed areas, mainly in Humpata, Tchivinguiro and Bruco areas, and near Ivantala Lake; • Whenever possible new and temporary accesses should be created based in existent accesses, mainly in Humpata, Tchivinguiro and Bruco areas, and near Ivantala Lake; • The areas selected to be subjected to deforestation or deforestation operations should be previously marked with visible marks (e.g. coloured tapes), allowing for the identification of the intervention areas, thus facilitating the work of machinery operators and avoiding cutting vegetation that may be maintained. These operations should be as careful as the ecological or landscape interest of the vegetation formation considered; • The actions that cause negative impacts on flora and vegetation should be reduced to the minimum during the construction of the transmission line and the installation of access roads and workers' camps sites, and the felling of trees should be duly planned, especially in the case of baobabs, fruit trees, protected species, miombo trees in regeneration, and species in slight regeneration that are witness to natural vegetation; • Avoid any sensitive habitats (e.g., rocky ridges/inselbergs (broken terrain), etc.); • Prevent and discourage the use of fire, as this could easily cause runaway veldfires, causing problems (such as loss of grazing and domestic stock mortality, etc.) for the neighbouring communities; • Various rehabilitation measures are recommended for the most affected areas, i.e. temporary access route(s), construction sites, offices, etc.), such as removal/relocation of protected species, replanting/reseeding, etc.; • Prevent the unnecessary destruction of habitat trees, e.g. dead trees and old specimens. Cavity and bark dwelling faunal species utilize these trees, namely various geckos, snakes, bats, and genets, etc.); • Create nurseries with seedlings of plants that are endemic to the project region and threatened by Angola, which can be used to recover the areas deforested for the installation of the workers' camps, in order to maintain the natural characteristics of the region and because they are better adapted to the environment and are therefore easier to maintain and develop in the short term;	

Phase	Construction and Operation
	• To ensure compliance with the waste management techniques proposed in the Waste Management Plan for the project; • At the end of the construction work, the original physical structure of all affected areas should be restored. In the areas to be recovered, the land should be left in conditions favourable to natural re-vegetation and, whenever necessary, indigenous species of grass should be used.
Observation	Mitigation measures proposed in descriptors geology and geomorphology (**section 6.2.1.2**), soils (**section 6.2.1.3**), air quality (**section 6.2.1.4**), and landscape (**section 6.2.1.7**) is applicable.

- **Residual and Cumulative Impacts**

The residual impacts for this descriptor are related with the change in ecosystem structure and how flora will respond to the changes of the project implementation. The cumulative impacts are related to the increasing pressure on ecosystems, the project implementation will raise this pressure.

6.2.2.2 Fauna

- **Potential Impacts**

In terms of fauna, Project potential impacts will be focused on the avian populations within the development area and near surrounds. The main impacts relate to habitat loss associated with the construction activities, resulting in displacement from breeding and foraging areas, and habitat degradation. There are also indirect impacts associated with changes to ecosystem and biophysical processes. During operation, there is the potential for bird strikes to occur along the transmission lines.

This is most likely for large bird species, migrating species and species which have a varied flight pattern (dipping and circling). Near the transmission line route there is an Important Biodiversity and Bird Area (IBA AO023 Tundavala sites) and an important wetland known as Ivantala Lake (in the Nombungo substation to East Lubango substation corridor) that support sensitive bird's species (including aquatic birds), and is very important for wildlife maintenance. The TL Project corridor between Tchivinguiro, Bruco and Kapangombe (see **Figure 5-27** in Section **5.2.2.1.3** in **Chapter 5**) is also important space for the nesting, feeding and development of numerous bird species, including endemics.

Reduction of feeding, breeding and roosting areas

In construction and operation phases, clearance of vegetation and maintenance operations around the RoW, which will limit the recovery of vegetation within this corridor, and frequent maintenance operations will also contribute to the destruction of the feeding and nesting points, breeding and roosting areas for fauna species, especially for birds and mammals. Species that depend on trees will be especially affected, such as tree frogs, reptiles, rodents, and bats that use the inside of trees as roosts; but also several tree nesting birds species (most of the small birds, nocturnal birds, and raptors, among others); and even bigger mammals that roost in trees, like monkeys (see **Photo 5-3**, **Figure 5-25**, **Figure 5-26**, **Figure 5-27**, **Figure 5-28** and **Figure 5-30** in **Chapter 5**). Some feeding areas will be lost by vegetation clearance (mainly in Tchivinguiro and Bruco zones), although since the vegetation clearance strip is narrow, animals should be able to feed in similar nearby areas. Special attention should be given to bird nest that if found in the areas will need to be relocated by biodiversity experts where vegetation removal is required.

Increased fauna mortality and decreased species diversity

Vegetation clearance will lead to death of some animals, potential decreasing species diversity in the project area. Organisms that are sessile during the day and roost in trees, such as bats, tree frogs and reptiles, will most likely be affected, since these animals typically do not leave roosting sites during the day. As such, these will not escape and therefore will die during vegetation removal activities. In addition, birds that nest in trees (including eggs and chicks) and especially nocturnal ones, in what concerns adult birds, that are less vigilant during the day, can die during these activities. An increase in machinery, vehicles movements, and light will also lead to a high risk of run over. Animals that move slower, like reptiles and amphibians, are typically the most affected by this impact, because they have difficulties in moving away rapidly and are also difficult to detect by drivers.

In operation phase, the transmission line and East Lubango and New Namibe substations are expected to have no or negligible direct negative impacts on amphibians, reptiles and terrestrial mammals. Towers will be widely spaced across the landscape and the wires are unreachable for ground-dwelling species. Vegetation removal between Tchivinguiro, Bruco and Kapangombe will need to be undertaken in conjunction with biodiversity experts that can help to relocate animals and nests, if necessary.

In contrast, the direct impact of powerlines on bird communities is relatively well-known. Birds can find it difficult to see overhead power lines, particularly in situations of bad weather, causing fatal collisions, while the wingspan of larger species might make them bridge the gap between two parallel lines, resulting in electrocution. The collision risks are difficult to assess and depend on several factors, such as the species present and their ecological behaviour, the landscape features and the power lines' technical characteristics. For example, the risks are higher for night flyers, for species that migrate at low altitudes, large birds in general and species that fly fast and congregate in large flocks in situations of reduced visibility. Regarding the other groups of fauna that could be affected by collisions with the TL, it should be noted that they are not affected by these structures, thanks to their guidance and obstacle detection system. The birds identified as potentially affected on the Project route are: Ludwig's bustard (*Neotis ludwigi*), Namaqua sandgrouse (*Pterocles namaqua*), African marsh harrier (Circus ranivorus), the secretary bird (*Sagittarius serpentarius*) and the martial eagle (*Polemaetus bellicosus*) as shown in **Section 5.2.2.1.8** in **Chapter 5**.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-15 outlines the Impact Assessment anticipated for the fauna, and its mitigation measures during the construction phase.

Table 6-15: Impact Assessment and Mitigation Measures for Fauna.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Long term	Short term
Extent	Regional	Regional
Magnitude	Very High	Minor
Significance	Moderate Negative	Negligible
Probability	Highly probable	Likely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	The contractor's commitment to applying the recommended mitigation measures, reduces the impact, but this requires monitoring to ensure such measures are implemented. The influx of people along the route, as an indirect impact of the presence of the line, may exacerbate the loss of fauna species. However, the existing access route will be used as far as possible, so as not to create additional access opportunities. Vegetation removal between Humpata and Tchivinguiro, and Bruco and Kapangombe will need to be undertaken in conjunction with biodiversity experts that can help to relocate animals and nests, if necessary.	

Phase	Construction
Mitigation measures	• Limit the movement of machines and vehicles to work areas. Limit habitat fragmentation or loss outside site boundaries; • Prevent the unnecessary destruction of habitat trees, e.g. dead trees and old specimens. Cavity and bark dwelling faunal species utilize these trees, namely various geckos, snakes, bats, and genets, etc.); • Implement and maintain road rules with maximum speed limits (e.g., 40 km/h), as this would result in fewer animal road mortalities as well as less associated dust emissions. Temporary speed humps could also be used to limit the speed at which people travel; • The felling of trees must be properly planned, especially in the case of large native species, and must be authorised in advance by the Environmental Officer from the Surveillance team. When required, particularly between Humpata and Tchivinguiro and Bruco and Kapangombe, biodiversity experts should support the relocation of animals and nests; • Avoid off-road driving and unnecessary night-time driving in the area, as this often results in the destruction of slow-moving reptiles and mammals, particularly nocturnal species; • Educate/inform contractors about dangerous and protected species to avoid unnecessary harm/killing of these species, as well as about the consequences of illegal collection of such species; • Avoid sensitive habitats (informed by walk-down) when locating construction sites (e.g., IBA AO023 Tundavala sites, Serra da Leba, and associated riparian vegetation, rocky ridges/inselbergs (broken terrain), etc.).
Observation	Mitigation measures proposed in descriptors geology and geomorphology (**section 6.2.1.2**), soils (**section 6.2.1.3**), air quality (**section 6.2.1.4**), landscape (**section 6.2.1.7**), and habitats and vegetation (**section 6.2.2.1**) is applicable.

Table 6-16 outlines the Impact Assessment anticipated exclusively for avifauna, and its mitigation measures during the operational phase.

Table 6-16: Impact Assessment and Mitigation Measures for Avifauna.

Phase	Operation	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Permanent	Short term
Extent	Regional	Regional
Magnitude	High	Minor
Significance	Major Negative	Moderate Negative
Probability	Unlikely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Without mitigation, the impact is expected to be major in sensitive habitats.	
Mitigation measures	• Apply devices for signalling the lines (Bird Flight Diverters) and for resting the towers in areas with the greatest risk of bird collision, namely in the Ivantala Lake, Tchivinguiro and Bruco zones; • Initiate a bird collision monitoring programme during operation to determine the success of the bird avoidance mechanisms:	

Phase	Operation
	• The maintenance actions in the RoW should avoid the nesting period of most bird species, including the hatching of ground-nesting species; • In the event of receiving confirmation of regular bird strikes along the transmission line (based on the ongoing monitoring activities), the installation of high-visibility markers should be considered to make the lines more visible to birds, to reduce the risk of collision; • Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energised parts of transmission infrastructure; • Carry out additional studies on avifauna to define the most critical sites requiring mitigation measures, with particular attention being given to species of conservation concern such as the Endangered Ludwig's bustard (*Neotis ludwigi*) and other species of conservation concern, namely the Swierstra's francolin (*Pternistis swierstrai*), the secretary bird (*Sagittarius serpentarius*), martial eagle (*Polemaetus bellicosus*) and the bateleur (*Terathopius ecaudatus*); • To prohibit hunting in the Project areas and its surroundings.
Observation	Mitigation measures proposed in descriptors geology and geomorphology (**section 6.2.1.2**), soils (**section 6.2.1.3**), air quality (**section 6.2.1.4**), landscape (**section 6.2.1.7**), and habitats and vegetation (**section 6.2.2.1**) is applicable.

- **Residual and Cumulative Impacts**

The residual and cumulative impacts for this descriptor are related with the change in ecosystem structure and, probably, in the food chain in the areas of the transmission line routes, and how fauna (birds) will respond to the changes of the project implementation.

6.2.2.3 Ecosystem Services

- **Potential Impacts**

Although the proposed TL route in East Lubango and New Namibe substations are not expected to negatively impact most of the recognised ecosystem services within the Huíla and Namibe Provinces (see **Chapter 5**, **Section 5.3.1.12**), some along the TL route could potentially be affected if not addressed adequately during all stages of Project development. These ecosystem services are namely: cultivated crops, transhumance space, watercourses, landscape, wildlife, cultural services, etc.

The impact from towers' infrastructure is not expected to be significantly detrimental to ecosystem services as the total footprint of towers is relatively small (11.14 ha) (including 400 m distance from each tower) and not expected to impact services, especially if the proposed mitigation measures are

followed. Access roads are not expected to be highly detrimental to ecosystem services unless croplands, important species and heritage areas, and wetland areas, are drained for the purposes of creating/improving access, and/or roads are built up (raised), thus altering the water.

The impact associated with the implementation of the New Namibe substation in desert area and East Lubango substation in rural area are not expected to be detrimental to ecosystem services. The development footprint at these substations' sites is relatively small (no more than 5.5 ha), it is associated in areas with profound anthropic changes in their surroundings, and not expected to impact any ecosystem services around. None of the identified ecosystem services is exclusively associated with the proposed development areas and the Project footprint areas are not expected to contribute to major ecosystem services loss, if the proposed mitigation measures are implemented properly. The transhumance sites in the Project region are not fixed (see **Figure 5-42** in **Section 5.3.1.17** in **Chapter 5**), but rather randomly chosen according to favourable conditions for livestock, and it is premature to state that the TL Project may affect the transhumance spaces used by ethnolinguistic communities. All potential negative impacts on the region's ecosystem services should occur exclusively during the construction phase of the project.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-17 outlines the Impact Assessment anticipated for the ecosystem services, and its mitigation measures during the construction and operation phases.

Table 6-17: Impact Assessment and Mitigation Measures for Ecosystem Services.

Phase	Construction	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Brief
Extent	Local	Local
Magnitude	High	Low
Significance	Minor to Moderate Negative	Negligible
Probability	Unlikely	Unlikely
Confidence	Medium	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	The influx of people along the route as an indirect impact of the presence of the line, may exacerbate the loss of some ecosystem services. However, the existing access route will be used as far as possible so as not to create additional access opportunities.	

Phase	Construction
Mitigation measures	• Develop and implement a Resettlement and Compensation Plan for potentially affected parties; • The selection of possible water sources for the works will have to be discussed with the local authorities and approved by the Supervisory Authority in order to avoid conflicts of use with the local population; • Carry out awareness campaigns for local communities on the risks associated with the transmission line and substations and on the restrictions on the use of the security RoW and easement of the transmission line; • Carry out awareness campaigns for workers on customs and traditions of the local population, including Mucubai groups, during periods of transhumance, which should be strictly respected; • To monitor the use of forest resources in the region, reporting illegal practices and their over-exploitation to the competent authorities (MCTA, and the governments of Namibe and Huila provinces).
Observation	Mitigation measures proposed in descriptors geology and geomorphology (**section 6.2.1.2**), soils (**section 6.2.1.3**), air quality (**section 6.2.1.4**), landscape (**section 6.2.1.7**), habitats and vegetation (**section 6.2.2.1**), and Fauna (**section 6.2.2.2**) are applicable.

- **Residual and Cumulative Impacts**

The residual and cumulative impacts for this descriptor are related with the temporary change in ecosystem structure and, probably, in the food chain in the areas of the transmission line routes.

6.2.3 Socioeconomic Environment

Negative and positive impacts are anticipated for this component, the following impacts were considered important to be assessed:

Economic impacts

- Creation of job opportunities at local and provincial level;
- Opportunities for local sourcing of good and services; and
- Increased availability of electricity for the Namibe Province, particularly the Namibe city.

Land and livelihood impacts

- Physical displacement as a result of loss of shelter;
- Changes in transhumance patterns due to the existence of the right-of-way;
- Economic displacement as a result of loss of livelihoods; and
- Economic displacement as a result of loss of natural resources.

Health and safety impacts

- Improved safety after demining activities;
- Increased risk of contracting diseases;
- Increased risk of traffic and work-related accidents; and
- Increased risk related to the presence of the transmission line.

Quality of life impacts

- Discomfort generated by construction activities;
- Interference in/disruption of the daily activities of local communities;
- Increased accessibility to the transmission line corridor; and
- Exposure of the area to external influences.

6.2.3.1 Economy and Employment

- **Potential Impacts**

At the macro level, the Project is intended to result in increased electrical capacity in Moçâmedes (Namibe province capital), which is expected to contribute to the regional and national economy. Beyond these macro level impacts, the Project is expected to generate positive impacts on the local economy and employment conditions throughout its lifecycle (around 40 years). The primary impacts are expected during the construction phase through the creation of temporary local and regional employment opportunities (40% opportunities will be given to the local youth) and the creation of long-term benefits associated with capacity enhancement of local labour through on-the-job training.

Opportunities for economic development and diversification may also result from the use of local facilities and procurement of goods and services during the construction phase, in particular for water supply, waste management facilities, food products or catering services, telecommunications services (internet) and security for the workers' camps, etc. To a lesser extent, the operation phase will generate some limited longer-term local employment opportunities mainly for maintenance and monitoring activities, especially the line route.

Construction phase is expected to last 30 months, and the total number of people in the workforce will be approximately 30 persons for 220 kV TL in the first one year, 50 persons in the next half year, and 170 persons until three years, and 40 persons to build East Lubango and New Namibe substations (20 persons each in first step), which will be composed at 40% of locally sourced workers. The expected local opportunities will employ mainly semi-skilled and low skilled over a period of almost 30 months (two years and half).

The positive impact will be temporary during the construction phase, which will be followed by workforce reduction during the transmission line and East Lubango and New Namibe substations operations. Most workers are expected to be from urban areas such as Lubango, Humpata and Moçâmedes and peri-urban areas as Figueira, Calumue, Palanca Camponês and Aída. The remaining portions of the line in the municipality of Bibala are mostly rural with less activity and expertise in the construction sector, the people in this aisle depends exclusively on livestock.

In addition to the Project construction workforce, demining activities may also generate some limited and temporary employment (unskilled labour such as cleaning assistants, cooks, cleaners, etc.). The economic impact of Project workforce spending in the local economy is expected to be small, since the workers' camps will provide food and other services for the workers. However, due to the cultural variety of the workers should be expected to generate some income for local shops, bars, restaurants and cafés and other existing formal businesses in the service sector.

Finally, the Project will require potable water for the workers' camps as well as water for construction activities. It is expected that the Project will contract a private water supplier (see **Section 2.7**, **Chapter 2**). Similarly, solid waste will also be generated during construction and from the workers' camps. Waste generated in the workers' camps will be disposed of at appropriately licensed landfill sites in the region. The Project may also contract the security services, and services of a local catering company to provide food to the different workers' camps. As such, the use of local waste facilities and the services of a local water supplier and catering company may contribute to the creation of local economic development and diversification opportunities for the construction period (30 months).

In operation phase, the primary impact associated with the Project is expected to be the long-term employment of local workforce for maintenance of the infrastructure and the TL footprint corridor (5 m wide) and monitoring activities for the TL. Once construction is over, operation of the TL and

substations will be handed over to RNT as the line operator. Although the exact size of the workforce needed for the operation phase is not clear at this stage, recruitment is not expected to be extensive. RNT is a state company therefore hiring may be limited as RNT may not need to hire any additional workers. The maintenance and monitoring of the line are expected to require a higher skill level while vegetation clearance of the 5 m of TL footprint corridor will require unskilled workforce.

In addition to employment generation, Project operation will also result in increased electrical capacity in Moçâmedes city, which will receive the generated electricity through the national grid. This increase in electrical capacity is expected to contribute to the improvement of the regional and national economy, and livelihoods of the population through a more stable supply of electricity to the households and businesses in Moçâmedes city. Specifically, the improved and more stable supply may result in an increase in productivity and growth of service industries, tourism and in the development of small enterprises in the long run.

However, it should be noted that no connections along the TL will be made to supply electricity to the rural communities along the line (Poaires, Tchiwaya, Kapalanga, Heva, Kamba, Jamba I and Onculuvala settlements), which may result in some resentment from local communities (see **Chapter 5**, **Section 5.3.2**). Another transmission line will be built in the region and the communities still have no electricity.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-18 outlines the Impact Assessment anticipated for the new job opportunities, during the construction phase. The anticipated impact is positive but limited to the 30 months construction period, and maximising the impact will be the responsibility of the EPC and RNT.

In the operation phase, the Project (TL and East Lubango and New Namibe substations) will be under the exclusive management of RNT, which will be responsible for creating the necessary means for the regular maintenance. This may result in the hiring of new workers or not, however, the maximization of the positive impacts associated with the hiring of new workers (local or no) will be exclusively the responsibility of RNT. However, in this ESIA report the focus will be attributed to new job opportunities exclusively during construction phase.

Table 6-18: Impact Assessment and Mitigation Measures for Job Opportunities.

Phase	Construction	
	Without maximization	
Nature	Positive	
Duration	Short term	
Extent	National and International	
Magnitude	Very High	
Significance	Major Positive	
Probability	Almost certain and Highly probable	
Confidence	High	
Reversibility	High	
Resource irreplaceability		
Comment on significance	Not applicable	
maximization measures	• Develop a Local Employment Plan for the construction phase. This plan should include a hiring procedure to ensure that local people (both women and men) from the study area are employed wherever possible, and that this is done in a fair, consistent and transparent manner by the contractor. The Plan should ensure that women and people with disabilities benefit equally. Workers from the communities along the TL will be given priority for low-skilled jobs. • All workers should be adequately trained for the proper performance of their functions; • The EPC should work with the local Sobas to advertise all vacancies in ways that are accessible to the local communities and explain to both women and men how they can benefit from the project for them to be economically empowered; • Job creation efforts should be accompanied by protection of the fundamental rights of workers, in accordance with the requirements set out in the national labour law (Law no. 07/2015 of 15th June), and JICA Guidelines for Environmental and Social Conditions; • Ensure the prohibition of the employment of child labour or forced labour; • Formalise all employment contracts in writing, specifying working and payment conditions.	
Observation	The maximization of this impact will be the responsibility of the EPC and RNT.	

Table 6-19 outlines the Impact Assessment anticipated for the economic dynamization (sourcing of local goods and services in project region), during the construction phase. The anticipated impact is positive but limited to the 30 months construction period, and maximising the impact will be the responsibility of the EPC and RNT.

Table 6-19: Impact Assessment and Mitigation Measures for Economic dynamization.

Phase	Construction	
	Without maximization	
Nature	Positive	
Duration	Short term	
Extent	National and International	
Magnitude	Very High	
Significance	Moderate Positive	

Phase	Construction	
Probability	Almost certain and Highly probable	
Confidence	High	
Reversibility	High	
Resource irreplaceability		
Comment on significance	Not applicable	
maximization measures	• Develop a Local Procurement Plan for the construction phase. As part of the tendering process, the contractor should develop a purchasing strategy, stipulating how the local purchase of goods and services will be undertaken (e.g., construction materials from quarry operation located in the vicinity of the study area, waste management and disposal, water supply, catering, etc.), to maximize local procurement. This plan should ensure the equal and effective participation of women and men in the procurement board; • The EPC should work with the local Sobas to advertise all vacancies in ways that are accessible to the local communities and explain to both women and men how they can benefit from the project for them to be economically empowered.	
Observation	The maximization of this impact will be the responsibility of the EPC and RNT.	

In the operation phase, the Project will be under the exclusive management of RNT, which will be responsible for creating the necessary means for the TL and substations regular maintenance, including sourcing of local goods and services. This may result in the hiring of service providers, however, the maximization of the positive impact associated with the hiring of service providers will be exclusively the responsibility of RNT.

Table 6-20 outlines the Impact Assessment anticipated for the electricity supply in Moçâmedes city, during the operation phase.

Table 6-20: Impact Assessment and Mitigation Measures for Electricity Supply in Moçâmedes.

Phase	Construction	
	Without maximization	
Nature	Positive	
Duration	Permanent	
Extent	Regional and National	
Magnitude	Extremely High	
Significance	Major Positive	
Probability	Certain and Definitive	
Confidence	High	
Reversibility	High	
Resource irreplaceability	Low	
Comment on significance	Not applicable	
maximization measures	• The maximization of this impact will be the responsibility of RNT.	

- **Residual and Cumulative Impacts**

It is unlikely that another construction Project will occur simultaneously with the construction works of the 220 kV transmission line and 220/60 kV East Lubango and New Namibe substation. However, if this happens, the cumulative impact of job creation, economic dynamization (sourcing of local goods and services in project region), and electricity supply, which could be of major positive.

The presence of the Project, together with existing 60 kV transmission lines, will have cumulative impacts on the expansion of the RNT transmission network in region, contributing positively to the benefits that network expansion will bring to the Namibe socio-economic development.

6.2.3.2 Land and Livelihoods

- **Potential Impacts**

The East Lubango substation will be built in rural area, and the New Namibe substation will be built near desert area with no infrastructures inside the sites, however, the TL crosses primarily rural areas and peri-urban areas (i.e., Lubango and Humpata and outskirts of Kapangombe) where subsistence agriculture and animal husbandry are predominant, along with related activities including hunting and transhumance routes. Other economic activities such as small-scale trading and street vending, informal temporary jobs (including farm labour in Humpata region, construction-related work, cleaning services, etc.), informal businesses, and employment in the public and private sectors, are also observed in the peri-urban areas of Lubango and Humpata.

Vulnerable groups include households with particularly low incomes and high land dependency for subsistence and income generation. These households can be found throughout the project area and are prevalent in the rural settlements (Poaires Muhaha, Poaires Kapandi, Figueira, Heva de Cima and Onculuvala) where agriculture and livestock are the primary livelihood activities.

Physical Displacement (Involuntary resettlement)

During the TL implementation will be necessary the creation of a partial protected zone (equivalent to the RoW), which is defined as 45 meters corridor centred in the line's alignment (22.5 m to each side

of the line). The Project will thus need to acquire a land tract with a width of 45 meters. The execution and implementation of the Project will lead to some form of involuntary resettlement (physical, economic and/or cultural) of individuals and/or households who may be affected by the process of land acquisition, since within the protection zone (45 m) there can be no houses, schools, hospitals, and in the area near the towers, agriculture will not be allowed, etc.

Resettlement is expected to occur primarily along the Poaires Muhaha, Poaires Kapandi, Figueira and Km 14 settlements (Lubango municipality) and Heva de Cima, Jamba I, Camponês and Onculuvala settlements (Humpata municipality) where population density is higher. This implies the removal of all dwellings (associated structures and livelihoods) and the subsequent physical displacement of affected people/social groups to new locations (involuntary resettlement), which may lead to:

- Changes at the individual and family level, namely disturbances in established social relations (i.e., breakdown of social network);
- Modification of movement patterns (distance to schools, health units, livestock and agricultural areas, water sources, etc.); and
- Change or loss of income and livelihoods, which are essential for the survival of the affected people/social groups, and which may lead to food deprivation (food insecurity) in the case of the most vulnerable groups. However, this could only happen in case that involuntary resettlement is not managed properly.

No resettlement is expected in the Bibala and Moçâmedes region, where population density is extremely low, with only ethnolinguistic communities existing during periods of transhumance.

The number of people and social groups affected, is not known at this stage of the project, and will be confirmed during the final design of the Project, with a commitment to avoid, or minimise, physical displacement. For this purpose, during September (dry season), a detailed social survey of the corridor directly affected by the final alignment in terms of access, towers' locations and workers' camps, should be undertaken to avoid, where possible, or maximise the distance from, existing shelters.

Complete and concrete information on involuntary resettlement along the proposed TL Project route will be presented in the ARAP.

Economic Displacement and Temporary Changes in Transhumance Patterns

No economic displacement, loss of natural resources or significant changes in the transhumance routes and patterns are expected in the region where the East Lubango and New Namibe substations sites will be installed.

Along the 196 km of TL route between Nombungo substation (in Lubango) to New Namibe substation site (in Moçâmedes), during the construction phase, specific restriction (economic displacement) on forests and woodlands are expected, which provide local communities with firewood and construction material for their dwellings, agricultural crops and grazing areas for their cattle, due to:

- The creation of an access road (in areas where no adjacent RoW and access road exist), characterized as a permanent loss, and temporary tower site working areas inside de 45 m RoW;
- Removal of all vegetation in the workers' camps areas (temporary loss, which will be recovered in operational phase);
- Temporary loss of areas of agricultural crops, livestock areas and transhumance route for the establishment of the 495 towers inside the 45 m in RoW. The exact proportion of agricultural land affected will be confirmed during the ARAP Socioeconomic field surveys;
- Trees and vegetation more than 8 m high inside the TL footprint corridor of 45 m will be removed (see **Table 2-3**). This will include fruit trees, which tend to be clustered close to some settlements including Poaires, Tchiwaya, Kapalanga, Calumue, Jamba I, Camponês and Onculuvala.
- Access for the cultivation of the remaining crops (less than 8 m high) will be restricted during a short period of time during the demining activities (i.e., tentatively 8 hours/days per demining expert for each meter of land);
- Access and cultivation of the remaining crops inside the 5 m of TL footprint corridor will be allowed except at the 495 tower sites, a total of 11.14 ha;
- Permanent loss of access to land in the 45 m wide maintenance road in a total of 882 ha.

In construction and operation phases, the loss of access to land associated with the 5 m of TL footprint corridor, temporary tower sites working areas, and maintenance corridor will result in the loss of land used for seasonal crops, loss of natural resources, removal of fruit trees, restrictions to animal grazing, and temporary impacts on transhumance routes used by ethnolinguistic groups.

The loss of seasonal agricultural production for the establishment of the temporary tower sites working areas within the 45 m of TL RoW will be temporary over a period of more than two years and six months (predicted), while the loss will be permanent for seasonal crops located inside the footprint of the maintenance road (6 m wide).

In operational phase, cultivation of seasonal crops will be otherwise allowed in the 45 m RoW (but not in maintenance road and above the transmission line - TL), outside the tower sites working areas (15m x 15m), and after clearance of land mines and unexploded ordnance. It is recognized however that the land productivity may take time to fully re-establish as seasonal crops may take three to six months depending on the crop. This means that once the land is reinstated after the construction phase, land users may not experience an immediate return to their initial levels of productivity and income generation. The total area of agricultural and livestock areas clearance required are not known at this stage. The loss of these area is impossible to avoid, but will be reduced, given its large availability in the Project area, offering other location alternatives for the local communities to access and use.

It should be noted that potential damage to crops may also occur during mine clearance activities which will take place during a limited time period prior to the start of construction activities. In case of damages, there are specific procedures in place to calculate the value of the damage and compensate the affected parties in accordance with the crop rates established by the Ministry of Agriculture and Fisheries (see **Chapter 3**, **Section 3.1.4**).

With respect to animal grazing activities and transhumance temporary routes, potential impacts during the construction phase stem from cattle herdsmen and farmers having restricted access to grazing land due to the establishment of the maintenance road, tower sites working areas and access roads. However, animal grazing is usually undertaken over a wide area; therefore, farmers and cattle herdsmen with restricted access should be able to find alternative land in most instances.

Due to the heavy reliance on land-based activities and the small plot sizes (less than one hectare on average), the level of impact from the temporary loss of land will be determined not only by the proportion of land lost by individual households, but also by their level of dependence on the land, access to alternative land and livelihood activities and their current income levels. Households that have little access to alternative livelihood activities and/or are on a very low income, including subsistence farming, will experience a greater level of impact than those with access to alternative

resources, including savings, and are therefore considered particularly vulnerable to potential land-related impacts. In addition, loss of land has the potential to not only affect the livelihoods of customary landowners, but also those involved in crop sharing schemes on a particular plot owned by another household. These households are also vulnerable to potential impacts from temporary loss of land given they do not have clear customary rights.

During design, an optimization of the original TL route was undertaken, with alternative routes identified to minimize environmental and social impacts. This included minimizing potential physical and economic displacement, by following established TL routes. RNT, JICA and TEPSCO have also committed to minimizing land clearance for the maintenance road if other access roads are available, and to reducing tree cut-off in the temporary towers site working areas. However, the scale and impact of such measures are still unclear. Some land-requirement information is not available at this stage, such as the amount of vegetation clearance required for access roads or the potential establishment of a new workers' camps. This will be taken into account in the Resettlement Action Plans once the location of the different Project components is finalized.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-21 outlines the Impact Assessment anticipated for the Physical Displacement (Involuntary resettlement) as a result of loss of shelter, during the construction phase. The anticipated impacts are negative but limited exclusively inside the 45 m of Project RoW.

Table 6-21: Impact Assessment and Mitigation Measures for Physical Displacement.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Permanent	Permanent
Extent	Regional	Regional and Local
Magnitude	Very High	Moderate
Significance	Major Negative	Moderate Negative
Probability	Highly probable	Likely
Confidence	High	High
Reversibility	Medium	High
Resource irreplaceability	Medium	Low
Comment on significance	Not applicable	
Mitigation measures	• The new accesses, towers' locations and workers' camps should be determined in collaboration with the local Sobas and the affected people/social groups;	

Phase	Construction
	• Thoroughly assess and evaluate the possible of transmission line routes with the objective of reducing or minimizing the number of households to be resettled and/or the nature of the impact; • Elaborate and implementing the Resettlement and Compensation Action Plan (ARAP). The ARAP will guide the resettlement and compensation process to ensure that appropriate compensation is provided to the people/social groups that will be directly affected. It will be prepared in line with Angola's legal framework and with JICA Guideline for Environmental and Social Considerations (related to land acquisition and involuntary resettlement); • The resettlement activities should be implemented with a high level of involvement from the local governmental and traditional authorities (Sobas), affected people/social groups and local host communities, to ensure that the process is informed by the social and economic needs, constraints and expectations of all involved (included in the SEP, and stakeholder engagement meetings); • A male and female Community Liaison Officer should be appointed to ensure both genders are comfortable reporting grievances, and should be preferably locals and be familiar with the local language and customs. • Livelihoods' restoration and development projects outlined in the ARAP must ensure that affected individuals, households and communities are better off than they were prior to resettlement, or at the very least that their circumstance is as it where and has not deteriorated; • Guarantee free access to efficient and timeous mechanisms for redress and ensuring that the rights of the affected and surrounding communities are upheld; • Study appropriately alternative areas for the resettlement of those affected parties, including the deduction on the total amount of compensation, in order to avoid socio-cultural conflicts in the region; • Special attention should be given to the Poaires, Tchiwaya, Kapalanga and Onculuvala settlements as they are the most vulnerable communities along the proposed transmission line route; • Develop and implement Livelihood Restoration Plan (LRP) prior to land take in order to ensure that homes are ready, required infrastructure in place, and replacement livelihood resources can be accessed productively.
Observation	Maximization measures proposed in descriptors job opportunities and economy diversification (**section 6.2.3.1**) is applicable.

Table 6-22 outlines the Impact Assessment anticipated for the Economy Displacement – loss of livelihoods (agricultural crops damage and loss of natural resources, etc.) during the construction and operation phases. The anticipated impact is negative but limited exclusively inside the 45 m of Project RoW. In the operation phase, the communities will be able to return to the restricted cultivation areas as long as they do not cultivate near the towers, on the roads created for the maintenance of the lines, and under the lines. In this return, only the cultivation of low height agricultural products will be allowed, such as: cassava, corn, sweet potato, beans, garlic, lettuce, tomatoes, pineapples and other vegetables. The soil is likely to need improvement during the return (tillage, fertiliser, and compost).

Table 6-22: Impact Assessment and Mitigation Measures for Economy Displacement – loss of livelihoods.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Short term	Short term
Extent	Regional	Regional or Local
Magnitude	Extremely High	Moderate
Significance	Major Negative	Minor Negative
Probability	Highly probable	Likely
Confidence	High	High
Reversibility	Medium	High
Resource irreplaceability	Medium	Low
Comment on significance	Not applicable.	
Mitigation measures	• Thoroughly assess and evaluate the possible of transmission line routes with the objective of reducing or minimizing the number of agricultural crops areas to be damage and/or the nature of the impact; • Elaborate and implement the Abbreviated Resettlement Action Plan (ARAP). The ARAP will guide the resettlement and compensation process to ensure that both customary landowners and land users receive adequate compensation for the loss of crops, natural resources, related loss of income and, when required, are provided with access to alternative land of equal productivity. Compensation will also consider the investment required to prepare new agricultural plots (for alternative land) and to return the reinstated land to initial productivity levels for seasonal and permanent crops. It will be prepared in line with Angola's legal framework and with JICA Guideline for Environmental and Social Considerations (related to land acquisition and involuntary resettlement); • Type of compensation for losses of natural resources shall be agreed with the Traditional Authorities, based on the needs of local communities, which is mutually agreed upon, including Grievance and Complaints Mechanism, and priority will be given to compensation by provision of an asset rather than monetary compensation. • Compensation amounts for each affected farm or agricultural land should be negotiated with the owner and mainly in the presence of at least one representative of the governments of Huila and Namibe provinces, the municipal administrations of Lubango, Humpata, Bibala and Moçâmedes; • The compensations for the loss of agricultural land, and fruit trees should be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and the entire process should be fair, transparent and honest; • Creation of multidisciplinary working committees between RNT, TEPSCO, JICA, the Humpata, Lubango, Bibala and Moçâmedes Municipalities Administrations, and the Huíla and Namibe Provincial Directorates in order to ensure a fair process regarding compensation for damage to agricultural land, and potential displacement along the Project's route; • Provide a Grievance Redress Mechanism for the handling of complaints/requests, and for information that may prompt the need for implementation of new measures;	

Phase	Construction
	• In the case of changes in land values post-construction, affected landowners and/or right holders are entitled to cash compensation at replacement values for the reduced opportunities to use the land most productively; • Develop and implement Livelihood Restoration Plan (LRP) prior to land take in order to ensure that lands for agricultural activities are ready, required infrastructure in place, and replacement livelihood resources can be accessed productively; • The grievance mechanism established during the construction phase must be maintained during operations to ensure that local communities and stakeholders have an adequate channel to voice concerns.
Observation	Maximization measures proposed in descriptors Job opportunities and economy diversification (**section 6.2.3.1**), and mitigation measures proposed in Physical Displacement (see **Table 6-21**) are applicable.

The Project will be implemented in a phased manner over 30 months, with the possibility for affected parties to partially restore their growing areas. Others, after compensation, may leave their villages and settle in peri-urban areas of Lubango and Humpata cities. **Table 6-23** outlines the Impact Assessment anticipated for the Economy Displacement (loss or restriction of grazing areas and temporary impacts on transhumance route) during the construction phase. During the operation phase, cattle herders will not be restricted in their movements; on the contrary, grazing will help to keep the 45 m buffer RoW visible at all times.

Table 6-23: Impact Assessment and Mitigation Measures for Loss or Restriction of Grazing areas and Temporary Impacts on Transhumance.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Short term	Brief
Extent	Local	Local
Magnitude	High	Low
Significance	Minor Negative	Negligible
Probability	Probable	Likely
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Comment on significance	Not applicable	
Mitigation measures	• All the forested area requiring clearing will be verified during the detailed design, which is committed to prevent or minimize such economic damage. For this purpose, after demining activities, a detailed social survey will be conducted in the area directly affected by the final electric line layout. Access routes, towers, East Lubango and New Namibe substations, as well as the workers' camps, must avoid transhumance areas. Priority should be given to existing access routes and to areas already affected by the works.	

Phase	Construction
Observation	Apply mitigation measures proposed in **Section 6.2.2** (biotic environment) to limit vegetation clearance to the strictly required areas is applicable. Maximization measures proposed in descriptors Job opportunities and economy diversification (**section 6.2.3.1**), and mitigation measures proposed in Physical Displacement (**Table 6-21**) and Economy Displacement – loss of agricultural crops and natural resources (**Table 6-22**) are applicable.

- **Residual and Cumulative Impacts**

There will be a cumulative impact associated with the loss of cultivation areas, temporary impacts on transhumance routes and resettlement of houses as a result of the constant maintenance of the TL RoW, and various electricity projects planned for Lubango, particularly in the Nombungo region.

6.2.3.3 Community Health and Safety

- **Potential Impacts**

The presence of the Project could affect the health, safety and wellbeing of the communities along the TL route and near the East Lubango and New Namibe substations. Increased Project-related traffic, demining, civil works for sites preparations including sites clearances and excavation work, change to the environment due to increased noise, decreased air quality, inappropriate waste handling or disposal, and accidental leaks and spills, and the presence of the Project workforce all present potential hazards for the health and safety of local communities. Similarly, communities and stakeholder concerns around the safety of the TL once they are operational including exposure to electric and magnetic fields (EMF), also have the potential to affect communities.

Safety related to Road Traffic, Site Trespass, and Demining Activities

Prior to the start of construction, mine clearance will be undertaken in all areas inside the 45 m of TL RoW that have not been previously cleared and that do not have an associated demining certificate. Prior to the demining activity, affected landowners and households located in the areas marked for demining will be notified, and a safety perimeter will be established. Although demining activities will be conducted in line with international standards, exposure to potential mine explosions remains a risk to community safety, which may result in serious injuries and death.

RNT, JICA and TEPSCO will select an approved demining entity to conduct the demining activities, and will be required to operate according to best international practice with respect to community and occupational health and safety such as International Mine Action Standards (IMAS) and the Angolan National Technical Standards and Guidelines (NTSGs). In the operation phase, no risk of accidents associated with mines is expected. The clearance of land mines inside the TL RoW will result in increased safety for the communities moving through the area.

During construction there will be an increase in traffic movements of heavy machinery and light vehicles in the road along the TL route and in access roads leading to the 495 temporary working areas (towers sites) during a period of 24 months. This will include, among others, water trucks, cement trucks, transport of construction material, excavation machinery, etc., which is expected to increase the risk of road traffic accidents and potential injuries or fatalities to other road users or pedestrians. The increase in movement of vehicles during the construction phase may result in greater disturbance and decreased wellbeing for those communities closest to the tower sites working areas (Poiares, Tchiwaya, Calumue, Heva, Jamba I, Camponês and Onculuvala) and along transportation routes and access roads. In addition, the selected EPC contractor will be required to operate according to best international practice with respect to community and occupational health and safety.

In the operation phase, the risks of incident and/or road accident are negligible since the vehicles assigned for maintenance will all be light and perfectly fitted into the traffic organization of national road no. 280. The creation and improvement of access roads to the Project area will also increase local accessibility, benefitting mobility and communication between remote settlements and municipal or communal centers (e.g., Tchiwaya, and Kapalanga settlements), and transhumance routes.

It is assumed that the 495 towers site working areas (15m x 15m each on average) will not be fenced during construction activities. The risk of trespass is highest when the tower sites are closest to settlements and agricultural areas with no electricity coverage, which increases the risk of accidental trespass at night. Trespassing on the temporary tower site working areas could result in accidents leading to injuries or even fatalities, especially due to the presence of large machinery, tower construction parts such as metal structures, and open excavations, which could at times be partly filled with water, especially during rainy season (e.g., open excavations for the erection of towers). Young people, elders and children are most at risk of being injured.

Increased Risk of Contracting Disease

The construction phase will require an influx of workers in order to create the conditions and erect the Project. Whilst every effort should be made to draw on the local employees, given the condition of generalized poverty and the extremely low level of education, it is reasonable to assume – as with most other projects – that the bulk of the workforce for the construction phase will be formed by migrant workers and who will be predominantly male. Having relatively large groups of male migrant workers living in workers' camps, away from their families and normal life, is internationally associated with the rise in demand for nightclubs, bars, eateries, interaction with local communities, and an increase in prostitution.

In the Huíla context, and in areas such as Lubango urban centre, these associated demands are compounded by the context of generalized poverty and the extreme power disparities between those who have a higher standard of living, have more money and are better travelled, and households and families who have low levels of education and survive primarily off subsistence farming. Such power disparities are likewise often associated with ability to take advantage of those who are significantly less 'powerful', susceptible, and more vulnerable.

The increase in prostitution services may result in the localized increase of HIV and other STD's. It is not easy for vulnerable partners and sex workers to insist on forms of protection as a result of the significant power disparities (including gender disparities). These conditions may also heighten the risk of a rise in violence and abuse, both sexual and otherwise. Sexual abuse of women, girls and minors may also increase. Such circumstances are once again compounded by power disparities, where the vulnerable (in such cases women and children) are both unaware of their rights and may find it difficult, if not impossible to access justice and recourse.

Some activities will result in changes to the physical environment, with the potential to affect the health and welfare of communities. Dust and air pollutant emissions could lead to respiratory diseases. Noise emissions could lead to conditions such as stress, headaches and migraines. The discharge of pollutants into the soil and water could lead to diseases caused by contamination such as cholera, diarrhoea, tuberculosis and hepatitis. These emissions will be of limited duration and contained to restricted areas of the project execution, and will affect social groups living in the immediate vicinity

of the affected areas (at this level, children tend to constitute the most vulnerable group). However, significant and continuous emission levels that could induce changes in health are not expected.

In operation phase, although the non-ionizing radiation and corona discharges that will be emitted by the TL and other equipment's is not known, it can cause (in the event it is above the threshold limits defined by ICNIRP) a long-term health problem on the surrounding residents. However, the likelihood of this event is extremely low because the towers will be higher than 35 m from the ground. The proposed TL route is isolated and safety distances will be respected, and the expected levels of non-ionizing radiation will be under limits defined by ICNIRP. No impacts likely to affect the health and well-being of communities are expected. During the social survey work, the communities did not report any health risks associated with the presence of the 60 kV TL that connect Lubango to Moçâmedes.

Risk of Communities and Social Cohesion

All potential impacts mentioned above (socio-economic environment), such as those deriving from involuntary resettlement, employment of local labour, land conflicts, and short-term economic alterations, will in their totality have both immediate and residual impacts on the communities. Impacts such as those derived from land use rights and compensation disputes, tension over employment (perceived favouritism), migrant workers, weakening of social networks and unmet, unrealistic expectations.

As a result, communities and cohesion may be strained. When such an impact reaches a critical threshold, community structures, upon which individuals and households rely on, begin to unravel and alter. The vulnerable are often the first to be negatively affected and generally are impacted more severely. The important point of this impact is that it is based on the principle of multiple and cumulative impacts and its severity will in large part depend of the ability to mitigate and reduce the other above mentioned impacts. It is expected that the social conflicts will end after the full completion of the transmission line and substation work.

Increased Worker's Health and Safety and Labour Rights

Typical activities for the construction of the substations and TL include clearance of the RoW in vegetated areas, excavation works, erecting the towers, working at height and stringing the TL.

Workers conducting the demining activities are also exposed to land mine hazards during the preliminary land preparation phase. Considering that construction is identified as one of the sectors of employment (formal and informal) in Angola (including in the rural and peri-urban areas along the TL), the locally hired workforce may have some experience in traditional and basic construction activities such as excavation works. However, work practices and consideration for health and safety may fall short of international standards and best practice, such as the use of personal protective equipment (PPE), which will increase the severity of hazards to which the workforce are exposed.

Similarly, the storage and disposal of hazardous waste and materials generated from the use of materials during construction phase may also pose a hazard to the health of the workforce if not handled properly. Equipment and workers transport along the access roads to the works positions may also result in road accidents in the absence of a proper traffic management plan or if traffic safety rules are not enforced. The often-poor conditions of the existing roads may also increase the risk.

During construction, local employment will be subject to Angola labour laws and applicable international standards to which Angola is party in particular with respect to safeguarding the health and safety of workers. In addition, contractors will need to comply with JICA Guidelines for Environmental and Social Considerations aimed at safeguarding the health and safety of its employees and subcontractors. These include the use of appropriate equipment and facilities to allow employees to undertake their duties in a professional and safe manner ensuring rights and freedom of association as well as providing a safe and sound work environment for workers. The employer/contractor is therefore expected to develop and implement appropriate health and safety measures for its workforce including enforcing the use of appropriate PPE at all times.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-24 outlines the Impact Assessment anticipated for the Demining Activities (accident risk), during the construction phase. The anticipated impact is negative but limited exclusively inside the 45 m of RoW, and areas in the surroundings chosen for the detonation of possible explosive devices. Completed the process of identifying possible unexploded ordnance on the project route, positive impacts are expected in the operation phase in result of increased safety roads for the communities moving through the project area and surroundings.

Table 6-24: Impact Assessment and Mitigation Measures for Demining Activities.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Brief	Brief
Extent	Regional	Regional
Magnitude	Very High	Low
Significance	Moderate Negative	Negligible
Probability	Probable	Likely
Confidence	Low	Low
Reversibility	Low	Low
Resource irreplaceability	Low	Low
Comment on significance	Not applicable (The demining work is essential for the development of the transmission line project).	
Mitigation measures	• RNT and EPC will develop and implement a Workers' Health and Safety Management System covering all contractors and subcontractors including demining entity to be selected for the demining process; • RNT and the selected demining entity will develop Emergency Response Plans in cooperation with local emergency authorities and hospitals; • Establish appropriate safety distances and perimeters for communities, and implement a Community Grievance Mechanism; Liaise with communities and local authorities including the following: conducting preliminary meetings with the local authorities prior to any work being conducted in the area; advising on safety measures to be taken by the local population while operations are ongoing; and conducting a closing meeting on completion of the works to inform the local authorities that the operations have been completed and in which areas.	
Observation	Mitigation measures proposed in Physical Displacement (**Table 6-21**) and Economy Displacement – loss of agricultural crops and natural resources (**Table 6-22**) are applicable.	
Phase	**Operation**	
	Without maximization	
Nature	Positive	
Duration	Permanent	
Extent	Regional	
Magnitude	Very High	
Significance	Major positive	
Probability	Certain and definitive	
Confidence	Low	
Reversibility	Low	
Resource irreplaceability	Low	
Comment on significance	Not applicable	
Maximization measures	Not applicable	
Observation	Maximizing impact will be the responsibility of the selected entity for the demining process.	

Table 6-25 outlines the Impact Assessment anticipated for the traffic movements (risk of road traffic accidents) and site trespass, during the construction phase. The anticipated impact is negative but limited manly inside the 45 m of RoW, as on the main roads compliance with the Highway Code is

compulsory and enforced by traffic regulators. In the operation phase, the risks of incident and/or road accident may occur. However, these risks are negligible since the vehicles assigned for maintenance will all be light and perfectly fitted into the traffic organization of National Road no. 280.

There may also be a positive impact in the operation phase due to the use of the line's maintenance roads by nearby communities (i.e., movement of people, flow of agricultural and livestock produce and easy access to pasture areas, etc.).

Table 6-25: Impact Assessment and Mitigation Measures for Risk of Road Traffic Accidents and Site Trespass.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Short term	Brief
Extent	Regional	Local
Magnitude	Low	Low
Significance	Minor Negative	Negligible
Probability	Unlikely	Unlikely
Confidence	Low	Low
Reversibility	Medium	Medium
Resource irreplaceability	Low	Low
Comment on significance	Not applicable (The traffic movement is essential for the development of the transmission line and Moçâmedes substation project).	
Mitigation measures	• Implement a Community Health and Safety Plan, adopting 40 km/h speed limits and with adequate signs to ensure safety and traffic conditions; maintaining access control of construction sites to prevent access to people from the surroundings; • EPC will minimize clearance of the 4 m maintenance road as in some cases clearance may not be necessary since other access roads are available; • Implement the Stakeholder Engagement Plan, including prior and extended communication of the activities planned (and timeline) and the accesses to be used during the project construction phase, to enable local communities to increase perception and manage risk; • Promote awareness activities among local communities (particularly children) regarding the construction and traffic movement risks; • Promote awareness activities among workers about the culture, beliefs, habits and lifestyles of the local communities, and define appropriate rules of conduct. The code of conduct should apply to both contractors and RNT staff and should set out the disciplinary and legal implications of certain activities involving local communities; • Implement the Demining Management Plan prior to construction activities, in consultation with the competent authorities and including the local Sobas; • Provide a Grievance Redress Mechanism for the handling of complaints/requests, and for receiving information to assess the degree of interference perceived by local communities and to consider the need for implementation of new measures;	

Phase	Construction	
	• Implement the Demining Management Plan prior to construction activities, in consultation with the competent authorities and including the local Sobas; • Undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto sites, the meaning of signs, and the dangers of playing on or near equipment or entering fenced areas. Special attention to be paid in primary and secondary schools along the transmission routes and in areas where towers will be built close to residential or school areas; • Ensure that worker camps are fenced and that signs are put up around work fronts and workers' camps advising people of the risks associated with trespass. When work fronts are less than 100 m from a community or house, employ security guards from the local community to prevent trespass.	
Observation	Mitigation measures proposed in descriptors geology and geomorphology (**section 6.2.1.2**), soils (**section 6.2.1.3**), air quality (**section 6.2.1.4**), landscape (**section 6.2.1.7**), habitats and vegetation (**section 6.2.2.1**), and Fauna (**section 6.2.2.2**) are applicable.	
Phase	**Operation**	
	Without maximization	
Nature	Positive	
Duration	Permanent	
Extent	Regional	
Magnitude	High	
Significance	Minor positive	
Probability	Certain and definitive	
Confidence	Low	
Reversibility	Low	
Resource irreplaceability	Low	
Comment on significance	Not applicable	
Maximization measures	Not applicable	
Observation	Maximizing impact will be the responsibility of RNT.	

Table 6-26 outlines the Impact Assessment anticipated for the community health (Increased Risk of Contracting Disease), during the construction phase. No significant impact is expected during the operation phase. The other risks associated with the presence of the high-voltage line and the substation near the communities were classified as unplanned events.

Table 6-26: Impact Assessment and Mitigation Measures for Risk of Community Contracting Disease.

Phase	Construction and Operation	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Brief
Extent	Regional	Local
Magnitude	High	Low
Significance	Minor Negative	Negligible
Probability	Probable	Unlikely
Confidence	High	High
Reversibility	Medium	Medium

Phase	Construction and Operation	
Resource irreplaceability	Low	Low
Comment on significance	Not applicable	
Mitigation measures	• Implement a Health and Safety Management Plan. Given the limited supply of health care in the study area, this plan should include epidemiological control measures to be implemented by the EPC on the workers' camps to assist the workers and, in this way, avoid pressure on the existing health units. This plan should also include regular screening of communicable and STDs of all workers assigned to the site, a vaccination program to curb diseases responsive to vaccines, as well as to provide protection for workers most exposed to air pollution and noise while working; • Promote awareness activities among workers regarding water and hygiene related diseases and STDs, especially HIV/AIDS and associated code of conduct; • Locate the workers' camps in main peri-urban areas and not in the areas along the corridor, to avoid interactions between workers and communities, especially in communities with recorded presence of ethnolinguistic groups where adolescent girls are beggars and susceptible to being lured; • Promote awareness activities among local communities (particularly women and girls) about impacts associated with the presence of non-local workers (health impacts, gender-based violence, sexual harassment, as well as the existing legislation relating to sexual harassment and rape, and trafficking in persons). Women from affected communities should be hired and trained to implement awareness-raising activities. Materials can also be designed that can be replicated on other future projects; • Avoid the positioning and placement of construction camps within close proximity to schools or locations where there is a permanent presence of young women and/or female children (the areas at Lubango level used by the children and women of the Mumuíla tribe for begging should be avoided); • Provide a Grievance Redress Mechanism for the handling of complaints/requests, and for gathering information to assess the degree of risk perceived by local communities and consider the need for implementation of new measures; • Ensure that there is a well-functioning accessible mechanism for redress (part of the grievance mechanism). This mechanism should consider the stigma and shame associated, particularly with sexual violence and abuse of minors and must be constructed and operate in a way that enables/encourages, rather than dissuades victims from coming forward; • Implement the Waste and Wastewater Management Plans to ensure that potential chemical and biological contamination from construction activities is duly addressed and controlled; • Prepare and develop a course and/or information package on local context and vulnerability to be provided to all staff. Aspects of appropriate and expected behaviour by contractor staff must be adhered to. It is the responsibility of the contractor to ensure appropriate behaviour and conduct of all staff (code of conduct); • Ensure that entire worker force is dually informed and educated of above impacts and informed on the legislation, responsibility, and accountability. The repercussions and legal ramifications of any violation should be made explicit; • Ensure appropriate procedures and policies are in place to address any violation of the law and/or rights of individuals and/or communities;	

Phase	Construction and Operation
	• RNT will ensure that an Emergency Preparedness and Response Plan (EPRP) is developed; • EPC have to undertake stakeholder engagement with settlements along the transmission line route on a range of issues including changes to the visual environment, noise, air quality and socioeconomic concerns including interaction with workers; • To avoid electromagnetic fields and corona discharge, installation of transmission line above or adjacent to residential properties or other locations intended for highly frequent human occupancy (i.e., schools, health units, day-care or offices) will be absolutely avoided; • If electromagnetic fields and corona discharge levels are confirmed to be above the recommended exposure limits, application of engineering techniques will be considered to reduce discharge levels. Examples of such techniques include shielding with specific metal alloys, increasing height of towers, modification to size spacing and configuration of conductors; • Undertake initial measurements of the electromagnetic exposure levels to ensure that the public exposure levels are within the accepted limits as prescribed by ICNIRP; • Educational campaigns will be undertaken in affected communities to explain what electromagnetic fields and corona discharge are and that people should not build new houses within the RoW; • RNT have to undertake annual monitoring to ensure that people are not building new houses, churches and informal trade sites within the corridor; • Permanent warning plates (danger sign boards) and anti-climbing devices on all faces of the lattice towers.
Observation	Mitigation measures proposed in **Table 6-23**, **6-24** and **6-25**, and descriptors soils (**section 6.2.1.3**), air quality (**section 6.2.1.4**), landscape (**section 6.2.1.7**), and habitats and vegetation (**section 6.2.2.1**) are applicable.

Table 6-27 outlines the Impact Assessment anticipated for the community health (Risk of Communities and Social Cohesion), during the construction phase. No significant impact is expected during the operation phase.

Table 6-27: Impact Assessment and Mitigation Measures for Risk of Communities and Social Cohesion.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Short term	Brief
Extent	Regional	Local
Magnitude	High	Low
Significance	Minor Negative	Negligible
Probability	Probable	Unlikely
Confidence	High	High
Reversibility	Medium	Medium
Resource irreplaceability	Low	Low
Comment on significance	Not applicable	

Phase	Construction
Mitigation measures	• Promote awareness activities among workers about the culture, beliefs, habits and lifestyles of the local communities, and define appropriate rules of conduct. The code of conduct should apply to EPC and RNT staff and should set out the disciplinary and legal implications of certain activities involving local communities; • The Community Grievance Mechanism established during the construction phase will be maintained during the operation phase so stakeholders can report specific concerns.
Observation	Mitigation measures proposed in **Section 6.2.3.1** and **6.2.3.2** are applicable.

Table 6-28 outlines the Impact Assessment anticipated for the community health (Risk on worker's health and safety). During the construction phase, work accidents could occur during several of the planned construction activities, such as demining, site preparation, excavations, vegetation clearance, waste and hazardous materials management, transportation and circulation, or worksite restoration.

Similar to the construction phase, the operation phase may also lead to occupational health and safety issues in particular with respect to maintenance of the transmission lines (risk of electrocution and exposure to electric and magnetic fields) and the use of herbicides to maintain the RoW and access to the lines. However, it should be noted that during the maintenance of the line and substation there will be an interruption of temporary electricity, and all work will be carried out by trained specialists with many years of experience in the sector.

Table 6-28: Impact Assessment and Mitigation Measures for Risk on worker's health and safety.

Phase	Construction and Operation	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Short term	Brief
Extent	Regional	Local
Magnitude	High	Low
Significance	Minor Negative	Negligible
Probability	Probable	Unlikely
Confidence	High	High
Reversibility	Medium	Medium
Resource irreplaceability	Low	Low
Comment on significance	Not applicable	
Mitigation measures	• Child worker should be avoided at all costs. Child worker is described as having workers below 18 years of age; • The EPC will develop and implement a Health and Safety Management Plan to protect every worker involved in construction activities, even temporary workers. This plan will comply with national legislation, JICA Guidelines, and international guidelines and will address all aspects of labour standards relevant to the project;	

Phase	Construction and Operation
	• 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; • RNT will develop a Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line and substation, compensation including consideration of overtime, holidays etc. RNT will require the EPC to put in place policies in line with national legislation and applicable international legislation and RNT Code of Conduct and Policies; • RNT will establish contractual clauses to be embedded in the contracts of the EPC and all sub-contractors that require adherence to Angolan law and international standards to be upheld related to worker rights and providing the EPC and RNT with the right of audit; • Prohibit the use of alcohol and drugs, which could adversely affect the ability the employee to perform the work safely or adversely affect the health and safety of other employees, community members and/or the environment; • Ensure that training on health and safety measures is provided to all construction workers and maintenance workers prior to starting to work on the Project and that supervisors have adequate experience to deliver on their responsibilities, and use of personal protective equipment at all times (e.g., safety helmets, fall protection equipment); • Implement regular health and safety checks and audits of workers, contractors and subcontractors and implementing sanctions in case of breaches of national standards and the Project's specific standards. Such audits to include workplace H&S; worker contracts, working hours, pay and conditions; housing and food standards; • Develop and implement a Workers Grievance Mechanism for the Project workforce including contractors and subcontractors; • Establish a procedure for the recording and analysis of incidents and lessons learned such that additional actions can be implemented to avoid or minimize occupational health and safety risks; • Ensure that adequate clean water, adequate food and access to medical care is provided to all workers on the worksite and at accommodation sites; • Put in place measures to ensure no employee or job applicant is discriminated against to his or her gender, marital status, nationality, age, religion or sexual orientation; • Develop a Waste Management Plan for the operation phase with clear guidelines for the safe storage and disposal of hazardous waste and handling of hazardous materials; • Ensure that its Code of Conduct is followed to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE; • Use of appropriate equipment and PPE for risk-free maintenance operations as well as proper implementation of the maintenance plan; • Develop and implement appropriate health and safety measures for its workforce including enforcing the use of appropriate PPE at all times.
Observation	Mitigation measures proposed in **Section 6.2.3.1** and **6.2.3.2** are applicable.

- **Residual and Cumulative Impacts**

The implementation of mitigation measures will contribute to reducing demining activities risks, risks of traffic movement, risk of communities and social cohesion, occupational health and safety risks and the risk of labour rights abuses significantly. However, the risk of potential accidents still exists and may potentially lead to injuries or fatalities for the workforce during construction and operation.

However, it is unlikely that other construction Projects occur simultaneously with the transmission line Project between Lubango to Moçâmedes. However, if this happens, the cumulative impact of the community health and safety risk may increase the Project impact to a minor negative significance.

6.2.4 Cultural Heritage

- **Potential Impacts**

Baseline assessments have identified cultural heritage sites in the proposed TL corridor, namely: a secular cemetery with 20 graves of the first Boers in Jamba Farm (Humpata) and one community cemetery was mapped in Onculuvala. Despite being more than 10 km from the TL Project's route area, the statue of Christo Rei (in Lubango) has been designated as a Historic-Cultural Heritage Site (Executive Decree no. 29/14 February 10th). It is therefore imperative to scrupulously observe all precautions in order to prevent the Project from having a direct impact on these structures in case of potential transmission line modification route after geology and topography studies, under penalty of a crime against the national historical, cultural and artistic heritage.

Despite not being officially recognized as cultural heritage by the Ministry of Culture, Tourism and Environment and by UNESCO, the Boer cemetery is an important vestige of the presence of this community in Angola, who came from South Africa, which certainly constitutes one of the important milestones in the history of colonisation of the southwestern region of the country, with great influence on the development of agriculture in the Huíla province. The vestige of the presence of this community in the high lands of Chela naturally constitutes a historical and cultural heritage of the region and deserves attention with a view to its preservation.

Despite the community cemetery in Onculuvala settlement not being classified as an *akôkôto* cemetery (cemetery of sovereigns, nobles or kings) the space has an enormous sentimental value for the many families that have their loved ones buried there, so it is of interest to preserve them. During the construction phase it is also possible that places used by traditional authorities (*Jangos* or ceremonial sites) for the resolution of community problems such as; marriage, rituals, traditional courts and traditional council meetings may be affected by the RoW. It should also be noted that these impacts can, for the most part, be avoided through the execution of a pre-construction walk-down for the transmission line alignment.

During the fieldwork (rainy and dry seasons) was not mapped any fossils, archaeological and paleontological sites along the transmission line route neither near the East Lubango and New Namibe substations areas.

- **Environmental Impact Assessment and Mitigation Measures**

Table 6-29 outlines the Impact Assessment anticipated for the damage to graves and burial sites along the TL route, and its mitigation measures. This impact, if unavoidable, will occur exclusively during the construction phase. No impacts are expected in East Lubango and New Namibe substations sites.

Table 6-29: Impact Assessment and Mitigation Measures for Damage to Graves and Burial Sites.

Phase	Construction	
	Without mitigation	With mitigation
Nature	Negative	Negative
Duration	Permanent	Brief
Extent	Regional	Local
Magnitude	Local	Low
Significance	Moderate Negative	Negligible
Probability	Probable	Unlikely
Confidence	High	High
Reversibility	Medium	Medium
Resource irreplaceability	Low	Low
Comment on significance	Avoidance is the preferred mitigation, so as not to relocate graves, due to the cultural repercussion thereof, and enormous sentimental value for the many families that have their loved ones buried there.	
Mitigation measures	• Walk-down of final alignment to assist with the avoidance of graves, or exhumation and relocation, as part of the resettlement activities; • During the walkdown, the specialist must be accompanied by representative/s from the local communities to assist in the identification of heritage and cultural sites; Sobas and other elders must be involved, as they hold this knowledge;	

Phase	Construction
	• Elaborate and Implemented of the Heritage Management Plan, and Grave Management Plan; • As part of the social mitigation measures, these sites should be identified through the demining process and relocated. Certain deconsecrating ceremonies may apply; • Work with local community representatives to develop cultural awareness materials (published in Portuguese and Nyaneca-Humbi) that will cover key issues including the location and importance of all local cultural sites and other cultural sensitivities (graves); • Do not remove any cultural heritage including graves without prior consultation to the communities and fulfilling the legal requirements. Any removal of cultural heritage should be conducted by the best available techniques; • Develop a chance find procedure which will detail the appropriate course of action that must be followed for any relevant cultural heritage discoveries.
Observation	Mitigation measures proposed in **Table 6-27** is applicable.

- **Residual and Cumulative Impacts**

Increased access, due to Project development combined with the existence of large farms in both affected provinces, could increase access to burial areas that are currently isolated, and this could increase the cumulative impact on such sites. Some ceremonial areas are also associated with burial practices. There will be a cumulative impact where graves are also to be relocated and these sites then are no longer available for the required ceremonies. With the proposed mitigation measures, particularly the development of chance finding procedures the residual negative impacts on cultural resources are assessed to be of a low magnitude.

6.2.5 Public Infrastructure

- **Potential Impacts**

During the construction phase of the Project there will be no use of public infrastructures, namely: sources of drinking water supply, electricity, public waste disposal containers, etc. These services will be provided by companies based in the provinces of Huila and Namibe, the workers' camps will be equipped with generators as a source of power generation and distribution. Similarly, the same may occur in the operation phase, and in this phase the East Lubango and New Namibe substations will be self-sustaining from the point of view of electricity production.

A Waste Management Plan (WMP) has been also elaborated and will be implemented to guarantee the correct management of all hazardous and non-hazardous waste to be expected in the different phases of the Project.

- **Environmental Impact Assessment and Mitigation Measures**

Not applicable.

6.2.6 Unplanned Events

The following Section presents the assessment of impacts resulting from unplanned or non-routine events and those which are a result of accidents. These are different to impacts that would reasonably be predicted to occur in the normal course of activities (including the application of in-built control measures) during construction and operations.

Unplanned and accidental events have the potential to occur during Project activities and therefore the evaluation of impacts for unplanned and accidental event considers the likelihood of the event occurring into the impact magnitude. Likelihood is determined as unlikely, possible, or likely based in professional judgement and quantitative information (statistical frequency) where available.

Given the nature of Project activities, unplanned and accidental events relate to potential accidental spills of equipment fuel and oils and vehicle traffic accidents. If unplanned and accidental events did occur, there would be effects on the biophysical and social environment. The risks of unplanned and accidental events are described in this Section.

6.2.6.1 Potential Impacts to Soil and Watercourse

- ***Impact Assessment***

During construction there is the potential for spills of fuels and oils during construction activities, fuelling, maintenance of machinery and vehicles. Spills could occur in a number of locations along the TL RoW and East Lubango and New Namibe substations sites. Spills have the potential to affect

terrestrial environments and could lead to the deterioration of soil, water and sediment quality. This could lead to knock on effects for flora and fauna and local community users.

Incidental spills of fuels are infrequent, but do occur; most frequently due to malfunction of handling systems, poor practice of workers and force majeure. Spills are most likely to occur during refilling and transportation of substances. Large releases of hazardous materials are rare and it is considered unlikely that a spill would occur of emergency scale. However, soils and watercourses could be impacted if the spill were to occur within proximity of these resources.

- ***Significance of Impacts***

For impacts to soils, the spatial scale is considered to be local. The impact could be long term and is a direct negative impact. The overall magnitude is considered to be medium. There are areas along the TL RoW which are used for cultivation and therefore the sensitivity is considered of medium sensitivity. This results in a potential negative impact of **minor** significance.

For watercourse, the impact of the spill would be short to medium term as the release of fuel or oil is likely to be a discrete (e.g., non-continuous) event and the effects on water quality naturally mitigated through dilution and natural attenuation. Despite the unavailability of information on watercourse quality, the sensitivity is considered medium as the communities along this natural resource make use of the water for various domestic, agricultural and livestock needs. The impact of the magnitude is considered medium and the potential impact is therefore of **moderate** significance.

- ***Mitigations measures***

The following management measures will be implemented in the Project's Environmental and Social Management Plan (ESMP) Framework:

- Develop a detailed Oil Spill Response Plan (OSRP) which includes community notifications when required. The Project will maintain spill clean-up and response capability adequate for addressing spills during all phases of the Project. All spills will be immediately contained and cleaned up. Contaminated areas will be remediated and post remediation verification will be carried out (involving sampling of water and/or soil).

- Hazardous material storage will be on hard standing and impermeable surface and the bulk storage facility will be bunded. The Project will restrict storage and handling of hazardous materials and fuels to bunded areas of sufficient capacity to contain a release. There will be strict compliance with the guidelines presented in the WMP.
- Hydrocarbon spill clean-up kits shall be available at all locations where refuelling or maintenance of vehicles and equipment is done, and responsible people shall be trained in the use thereof.

o ***Residual Impacts***

The impacts on soils are considered **minor** post mitigation, largely because parts of the transmission line occur in cultivated areas and spills of hazardous substances here are likely to have a greater impact than spills in unutilized areas. Based on the watercourse context, impacts will be of **minor** significance post mitigation.

6.2.6.2 Potential Impacts to Community Health and Safety

o ***Impact Assessment***

During the substations and TL construction and operation phases, unplanned events with the potential to negatively affect human population could occur. Stringing activity around the wires and other electrical units can be a potential hazard if proper planning is not followed. The assumption that local workers at times are not accustomed to use PPE should be taken in consideration (i.e., their attitude to avoid PPE may result in accident/hazard). During operation, there is a possibility of lines or towers/parts of the tower failing and causing injuries and/or fatalities. Additionally, during the operation phase, contact with the TL can result in electrocution. However, the potential impacts are all considered unlikely in that they are not likely to occur during the lifetime of the Project.

o ***Significance of Impacts***

Considered a negative event that could lead to permanent impacts if there are injuries and fatalities. The overall impact is considered of **moderate** significance. The risk is influenced by poor foundation quality, tower member theft, material corrosion due to poor coating and poor quality or damaged

fittings exposing the system to failure. The receptor sensitivity is considered high as there are households and businesses within the TL RoW in the areas close to Moçâmedes urban centre.

This is therefore considered as a **major** significant impact, which is unlikely to occur during the lifetime of the Project.

- ***Mitigations measures***

The following mitigation measures will be employed to reduce any potential unplanned event:

- Stringing activities near wires and other electrical utilities will be done after proper shutdown of the line/utilities with prior information and permission.
- An Emergency Prevention and Response Plan (EPRP) will be developed according to Angola requirements, JICA Guidelines, and international industry standards and best practices.
- The EPRP will be developed in consultation with the competent authorities, emergency service/civil defence and administrations along the transmission routes and around the substations. Personnel must be trained on how to respond to unplanned events.
- Risks to general public during operation will be reduced by public awareness and education and physical measures by attaching an appropriate warning sign on all faces of the tower.
- Once the stringing work is complete, notices and permanent anti-climbing devices will be installed on the tower (in particular in lattice towers). The operational start date for electricity transmission and safety implications will be published locally in advance.
- In addition, the risk of the transmission line spanning or towers collapse can be mitigated through complying with design specifications, installing antitheft devices, conducting material quality inspection and compliance, and following RNT's installation procedures.

- ***Residual Impacts***

A residual risk of non-routine events occurring is inherent to the nature of the Project type and is likely to remain so. Provided the above mitigation measures are implemented the residual risk related to unplanned events is considered to be **minor** (stringing, unplanned spillages and fires) and **moderate** for the risk due to transmission line snapping/collapse.

6.2.7 Impact Assessment Summary

This section presents a summary of all impacts assessed for the Project, including pre-and-post mitigation assessments. It further presents the proposed key mitigation to facilitate a global perception of the Project's impacts. The impact assessment summary is presented in tabulated form, separated by environmental component and per project phase.

The impact assessment has been conducted in accordance with international best practice (such as the JICA Guidelines for Environment and Social Considerations - 2010) and national legislative requirements. Following a scoping process, this impact assessment was focussed on interactions between the Project activities and various resources/receptors that could result in significant impacts.

Table 6-30 presents the outcomes of the comprehensive assessment of identified impacts as a result of the different phases of the Project. All of the impacts are classified as negligible to moderate significance, with the implementation of mitigation measures specified.

Table 6-30: Summary of the main environmental and socio-economic impacts expected.

Environmental and Social Variable	Project Activities/Impacts	Phase	Significance	
			Before Mitigation	With Mitigation
Soils	Loss of soil resources due to erosion and vegetation clearance in the RoW and East Lubango and New Namibe substations sites.	Construction	Minor Negative	Negligible
	Soil Contamination from accidental hydrocarbons spills from maintenance vehicles, backup generators, and machinery.	Construction	Moderate Negative	Negligible
Water Resources	Availability and Quality of Water Resources (as a result of the clearing of vegetation and excavation of foundations near surface water bodies).	Construction	Minor Negative	Negligible
Air Quality	Road Traffic Exhaust Emissions, namely: emissions of nitrogen oxides (NO_2), carbon monoxide (CO), carbon dioxide (CO_2) and sulphur dioxide (SO_2), and dust and particulate matter (as $PM_{2.5}$ and PM_{10}).	Construction	Minor Negative	Negligible
	Dust and PM_{10} from construction activities (vegetation removal, earthworks, excavation, soils modelling, and borrow pits).			
Noise, Vibration and Radiation	Noise from construction activities affecting nearby dwellings (e.g., demining, earthworks and vegetation clearance, etc.).	Construction	Minor Negative	Negligible
	Noise emissions due to the corona discharge and traffic during the maintenance in the RoW.	Operation		
	Electromagnetic radiation (resulting from the operation of the transformers in the East Lubango and New Namibe Substations).	Operation		
Landscape	Visual impact (presence of workers' camps and vegetation removal in the RoW – 45 meters).	Construction	Moderate Negative	Minor Negative

Environmental and Social Variable	Project Activities/Impacts	Phase	Significance	
			Before Mitigation	With Mitigation
	Visual intrusion (presence of East Lubango and New Namibe substations).	Operation		
Flora and Vegetation	Fragmentation or loss to vegetation, habitat loss and fragmentation as a result of the clearing of vegetation in the RoW (45 meters) or degradation to environment and habitat.	Construction	Moderate to Major Negative	Minor Negative
	Fragmentation or loss to vegetation and potential grow of invasive species as result of the maintenance works.	Construction and Operation		
Fauna	Habitat fragmentation or loss to avifauna, frogs and reptile's species (e.g., associated with the construction activities, resulting in displacement from breeding and foraging areas, and habitat degradation).	Construction	Moderate to Major Negative	Negligible
	Increase in bird mortality due to bird strikes during the TL operation.	Operation		
Ecosystem Services	Probable temporary restriction to the local populations the cultivation and grazing areas, transhumance areas and obstruction of the landscape.	Construction	Minor to Moderate Negative	Negligible
Economy and Employment	Local employment opportunities, capacity building and economic development (40% opportunities will be given to the local youth).	Construction	Major Positive	
	Long term local employment opportunities as an RNT company employee.	Operation	Moderate Positive	
	Economic development and diversification (procurement of goods and services during the construction phase, in particular for water supply, waste management facilities, food products or catering services, telecommunications services and security for the workers' camps, etc.).	Construction	Moderate Positive	

Environmental and Social Variable	Project Activities/Impacts	Phase	Significance	
			Before Mitigation	With Mitigation
	Increased electrical capacity in Moçâmedes city.	Operation	Major Positive	
Land and Livelihoods	Economy Displacement - temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land in the RoW (45 meters), and workers' camps sites, etc.	Construction	Major Negative	Minor Negative
	Loss or restriction of grazing areas and temporary impacts on transhumance (vegetation clearing in the RoW – 45 m).	Construction	Minor Negative	Negligible
	Temporary loss of access to forest products from site clearing during construction.	Construction	Minor Negative	Negligible
	Temporary loss of access to forest products from site clearing during construction.	Construction	Minor Negative	Negligible
	Physical displacement of Project-Affected People during construction (in the RoW 45 m there can be no houses, schools, hospitals, and in the area near the towers agriculture activities will not be allowed, etc.).	Construction	Major Negative	Moderate Negative
	Permanent loss of livelihoods and household income due to permanent land take and restrictions.	Construction	Major Negative	Moderate Negative
	Changes in land and property value.	Operation	Minor Negative	Negligible
	Improvement of the local road networks.		Major Positive	
Community Health and Safety	Community Safety (Road Accidents, Site Trespass, Demining)	Construction	Moderate Negative	Negligible
	Demining Activities (The clearance of land mines inside the TL RoW will result in increased safety for the communities moving through the area).	Operation	Major Positive	

Environmental and Social Variable	Project Activities/Impacts	Phase	Significance	
			Before Mitigation	With Mitigation
	Increased Risk of Contracting Disease (Presence of non-native workers combined with extreme poverty of rural communities).	Construction	Minor Negative	Negligible
	Increased Worker's Health and Safety and Labour Rights.	Construction	Minor Negative	Negligible
	Environmental Health (Noise and Air affectation) and EMF Health effects.	Operation	Minor Negative	Negligible
Cultural Heritage	Damage to Graves and Burial Sites (cemeteries space have an enormous sentimental value for the many families that have their loved ones buried there, so it is of interest to preserve them).	Construction	Moderate Negative	Negligible
Unplanned Events - Unplanned Spillages	Reduction in local soil quality (potential for spills of fuels and oils during construction activities, fuelling, maintenance of machinery and vehicles).	Construction	Moderate Negative	Negligible
Unplanned Events - Unplanned Spillages	Reduction in surface water (Spills have the potential to affect water and sediment quality).	Construction	Moderate Negative	Negligible
Unplanned Events - Community Health and Safety	Risk due to transmission line snapping and transmission tower collapse.	Operation	Moderate Negative	Negligible

Chapter 7

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

An Environmental and Social Management Plan is an instrument to provide a project with an efficient structure to ensure the implementation and control of the actions planned in the various programmes, the adequate environmental condition of the infrastructures erected, as well as to control information and maintain a high standard of quality during the construction activities of the 220 kV transmission line Project between Lubango and Moçâmedes. This Environmental and Social Management Plan (ESMP) contains a set of programmes that include several measures and actions to be applied during the implementation of the Project's activities. These programmes will stimulate the improvement of the quality of life in the social, environmental, cultural and economic dimensions.

In addition to the Environmental and Social Management Plan proposed in **Table 7-1**, the ESMP includes other programmes and plans that due to the type of Project and the likely negative environmental and socio-economic impacts described in **Chapter 6**, it is suggested that RNT and the EPC prepare and implement. The programs and plans proposed in this ESMP are the following:

- Stakeholder Engagement Plan;
- Waste Management Plan;
- Resettlement Action Plan;
- Health, Safety and Environment Plan (to be developed by the EPC);
- Community Health and Safety Management Plan (to be developed by the EPC);
- Construction Management Plan (to be developed by the EPC);
- Emergency Preparedness & Response Plan (to be developed by the EPC);
- Traffic and Transportation Management Plan (to be developed by the EPC);
- Local Employment and Procurement Plan (to be developed by the EPC)
- Biodiversity Management Plan including monitoring activities (to be developed by the EPC);

Other plans could be required either by the Angolan authorities or based on the JICA Guidelines for Environmental and Social Considerations (April 2010).

7.1 Environmental and Social Management Plan

In order to comply with the environmental legislation in force, namely the Presidential Decree no. 117/20 of 22nd April and Executive Decree no. 92/12 of 1st March, the Environmental and Social Management Plan aims to provide the essential elements to mitigate the potential negative impacts arising from the construction and operation phases of the Project and is based on the information in the chapters regarding the Project description, the institutional and legal framework, the environment and social baseline, as well as the potential negative impacts identified.

According to the environmental impact assessment carried out, the descriptors that could be subject to more significant impacts such as degradation of people's living environment and social network, natural habitat fragmentation or loss, and landscape degradation, and that are compatible with the justification of the implementation of the Environmental and Social Management Plan (ESMP) corresponds to: Soil, Air Quality, Water Resources, Noise, Vibration and Radiation, Landscape, Flora and Fauna (birds), Involuntary Resettlement, temporary and/or permanent loss of livelihoods and household income, Population (health and safety of communities).

The ESMP presented in **Table 7-1** aims to assist in the implementation of mitigation measures in the different phases of the Project. It determines the type of intervention, the responsibility of each party involved, as well as the deadline for implementation of each activity.

The recommendations of the mitigation measures and those contained in this ESMP will be extremely important for future environmental audits of the Project as well as to ensure that the impacts in question are insignificant. The measures described in the table below include only those applicable to descriptors whose impacts were classified as low to moderate-high, not being represented those whose potential impacts are insignificant or negligible, after the implementation of a given mitigation measure.

Offset measures to compensate for the impacts that cannot be mitigated will be discussed with the Ministry of Culture, Tourism and Environment and with the Provincial authorities. These could include reforestation projects, development of nurseries and implementing research programmes to propose the establishment of conservation areas in the region.

The respective ESMP should be ensured and monitored by a technical team from RNT and EPC (Health, Safety and Environment Department), to assume the following tasks:

- ✓ Evaluate performance and progress in the implementation of mitigation measures and the respective impact monitoring and follow-up plan;
- ✓ To ensure the adaptability and feasibility of the mitigation measures in time and space, obtaining, when necessary, financial and human resources from the company's management;
- ✓ Guide the development and implementation of monitoring programmes and procedures particularly for noise, air quality, and biodiversity;
- ✓ Disclosure information about the Project and its potential environmental and social impacts, recording and responding to any complaints or claims made by the surrounding population and the State administrative authorities;
- ✓ Draw up environmental and social progress reports and submit them to the National Institute for Environmental Management (INGA).

Table 7-1: Environmental and Social Management Plan

(1) 220kV Transmission Line

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
Pre-construction phase						
1	Air pollution	- Air pollutant emissions from the implementation of demining work	- Appropriately maintain the equipment and vehicles used and reduce the generation of air pollutants. - During demining work, water will be sprayed as necessary to prevent dust generation. - Reduce speed on unpaved access roads to prevent dust generation.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
2	Water pollution	- Generation of wastewater in workers' camp, etc.	- All wastewater from workers' camp etc. is collected and treated from the site for proper disposal at an approved municipal facility. - Installation of watertight septic tanks (or equivalent) to collect wastewater from the site, including vehicle and machinery washing waste water. - When mobile chemical toilets are used, they should be installed and collected by an approved contractor and disposed of properly. - When discharging wastewater into the environment, Angolan legislation on wastewater standards (Annex VI of Presidential Decree No 261/11 of 6 October) shall be complied with.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
		- Turbidity generation due to the implementation of demining work.	- In sections where clearing and rooting has been carried out due to demining work, ROWs, construction roads, material storage areas and post-service management roads should be promptly secured to prevent sediment run-off. - If the location of the steel tower and ROW are determined and there is concern about the impact on surface water, well water, spring water, etc., appropriate measures should be taken in consultation with users.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
3	Soil pollution	- Spills of lubricating oil, fuel oil, etc. from heavy	- Ensure that lubricants and fuel oils are properly managed and that a receptacle is available in case of spillages when	CND	Consultant / RNT/CND	Measures can be taken through

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		machinery.	refilling.			standard, careful management and operation, and special cost is not required.
4	Noise and vibration	- Noise and vibration caused by the implementation of demining work	- Appropriately maintain and manage the equipment and vehicles used to reduce noise and vibration.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
5	Offensive odors	- Generation of odors due to improper waste management.	- Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the accumulation of odour, pest control problems, general litter and other nuisance sources of waste on the site. - Provide training, education and signage to ensure compliance with waste management plans.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
6	Waste	- Cutting and de-rooting result in plant bodies becoming waste. - Waste is generated in the workers' camp.	- Plants are not discarded, but used for soil retention and surface cover to prevent soil erosion and also encourage regeneration where possible. - Waste management plans prepared for power utilities are applied mutatis mutandis to properly dispose of waste generated at workers' camp.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
7	Ecosystems	- Selection of transmission line ROW and tower construction sites	- As considerations for the ecosystem in the project area, (1) the route around the area where the endangered species (Ludwig's bustard (*Neotis ludwigii*)) was confirmed was taken as close to the road as possible, (2) if there are habitats for bats in the forest in Bruco Gorge, such habitats should be avoided and logging and root cutting should be done manually as much as possible, (3) in Ivantala swamp, a detour route to the west was already planned, and (4) as a topographical and landscape element, the impact on the residual hills should be avoided. Based on the detailed design and the results of the geomorphological survey carried out by the Contractor, habitats of high ecological	Consultant	RNT	Included in the Consultancy Services

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			(including local landscape) value (habitats of endangered species, forest and bat and other habitats in the Bruco, Ivantala Swamp, residual hills, etc.) will be avoided and no impact will be confirmed before the tower construction point and ROW are finalized. - Vegetation clearance should be as little as possible and limited to strictly necessary areas, mainly in the Humpata, Tchvinguilo and Bruco areas and near Ivantala Swamp. - Wherever possible, create new or temporary accesses based on existing accesses (mainly in the Humpata, Tchvinguilo and Bruco areas, near Ivantala Swamp). - Minimise actions that have a negative impact on flora and vegetation, and the felling of trees, particularly baobabs, fruit trees, species of plants that are unique or desirable for protection in the ecoregion, regenerating miombo trees and species undergoing natural vegetation regeneration should be avoided as much as possible to determine the tower location. .			
		- Planning of demining work.	- Based on the finalised tower construction sites and ROW, determine the scope and methods of demining work, access roads, temporary storage of rooted vegetation where possible, etc., and study the layout of ROW, material storage areas, access roads and post-service management roads for transmission line construction, soil erosion prevention measures and vegetation restoration plans will be formulated.	CND	Consultant / RNT/CND	Proper planning and designing will be taken by consultants without special cost.
		- Clearing and de-rooting by carrying out demining work	- Areas targeted for deforestation or logging operations should be marked in advance with visible markers (e.g. coloured tape) so that intervention areas can be identified, facilitating the work of machine operators. These operations should be carried out carefully, taking into account the ecological or landscape benefits of vegetation formation. - Prompt transition to and coordination of transmission line construction works, based on soil erosion prevention measures and vegetation restoration plans, to prevent soil	CND	Consultant / RNT/CND	Proper planning and designing will be taken by consultants without special cost.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			erosion and promote rapid vegetation recovery - Measures to prevent illegal tree felling and hunting, as it is easier to enter the forest through felling and root clearing.			
8	Hydrology	- Increased rainfall run-off associated with the implementation of demining work	- Plants are not discarded, but used for soil retention and surface cover to prevent soil erosion and also encourage regeneration where possible	CND	Consultant / RNT/CND	Proper planning and designing will be taken by consultants without special cost.
9	Topography and geology	- Surface soil erosion from the implementation of demining work.	- Plants are not discarded, but used for soil retention and surface cover to prevent soil erosion and also encourage regeneration where possible	CND	Consultant / RNT/CND	Proper planning and designing will be taken by consultants without special cost.
10	Land acquisition and resettlement	- Selection of transmission line ROW and tower construction sites	- Avoid private land and used land area as much as possible, based on the detailed design and the results of the geological and topographical survey carried out by the Contractor, the tower construction sites and ROW are finalised.	Consultant	RNT	Included in the Consultancy Services
			- Provide alternative agricultural land and houses of equal or greater value. - Pay compensation equivalent to the replacement value of standing crops and fruit and trees where agricultural land is affected. - Provide a preliminary explanation to the inhabitants of the area concerned.	RNT	RNT	RNT
11	Existing social infrastructures and services	Impact on social services of demining work.	- Enforce access restrictions, etc. around mine exploration and clearance operation sites. - Provide information on the scope of impact and publish the work schedule	CND	Consultant / RNT/CND	Included in the cost of demining work
12	Cultural heritage	Selection of transmission line ROW and tower construction sites	- Based on the detailed design and the results of the geological and topographical survey carried out by the Contractor, finalise ROW and the tower construction sites, avoid Boer cemeteries and other sites with cultural and historical values, and confirm that there will be no impact.	Consultant	RNT	Included in the Consultancy Services
13	Working environment	- Accidents and injuries to operators caused by	- Continue to educate operators and ensure that they know the procedures and who to contact to prevent accidents	CND	Consultant / RNT/CND	Included in the cost of demining work

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
	(including occupational safety)	explosions of mines and UXO	and injuries. Ensure that operators are given instructions on first aid as stipulated in the SOPs, in case of an accident. - Ensure safety measures for workers (e.g. wearing protective clothing and proper equipment maintenance).			
14	Accidents	- Conduct demining work	- Carry out safety checks and take accident prevention measures such as prohibiting access to the area and traffic until the process is complete. - Provide safety measures for operator / workers engaged in demining work (e.g. wearing protective clothing and proper equipment maintenance).	CND	Consultant / RNT/CND	Included in the cost of demining work
Construction phase						
1	Air pollution	- Emissions of air pollutants (SOx, NOx and others) and dust emissions due to the operation of heavy machinery in the construction of transmission line ROW, construction roads and towers, and the passage of construction vehicles.	- Ensure proper maintenance of equipment and vehicles used and reduce emissions of air pollutants (SOx, NOx and others). - Construction vehicle traffic routes are supposed to bypass the vicinity of residential areas hospitals, schools, etc., and where unavoidable, speed limits are limited to 30 km/hour or less. - On unpaved roads, water is sprayed by sprinkler trucks as necessary to reduce dust generation. - When transporting earth, sand, etc., do not fill the load fully, but cover it with plenty of room. - Effectively educate and train relevant personnel.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
2	Water pollution	- Generation of wastewater in workers' camp, etc.	- All effluent from worker quarters etc. is collected and treated from the site for proper disposal at an approved municipal facility. - Installation of watertight septic tanks (or equivalent) to collect waste water from the site, including vehicle and machinery washing waste water. - When mobile chemical toilets are used, they should be installed and collected by an approved contractor and disposed of properly. - When discharging wastewater into the environment, Angolan legislation on wastewater standards (Annex VI of Presidential Decree No 261/11 of 6 October) shall be	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			complied with.			
		- Turbidity run-off from power line ROW and construction road maintenance	- In sections where clearing and rooting has been carried out due to demining work, ROWs, construction roads, material storage areas and post-service management roads should be promptly secured to prevent sediment run-off. - If the location of the steel tower and ROW are determined and there is concern about the impact on surface water, well water, spring water, etc., appropriate measures should be taken in consultation with users.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
3	Soil pollution	- Lubricating oil and fuel oil leaks from construction vehicles, construction machinery, etc.	- Properly maintain vehicles and heavy equipment and, in particular, store and control lubricants and fuel oil, etc. at the workers' filling stations.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
4	Noise and vibration	- Noise and vibration caused by the operation of heavy machinery and the passage of construction vehicles.	- Avoid residential areas, schools, hospitals and other neighbourhoods when selecting worker accommodation. - Construction activities, especially noisy ones, should be limited to daytime only and avoided at night and on weekends. - Construction vehicle traffic routes are supposed to bypass the vicinity of residential areas hospitals, schools, etc., and where unavoidable, speed limits are limited to 30 km/hour or less. - Contractors need to present preliminary information to local residents in the vicinity of the construction site on upcoming construction activities, including information on the commencement of planned activities, their nature and duration. This communication should also include information on the nature and objectives of the project. - Implement a grievance redress mechanism (GRM) to address complaints about noise and vibration impacts.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
5	Offensive odors	- Generation of odours due to improper waste	- Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to	Contractor	Consultant / RNT	Measures can be taken through standard, careful

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		management.	avoid the build-up of odour, pest control problems, general rubbish and other nuisance sources on the site. - Provide training, education and signage to ensure compliance with waste management plans.			management and operation, and special cost is not required.
6	Waste	- Improper storage, handling and disposal of general and hazardous waste.	- Implement a Waste Management Plan (WMP) to establish waste management priorities and hierarchy. - WMPs also include the proper management, treatment and disposal of toilet and domestic wastewater. - Train employees on storage methods, waste handling, prevention of leakage/disposal and what to do in the event of a leakage, and provide them with the personal protective equipment necessary for handling hazardous waste. - Train employees to recycle and reuse waste materials such as glass, iron, steel, wood, cardboard paper and plastic as much as possible. - Develop spill response and emergency response plans that incorporate the potential for accidental release of hazardous waste.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
7	Ecosystems	- Post-vegetation clearing and rooting of vegetation	- Backfilling of surface soil. - Restrict the movement of machinery and vehicles into the work zone. Mainly between Tchvinguilo and Bruco. - For the most affected areas (e.g. temporary access routes, construction sites, offices), develop and implement various short- to long-term vegetation restoration plans, including removal/relocation of protected species and afforestation/reforestation. - Strictly prohibit the collection of trees and hunting by workers.	Contractor	Consultant / RNT	Proper planning and designing will be taken by consultants without special cost.
		- Fragmentation and loss of bird habitat	- To preserve nesting sites, expert surveys are carried out prior to demining work. - Conservation of habitats of endangered species (optimal routes and monitoring) - Hunting in and around the project area is prohibited.	Contractor	Consultant / RNT	Proper planning and designing will be taken by consultants without special cost.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		- Fragmentation and loss of fauna habitats.	- Restrict the movement of machinery and vehicles to the work area. - Prevent unnecessary destruction of trees (e.g. dead trees and old specimens) as habitat for geckos, snakes, bats and genets. - Establish speed limits for vehicles to prevent roadkill. - Train workers not to interfere with animals unnecessarily.	Contractor	Consultant / RNT	Proper planning and designing will be taken by consultants without special cost.
8	Topography and geology	- Soil erosion due to vegetation removal.	- On sloping terrain, earth retaining works should be implemented.	Contractor	Consultant / RNT	Proper planning and designing will be taken by consultants without special cost.
9	Land acquisition and resettlement	- Temporary and permanent acquisition of private land and used land area - Restrictions on access to and land use of construction sites and their surroundings	- Provide assistance to the project affected persons in the transition period and implement livelihood restoration and improvement activities	RNT	RNT	RNT
			- Explain the progress to the residents of the area concerned with regard to the implementation of access restrictions around the construction site, and handle complaints as necessary.	Contractor	Consultant / RNT	Included in the Contractor's contract
10	The poor	- Temporary and permanent acquisition of private land and used land area	- Implement livelihood improvement activities as required.	RNT	RNT	RNT
			- Employ local and project affected persons in unskilled labour quotas.	Contractor	Consultant / RNT	Included in the Contractor's contract
11	Local economies, such as employment and livelihood, etc.	- Temporary and permanent acquisition of private land and used land area - Restrictions on access to and land use of construction sites and their surroundings - Loss of agriculture and other means of livelihood	- Provide assistance in the transition period and livelihood restoration / improvement activities to maintain the livelihood levels of project affected households.	RNT	RNT	RNT
			- Employ local and project affected persons in unskilled labour quotas.	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
12	Land use and utilization of local resource	- Restrictions on access to and land use of construction sites and their surroundings	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Enforce access restrictions around construction sites	Contractor	Consultant / RNT	Included in the Contractor's contract
13	Existing social infrastructures and services	- Increase in traffic accidents, etc.	- Provide education on compliance with traffic rules, traffic signage and safe driving - Provide training on safe vehicle operation	Contractor	Consultant / RNT	Included in the Contractor's contract
14	Misdistribution of benefits and damages	- Temporary and permanent acquisition of private land and used land area - Restrictions on access to and land use of construction sites and their surroundings	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Enforce access restrictions around construction sites	Contractor	Consultant / RNT	Included in the Contractor's contract
15	Local conflicts of interest	- Temporary and permanent acquisition of private land and used land area - Restrictions on access to and land use of construction sites and their surroundings. - Conflicts between migrant workers and local residents	- Explain the progress to the residents of the area concerned in line with the stakeholder engagement plan. - Establish a grievance mechanism to handle complaints as required.	RNT	RNT	RNT
			- Provide instructions to personnel and workers from outside and ensure that local communities are well taken care of.	Contractor	Consultant / RNT	Included in the Contractor's contract
16	Cultural heritage	- construction of a steel tower - Workers' camps and material storage areas established.	- Stop construction work immediately if any objects of cultural or historical value are found in and around the construction site during construction, document and share with the National Institute of Cultural Heritage (INPC).	Contractor	Consultant / RNT	Included in the Contractor's contract
17	Landscape	- Tree felling in the ROW - Establishment of	- Minimise the extent of logging where possible and plant trees after construction is completed.	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		workers' camps - Entry of heavy machinery, set up of material storage area	- In labour camps and material storage areas, use bare land wherever possible and keep sufficient distance from residential areas and public facilities (schools and hospitals). - Temporary structures should be removed and restored to their original state as soon as construction is completed.			
18	Gender	- Harassment by personnel and workers from outside	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Provide instructions to personnel and workers from outside to ensure the code of conduct, including a ban on harassment of local people. - Respect local culture and take into account local women's views while actively listening to them. - Provide employment opportunities for women and support local trading activities.	Contractor	Consultant / RNT	Included in the Contractor's contract
19	Children's rights	- Possibility of child labour and inappropriate work by minors.	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Ensure employment compliant with the law and prohibition of minors' school attendance.	Contractor	Consultant / RNT	Included in the Contractor's contract
20	Infectious diseases such as HIV/AIDS	- Spread of infectious diseases due to influx of construction workers, etc.	- Provide instructions on health and hygiene to construction workers - Ensure that routine precautionary measures are taken, such as washing hands and gargling. - Regularly disinfect labour camps and construction site offices. - Encourage immunisations and keep medicines always available in labour camps and construction site offices	Contractor	Consultant / RNT	Included in the Contractor's contract
21	Working environment (including occupational safety)	- Accidents and injuries to workers caused by explosions of mine and UXO	- Prohibit prior entry by construction workers to areas other than those where demining work is completed and safety is confirmed by the Government of Angola - Educate workers and make sure they know the procedures and local contacts - If mines or UXO are found, suspend construction work and not resume until the safety of construction workers is	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			confirmed.			
			- If mines or UXO are found, demining work is to be carried out. - Ensure instructions on first aid as stipulated in the SOPs in the event of an accident. - Ensure safety measures for workers (e.g. wearing protective clothing and proper equipment maintenance).	CND	Consultant / RNT/CND	Included in the cost of demining work
		- Accidents at construction sites. - hygiene problem	- Manuals on occupational accident prevention (including safety education and training) should be prepared and thoroughly implemented. - Provide safety equipment - Ensure that cranes and other lifting equipment use is below the expected weight. - Maintenance checks and proper checking of lifting equipment - Use of equipment and devices to prevent electrical shock. - Establish medical posts in labour camps and conduct regular health check-ups. - Fire precautions are taken and fire extinguishers etc. are deployed at the site office and labor camps. - Keep medical supplies and lifesaving equipment always available and installed in labour camps and construction site offices.	Contractor	Consultant / RNT	Included in the Contractor's contract
22	Accidents	- Accidents caused by explosions of mine and UXO	- Inform the public about the procedures of demining work when they are found, and contact details, and post them near the construction site at all times. - If mine or UXO are found, suspend construction work and not resume the construction work until the safety of construction workers and the surrounding population is confirmed.	Contractor	Consultant / RNT	Included in the Contractor's contract
			- If mine or UXO are found, carry out demining work. - Take measures such as traffic restrictions to ensure safety in the vicinity.	CND	Consultant / RNT/CND	Included in the cost of demining work

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			- Take measures to prevent accidents, such as prohibiting entry and traffic in the vicinity until the demining work is completed.			
		- Traffic accidents due to increased traffic volume	- Provide education on compliance with traffic rules, traffic signage and safe driving. - Provide training on safe vehicle operation. - Carry out regular inspections and maintenance of equipment and instruments.	Contractor	Consultant / RNT	Included in the Contractor's contract
Operation phase						
1	Water pollution	- Removal of vegetation under railway lines and on administrative roads causes turbidity due to sediment run-off from exposed areas.	- Prevent exposure of the soil surface as much as possible by managing within the isolation distance standard below the line.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
2	Noise and vibration	- Noise and vibration caused by the passage of related vehicles.	- Standardise speed limits and passing routes for the vehicles concerned.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
3	Ecosystems	- Birds striking power lines.	- The route of the 220 kV TL was chosen to avoid the route where the tower protrudes over the ridge line, and in the vicinity of the Tundavala IBA, the route passes through the valley line on the back of Mt. Leba as in the steep cliff area in the Tundavala area, similar to the existing transmission line (60 kV), to reduce the risk of bird strikes. Therefore, it is considered necessary to accumulate information in order to decide on the application of further mitigation measures in the project area after carefully examining other good practices and studies on bird strike mitigation measures. In this regard, monitoring should be carried out around Ivantara Swamp, around Humpata, between Tchvinguilo and	RNT	RNT	RNT Very careful monitoring prepared by RNT should be conducted, and proper measures should be considered based on accumulated information.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			Bruco, and around Caraculo, where endangered species are thought to be present, and if birds are observed striking power lines, consider wearing markers to increase the visibility of power lines and ground lines.			
4	Hydrology	- Stormwater run-off from vegetation removal.	- Earth retaining works in sloping areas. Bare land cover.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
5	Topography and geology	- Soil erosion due to vegetation removal.	- On sloping terrain, earth retaining works should be implemented.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.

Source: JICA survey team

Table 7-1: Environmental and Social Management Plan

(2) 220/60 kV New Namibe Substation

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
Pre-construction phase						
1	Air pollution	- Air pollutant emissions from the implementation of demining work	- Appropriately maintain the equipment and vehicles used and reduce the generation of air pollutants. - During demining work, water will be sprayed as necessary to prevent dust generation. - Reduce speed on unpaved access roads to prevent dust generation.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
2	Water pollution	- Generation of wastewater in workers' camp, etc.	- All effluent from worker quarters etc. is collected and treated from the site for proper disposal at an approved municipal facility. - Installation of watertight septic tanks (or equivalent) to collect waste water from the site, including vehicle and machinery washing waste water. - When mobile chemical toilets are used, they should be installed and collected by an approved contractor and disposed of properly. - When discharging wastewater into the environment, Angolan legislation on wastewater standards (Annex VI of Presidential Decree No 261/11 of 6 October) shall be complied with.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
3	Soil pollution	- Spills of lubricating oil, fuel oil, etc. from heavy machinery.	- Ensure that lubricants and fuel oils are properly managed and have containers available to catch spills when refilling.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
4	Noise and vibration	- Noise and vibration caused by the implementation of demining work	- Appropriately maintain the equipment and vehicles used and reduce the occurrence of vibrations.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
5	Offensive odors	- Generation of odours due to improper waste management.	- Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the build-up of odour, pest control problems, general rubbish and other nuisance sources on the site. - Provide training, education and signage to ensure compliance with waste management plans.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
6	Waste	- Waste is generated in the workers' camp.	- Waste management plans prepared for power utilities are applied mutatis mutandis to properly dispose of waste generated at workers' camp. - Provide training, education and signage to ensure compliance with waste management plans.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
7	Ecosystems	- Fragmentation and loss of habitats for flora and fauna, especially reptiles, due to the implementation of demining work	- Installation of sandbags and sedimentation ponds to prevent sediment run-off, if necessary.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
8	Topography and geology	- Surface soil erosion from the implementation of demining work	- Plants are not discarded, but used for soil retention and surface cover to prevent soil erosion and also encourage regeneration where possible	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
9	Working environment (including occupational safety)	- Accidents and injuries to operators caused by explosions of mines and UXO	- Continue to educate operators and ensure that they know the procedures and who to contact to prevent accidents and injuries. Ensure that operators are given instructions on first aid as stipulated in the SOPs, in case of an accident. - Ensure safety measures for workers (e.g. wearing protective clothing and proper equipment maintenance).	CND	Consultant / RNT/CND	Included in the cost of demining work
10	Accidents	- Conduct demining work	- Carry out safety checks and take accident prevention measures such as prohibiting access to the area and traffic until the process is complete. - Provide safety measures for operator / workers engaged in demining work (e.g. wearing protective clothing and proper equipment maintenance).	CND	Consultant / RNT/CND	Included in the cost of demining work
Construction phase						
1	Air pollution	- Emissions of air pollutants (SOx, NOx and others) and dust emissions due to the	- Ensure proper maintenance of equipment and vehicles used and reduce emissions of air pollutants (SOx, NOx and others).	Contractor	Consultant / RNT	Measures can be taken through standard, careful management

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		operation of heavy machinery and the passage of construction vehicles during the construction of access roads and substations	- Construction vehicle traffic routes are supposed to bypass the vicinity of residential areas hospitals, schools, etc., and where unavoidable, speed limits are limited to 30 km/hour or less. - On unpaved roads, water is sprayed by sprinkler trucks as necessary to reduce dust generation. - When transporting earth, sand, etc., do not fill the load fully, but cover it with plenty of room. - Effectively educate and train relevant personnel.			and operation, and special cost is not required.
2	Water pollution	Generation of wastewater in workers' camp, etc.	- All effluent from worker quarters etc. is collected and treated from the site for proper disposal at an approved municipal facility. - Installation of watertight septic tanks (or equivalent) to collect wastewater from the site, including vehicle and machinery washing waste water. - When mobile chemical toilets are used, they should be installed and collected by an approved contractor and disposed of properly. - When discharging wastewater into the environment, Angolan legislation on wastewater standards (Annex VI of Presidential Decree No 261/11 of 6 October) shall be complied with.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
3	Soil pollution	Lubricating oil and fuel oil leaks from construction vehicles, construction machinery, etc.	Properly maintain vehicles and heavy equipment and, in particular, store and control lubricants and fuel oil, etc. at the workers' filling stations.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
4	Noise and vibration	Noise and vibration caused by the operation of heavy machinery and the passage of construction vehicles.	- Avoid residential areas, schools, hospitals and other neighbourhoods when selecting worker accommodation. - Construction activities, especially noisy ones, should be limited to daytime only and avoided at night and on weekends. - Construction vehicle traffic routes are supposed to bypass the vicinity of residential areas hospitals, schools, etc., and	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			where unavoidable, speed limits are limited to 30 km/hour or less. - Contractors need to present preliminary information to local residents in the vicinity of the construction site on upcoming construction activities, including information on the commencement of planned activities, their nature and duration. This communication should also include information on the nature and objectives of the project. - Implement a grievance redress mechanism (GRM) to address complaints about noise and vibration impacts.			
5	Offensive odors	Generation of odours due to improper waste management.	- Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the build-up of odour, pest control problems, general rubbish and other nuisance sources on the site. - Provide training, education and signage to ensure compliance with waste management plans.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
6	Waste	Improper storage and handling of general and hazardous waste.	- Implement a Waste Management Plan (WMP) to establish waste management priorities and hierarchy. - WMPs also include the proper management, treatment and disposal of toilet and domestic wastewater. - Train employees on storage methods, waste handling, prevention of leakage/disposal and what to do in the event of a leak, and provide them with the personal protective equipment necessary for handling hazardous waste. - Train employees to recycle and reuse waste materials such as glass, iron, steel, wood, cardboard paper and plastic as much as possible. - Develop spill response and emergency response plans that incorporate the potential for accidental release of hazardous waste.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
7	Ecosystems	- Air pollution, noise and vibration caused by the operation and passage of construction vehicles	- (Same as air pollution, noise and vibration mitigation measures.)	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
						special cost is not required.
8	Topography and geology	- Soil erosion from land clearance, foundation works, etc.	- Installation of sandbags and sedimentation ponds to prevent sediment run-off, if necessary.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
9	Existing social infrastructures and services	- Increase in traffic accidents, etc.	- Provide education on compliance with traffic rules, traffic signage and safe driving - Provide training on safe vehicle operation	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
10	Landscape	- Establishment of labour camps - Entry of heavy machinery, set up of material storage area	- In labour camps and material storage areas, use bare land wherever possible and keep sufficient distance from residential areas and public facilities (schools and hospitals). - Temporary structures should be removed and restored to their original state as soon as construction is completed.	Contractor	Consultant / RNT	Included in the Contractor's contract
11	Gender	- Harassment by personnel and workers from outside	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Provide instructions to personnel and workers from outside to ensure the code of conduct, including a ban on harassment of local people. - Respect local culture and take into account local women's views while actively listening to them. - Provide employment opportunities for women and support local trading activities.	Contractor	Consultant / RNT	Included in the Contractor's contract
12	Children's rights	- Possibility of child labour and inappropriate work by minors.	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Ensure employment compliant with the law and prohibition of minors' school attendance.	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
13	Infectious diseases such as HIV/AIDS	- Spread of infectious diseases due to influx of construction workers, etc.	- Provide instructions on health and hygiene to construction workers - Ensure that routine precautionary measures are taken, such as washing hands and gargling. - Regularly disinfect labour camps and construction site offices. - Encourage immunisations and keep medicines always available in labour camps and construction site offices	Contractor	Consultant / RNT	Included in the Contractor's contract
14	Working environment (including occupational safety)	- Accidents and injuries to workers caused by explosions of mine and UXO	- Prohibit prior entry by construction workers to areas other than those where demining work is completed and safety is confirmed by the Government of Angola - Educate workers and make sure they know the procedures and local contacts - If mines or UXO are found, suspend construction work and not resume until the safety of construction workers is confirmed.	Contractor	Consultant / RNT	Included in the Contractor's contract
			- If mines or UXO are found, demining work is to be carried out. - Ensure instructions on first aid as stipulated in the SOPs in the event of an accident. - Ensure safety measures for workers (e.g. wearing protective clothing and proper equipment maintenance).	CND	Consultant / RNT/CND	Included in the cost of demining work
		- Accidents at construction sites. - hygiene problem	- Manuals on occupational accident prevention (including safety education and training) should be prepared and thoroughly implemented. - Provide safety equipment - Ensure that cranes and other lifting equipment use is below the expected weight. - Maintenance checks and proper checking of lifting equipment - Use of equipment and devices to prevent electrical shock. - Establish medical posts in labour camps and conduct regular health check-ups.	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			- Fire precautions are taken and fire extinguishers etc. are deployed at the site office and labor camps. - Keep medical supplies and lifesaving equipment always available and installed in labour camps and construction site offices.			
15	Accidents	- Accidents caused by explosions of mine and UXO	- Inform the public about the procedures of demining work when they are found, and contact details, and post them near the construction site at all times. - If mine or UXO are found, suspend construction work and not resume the construction work until the safety of construction workers and the surrounding population is confirmed.	Contractor	Consultant / RNT	Included in the Contractor's contract
			- If mine or UXO are found, carry out demining work. - Take measures such as traffic restrictions to ensure safety in the vicinity. - Take measures to prevent accidents, such as prohibiting entry and traffic in the vicinity until the demining work is completed.	CND	Consultant / RNT/CND	Included in the cost of demining work
		- Traffic accidents due to increased traffic volume	- Provide education on compliance with traffic rules, traffic signage and safe driving. - Provide training on safe vehicle operation. - Carry out regular inspections and maintenance of equipment and instruments.	Contractor	Consultant / RNT	Included in the Contractor's contract
Operation phase						
1	Water pollution	- Generation of domestic wastewater by facility personnel	- Proper disposes of wastewater, rubbish, fuel and oil etc.. - Provide training to operator of wastewater, rubbish, fuel and oil.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
2	Noise and vibration	- Noise and vibration from related vehicle traffic is expected to be generated,	- Standardise speed limits and traffic routes for the vehicles concerned, and take all possible measures to prevent noise from substation facilities, especially transformers.	RNT	RNT	RNT Measures can be taken through standard,

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		and background noise from substations				careful management and operation, and special cost is not required.
3	Offensive odors	- Generation of odours due to improper waste management.	- Ensure proper disposal of waste generated by the activities of maintenance personnel as a manned facility.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
4	Waste	- Impact of improper waste management.	- Ensure proper disposal of waste generated by the activities of maintenance personnel as a manned facility.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
5	Ecosystems	- Permanent habitat loss due to substations.	- Drainage systems for rainfall from substations to prevent erosion caused by rainfall, wind, etc. to avoid erosion in the vicinity of substations.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
6	Topography and geology	- Erosion due to long-term rainfall	- Improvement of stormwater drainage systems around substations.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.

Source: JICA survey team

Table 7-1: Environmental and Social Management Plan

(3) 220/60 kV East Lubango Substation

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
Pre-construction phase						
1	air pollution	- Air pollutant emissions from the implementation of demining work	- Appropriately maintain the equipment and vehicles used and reduce the generation of air pollutants.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
2	water pollution	- Generation of wastewater in workers' accommodation, etc.	- All effluent from worker quarters etc. is collected and treated from the site for proper disposal at an approved municipal facility. - Installation of watertight septic tanks (or equivalent) to collect waste water from the site, including vehicle and machinery washing waste water. - When mobile chemical toilets are used, they should be installed and collected by an approved contractor and disposed of properly. - When discharging wastewater into the environment, Angolan legislation on wastewater standards (Annex VI of Presidential Decree No 261/11 of 6 October) shall be complied with.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
3	soil pollution	- Spills of lubricating oil, fuel oil, etc. from heavy machinery.	- Ensure that lubricants and fuel oils are properly managed and that a receptacle is available in case of spillages when refilling.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation,

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
						and special cost is not required.
4	Noise and vibration	- Noise and vibration caused by the implementation of demining work	- Appropriately maintain and manage the equipment and vehicles used to reduce noise and vibration.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
5	offensive odors	- Generation of odours due to improper waste management.	- Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the build-up of odour, pest control problems, general rubbish and other nuisance sources on the site. - Provide training, education and signage to ensure compliance with waste management plans.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
6	waste	- Waste is generated in the workers' quarters.	- Waste management plans prepared for power utilities are applied mutatis mutandis to properly dispose of waste generated at workers' quarters.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
7	Ecosystems	- Fragmentation and loss of habitats for flora and fauna, especially reptiles, due to the implementation of demining work	- After the completion of mine/UXO search and clearance activities, the topsoil is returned and the surface is flattened/smoothed to limit the effects of erosion during rainfall.	Consultant	RNT	Measures can be taken through standard, careful management

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
						and operation, and special cost is not required.
8	Topography and geology	- Surface soil erosion from the implementation of demining work.	- Installation of sandbags and sedimentation ponds to prevent sediment run-off, if necessary.	CND	Consultant / RNT/CND	Measures can be taken through standard, careful management and operation, and special cost is not required.
9	Working environment (including occupational safety)	- Accidents and injuries to operators caused by explosions of mines and UXO	- Continue to educate operators and ensure that they know the procedures and who to contact to prevent accidents and injuries. Ensure that operators are given instructions on first aid as stipulated in the SOPs, in case of an accident. - Ensure safety measures for workers (e.g. wearing protective clothing and proper equipment maintainance).	CND	Consultant / RNT/CND	Included in the cost of demining work
10	accidents	- Conduct demining work	- Carry out safety checks and take accident prevention measures such as prohibiting access to the area and traffic until the process is complete. - Provide safety measures for operator / workers engaged in demining work (e.g. wearing protective clothing and proper equipment maintainance).	CND	Consultant / RNT/CND	Included in the cost of demining work
Construction phase						
1	air pollution	- Emissions of air pollutants (SOx, NOx and others) and dust emissions due to the operation of heavy machinery and the passage of construction vehicles during the construction of access roads and substations	- Ensure proper maintenance of equipment and vehicles used and reduce emissions of air pollutants (SOx, NOx and others). - Construction vehicle traffic routes are supposed to bypass the vicinity of residential areas hospitals, schools, etc., and where unavoidable, speed limits are limited to 30 km/hour or less. - On unpaved roads, water is sprayed by sprinkler trucks as necessary to reduce dust generation. - When transporting earth, sand, etc., do not fill the load fully, but cover it with plenty of room.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			- Effectively educate and train relevant personnel.			
2	water pollution	- Generation of wastewater in workers' accommodation, etc.	- All effluent from worker quarters etc. is collected and treated from the site for proper disposal at an approved municipal facility. - Installation of watertight septic tanks (or equivalent) to collect wastewater from the site, including vehicle and machinery washing wastewater. - When mobile chemical toilets are used, they should be installed and collected by an approved contractor and disposed of properly. - When discharging wastewater into the environment, Angolan legislation on wastewater standards (Annex VI of Presidential Decree No 261/11 of 6 October) shall be complied with.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
3	soil pollution	- Lubricating oil and fuel oil leaks from construction vehicles, construction machinery, etc.	- Properly maintain vehicles and heavy equipment and, in particular, store and control lubricants and fuel oil, etc. at the workers' filling stations.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
4	Noise and vibration	- Noise and vibration caused by the operation of heavy machinery and the passage of construction vehicles.	- Avoid residential areas, schools, hospitals and other neighbourhoods when selecting worker accommodation. - Construction activities, especially noisy ones, should be limited to daytime only and avoided at night and on weekends. - Construction vehicle traffic routes are supposed to bypass the vicinity of residential areas hospitals, schools, etc., and where unavoidable, speed limits are limited to 30 km/hour or less. - Contractors need to present preliminary information to local residents in the vicinity of the construction site on upcoming construction activities, including information on the commencement of planned activities, their nature and	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			duration. This communication should also include information on the nature and objectives of the project. - Implement a grievance redress mechanism (GRM) to address complaints about noise and vibration impacts.			
5	offensive odors	- Generation of odours due to improper waste management.	- Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the build-up of odour, pest control problems, general rubbish and other nuisance sources on the site.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
6	waste	- Improper storage, handling and disposal of general and hazardous waste.	- Implement a Waste Management Plan (WMP) to establish waste management priorities and hierarchy. - WMPs also include the proper management, treatment and disposal of toilet and domestic wastewater. - Train employees on storage methods, waste handling, prevention of leakage/disposal and what to do in the event of a leakage, and provide them with the personal protective equipment necessary for handling hazardous waste. - Train employees to recycle and reuse waste materials such as glass, iron, steel, wood, cardboard paper and plastic as much as possible. - Develop spill response and emergency response plans that incorporate the potential for accidental release of hazardous waste.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
7	Ecosystems	- Air pollution, noise and vibration caused by the operation and passage of construction vehicles	- (Same as air pollution, noise and vibration mitigation measures.)	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation,

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
						and special cost is not required.
8	Topography and geology	- Soil erosion from land clearance, foundation works, etc.	- Installation of sandbags and sedimentation ponds to prevent sediment run-off, if necessary.	Contractor	Consultant / RNT	Measures can be taken through standard, careful management and operation, and special cost is not required.
9	existing social infrastructures and services	- Increase in traffic accidents, etc.	- Provide education on compliance with traffic rules, traffic signage and safe driving. - Provide training on safe vehicle operation.	Contractor	Consultant / RNT	Included in the Contractor's contract
10	landscape	- Establishment of labour camps - Entry of heavy machinery, set up of material storage area	- In labour camps and material storage areas, use bare land wherever possible and keep sufficient distance from residential areas and public facilities (schools and hospitals). - Temporary structures should be removed and restored to their original state as soon as construction is completed.	Contractor	Consultant / RNT	Included in the Contractor's contract
11	gender	- Harassment by personnel and workers from outside	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Provide instructions to personnel and workers from outside to ensure the code of conduct, including a ban on harassment of local people. - Respect local culture and take into account local women's views while actively listening to them. - Provide employment opportunities for women and support local trading activities.	Contractor	Consultant / RNT	Included in the Contractor's contract
12	children's rights	- Possibility of child labour and inappropriate work by minors.	- Explain the progress to the residents of the area concerned and handle complaints as required.	RNT	RNT	RNT
			- Ensure employment compliant with the law and prohibition of minors' school attendance.	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
13	infectious diseases such as HIV/AIDS	- Spread of infectious diseases due to influx of construction workers, etc.	- Provide instructions on health and hygiene to construction workers - Ensure that routine precautionary measures are taken, such as washing hands and gargling. - Regularly disinfect labour camps and construction site offices. - Encourage immunisations and keep medicines always available in labour camps and construction site offices	Contractor	Consultant / RNT	Included in the Contractor's contract
14	Working environment (including occupational safety)	- Accidents and injuries to workers caused by explosions of mine and UXO	- Prohibit prior entry by construction workers to areas other than those where demining work is completed and safety is confirmed by the Government of Angola - Educate workers and make sure they know the procedures and local contacts - If mines or UXO are found, suspend construction work and not resume until the safety of construction workers is confirmed.	Contractor	Consultant / RNT	Included in the Contractor's contract
			- If mines or UXO are found, demining work is to be carried out. - Ensure instructions on first aid as stipulated in the SOPs in the event of an accident. - Ensure safety measures for workers (e.g. wearing protective clothing and proper equipment maintenance).	CND	Consultant / RNT/CND	Included in the cost of demining work
		- Accidents at construction sites. - hygiene problem	- Manuals on occupational accident prevention (including safety education and training) should be prepared and thoroughly implemented. - Provide safety equipment - Ensure that cranes and other lifting equipment use is below the expected weight. - Maintenance checks and proper checking of lifting equipment - Use of equipment and devices to prevent electrical shock. - Establish medical posts in labour camps and conduct regular health check-ups. - Fire precautions are taken and fire extinguishers etc. are deployed at the site office and labor camps.	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
			- Keep medical supplies and lifesaving equipment always available and installed in labour camps and construction site offices.			
15	accidents	- Accidents caused by explosions of mine and UXO	- Inform the public about the procedures of demining work when they are found, and contact details, and post them near the construction site at all times. - If mine or UXO are found, suspend construction work and not resume the construction work until the safety of construction workers and the surrounding population is confirmed.	Contractor	Consultant / RNT	Included in the Contractor's contract
			- If mine or UXO are found, carry out demining work. - Take measures such as traffic restrictions to ensure safety in the vicinity. - Take measures to prevent accidents, such as prohibiting entry and traffic in the vicinity until the demining work is completed.	CND	Consultant / RNT/CND	Included in the cost of demining work
		- Traffic accidents due to increased traffic volume	- Provide education on compliance with traffic rules, traffic signage and safe driving. - Provide training on safe vehicle operation. - Carry out regular inspections and maintenance of equipment and instruments.	Contractor	Consultant / RNT	Included in the Contractor's contract
Operation phase						
1	water pollution	- Generation of domestic wastewater by facility personnel	- Proper disposes of wastewater, rubbish, fuel and oil etc.. - Provide training to operator of wastewater, rubbish, fuel and oil.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
2	Noise and vibration	- Noise and vibration from related vehicle traffic is	- Standardisation of speed limits and traffic routes for the vehicles concerned, and taking all possible measures to	RNT	RNT	RNT

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
		expected to be generated, and background noise from substations	prevent noise from substation facilities, especially transformers.			Measures can be taken through standard, careful management and operation, and special cost is not required.
3	offensive odors	- Generation of odours due to improper waste management.	- Ensure proper disposal of waste generated by the activities of maintenance personnel as a manned facility.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
4	waste	- Impact of improper waste management.	- Ensure proper disposal of waste generated by the activities of maintenance personnel as a manned facility.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.
5	Ecosystems	- Permanent habitat loss due to substations.	- Drainage systems for rainfall from substations to prevent erosion caused by rainfall, wind, etc. to avoid erosion in the vicinity of substations.	RNT	RNT	RNT Proper planning and designing will b Measures can be taken through

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
						standard, careful management and operation, and special cost is not required.
6	Topography and geology	- Erosion due to long-term rainfall	- Improvement of stormwater drainage systems around substations.	RNT	RNT	RNT Measures can be taken through standard, careful management and operation, and special cost is not required.

Source: JICA survey team

The ESMP Framework has identified some additional plans that will be prepared by RNT and EPC prior to construction commencing on all transmission lines and substations. The specific management plans described below, present links to how these relate to the activities and impacts described within the ESIA, as well as the person identified for the implementation of each.

Together with this ESMP, these specific plans will form the overall Environmental and Social Management System (ESMS) for the Project.

7.2 Environmental Monitoring Plan

For the monitoring of the environmental activities included in the ESMP an Environmental Monitoring Plan (EMoP) has been developed and included in **Table 7-2**.

Table 7-2: Environmental Monitoring Plan

(1) 220kV Transmission Line

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
Pre-construction phase							
1	Air pollution	PM10, PM2.5	10 tower locations and adjacent residential and other boundaries.	Once every 3 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
2	Water pollution	Wastewater treatment records	workers' camp	Once a week	CND	Consultant / RNT/CND	Included in the cost of demining work
		Water quality items: pH, water temperature, conductivity, (transparency)	10 rivers and streams in the vicinity of the tower construction location	Once every 3 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
3	Soil pollution	Fuel, lubricant and other oil leakage records	Construction sites and workers' camp	Once a week	CND	Consultant / RNT/CND	Included in the cost of demining work
4	Noise and vibration	- noise level - complaint	- 10 tower locations and adjacent residential and other boundaries. - Municipalities, communes and settlements	- Once every 3 months before and after felling and de-rooting - at any time	Consultant	RNT	Included in the Consultancy Services
5	Offensive odors	- sensory - complaint	- workers' camp - Municipalities, communes and settlements	- Once a week - at any time	CND	Consultant / RNT/CND	Included in the cost of demining work
6	Waste	Waste storage and transport	Construction sites and workers' camp	Once a week	CND	Consultant / RNT/CND	Included in the cost of demining work
7	Ecosystems	flora and fauna	8 clear-cutting and rooting areas	Once every 6 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
		birds	Ivantara swamp, Poires, Humpata, Tchivinguilo, Bruco, Capangombe, Caraculo, Moçâmedes	Once every 6 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
		Threatened species Ludwig's bustard (*Neotis ludwigii)*	20 km section near Caraculo	Once every 3 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
8	Hydrology	Presence or absence of	10 points of towers within the clearing	Once every three months	CND	Consultant / RNT/CND	Included in the

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		erosion marks	and rooting area on sloping terrain.				Consultancy Services
9	Topography and geology	Status of vegetation recovery and soil erosion	10 points of towers within the clearing and rooting area on sloping terrain.	Once every 3 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
10	Land acquisition and resettlement	- Private land / used land area - residential building - place of work	Tower location, ROW	During geological investigation and detailed design	Consultant	RNT	Included in the Consultancy Services
		- Alternative land / buildings - crop compensation - Compensation process (including local consultations)	Land acquisition points (construction sites, ROW, tower)	- When compensation is provided - Local consultation meeting	RNT	RNT	RNT
11	Existing social infrastructures and services	Impact on social services of demining work	- Tower location - ROW - Surrounding settlements and facilities	at any time	CND	Consultant / RNT/CND	Included in the cost of demining work
12	Cultural heritage	Objects with cultural and historical values	Tower location, ROW	During geological investigation and detailed design	Consultant	RNT	Included in the Consultancy Services
13	Working environment (including occupational safety)	Casualties among operators due to mine and UXO explosion	Tower location, ROW	at any time	CND	Consultant / RNT/CND	Included in the cost of demining work
14	Accidents	Accidents occurred due to mine and UXO explosion	Tower location, ROW and workshop	at any time	CND	Consultant / RNT/CND	Included in the cost of demining work
Construction phase							
1	Air pollution	PM10, PM2.5	10 tower locations and adjacent residential and other boundaries.	Once every three months before and after construction of a steel tower	Contractor	Consultant / RNT	Included in the Contractor's contract
2	Water pollution	Wastewater treatment records	workers' camp	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
		Water quality items: pH, water temperature, conductivity,	10 rivers/streams in the vicinity of the tower location	Once every three months before and after	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		(transparency)		construction of a steel tower			
3	Soil pollution	Fuel, lubricating oil and other leaks	Construction sites, workers' camp	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
4	Noise and vibration	- noise level - complaint	- 10 points of tower construction location and adjacent residential and other boundaries. - Municipalities, communes and settlements	- Once every three months before and after construction of a steel tower - at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
5	Offensive odors	- sensory - complaint	- workers' camp - Municipalities, communes and settlements	- Once a week - at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
6	Waste	Waste storage and transport	Workers' camp, construction sites	Once a week	Contractor	Consultant / RNT	Included in the Contractor's contract
7	Ecosystems	flora and fauna	8 steel tower construction locations	Once every six months before and after construction of a steel tower	Contractor	Consultant / RNT	Included in the Contractor's contract
		birds	Ivantara swamp, Poires, Humpata, Tchvinguilo, Bruco, Capangombe, Caraculo, Moçâmedes	Once every six months	Contractor	Consultant / RNT	Included in the Contractor's contract
		Threatened species Ludwig's bustard (*Neotis ludwigii)*	20 km section near Caraculo	Once every three months before and after construction of a steel tower	Contractor	Consultant / RNT	Included in the Contractor's contract
8	Topography and geology	Status of vegetation recovery and soil erosion	Same towers as before construction in the area of felling and rooting on sloping ground 10 points	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
9	Land acquisition and resettlement	- Livelihood level and means of the affected population - Resident relations (e.g. complaint handling)	Place of residence / place of livelihood of affected population	Once every three months (at any time for residents relations)	RNT	RNT	RNT

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		Site management (e.g. access restrictions and boundary management)	- Tower location - ROW	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
10	The poor	Resident relations (e.g. complaint handling)	Place of residence and place of livelihood of local people	Once every three months (at any time for residents relations)	RNT	RNT	RNT
		Employment in construction work	Employment records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
11	Local economies, such as employment and livelihood, etc.	- Level and means of livelihood of affected population - Resident relations	Place of residence / place of livelihood of affected population	Once every three months (at any time for residents relations)	RNT	RNT	RNT
		Employment in construction	Employment records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
12	Land use and utilization of local resource	Resident relations (e.g. complaint handling)	Place of residence / place of livelihood of affected population	at any time	RNT	RNT	RNT
		Site management (e.g. access restrictions and boundary management)	Tower location, ROW	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
13	Existing social infrastructures and services	- Construction plans (e.g. time, number and frequency of vehicle operations) - vehicle operation record - Number of road accidents	- vehicle operation record - Accident records (construction site offices)	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
14	Misdistribution of benefits and damages	- Level and means of livelihood of affected population - Resident relations (e.g. complaint	concerned villages	Once every three months (at any time for residents relations)	RNT	RNT	RNT

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		handling)					
15	Local conflicts of interest	- Livelihood level and means of the affected population - Resident relations (e.g. complaint handling)	concerned villages	Once every three months (at any time for residents relations)	RNT	RNT	RNT
16	Cultural heritage	Objects with cultural and historical values	- Tower location - construction work area	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
17	Landscape	- trees and shrubs - Harmony between populated and natural landscapes	- ROW / tower location - Location of labor camps and material storage sites	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
18	Gender	Resident relations (e.g. complaint handling)	concerned villages	at any time	RNT	RNT	RNT
		Number of times, content and number of participants in instruction to contractor and subcontractor employees	Guidance records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
19	Children's rights	Resident relations (e.g. complaint handling)	concerned villages	at any time	RNT	RNT	RNT
		Availability of employment in construction	Employment records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
20	Infectious diseases such as HIV/AIDS	- Number of diseases and infections - having ready medical supplies - Number and type of vaccinations - Number of times, content and number of participants in instruction to contractor	- Sanitation records - inventory ledger - Immunization records - Guidance records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		and subcontractor employees					
21	Working environment (including occupational safety)	Casualties among workers due to mine and UXO explosion	construction site	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
		Demining work	construction site	at any time	CND	Consultant / RNT/CND	Included in the cost of demining work
		- Number of times, content and number of participants in safety training for tractor and subcontractor employees - Standing availability of PPE - work contents - Health status of workers - number of accidents - working hours	- Guidance records (construction site offices) - inventory ledger - operation record - health record - accident record - working hours record	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
22	Accidents	Casualties among workers due to mine and UXO explosion	construction site	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
		Demining work	construction site	at any time	CND	Consultant / RNT/CND	Included in the cost of demining work
		- work contents - vehicle operation record - number of accidents	- vehicle operation record - Accident records (construction site offices)	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
Operation phase							
1	Water pollution	Water quality items: pH, water temperature, conductivity, (transparency)	10 points for rivers/streams in the vicinity of the tower location and controlled road	Once every three months	RNT	RNT	RNT
2	Noise and vibration	- Noise level	- Representative points under the transmission line and administrative roads, areas	- Once every three months	RNT	RNT	RNT

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		- complaint	where wind noise is likely to occur and neighboring settlements. - Municipalities, communes and settlements	- at any time			
3	Ecosystems	flora and fauna	10 tower positions	Once every three months	RNT	RNT	RNT
		birds	Ivantara swamp, Humpata, Tchvinguilo, Bruco	Once every three months	RNT	RNT	RNT
		Threatened species Ludwig's bustard (*Neotis ludwigii)*	- 20 km section near Caraculo				
4	Hydrology	Observation of erosion marks	10 points of towers within the clearing and rooting area on sloping terrain	Once every three months	RNT	RNT	RNT
5	Topography and geology	Status of vegetation recovery and soil erosion	10 points for towers within the felling and felling rooting area on sloping terrain	Once every three months	RNT	RNT	RNT

Source: JICA survey team

Table 7-2: Environmental Monitoring Plan

(2) 220/60kV New Namibe Substation

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
Pre-construction phase							
1	Air pollution	- SO_2, NO_2, O_3 - PM10, PM2.5	- New Namibe substation - Boundaries of dwellings and other structures in close proximity to substations, access roads	- Once every 6 months before and after felling and de-rooting, for one week in a row - Once every 3 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
2	Water pollution	Wastewater treatment records	New Namibe substation, workers' camp	Once a week	CND	Consultant / RNT / CND	Included in the cost of demining work

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
3	Soil pollution	Fuel, lubricant and other oil leakage records	New Namibe substation, workers' camp	Once a week	CND	Consultant / RNT / CND	Included in the cost of demining work
4	Noise and vibration	- noise level - complaint	- New Namibe substation and adjacent residential and other boundaries, access roads - Municipalities, communes and settlements	- Once every 3 months before and after felling and de-rooting - at any time	Consultant	RNT	Included in the Consultancy Services
5	Offensive odors	- sensory - complaint	- New Namibe substation, workers' camp. - Municipalities, communes and settlements	- Once a week - at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
6	Waste	Waste storage and transport	New Namibe substation, workers' camp	Once a week	CND	Consultant / RNT / CND	Included in the cost of demining work
7	Ecosystems	flora and fauna	New Namibe substation	Once every 6 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
		birds	New Namibe substation	Once every 6 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
8	Topography and geology	Topographic and vegetation changes and soil erosion	New Namibe substation	Once each before and after felling and de-rooting.	Consultant	RNT	Included in the Consultancy Services
9	Working environment (including occupational safety)	Casualties among operators due to mine and UXO explosion	New Namibe substation	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
10	Accidents	Accidents occurred due to mine and UXO explosion	New Namibe substation and workshop	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
Construction phase							
1	Air pollution	- SO_2, NO_2, O_3 - PM10, PM2.5	- New Namibe substation - Boundaries of dwellings and other structures in close proximity to substations,	- Once every six months for one week in a row - Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
			access roads				
2	Water pollution	Wastewater treatment records	New Namibe substation, workers' camp	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
3	Soil pollution	Fuel, lubricant and other oil leakage records	New Namibe substation, workers' camp	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
4	Noise and vibration	- noise level - complaint	- New Namibe substation and adjacent residential and other boundaries, access roads - Municipalities, communes and settlements	- Once every three months - at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
5	Offensive odors	- sensory - complaint	- New Namibe substation, workers' camp. - Municipalities, communes and settlements	- Once a week - at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
6	Waste	Waste storage and transport	New Namibe substation, workers' camp	Once a week	Contractor	Consultant / RNT	Included in the Contractor's contract
7	Ecosystems	flora and fauna	New Namibe substation	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
		birds	New Namibe substation	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
8	Topography and geology	Topographic and vegetation changes and soil erosion	New Namibe substation	Once every six months	Contractor	Consultant / RNT	Included in the Contractor's contract
9	Existing social infrastructures and services	- Construction plans (e.g. time, number and frequency of vehicle operations) - vehicle operation record - Number of road accidents	- vehicle operation record - Accident records (construction site offices)	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
10	Landscape	- trees and shrubs	- New Namibe substation	Once every three months	Contractor	Consultant / RNT	Included in the

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		- Harmony between populated and natural landscapes	- Location of labor camps and material storage sites				Contractor's contract
11	Gender	Resident relations (e.g. complaint handling)	concerned villages	at any time	RNT	RNT	RNT
		Number of times, content and number of participants in instruction to contractor and subcontractor employees	Guidance records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
12	Children's rights	Resident relations (e.g. complaint handling)	concerned villages	at any time	RNT	RNT	RNT
		Availability of employment in construction	Employment records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
13	Infectious diseases such as HIV/AIDS	- Number of diseases and infections - having ready medical supplies - Number and type of vaccinations - Number of times, content and number of participants in instruction to contractor and subcontractor employees	- Sanitation records - inventory ledger - Immunization records - Guidance records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
14	Working environment (including occupational safety)	Casualties among workers due to mine and UXO explosion	construction site	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
		Demining work	construction site	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
		- Number of times, content and number of participants	- Guidance records (construction site offices).	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		in safety training for tractor and subcontractor employees - Standing availability of PPE - work contents - Health status of workers. - number of accidents - working hours	- inventory ledger - operation record - health record - accident record - working hours record				
15	Accidents	Casualties among workers due to mine and UXO explosion	construction site	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
		Demining work	construction site	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
		- Tasks - vehicle operation record - number of accidents	- vehicle operation record - Accident records (construction site offices)	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
Operation phase							
1	Water pollution	Status of disposal of wastewater, garbage, fuel, oil, etc. and education implementation	New Namibe substation	Once every three months	RNT	RNT	RNT
2	Noise and vibration	- noise level - complaint	- New Namibe substation and adjacent residential and other boundaries, access roads - Municipalities, communes and settlements	- Once every three months - at any time	RNT	RNT	RNT
3	Offensive odors	- sensory - complaint	New Namibe substation	at any time	RNT	RNT	RNT
4	Waste	Waste storage and transport	New Namibe substation	at any time	RNT	RNT	RNT
5	Ecosystems	flora and fauna	New Namibe substation	Once every three months	RNT	RNT	RNT

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		birds	New Namibe substation	Once every three months	RNT	RNT	RNT
6	Topography and geology	Topographic and vegetation changes and soil erosion	New Namibe substation	Once every six months	RNT	RNT	RNT

Source: JICA survey team

Table 7-2: Environmental Monitoring Plan

(3) 220/60kV East Lubango Substation

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
Pre-construction ('before' and 'during' covering mine and UXO search and clearance activities before and during implementation).							
1	Air pollution	- SO_2, NO_2, O_3 - PM10, PM2.5	- East Lubango SS - Boundaries of dwellings and other structures in close proximity to substations, access roads	- Once every 6 months before and after felling and de-rooting, for one week in a row - Once every 3 months before and after felling and de-rooting	Consultant	RNT	Included in the cost of Consultancy Services
2	Water pollution	Wastewater treatment records	East Lubango SS, workers' camp	Once a week	CND	Consultant / RNT / CND	Included in the cost of demining work
3	Soil pollution	Fuel, lubricant and other oil leakage records	East Lubango SS, workers' camp	Once a week	CND	Consultant / RNT / CND	Included in the cost of demining work
4	Noise and vibration	- -Noise level - complaint	- East Lubango SS and adjacent residential and other boundaries, access roads - Municipalities, communes and settlements	- Once every 3 months before and after felling and de-rooting - at any time	Consultant	RNT	Included in the Consultancy Services
5	Offensive odors	- sensory - complaint	- East Lubango SS, workers' camp. - Municipalities, communes and	- Once a week - at any time	CND	Consultant / RNT / CND	Included in the cost of demining work

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
			settlements				
6	Waste	Waste storage and transport	East Lubango SS, workers' camp	Once a week	CND	RNT	Included in the cost of demining work
7	Ecosystems	flora and fauna	East Lubango SS	Once every 6 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
		birds	East Lubango SS	Once every 6 months before and after felling and de-rooting	Consultant	RNT	Included in the Consultancy Services
8	Topography and geology	Topographic and vegetation changes and soil erosion	East Lubango SS	Once each before and after felling and de-rooting.	Consultant	RNT	Included in the Consultancy Services
9	Working environment (including occupational safety)	Casualties among operators due to mine and UXO explosion	East Lubango SS	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
10	Accidents	Accidents occurred due to mine and UXO explosion	East Lubango SS and workshop	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
Construction phase							
1	Air pollution	- SO_2, NO_2, O_3 - PM10, PM2.5	- East Lubango SS - Boundaries of dwellings and other structures in close proximity to substations, access roads	- Once every six months for one week in a row - Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
2	Water pollution	Wastewater treatment records	East Lubango SS, workers' camp	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
3	Soil pollution	Fuel, lubricant and other oil leakage records	East Lubango SS, workers' camp	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
4	Noise and vibration	- noise level - complaint	- East Lubango SS, and adjacent residential and other boundaries, access roads - Municipalities, communes and settlements	- Once every three months - -At any time	Contractor	Consultant / RNT	Included in the Contractor's contract
5	Offensive odors	- sensory	- East Lubango SS, workers'	- Once a week	Contractor	Consultant / RNT	Included in the

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		- complaint	camp. - Municipalities, communes and settlements	- at any time			Contractor's contract
6	Waste	Waste storage and transport	East Lubango SS, workers' camp	Once a week	Contractor	Consultant / RNT	Included in the Contractor's contract
7	Ecosystems	flora and fauna	East Lubango SS	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
		birds	East Lubango SS	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
8	Topography and geology	- Topographic and vegetation changes and soil erosion	- East Lubango SS	Once every six months	Contractor	Consultant / RNT	Included in the Contractor's contract
9	Existing social infrastructures and services	- Construction plans (e.g. time, number and frequency of vehicle operations) - vehicle operation record - Number of road accidents	- vehicle operation record - Accident records (construction site offices)	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
10	Landscape	- trees and shrubs - Harmony between populated and natural landscapes	- East Lubango SS - Location of labor camps and material storage sites	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
11	Gender	Resident relations (e.g. complaint handling)	concerned villages	at any time	RNT	RNT	RNT
		Number of times, content and number of participants in instruction to contractor and subcontractor employees	Guidance records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
12	Children's rights	Resident relations (e.g. complaint	concerned villages	at any time	RNT	RNT	RNT

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		handling)					
		Availability of employment in construction	Employment records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
13	Infectious diseases such as HIV/AIDS	- Number of diseases and infections - having ready medical supplies - Number and type of vaccinations - Number of times, content and number of participants in instruction to contractor and subcontractor employees	- Sanitation records - inventory ledger - Immunization records - Guidance records (construction site offices)	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
14	Working environment (including occupational safety)	Casualties among workers due to mine and UXO explosion	construction site	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
		Demining work	construction site	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
		- Number of times, content and number of participants in safety training for tractor and subcontractor employees. - Standing availability of PPE - Tasks - Health status of workers. - number of accidents - working hours	- Guidance records (construction site offices). - inventory ledger - operation record - health record - accident record - working hours record	Once every three months	Contractor	Consultant / RNT	Included in the Contractor's contract
15	Accidents	Casualties among workers due to mine and	construction site	at any time	Contractor	Consultant / RNT	Included in the

No	Items (impacts)	Monitoring Parameter	Monitoring Point	Frequency	Implementing Organization	Responsible Organization	Cost
		UXO explosion					Contractor's contract
		Demining work	construction site	at any time	CND	Consultant / RNT / CND	Included in the cost of demining work
		- work contents - vehicle operation record - number of accidents	- vehicle operation record - Accident records (construction site offices)	at any time	Contractor	Consultant / RNT	Included in the Contractor's contract
Operation phase							
1	Water pollution	Status of disposal of wastewater, garbage, fuel, oil, etc. and education implementation	East Lubango SS	Once every three months	RNT	RNT	RNT
2	Noise and vibration	- noise level - complaint	- East Lubango SS and adjacent residential and other boundaries, access roads - Municipalities, communes and settlements	- Once every three months - at any time	RNT	RNT	RNT
3	Offensive odors	- sensory - complaint	- East Lubango SS	- at any time	RNT	RNT	RNT
4	Waste	Waste storage and transport	East Lubango SS	at any time	RNT	RNT	RNT
5	Ecosystems	flora and fauna	East Lubango SS	Once every three months	RNT	RNT	RNT
		birds	East Lubango SS	Once every three months	RNT	RNT	RNT
6	Topography and geology	Topographic and vegetation changes and soil erosion	East Lubango SS	Once every six months	RNT	RNT	RNT

Source: JICA survey team

7.3 Construction Management Plan

The Construction Management Plan (CMP) will focus exclusively on the construction phase of the Project and will outline the mitigation measures required to ensure that potential negative environmental, health and safety and social impacts are avoided or, if not possible, reduced in terms of magnitude and significance. Concomitantly, the CMP will also specify concrete actions, responsibilities, compliance requirements and mitigation activities to be followed during the pre-construction and construction phases. The mitigations and measures that will be detailed in this plan are necessary to achieve compliance with the requirements of the Project's commitments, good practice and international standards. The EPC will be responsible for the preparation and implementation of the Plan and the RNT will be responsible for approving it.

7.4 Waste Management Plan

The Waste Management Plan (WMP) will primarily aim to plan the management operations for waste generated during the construction and operational phases of the Project. The WMP will encourage a sustainable environment in order to minimise the production of construction, electrical, urban and other waste from the source, adequate segregation at source, correct identification and storage of waste, recovery of waste susceptible to recycling and reuse, and control potential environmental and public health risks.

The WMP was previously prepared by the Project promoter and will be submitted to the National Waste Agency (ANR) for technical advice and approval.

7.5 Emergency Preparedness and Response Plan

The 220 kV transmission line construction Project will cross rural regions with the presence of several large agro-livestock projects, and due to the importance of these infrastructures for the socio-economic development of the country, it is advisable to adopt measures to prevent future risks or accidents that may affect them. For this purpose, an Emergency Preparedness and Response Plan (EPRP) for the Project will be prepared and implemented by EPC.

The EPRP is essentially aimed at establishing a readiness and response mechanism against accidents in the Project's operations taking place in the workers' camps, as well as during line maintenance operations, such as fire in conductors, transformers, backup generators or fall of steel cables and very high voltage towers due to natural phenomena (wind, rain, etc.), risks of electrocution and/or collision of motor vehicles with the towers, and overflow or spillage of hydrocarbons, etc. This Plan aims to ensure a rapid and effective response to such incidents and/or accidents. This Plan aims to ensure a rapid and effective response to such incidents and/or accidents. The plan will be prepared to guide preventive actions and will provide a timely response to any accident or pollution event occurring at the East Lubango and New Namibe substations and along the Project's route.

The procedures set out in the EPRP will apply to the facilities supporting the works (construction sites), the different work fronts, etc. EPC's Health, Safety and Environment Department will be responsible for the compliance with the plan and all workers involved in the Project, including visitors, should receive the necessary information for an adequate response in case of emergency.

7.6 Stakeholder Engagement Plan

In addressing the different needs of stakeholders, the Project have developed a Stakeholder Engagement Plan (SEP), which will be modified and updated as required. Implementation will rest with the EPC HSE Manager and the Community Liaison Team Manager. The stakeholder engagement activities will include the following:

- **Community engagement** – recognising and ensuring active participation of differentiated interest groups within the affected communities. Engagement frequently during pre-construction and during site preparation and construction with support of traditional authorities (Sobas, Seculos and Regedores).
- **Engagement with Government Authorities** – this will facilitate integration between project activities with ongoing Provincial and municipal planning and implementation. It will also allow partnerships where appropriate.

Project information will be available from the workers' camps, and provide relevant Project information appropriate for the Project phases and activities. In addition, on-going verification and

monitoring activities will be a key component of continued stakeholder engagement, ensuring reporting on compliance and performance regarding environmental and social commitments.

The Grievance Mechanism as defined in the SEP will be established. This procedure will be implemented by the Project to manage and address all public grievances. Labour-related grievances will be dealt with internally. EPC will manage grievances of its employees in accordance with Angolan regulatory requirements. As above, contractors will be expected to comply with Angolan labour regulations.

7.7 Communication Plan

EPC and RNT will maintain a formal procedure for communications with the regulatory authorities and communities. The EPC HSE Manager will be responsible for communication of Environment, Health and Safety (EHS) issues to and from regulatory authorities whenever required. The EPC (Project Manager) is kept informed of such communications and pertinent information arising from such interactions will be communicated to RNT through the HSE Manager.

Meetings will be held, as required, between EPC and the appropriate regulatory agency and community representatives to review EHS performance, areas of concern and emerging issues. Dealings will be transparent and stakeholders will have access to personnel and information to address concerns raised.

The Project will implement a grievance mechanism whereby community members can raise any issues of concern. Grievances may be verbal or written and are usually either specific claims for damages/injury or complaints or suggestions about the way that the Project is being implemented. When a grievance has been brought to the attention of the Project team it will be logged and evaluated. The person or group with the grievance is required to present grounds for making a complaint or claiming loss so that a proper and informed evaluation can be made.

Where a complaint or claim is considered to be valid, then steps are required to be undertaken to rectify the issue or agree compensation for the loss.

In all cases the decision made and the reason for the decision will be communicated to the relevant stakeholders and recorded. Where there remains disagreement on the outcome then an arbitration procedure may be required to be overseen by a third party (e.g., government official). Local community stakeholders will be informed on how to implement the grievance procedures.

Chapter 8

FINAL CONSIDERATIONS

8 FINAL CONSIDERATIONS

In order to reinforce the National Electricity Transport Network, enabling the Northern production system capacity to be transported to the Central and South Region, the National Transportation Network – Public Company (RNT) in partnership with Japan International Cooperation Agency (JICA) and their contractor, Tokyo Electric Power Services Co., Ltd. (TEPSCO) intends to provide support for the construction of a 220 kV electricity transmission line with 196 km from Lubango (in Huíla province) to Moçâmedes (in Namibe province), including the construction and installation of 220/60 kV substations in Lubango (East Lubango substation) and Moçâmedes municipalities (New Namibe substation).

The 220 kV transmission line Project has a strategic economic and social potential for the development of the provinces of Huíla and Namibe, with emphasis on improving the electricity supply for various consumers, urban lighting and promoting tourism and industrialisation in the Namibe province. Although temporary, it is expected that the construction of the Project will provide new job opportunities for several young people in the corridor region (Lubango, Humpata, Bibala and Moçâmedes) and bring additional tax revenues to the region.

From the point of view of fulfilling the Angolan government's strategies, the Project is aligned with the 2018 - 2022 National Development Plan and several strategies defined for the national electricity sector with emphasis on the interconnection of the electricity transmission system in the national territory and the supply of electricity in urban and rural areas throughout the country.

Under the Angolan environmental regulations high voltage transmission lines are an undertaking for which an ESIA is mandatory. In 2020, TEPSCO commissioned Holísticos to carry out the ESIA. This ESIA was developed by Holísticos to meet the JICA Guidelines on Environment and Social Considerations (2010), Angola requirements in ESIA and other international best practices.

The ESIA identified and assessed a number of potential environmental and social impacts. The expected negative impacts during the construction and operation phases (see **Chapter 6**) range from **negligible to moderate negative**. EPC and other subcontractors under the supervision of the monitoring company and the Project sponsor (RNT) will implement the mitigation measures, compensation and environmental monitoring programs outlined in the Environmental and Social

Management Plan (see **Chapter 7**). As such, the Project is ready to proceed with the mitigation measures proposed in this report, consequently, any residual impacts can be mitigated during planning and construction and managed throughout the life cycle of the Project. Positive impacts are expected from the Project in the form of local employment, supply of electrical power to the Moçâmedes city, capacity building and long-term employment opportunities. Enhancement measures have been identified to further develop these positive opportunities. Offset measures to compensate for the loss of biodiversity (fauna and flora) are to be discussed with the Ministry of Culture, Tourism and Environment and with the Provincial authorities.

In light of the above, and of the potential environmental and socio-economic impacts identified in the Environmental and Social Impact Assessment, and based on the feasibility of mitigation measures, no environmental and social impediments were identified for the non-execution of the Project. However, its implementation must scrupulously consider the Environmental and Social Management Plan (ESMP) and its respective programmes and plans for environmental management and occupational health and safety proposed in **Chapter 7**, as well as national legislation in force, the JICA guidelines for environmental and social considerations (2010), other international best practices and additional measures that may eventually be recommended by the environmental agency.

Chapter 9

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APPENDIX 1

Proof of Registration at SIA/MCTA

República de Angola

MINISTÉRIO DA CULTURA, TURISMO E AMBIENTE

Direcção Nacional de Prevenção e Avaliação de Impactes Ambientais

Número do Protocolo: 3561602204

Empreendedor: 5410778197 - Rede Nacional de Transporte de Electricidade

ASSUNTO: Licença Ambiental do projecto da Entidade Rede Nacional De Transporte De Electricidade

Os nossos respeitosos cumprimentos.

A vossa solicitação necessita de ajustes. Proceda com as alterações nos pontos mencionados e submeta novamente para análise prévia.

Assim sendo, de acordo com Decreto Presidencial n.º 117/20 , o projecto em análise enquadra-se na categoria A. Sendo assim é obrigatório para todas as actividades de categoria A , apresentação de Estudo de Pré-Viabilidade Ambiental e Definição de Âmbito (EPDA). O mesmo deverá ser submetido no SIA no campos "Outros".

Importa referir que a empresa proponente dispõe de 15 (Quinze) dias para apresentação da documentação solicitada, ficando suspenso o prazo administrativo.

Sem outro assunto de momento, subscrevo-me com consideração.

DIRECÇÃO NACIONAL DE PREVENÇÃO E AVALIAÇÃO DE IMPACTES AMBIENTAIS,em Luanda aos 22 de Janeiro de 2021.

O DIRECTOR

IURY SANTOS

A autenticidade deste documento poderá ser verificada através dos passos a seguir:
1. Aceda ao Portal MINAMB (https://sia.minamb.gov.ao/validacaodocumentos).
2. Introduza o código **PAR-NjM4Njc|NA==** no campo "Código de Validação". 3. Clique em "Pesquisar".

DNPAIA - Rua do MAT, Complexo Administrativo "Clássicos de Talatona", Município da Samba, 4 Edifício do MCTA - 4º andar - Luanda, Angola
Email: dnpaia@mcta.gov.ao - Página 1 de 1

APPENDIX 2

STAKEHOLDER ENGAGEMENT PLAN

Stakeholder Engagement Plan - 220 kV Transmission Line Project between Lubango and Moçâmedes, Huíla and Namibe Provinces

OCTOBER 2022

Technical sheet

Title:

Stakeholder Engagement Plan 220 kV Transmission Line between Lubango and Moçâmedes, Huíla and Namibe Provinces.

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Date: October 2022

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CBO	Community-Based Organisation
CLO	Community Liaison Officer
DNPAIA	National Directorate for Prevention and Environmental Impact Assessment
EIA	Environmental Impact Assessment
ENDE – E.P.	National Company for Electricity Distribution
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Study
GIIP	Good International Industry Practice
GM	Grievance Mechanism
GRC	Grievance Review Committee
HSE	Health, Safety and Environment
IAP	Interested and Affected People
ICP	Informed Consultation and Participation
IFC	International Finance Corporation
INAVIC	National Institute of Civil Aviation
JICA	Japan International Cooperation Agency
kV	Kilo Volt
MINAGRIF	Ministry of Agriculture and Forests
MINAMB	Ministry of Environment
MINCULT	Ministry of Culture
MIND	Ministry of Industry
MINEA	Ministry of Energy and Water
MINTRANS	Ministry of Transport
NGO	Non-Governmental Organisation
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
PRODEL – E.P.	Public Company for Electricity Production
PS	Performance Standard
RNT – E.P.	National Network of Electricity Transmission
SEP	Stakeholder Engagement Plan
TL	Transmission Line

1. INTRODUCTION

In alignment with the 2018 - 2040 National Energy and Water action Plan and as part of the governmental effort to link the three independent grids as part of a national grid system, the Ministry of Energy and Waters (MINEA) of Angola is planning the implementation of several project and subprojects that will allow the connection of the systems. One of these projects is "the Project for Transmission System Reinforcement in Southern Angola" which aims to reinforce the transmission system in southern Angola, and to install 220 kV transmission line between Lubango (Arimba substation) in the Huíla Province to Moçâmedes (Moçâmedes substation) in the Namibe Province.

According to the request from the Government of Angola to the Government of Japan, this project is expected to be implemented with the Japanese Official Development Assistance (ODA) loan, and the preparatory survey for this project has been implemented by Japan International Cooperation Agency (hereinafter referred to as **JICA**) since November 2019. The preparatory survey is conducted by Tokyo Electric Power Services Co., Ltd. (hereinafter referred to as **TEPSCO**) under the contract with JICA, and National Electricity Transportation Company (hereinafter referred to as **RNT-E.P**.) is the project proponent of Angolan side.

RNT - E.P., TEPSCO and JICA (Project financier) recognizes that the implementation of such a great undertaking as the construction of a 220 kV transmission line (**220 kV TL**), brings along a potential impacts which may affect local communities, such as small households farmers, local business people and livestock breeders in Huíla and Namibe Provinces. Thus, the need for the development of a Stakeholder Engagement Plan focusing in the Environmental and Social Impact Study (ESIS) is recognised. The ESIS report is prepared by Holísticos – Serviços, Estudos & Consultoria, Lda. (Holísticos), an Angolan firm with the required license to undertake the ESIS.

The Angolan legislation does not require a Stakeholder Engagement Plan (SEP) but rather a public consultation process. According to the Environmental Framework Law (Law No. 5/98 of 19th June), Environmental Impact Assessment Regulation and Environmental Licensing Procedure (Presidential Decree No. 117/20 of 22nd April), Decree on Public Consultation (Executive Decree No. 87/12 of 24th February), and other applicable legislation, the public consultation process is a procedure covered by public participation aimed at collecting opinions, suggestions and other contributions of the interested public on the project subject to Environmental Impact Assessment (EIA).

However, due to the nature of the project and potential impacts on people's livelihoods TEPSCO and RNT – E.P. has developed the present SEP. This SEP was developed according to Angolan legislation and takes into account recommendations proposed by multilateral environmental agreements ratified by Angola. It has also considered the JICA Guidelines for Environmental and Social Considerations (2010), International Finance Corporation Guidelines and Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts, where applicable, and with the recommendations of the Organization for Economic Co-operation and Development (OECD) and the Equator Principles III (The Equator Principles Association, 2013).

The importance of engagement with stakeholders lies in the need to point out relevant issues to be addressed to mitigate potential social impacts, referring priority actions, identifying key groups and understanding the perception and expectations of the population regarding the transmission line Project (hereinafter referred to as **Project**), as well as obtaining contributions for choosing strategic pathways. The public consultation process also serves as an environmental management instrument, in order to inform the stakeholders of the Project on its implementation and get suggestions, opinions and recommendations (appropriate mitigation measures) for the potential negative and positive aspects, not only from the social and economic point of view but also environmentally.

The ownership and overall oversight responsibility for implementing this Stakeholder Engagement Plan (SEP) will lie with the RNT - E.P., TEPSCO and EPC (which will be selected at later stage and will be responsible for construction phases of the Project) with the support from Holísticos during the development of the ESIS report. This SEP describes the approach TEPSCO and RNT – E.P., will take to interact with stakeholders (primarily information disclosure and consultations) during the construction phases of the Project. Engagement with stakeholders is an ongoing process, and this SEP is a working document, which will be revised and amended, always as necessary.

The SEP includes the commitments for providing timely, understandable (in language and format) and appropriate information to stakeholders to be applicable during the construction phase. It aims to ensure that stakeholders can express their views and make comments on the Project and its current and future potential impacts, and that these comments are considered in future decisions on Project design and construction-related practices. It will also ensure that a culturally appropriate means of

providing information and undertaking consultations is in place, with due emphasis on vulnerable people living in the vicinity[1] of the project area.

1.1. OBJECTIVES OF THE STAKEHOLDER ENGAGEMENT PLAN

The strategy of the SEP aims to involve all stakeholders for the Project construction phase planning process in order to ensure active participation, harmonization of interests and the creation of widened consensus. This is a dynamic strategy that, on the one hand also seeks to contribute for the dissemination of information on the Project and on the other, for consultation of stakeholders, stimulating synergies[2] and forms of active participation.

In order to achieve social consensus to promote the full implementation of the Project in Huíla and Namibe provinces, the engagement activities during the ESIS elaboration and construction phase will have, among others, the following objectives:

- Provide information of the Project and its implications in local communities' livelihoods living in the vicinity of the Project route;
- Identify perceptions, concerns, issues of stakeholders on the Project engineering, procurement, pre-construction, construction and operation phases;
- Provide the interested and affected parties of the Project an opportunity to effectively contribute and recommend measures for improvement of the project implementation;
- Gather opinions, suggestions and other inputs from interested and affected parties of the Project; and
- Raise awareness among the general population and, in particular the agricultural and livestock community of the affected villages/communities living in the vicinity of the project areas, on the importance of the Project implementation from the perspective of fostering of the distribution

[1] For this project "vicinity" refers to the Right-of-Way (*faixa confinante*) of 22,5 m safety distance either side of an electric transmission line has established by paragraph g) of the article 27 of the land law where physical impacts are likely to impact on people's livelihoods (i.e. infrastructure, agricultural land, burial sites, etc.).

[2] It is understood that participation of stakeholders should not be limited to the mere availability of information, whereby a wide range of activities is suggested that aim to foster monitoring and an effective and fruitful participation, that is considered to be crucial to the sustainability of the project.

of electric energy and other benefits from Project's implementation to improve the social conditions of the local populations.

This SEP will also comply with the following principles:

- Participatory and transparent process involving the potentially affected stakeholders;
- Timely availability of information to people affected by the Project construction phase and other potential stakeholder;
- Incorporation of suggestions and recommendations in the Environmental and Social Impact Assessment and in subsequent plans of the Project; and
- Ensure a regular and effective feedback with the stakeholders during the ESIS elaboration phase, pre and construction phase of the Project, through the provincial authorities (i.e. municipal and communal administrations) and channels to be established by TEPSCO and RNT - E.P.

1.2. SCOPE

The SEP applies to all the Project's proponent staff (TEPSCO, RNT - E.P. as the main EPC, its contractors, services providers and subcontracted companies) and suppliers who carry out activities under the 220 kV TL and Moçâmedes substation Project during engineering, procurement, pre-construction and construction phases. The scope of the SEP is for the elaboration ESIS phase and construction phase. Activities related to the future operation of the project including the maintenance of the 220 kV TL and Moçâmedes substation are excluded from this SEP as the Government of Angola through its Electricity Transmission Company (RNT - E.P.) will own the assets and will develop the appropriate engagement tools for the operational phase. Engagement plans for decommissioning will be developed closer to the Project's end of life in compliance with the national legislation and international good practice. The five (5) phases for this Project include:

- **Engineering and procurement:** includes activities such topographic surveys for the conclusion of the design of the 220 kV transmission line, Lubango connection and Moçâmedes substation as well as verification of the demining needs and actions. TEPSCO team will develop the executive project, incorporating amendments to the proposed route to minimize social and environmental impacts and to match optimally tower positions in consequence. If needed, the results of the topographic surveys will also be fed into the Resettlement Action Plan (RAP).

- **Pre-construction phase:** includes activities such as fencing of the Moçâmedes substation area, additional topographic and pedology studies which might be required, establishment of the worker's camps, demining activities of the entire length corridor (if required) and other studies relevant for refining of the 220 kV TL routes and the substation placing (e.g. discussions with MINEA/RNT – E.P. and local authorities to establish bend points for the proposed route which will be surveyed by the surveyor and on site measurements to accurately determine the final route and substation).

- **Construction phase:** includes activities such as earthworks, vegetation removal in entire length corridor (where required), excavation, establishing the site, access road establishment, foundation construction and structure installation, and energising the installations (both the transmission line and substations). All construction equipment and materials will be sourced in Japan, sea shipping will be used to transport the equipment to Luanda. Once in Luanda, terrestrial shipping will be used to convey the equipment to Project site.

- **Operational phase:** this phase includes operational activities associated with the management, maintenance and control of the transmission line and Moçâmedes substation. Once commissioned, the Project will be transferred by MINEA, which will be operated by RNT - E.P. RNT – E.P. will have responsibility to operate the 220 kV transmission line and 220/60 kV Moçâmedes substation, and will ensure that available paths allow for access to the towers for maintenance. Access will be directly from the main roads, along existing access roads or from the corridor of the 220 kV transmission line. The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the 220 kV transmission line.

- **Decommissioning:** this phase will include measures for complying with the regulatory requirements for rehabilitation and managing environmental impacts in order to render the project area suitable for future use. The design life of the 220 kV TL and Moçâmedes substation is 40 years and the decommissioning procedure will be provided as part of the maintenance manual during handover of the completed Project.

1.3. PLAN STRUCTURE

This SEP describes how the Project will engage stakeholders during the elaboration of the ESIS and during pre-construction and construction phases and how stakeholder engagement activities will be incorporated into the Project's overall management system. The Plan is structured as follows:

- **Section 2:** describes the proposed Project (proposed high level route, tentative location of construction camps and main features of the 220 kV TL and Moçâmedes substation);
- **Section 3:** presents the regulatory framework (i.e., Angolan and International Requirements and Health, Safety and Environment Policies);
- **Section 4:** presents an identification and characterization of stakeholders in order to determine appropriate ways of engagement;
- **Section 5:** presents the stakeholder engagement activities;
- **Section 6:** presents the communication mechanisms;
- **Section 7:** presents the comment management process and grievance mechanism;
- **Section 8:** presents the resources, tasks and responsibilities of SEP implementation;
- **Section 9:** presents the monitoring and evaluation of the stakeholder engagement process and the key performance indicators;
- **Section 10** presents the final considerations;
- **Section 11:** References.

2. PROJECT DESCRIPTION

This project spans in Huíla province from northern Lubango to northern Humpata whereas in Namibe province, it goes from northern Bibala to the municipality of Moçâmedes. The proposed 220 kV TL of about 196 km length is located in southern Angola and will cross four municipalities (Lubango, Humpata, Bibala and Moçâmedes) in both provinces. **Table 2-1** shows the locations (municipalities and communes) that the electricity TL between Lubango – Moçâmedes will cross. The proposed 220 kV TL with the footprint are summarised in **Figure 2-1**. The 220/60 kV East Lubango and New Namibe substations will be installed in the Arimba commune (Lubango municipality) and Aida neighbourhood (Moçâmedes municipality).

Figure 2-1: Route studied for Transmission Line between Lubango and Moçâmedes.

In total, approximately 495 towers will be erected with about 400 meters between towers. Each tower will have four cement foundations, occupying permanently an area of 15mx15m, requiring a temporary area of about 25mx25m during construction works. Wherever possible, existing accesses will be used to access the towers sites (access used to maintain the 60 kV TL), however there may be a need to open new accesses during the construction phase. **Table 2-2** shows the locations that the electricity 220 kV TL Project between Lubango – Moçâmedes will cross.

Table 2-1: Transmission line localities (route).

Province	Municipality	Commune
Huíla	Lubango	Arimba
		Lubango
	Humpata	Humpata
Namibe	Bibala	Kapangombe
	Moçâmedes	Moçâmedes

The 220 kV TL Project will pass in parallel to the current 60 kV transmission line that connects the Lubango city Substation to Moçâmedes, avoiding whenever possible to cross:

- Aeronautical or radio service;
- Urban or urban expansion areas and rural residential areas;
- Ecologically and biologically sensitive areas;
- Hospital and school buildings;
- Cultural heritage sites.

Permanent project components include the electrical infrastructure (220/60 kV in Moçâmedes, control buildings, transformers, transformer bays, line bays, busbars, reactive power compensation, etc.), the tower that will support the overhead transmission line, foundations to support the tower, transmission line markers, and access roads and right-of-way. In addition, to reduce the potential negative impacts on avifauna in the area, bird flight diverters may be required on the 220 kV TL at certain sections, as recommended by the ecologist. The transmission line life cycle include the following main activities:

Planning and executive design phase:

- Design principles;
- Topography and pedology studies;
- Towers type design;
- Foundations type design;
- Plant and line profile;
- Administrative project
- Demining route 45 m wide;

- Access design;
- Operational design, organization and mobilization.

Construction phase:

- Administrative management occupations;
- Payment of compensation;
- Access Construction;
- Stakeout and staking;
- Geotechnical study;
- To adapt foundations;
- To adapt Plant and profile;
- Foundations;
- Grounding network;
- Supply of towers;
- Assembling and hoisting;
- Supply of insulators and accessories;
- Supply of conductors;
- Laying, cable stringing, stapled and regulation;
- Commissioning;
- Control of works and as built.

Operational phase:

The operational phase refers to the operation of the proposed transmission line (electricity transmission) and associated infrastructure (i.e. Lubango and Moçâmedes substations), which will be maintained periodically according to the specifications of the power utility company.

Decommissioning phase:

This phase will include measures for complying with the regulatory requirements for rehabilitation and managing environmental impacts in order to render the project area suitable for future use. In the following project stage, after alignment definition, a safety area (right-of-way) will be established along the tower position of the 220 kV TL, with 22.5 meters for each side. This area will be used during construction works, for cables stringing and vehicles circulation, and for maintenance works, during

operation. As per the Land Law (paragraph g of the article 27) it will be established a servitude of 30 meters each side of the line, where no land rights can be obtained.

In the operation phase a 45 m-wide right-of-way will be constituted of along the line, where the land use will be conditioned. A buffer area will be maintained, in which there may be no buildings (schools and hospitals) or large trees, periodically requiring cutting or pruning activities and maintaining access roads to the towers for maintenance purposes. The construction phase will take place between 24-30 months. The Project is expected to have a lifespan of at least 40 years.

In addition to the elements presented above, the Project design also includes lightning arrestors: aircraft signalling, bird diverters and vibrations dampers. The exact placement of such arrestors will be identified during the engineering phase. The project will include Engineering (detailed engineering, calculations, topographic survey, route alignment, tower siting, etc.); Procurement (specifications and quantities, contracts, transportation and logistics, construction camps, etc.) and Construction (construction plan, earth works, tower installation, start-up, commissioning and turn-over to RNT E.P.).

2.1. RIGHT-OF-WAY AND CLEARANCES

The implementation of a transmission line requires that procedures be adopted and standards are put in place to ensure proper installation, reliability and, above all, the safety of everything and everyone around these structures. The RNT E.P., Technical Specification states that there must be a minimum vertical distance of 8 meters between the transmission line and buildings or trees.

During the detailed project, the TEPSCO and RNT – E.P engineering teams, together with social and environmental experts, will seek to find possible solutions to prevent the loss of structures and trees into 220 kV TL route. Trees within the safety area must be cleaned or pruned for the right-of-way, following the detailed technical specifications of the RNT - E.P., in order to minimize the cleaning area and ensure that the work is carried out safely. Thus, in the construction and installation of the transmission line along the defined stroke, the safety distances associated with cables contained in **Table 2-2** will be considered.

Table 2-2: Minimum safety distances from the transmission line in relation to different structures.

Line Voltage (220 kV)	Distance (m)
Building restriction from line centre	22.5
Separation parallel lines	32
Timber restriction Forestry area	38.5
Railway	9
Normal ground	8.5
Cultivated and open area	8.8
Communication lines and transmission lines	4

Due to the proximity to other 60 kV TL (Lubango - Moçâmedes), and as the corridor is running in close vicinity of main National road (from Lubango to Moçâmedes), it is expected that existing access roads can be utilized. For existing access roads, the four meter right-of-way each side will be cleared, and access roads re-established/constructed. For new access roads the servitude will be respected and, once the works are finished, the access will be closed and affected areas restored to the original condition.

2.2. SUBSTATIONS DESCRIPTION

There are two (2) options for New Namibe substations construction. The first option is an outdoor type, the 220/60 kV New Namibe Substation will be implemented in an area of approximately 11,700 m2 (90m x 130m), building area of approximately 875 m^2 (35 m x 25 m) ensuring the space for 4 + 2 planned expansions for 220 kV transmission line feeder porticos under this project, with consideration by the direction of Tômbwa and Sacomar. Reserve space for additional expansion (additional gantry, transformer, etc.) will be guaranteed. **Figure 2-2** shows the layout of Moçâmedes Substation.

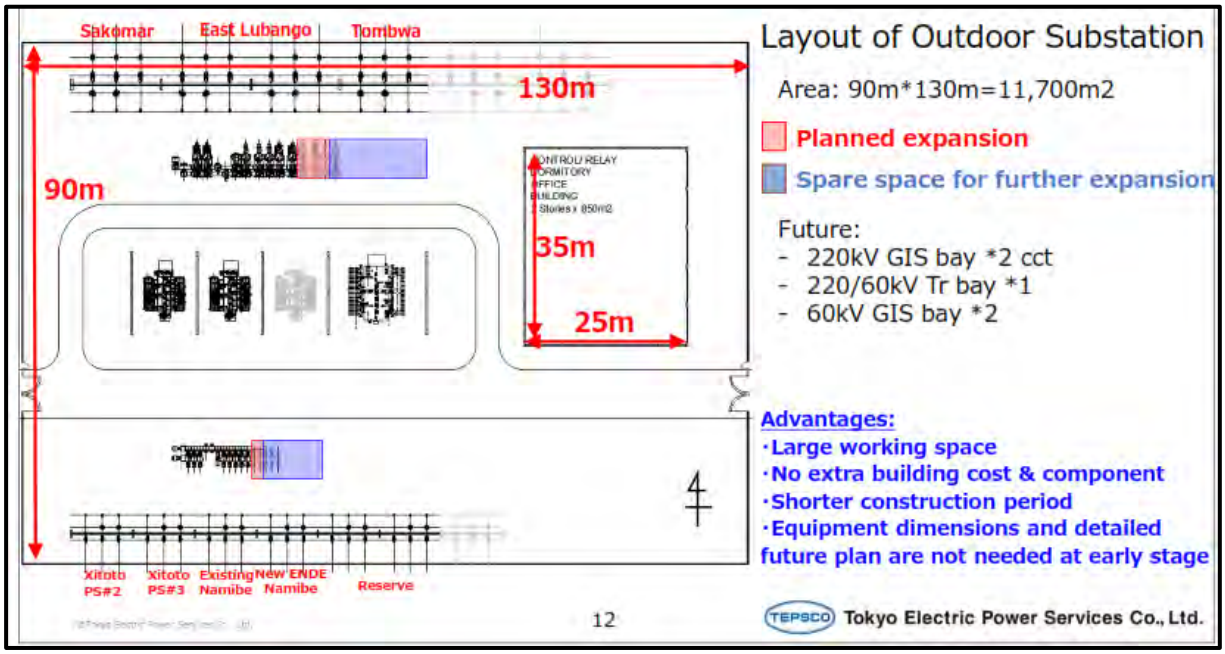

Figure 2-2: Location of planned substation in Moçâmedes (TEPSCO, 2020).

The second option is an indoor type, the 220/60 kV New Namibe Substation will be implemented in an area of approximately 14,300 m2 (110m x 130m), building area of approximately 875 m^2 (35 m x 25 m) ensuring the space for 4 + 2 planned expansion for 220 kV transmission line feeder porticos was secured. However, depending on manufacturer, changes of size may occur, leading to the reduce of number of planned feeders inside the estimated GIS room, with consideration by the direction of Tômbwa and Sacomar. Reserve space for additional expansion (additional gantry, transformer, etc.) will be guaranteed, **Figure 2-3** shows the layout of New Namibe Substation second option.

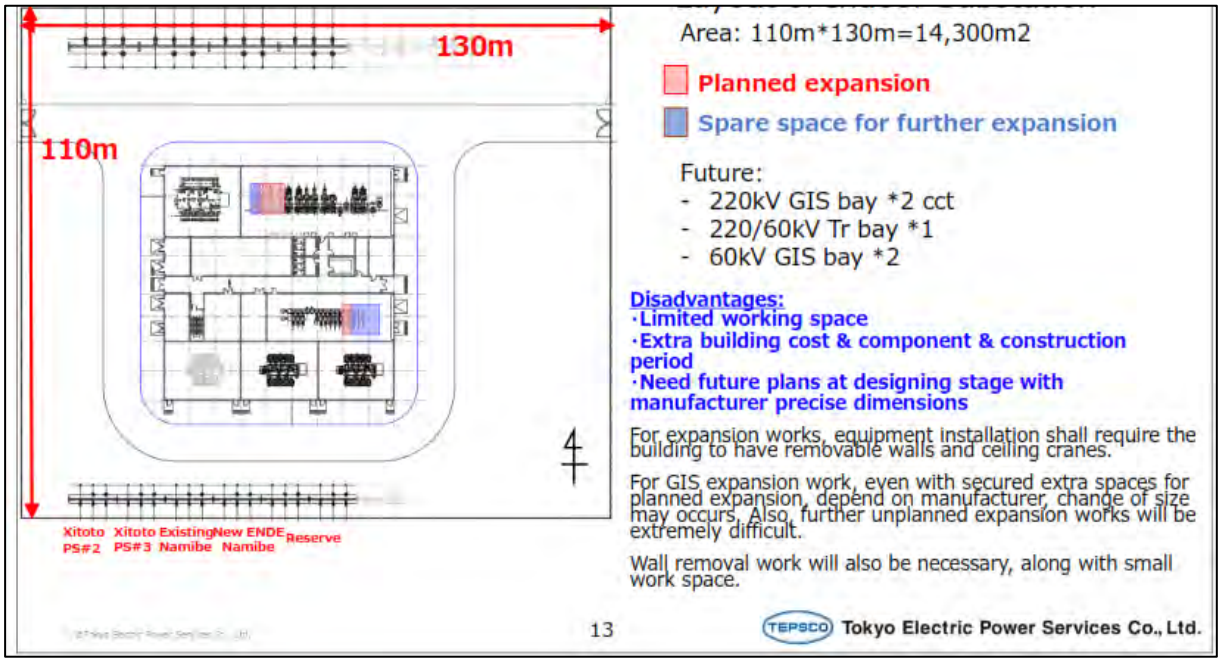

Figure 2-3: Layout of New Namibe substation (Second option). **Source:** JICA, 2021.

The 220/60 kV East Lubango Substation will be implemented in an area of approximately 40,500 m^2. **Figure 2-4** shows the layout of East Lubango Substation and additional information on operation and future connections.

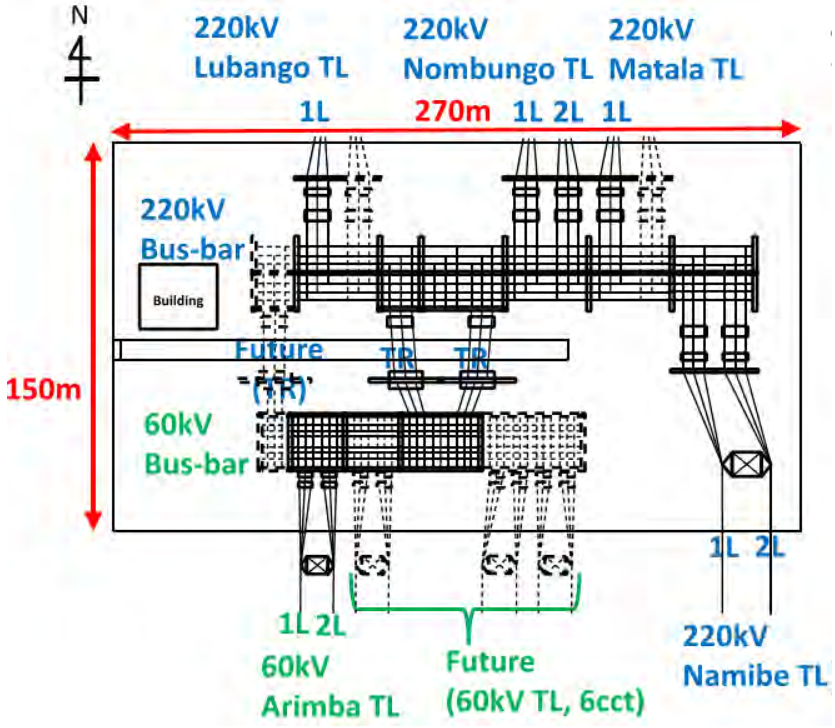

Figure 2-4: Layout of East Lubango substation and specification. Source: JICA, 2021.

2.3. WATER AND ELECTRICITY

During the construction stage, the EPC will require potable water, for the construction workers. Water will also be required for the construction of the foundations for the towers and the substations construction as well as for other any constructions activities. Water will be sourced from contracted water trucks approved by the local authorities and provided as bottled drinking water for the staff. Daily water consumption is expected in the order of 44.04 m^3.

During the development of the Project, electricity consumption will be ensured by generator group. At least one generator is expected to be installed at each workers' camps. In the future the substations will be self-sustaining.

2.4. WASTE MANAGEMENT

All municipal and similar waste, industrial, electrical and other expected in the workers camp will be packed in specific containers for the treatment or recycling of the same, these containers will be installed in strategically defined and correctly signposted places. A Waste Management Plan (MWP) will be prepared in compliance with Presidential Decree No. 190/12 of August 24th on the Waste Management Regulation. In this way, all waste resulting from the construction activities of electricity transmission lines such as waste from chemical containers, packaging, cardboard, paper, cardboard, labels, wood pallets, electrical equipment and damaged glass, etc., will be required to be recycled or reused (when or whenever applicable).

The area of the transmission line of electricity does not have essential infrastructure, including the collection network of domestic wastewater and rainwater. Taking into account the nature of the Project, large quantities of water are not expected to be produced on the different work fronts. The effluents produced in the sanitary facilities and cafeterias of the workers camp will be correctly routed in a PVC biological septic tank sized according to the production of effluents expected in the Project.

When they reach the limit, they will be removed by sanitation companies based in the provinces of Namibe and Huíla, previously authorized for the exercise of activity at the level of both regions.

3. REGULATORY FRAMEWORK

The regulatory framework for stakeholder engagement applicable to the Project is discussed in this section, including Angolan (national) requirements and international (IFC, Ecuador Principles and Good International Industry Practice – GIIP) requirements and JICA Guidelines for Environmental and Social Conditions (published in 2010).

3.1. ANGOLAN NATIONAL REQUIREMENTS

The Environmental Framework Law No. 5/98 June 19th, 1998 (*Lei de Bases do Ambiente*) was promulgated in accordance with the former Constitutional Law of the Republic of Angola (paragraphs 1, 2 and 3 of Article 39 and paragraph m of Article 21). The purpose of the law is to provide the framework for environmental legislation and regulations; more specifically to "define the basic concepts and principles for the protection, preservation and conservation of the Environment, promotion of Quality of Life and the rational use of Natural Resources" (Article 1). The Environmental Framework Law incorporates international declarations which Angola has ratified (e.g. Agenda 21) and defines citizens' rights and responsibilities.

Article 16 of Environmental Framework Law stipulates that an Environmental Impact Assessment (EIA), including public consultation (Articles 10 and 32), is mandatory for all undertakings which have an impact on the balance and wellbeing of the environment and society.

Presidential Decree No. 117/20 April 22nd on Environmental Impact Assessment Regulation and Environmental Licensing Procedure was issued under the Environmental Framework Law in order to ensure better environmental protection from human activities likely to have an impact on the environment. Article 16 of the Presidential Decree presents a provision for public consultation to be organised by Ministry of Culture, Tourism and Environment, but other than specifying the release of a Non-Technical Summary, it does not specify the method of consultation. It is important to note that this will take place based on Ministry of Culture, Tourism and Environment's decision after their review of the ESIS for Transmission Line Project and pre-licensing visit to the project route.

Executive Decree No. 87/12 February 24th, 2012 provides a more detailed and extensive explanation of the objectives and requirements for public consultation. The aim is to collect relevant opinions and

suggestions of stakeholders on projects subject to the EIA process and ensure that these are taken into consideration in the decision-making process performed by the National Directorate for Prevention and Environmental Impact Assessment (DNPAIA) within the Ministry of Culture, Tourism and Environment (hereinafter referred to as **MCTA**).

The DNPAIA has the responsibility for chairing consultation activities (Article 4, Paragraph 3). To ensure stakeholder participation, the decree stipulates consultation must be advertised in the daily newspaper *Jornal de Angola* and other relevant media (Article 7). The requirements for information disclosure are detailed in Article 8, particularly regarding non-technical summaries of ESIS. It includes administrative details such as the timeframe for the consultation, which must take place in 5-10 days. The decree also details the need to submit a public consultation report. If required by the MCTA, this needs to be done before the construction phase.

Executive Decree No. 87/12 February 24th, 2012 focuses on consultation during the EIA process and after the final EIS report has been submitted to the relevant authorities. There are no explicit requirements for ongoing stakeholder consultation during construction or operation of projects in Angolan legislation. This will be done before the construction phase. Per legislation, the public consultation process is a procedure covered by public participation aimed at collecting opinions, suggestions and other contributions of the interested public on the project and it's Environmental Impact Assessment. However, MCTA can opt for not holding a public consultation process if they believe that the potential impacts of the project do not require wider consultation.

3.2. INTERNATIONAL REQUIREMENTS

The Performance Standards of the International Finance Corporation (IFC, 2012) are regarded as the most inclusive standards with regard to Environmental and Social Impact Assessment (ESIA) processes and have become a benchmark for large private sector projects, especially in developing countries. The IFC Performance Standards underpin the Equator Principles (EPFIs, 2013), a voluntary set of guidelines developed by leading financial institutions for managing environmental and social issues in project finance lending in non-high-income Organisation for Economic Co-Operation and Development (OECD) countries. The requirements for public consultation in the relevant IFC Performance Standard (PS1 - and its corresponding Guidance Note) are summarised in **Table 3-1** below.

Table 3-1: IFC requirements for public consultation.

Performance Standard 1: Social and Environmental Assessment and Management Systems
Public consultation and disclosure should: • Provide to the Interested and Affected Parties (IAP) access to relevant information on the project at a level of detail commensurate with the environmental and social risks anticipated, during all stages of the project life-cycle; • Be free of external manipulation, interference, coercion or intimidation; • Be inclusive of all segments of the IAP (including women, children, the elderly, etc.); • Be based on timely, relevant, understandable and accessible information – this requires information to be provided in the languages and methods preferred by the IAP; • Be informed by preliminary stakeholder analysis; • Entail both open (public) community meetings and discussions with community leaders; • Clearly communicate potential project-related risks and impacts; • Start during early scoping (especially for projects with significant impacts); • Allow IAP to identify project risks (i.e. scope the impact assessment phase); • Allow IAP to comment on the impact assessment undertaken (and mitigation measures); • Allow time and opportunities for collective decision-making (especially for indigenous peoples) and for contextually appropriate feedback mechanisms; • Lead to 'broad community support' defined as 'a collection of expressions by the IAP, through individuals and their recognised representatives, in support of the project'; • Entail a clear action plan based on the environmental and social management plan; and • Accompany all significant changes to project planning, scope and execution.

For projects with multiple stakeholder groups and issues, the IFC recommends the compilation and implementation of a Stakeholder Engagement Plan "that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities. Where applicable, the Stakeholder Engagement Plan (SEP) will include differentiated measures to allow the effective participation of those identified as disadvantaged or vulnerable" (IFC, 2012).

For projects with potentially significant adverse impacts, IFC recommends conducting an Informed Consultation and Participation (ICP) process that will result in informed participation of the IAP. This process should be documented, especially the measures taken to avoid or minimise adverse impacts on IAP, and to inform those affected about how their concerns have been considered. This is considered relevant when a proposed project is subject to an ESIA process involving stakeholder engagement focusing on expected risks and impacts.

The IFC Performance Standards have additional stakeholder engagement and consultation requirements to manage specific impacts as described in the following:

- **Performance Standard 2:** Labour and Working Conditions;
- **Performance Standard 4:** Community Health, Safety and Security;
- **Performance Standard 5:** Land Acquisition and Involuntary Resettlement;
- **Performance Standard 6:** Biodiversity Conservation and Sustainable Natural Resource Management;
- **Performance Standard 7:** Indigenous People; and
- **Performance Standard 8:** Cultural Heritage.

Figure 3-1 illustrates different actions to be implemented during the Stakeholder Engagement process. These actions should be implemented during the Project's different phases, including during the construction activities.

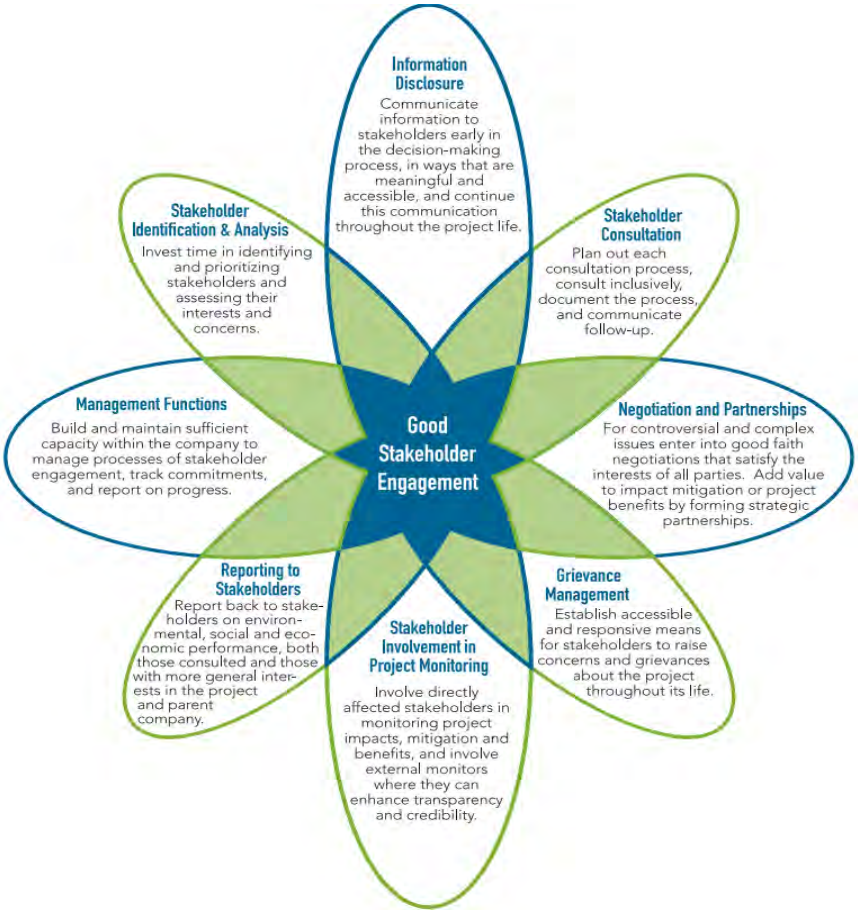

Figure 3-1: Good Stakeholder Engagement activities illustration. **Source:** IFC, Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, 2007.

3.3. JICA GUIDELINES

According to Guideline, JICA defines **Local stakeholders** means affected individuals or groups (including illegal dwellers) and local NGOs and **Stakeholders** are individuals or groups who have views about cooperation projects, including local stakeholders.

In these guidelines, JICA has created clear requirements regarding environmental and social considerations, which project proponents etc., must meet. JICA provides project proponents with support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation projects. JICA examines undertakings by project proponents etc. in accordance with the requirements and makes adequate decisions regarding environmental and social considerations on the basis of examination results. JICA recognizes the following seven (7) principles to be very important:

1) A wide range of impacts must be addressed.
2) Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage.
3) JICA is responsible for accountability when implementing cooperation projects.
4) JICA asks stakeholders for their participation.
5) JICA discloses information.
6) JICA enhances organizational capacity.
7) JICA makes serious attempts at promptness.

JICA encourages project proponents etc. to disclose and present information about environmental and social considerations to local stakeholders. For consultation with local stakeholders the guideline recommends:

1) In principle, project proponents etc. consult with local stakeholders through means that induce broad public participation to a reasonable extent, in order to take into consideration the environmental and social factors in a way that is most suitable to local situations, and in order to reach an appropriate consensus. JICA assists project proponents etc. by implementing cooperation projects as needed.

2) In an early stage of cooperation projects, JICA holds discussions with project proponents etc. and the two parties reach a consensus on frameworks for consultation with local stakeholders.
3) In order to have meaningful meetings, JICA encourages project proponents etc. to publicize in advance that they plan to consult with local stakeholders, with particular attention to directly affected people.
4) In the case of Category A projects, JICA encourages project proponents etc. to consult with local stakeholders about their understanding of development needs, the likely adverse impacts on the environment and society, and the analysis of alternatives at an early stage of the project, and assists project proponents as needed.
5) In the case of Category B projects, JICA encourages project proponents etc. to consult with local stakeholders when necessary.
6) JICA encourages project proponents etc. to prepare minutes of their meetings after such consultations occur.

3.4. JICA ENVIRONMENTAL POLICIES

The greatest responsibility of humanity is to provide a rich and diverse global environment for the future generations. JICA is determined to protect our global environment that is extremely vital for the survival of mankind and natural life on earth. It also seeks the balance among environmental conservation, social prosperity, and sustainable development.

As stated in the "Law on General Rules of Japan International Cooperation Agency," JICA's mission is to "contribute to the promotion of international cooperation and to the sound development of Japan and the international socioeconomic by contributing to the development or reconstruction of the economy and society, or economic stability of overseas regions which are in the developing stage," particularly to global environmental protection in compliance with environmental laws and regulations. Furthermore, in order to prevent and reduce negative environmental impacts that result from JICA's activities, JICA will utilize an environmental management system and shall work continuously to improve it. The system will be based on the following policies:

- Promotion of environmental measures through international cooperation activities;
- Promotion of activities for general environmental awareness;
- Promotion of environmentally friendly activities within JICA offices and other JICA facilities;

- Compliance with environmental laws and regulations.

JICA will consistently adhere to relevant environmental laws and regulations. This Environmental Policy will be communicated to all employees and personnel who work in or on behalf of JICA, and also be publicized.

3.5. RNT - E.P. HEALTH, SAFETY AND ENVIRONMENT POLICIES

RNT - E.P. is committed to the belief that the health and safety of its stakeholders and environment protection is of the utmost importance. In pursuit of this commitment, RNT - E.P. strives to:

- Maintain and proactively improve management systems to minimize health and safety hazards to stakeholders.
- Ensure total compliance with all applicable occupational health, safety and environment regulations and other legal requirements.
- Integrate health, safety and environment procedures and best practices into every operational activity at all levels for improving and sustaining health, safety and environment performance.
- Encourage employees to maintain a safe and healthy workplace through periodic reviews of operational procedures, and safe methods of work.
- Provide appropriate training at all levels to enable employees to fulfil their health, safety and environment obligations.
- Incorporate appropriate health, safety and environment criteria into business decisions for selection of the suitable technology.
- Ensure availability at all times of appropriate resources to fully implement the health, safety and environment policy of the company.
- Actively communicate this policy to all stakeholders by suitable means and periodically review its relevance in a continuously changing business environment.

RNT - E.P. selection of contractors is based on a number of criteria, which include technical qualifications; experience in country; record of accomplishment in constructing, installing and operating transmission lines project; management capacity and supporting management systems; commitment to safety and protecting of the environment.

4. STAKEHOLDER IDENTIFICATION

This section provides a description of the main stakeholders of relevance to the Project and a summary of previous stakeholder engagement activities undertaken. Additionally, the section provides an overview of the stakeholder engagement programme that will be implemented by the Project. This programme is designed to cover all phases of the Project.

4.1. STAKEHOLDER MEETINGS

During the development of the Environmental Pre-Feasibility Study and Scoping Report, stakeholder meetings were held in the four (4) municipalities and in the Arimba commune affected by the project implementation (see **Table 4-1**). Participants of these meetings included Huíla and Namibe Vice-Governors for Technical Services and infrastructures, Provincial Directors, Municipal and Communal Administrators, Administration Representatives, Associations Members, Religious Entities, Public Authorities' Representatives, Traditional Authorities, NGO's, Businessman and General Population (see **Appendix 8 for the Participants' List**). The objectives of these meetings were four-fold, namely a) present the 220 kV TL Project to the governmental institutions and traditional authorities, b) obtain feedback on issues of concern, questions and expectations of the participants, c) identify potential stakeholders and d) social baseline collection for the ESIS report.

Table 4-1: Stakeholder meetings with the five (5) places.

Municipality (Places)	Date	Numbers Attendees	Stakeholders
Huíla			
Lubango	23/02/2021	15 13 male / 2 female	Huíla vice-governor for technical services and infrastructures, provincial directors, Members of the Municipal Administration of Lubango, businessman, Members of the RNT Huíla and **via Zoom**: INAVIC, JICA, RNT Luanda and the Executive Demining Commission (CED) representatives.
Humpata	24/02/2021	17 13 male / 4 female	Members of the Municipal Administration of Humpata, Traditional leaders, Committee of Residents of Humpata Neighbourhood and ADRA representatives. Via Zoom: JICA, RNT and INAVIC representatives.

Municipality (Places)	Date	Numbers Attendees	Stakeholders
Arimba commune	24/02/2021	42 36 male / 6 female	Members of the Communal Consultation Committee of Arimba, including representatives of communal administration, traditional leaders, religious leaders and Committee of Residents of Arimba Neighbourhood.
Namibe			
Moçâmedes	25/02/2021	48 39 male / 9 female	Namibe vice-governor for technical area and infrastructures, provincial directors, Members of the Municipal Administration of Moçâmedes, Members of the PRODEL and ENDE Namibe, local and traditional leaders, religious leaders, local business association, private companies, teachers and students and via Zoom: INAVIC, JICA, Ministry of Agriculture and Fisheries and RNT Luanda representatives.
Bibala	25/02/2021	**48** 45 male / 3 female	Members of the Municipal Consultation Committee of Bibala, including representatives of municipal administration, communal administration, traditional leaders, religious leaders, teachers and students, women and youth.

The five (5) stakeholder engagement meetings were organised by RNT, and were attended by 170 participants (see **Appendix 8** - Participants' List). Women attendance to the stakeholder engagement meetings was low, with less than 20% of the participants in five (5) meetings. To present the Project information a presentation was carried out in Portuguese, the national official language, and in addition to the presentation a Background Information Document (BID) was produced and distributed to all participants. In order to guarantee a massive participation, the meetings were announced in Angola Newspaper between 18th and 20th February (see **Appendix 5**), there was also an announcement for those who wanted to follow the meeting via Zoom during two (2) weeks.

A copy of the presentation used is presented in **Appendix 7** (**Power Point Presentation**). A copy of the BID is presented in **Appendix 6**. At the meeting held at Arimba commune (in *Jango*), there was simultaneous translation from Portuguese into Nyaneca-Humbi language in order to ensure understanding of the Project for all participants.

The stakeholder engagement meetings presentation was made by Mr. Eduardo Ferdinand (Holísticos) and during the meeting, stakeholders raised a number of questions associated with the Project's implementation. **Table 4-2** presents a summary of the key issues raised by the participants. Photographic evidence of the stakeholder meeting is presented below.

Table 4-2: Summary of key questions from five (5) stakeholders in Huíla and Namibe Provinces.

Questions raised	Responses and Clarifications
Mr. Rosário Ima Panzo - What kind of training do you have in mind for workers who will be hired during the construction phase of the Project? - What is the scope of equipment that will be used during Project implementation at the various construction sites? - What is planned regarding technical assistance?	The hiring of national staff, both skilled and unskilled, is planned and that training will be provided before the Transmission Line (TL) construction phase. Because the Project is still in the technical feasibility pre-study phase, exactly what equipment would be needed is unknown.
Ms. Lídia Amaro Suggested that during field work, experts from the Namibe Academy of Fisheries and Marine Sciences be invited to participate, as well as technicians from the Provincial Office of Environment, Solid Waste Management, and Community Services (GPAGRSEC), in order for all to gain more experience and be able to monitor future developments.	The Project is in the Environmental Pre-Feasibility Study and Scoping Report phase (EPDA), which is required by law for all category A projects. In terms of the integration of technicians from higher education institutions and GPAGRSEC, was stated that including them in teams that will conduct the social and environmental surveys would be considered.
Mr. Estanislau Paulo Inquired whether the compensation process regarding parties affected by the Project in terms of losing agricultural land, as well as whether electricity will be provided to the people living along the line's path?	A list would be developed detailing current infrastructure along the Project's route that is prone to being affected, with the goal to determining that which will be truly impacted, thus avoiding potential opportunism on the part of local communities. Was mentioned that the compensation for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Was proposed the creation of working

Questions raised	Responses and Clarifications
	committees between RNT – E.P, the Huíla and Namibe provincial directorates and the four (4) municipals administrations, including the traditional authorities. The planned TL route will not allow for electricity distribution and that the National Electricity Distribution Company (ENDE) should promote satellite expansion and distribution projects in the future.
Ms. Ana Domingos Mentioned that in the recent past, some locations along the Project route had been used for military operations and suggested contacting the Executive Demining Commission (CED) regarding verifying that no undetonated explosive devices are present in the area.	The CED had already been contacted regarding verifying that no undetonated explosive devices are present in the proposed TL route and area. During 2019 the CED team had met with the JICA and RNT teams on several occasions to conduct an extensive survey of the TL route area. The number of technical meetings has decreased as a result of the SARS COVID-19 pandemic, however, the Lubango demining brigade is ready to implement the work of checking the Project route for undetonated explosive devices. Was stated that Project works would only begin following confirmation that the proposed route is free of mines and unexploded ordnance devices, and a certificate has been issued stating the same.
Mr. Cecílio Elindo Suggested the ability to consistently listen to all interested and affected parties and that all understand how to interpret information from people who are directly affected by the Project. Suggested that background project information be developed in a simpler way so that all parties understand the same. At the end ask for information whether the Nombungo substation will be situated in Hoque and	Ongoing meetings would be held in order to update all concerned parties regarding environmental and social surveys that have yet to be implemented, and that all provided information originated from literature, papers, and electronic portals. The exhaustive surveys will be implemented during April 2021, with the full schedule set to be completed by December following the realization of the EPDA and ESIS Report. After this, public consultation will be held to present the ESIS final report. In terms of collaborators, the team is multidisciplinary and broad. Regarding the province of Huíla, have collaborated with universities and have carefully selected lecturers.

Questions raised	Responses and Clarifications
when will the ESIS be concluded and who are the main partners involved in its elaboration?	Lídia Amaro, the GPAGRSC Provincial Director, made herself available regarding appointing a field survey technician. Details provided to the impacted communities will always be consistent and transparent. The Project Financier has prepared a compensation package that will be negotiated with RNT. RNT already has previous experience with compensation-related programs.
Mr. Mateus Baptista Questioned the sizes of each tower and how will they affect the population?	The towers will cover an area of 15x15 meters and there will be electrical signalling along the entire route that includes distance indicators, as per the Financier's specifications.
Mr. Edson Chipal Inquired whether employment opportunities and how positions would be filled.	The Public Procurement Act requires the use of locally sourced labour and mentioned that the contractor would need to recruit through newspaper advertising, in compliance with RNT and JICA rules and regulations. Was also explained that the company that wins the bid for Project construction must recruit local talent and implement a training program, as per JICA and RNT criteria.
Ms. Elizandra Soma Questioned with a long the TL route there are any endangered species?	The Tundavala area is well known and is home to several endangered bird species that are important in terms of biodiversity, as well as the area being classified as an IBA 14. Additional surveys will be conducted during April 2021 to identify biodiversity (vegetation and all fauna species), resulting in the team being able to confirm whether any endangered plant and fauna species are present in the area.
Mr. Carlos Xavier Questioned the capacities of the future Arimba and Namibe substations? Said also that there are communes that have never received electricity along the TL route and if will be the possibility of an	The current 60 kV TL does not have the capacity to supply the demand of the city of Namibe. Therefore, there would be a need to install a 220 kV TL to the north and central system of Laúca that is connected until Huambo, which would also reinforce the future

Questions raised	Responses and Clarifications
extension to enable these communities to have electricity access?	industrial hub of Sacomar. Regarding capacity, studies are still being implemented.
Mr. Venâncio Paulo Stated that the Humpata landscape is characterized by irregular relief and the TL will pass through a mountainous region of approximately 2,000 meters in altitude that divides Lubango and Namibe. For example, if an aircraft is flying over the area at an altitude of 20,000 feet (8 km) when arriving in this area it will be close to the towers. The concern is to know if the height of the towers will cause any damage during the operations of landing and taking off of the planes.	The height of the towers at the airport entrance has been discussed and that as a result of work implemented with INAVIC technicians, the substation site was moved further away from the airport entrance. The height of the towers varies between 18, 24 and 30 meters, with the towers becoming shorter as relief rises; adequate signalling is guaranteed regarding aviation safety. RNT collaborated with INAVIC during 2019 to determine the location of the Aida substation and worked with a local technician. Was informed that, in addition to RNT's communication with INAVIC, there are technical norms in force in Angola as well as internationally that stipulate a safety distance from an airport approach. This distance ranges from 5 to 15 kilometres. And that the airport approach is safeguarded in theory and that the team have been working with INAVIC in Luanda, which is regularly contacted for their opinion regarding similar projects in order to guarantee aviation safety.
Ms. Ana Domingos Inquired whether the communities in the Nambungo and Arimba substation's vicinity would be considered for electricity supply.	The sole purpose of the Project is to facilitate the transportation of electricity between the Arimba and Moçâmedes 220/60 kV substations but added that there are projects underway that should guarantee the supply of electricity to the communities of Nambungo, Oke and Toco. Regarding providing electricity to Arimba's other districts, was informed that the suggestion had been taken into consideration and that details would be shared with RNT Huíla management.
Mr. Domingos Sapalinha	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such

Questions raised	Responses and Clarifications
Requested clarification regarding the involuntary relocation and compensation process, asking what would happen in the event of infrastructure damage caused by third parties (housing, agricultural areas, etc.).	issues are addressed in compliance with the Agency's regulations and standards. Was emphasized that TL to be installed cannot pass over houses, schools, hospitals and large trees. Was mentioned that during the stakeholder engagement meetings and social field surveys, which will take place between March and April 2021, a social team will be mapping all infrastructure and economic activities present in the Project's direct area of influence, so as it can be avoided during Project implementation. However, was explained that there would be cases where this would not be feasible, whereby JICA has very specific rules, and as a result a Resettlement and Compensation Plan (RCP) would be elaborated to ensure that families affected by the Project have equal or better conditions than those that were present prior to Project development.
Mr. Miguel Savazuca Suggested that the TL's proposed route pass through Bibala's municipal headquarters in order to exploit the region's mining and industrial sectors, and that it also pass through Kapangombe's communal headquarters, which is set to become a municipality. Concluded by asking for clarification regarding the Project's timeline and start date.	The chosen route for the TL excluded the municipal headquarters of Bibala and Serra da Leba regions due to geomorphological and physiographic complications and that the proposed route is feasible from a technical and economic point of view. Was added that there are other active projects regarding the supply of electricity to other municipalities of the province, citing the Arimba substation in Lubango as an example, which will support Bibala and Humpata cities. It was also added that the implementation of a TL project is divided into phases; high voltage lines are initially installed together with substations that enable the voltage to be lowered, after which the distribution of electricity to potential consumers in the cities of Bibala, Moçâmedes and Tômbwa can be implemented. Was said that in order for energy to reach houses, ENDE would have to propose lower voltage line installation and connection projects.

Questions raised	Responses and Clarifications
	The proposed global construction schedule for the Project is 30 months, but that the process will only begin after the Project Financier (JICA) and the Ministry of Culture, Tourism, and Environment have completed and approved the Environmental and Social Impact Study (ESIS). And with that, the Project's construction phase could begin during 2030 if funding is secured. There is not yet an EPC for the Project and that the Japanese company TEPSCO is preparing the engineering studies. RNT would hold a public tender to find an EPC with the necessary experience and expertise in order to complete the Project in a timeframe shorter than that proposed in the specifications.
Mr. Mendes de Carvalho Inquired whether the existing towers could be used for the 220 kV TL and asked about the Project's budget.	The current 60 kV TL and towers would not be able to support the 220 kV TL Project. Was also drew attention to the fact that accessibility makes the initiative unfeasible and that a Project of this nature may pose serious risk to populations situated near the Project's route. The Project's costs are typically divided into two (2) categories, the first being associated with substation construction and the second with TL construction, and that the cost of a TL varies depending on its the type and length, and that a single kilometre can cost up to 0.12 million USD. The costs are defined according to types of materials used, weather conditions, and any complications that may be encountered along the route, mentioning that the Project will cost over 90,000,000 USD.
Mr. Pedro Joaquim	JICA has budgeted for all possible negative impacts related to the Project such as involuntary resettlement, reimbursement for environmental losses, and

Questions raised	Responses and Clarifications
Inquired whether the Project team intends to replant forest biomass that will be removed along the 190 km, along 45 meter of TL buffer. Recommended that the ESIS Report incorporate the Forest and Wild Fauna Framework Law.	compensation for damage to the environment or the property of third parties, etc. Was mentioned that biomass that will be lost along the route will be replaced by native plant species or those adapted to the region's climatic conditions. In cases where the repopulation of vegetation is not feasible, the Namibe Provincial Office of Culture, Tourism, and Environment would recommend alternative sites regarding compensation. Was proposed the creation of working committees between RNT - EP, the Moçâmedes and Bibala municipal administrations and the Huíla provincial directorates.
Mr. Edmilson Gama Inquired whether any electromagnetic effects that may occur due to the operation of the 220 kV high voltage line.	Regarding any electromagnetic effects it was stated that the towers would be 30 to 35 meters tall and that any electromagnetic fields would be negligible at these heights. Was also explained that all efforts would be made that the TL does not cross residential areas
Mr. Fernando Solinho Questioned why the TL would not continue to the municipality of Tômbwa and which company would be responsible for maintaining the system during the Project's operational phase.	ENDE is working on interconnection projects and that a 60/15 kV substation will be installed in the city of Tômbwa. Was said also that the city of Tômbwa will be actually electrified using a set of generators. The maintenance of the electricity transmission system would be the sole responsibility of RNT and that training would be provided to the line's maintenance technicians.
Mr. Wedeirgue Hach Suggested that the Government of Namibe Province urgently start working on the preparation of Land Management Plans and Municipal Master Plans, and that, if the province suffered from environmental and social problems related to the Project, these plans would help alleviate such problems.	The Moçâmedes Municipality Master Plan is approaching completion and will include projects promoted by ENDE, RNT and PRODEL. RNT engineering team held several meetings in Namibe province at the start of the Project (2015) to ensure the passage of the TL could be successfully implemented.
Mr. António Pombo Stated that there had been many cases of power cable theft reported in the media recently and inquired whether security measures would be	The Project would not utilize copper cables that can be a target for theft. On the other hand, the towers would be of considerable height and the voltage used would not allow anyone to access the 220 kV TL. Was also

Questions raised	Responses and Clarifications
implemented in order to prevent future theft or vandalism.	explained the risks associated with people vandalizing the towers and high voltage cables.
Mr. Carlos Cambango Thanked RNT for the initiative of developing the Project in the area and listening to locals long before the construction phase began. Proposed that the Project's proponents use more modern equipment, mentioning that the existing 60 kV TL and towers between the Lubango and Moçâmedes substations are effected by heavy gusts of wind.	The Project is in its technical feasibility pre-study phase and that several studies would be conducted to ensure that natural phenomena occurring in the region would not affect the Project's high voltage towers. The Project will make use of new technology that is more durable and only utilize equipment that can withstand the region's climatic conditions, as well as mentioning that the towers will be of considerable height. Concluded by stating that the new TL would run parallel to the existing 60 kV TL in certain areas in order to minimize impacts on populations and infrastructure.
	
Photo 1: Stakeholder engagement meeting organized in Moçâmedes.	
	
Photo 2: Participants in stakeholder Meeting in Bibala.	**Photo 3:** Participants in stakeholder meeting in Arimba.

Questions raised	Responses and Clarifications
	
Photo 4: Mr. António asking question about Project.	**Photo 5:** Project presentation in Lubango.

For the second phase, based on Google Earth, and social preliminary field survey performed in March 2021 approximately twelve settlements are physically located inside or close proximity to the 1 Km buffer (500 meters each side from the proposed transmission line route). From 19th to 23rd of Abril of 2021 to cover the rainy season, Holísticos social team performed stakeholder engagement meetings with all settlements mapped along the 1 Km buffer area (see **Table 4-3**).

Table 4-3: Stakeholder Engagement held with settlements along 1 km 220 kV TL Buffer.

REF.	DATE/TIME	MEETING PLACE	PARTICIPANTS	STAKEHOLDERS
1	19-04-2021 (Monday) 09h00	Poaires Settlements (Kapandi and Muhaha) in Lubango.	77 39 male / 37 female	Residents of the Poaires Kapandi and Muhaha villages. Residents' Committee. Civil society. Traditional authorities.
2	19-04-2021 (Monday) 14h00	Tchiwaya Settlement in Lubango.	30 12 male / 18 female	Residents of the Tchiwaya village. Residents' Committee. Civil society. Traditional authorities.
3	20-04-2021 (Tuesday) 08h30	Kapalanga Settlement in Lubango.	42 28 male / 14 female	Residents of the Kapalanga Settlement. Residents' Committee. Civil society. Traditional authorities.
4	21-04-2021 (Wednesday) 09h00	Heva, Kamba Cristo and Palanca Settlements in Humpata.	52 44 male / 8 female	Residents of the Heva, Kamba Cristo and Palanca Settlements. Residents' Committee. Civil society. Traditional authorities.
5	21-04-2021 (Wednesday) 14h00	Jamba Settlement in Humpata.	64 45 male / 19 female	Residents of the Jamba Settlement. Residents'

REF.	DATE/TIME	MEETING PLACE	PARTICIPANTS	STAKEHOLDERS
				Committee. Traditional authorities.
6	21-04-2021 (Wednesday) 16h00	Camponês Settlement in Humpata.	56 35 male / 21 female	Residents of the Camponês Settlement. Residents' Committee. Civil society. Traditional authorities.
7	22-04-2021 (Thursday) 08h30	Kalumue Settlement in Humpata.	36 30 male / 6 female	Residents of the Kalumue Settlement. Residents' Committee. Civil society.
8	22-04-2021 (Thursday) 10h30	Onculuvala Settlement in Humpata.	72 41 male / 31 female	Residents of the Onculuvala Settlement. Residents' Committee. Civil society. Traditional authorities.
9	23-04-2021 (Friday) 08h30	Aida Settlement (Moçâmedes).	49 39 male / 10 female	Residents of the Onculuvala Settlement. Residents' Committee. Civil society.

The stakeholder engagement meetings were all held in their respective settlements. However, at the request of Soba and the Humpata Municipal Administration, was joined the Soba and the key informants of three neighbourhoods (Heva de Cima, Kamba Cristo and Palanca) because the three settlements belong to the same "Kingdom" and have a single Soba and a single president of the residents' committee, assisted by deputies from each neighbourhood.

As in the stakeholder engagement meetings held for **Phase 1**, for **Phase 2** the following documents will be also prepared by RNT with Holísticos support: update of Background Information Document (BID) for the phase, banners with relevant schemes about the Project to share with the settlements, announcement in Angola Newspaper, and attendance list, etc. A presentation was carried out in Portuguese, the national official language and where possible and necessarily had simultaneous translation from Portuguese into Nyaneca-Humbi language in order to ensure understanding of the Project for all participants. Banner was prepared with relevant information about the Project, and BID was also produced and distributed to all participants.

The meetings were announced in Angola Newspaper between 15th and 17th Abril 2021. At the same time, letters about the meetings will be sent to the Governments of the Province of Huíla and Namibe.

The Governments of the Provinces of Huíla and Namibe had the responsibility to communicate the settlements and the traditional authorities within their respective jurisdictions.

In general, women attendance to the stakeholder engagement meetings (**Phase 2**) was low, with less than 30% of the participants in nine meetings, except in Poiares, Tchiwaya and Camponês villages where women's participation was massive, and above 40%. Holísticos social team called women, and encouraged them to join the meetings, but it was up to them if they join or not. They mostly follow Soba's request to join the meetings at village level, but urban women decide by themselves if they join or not. They are busy with various domestic works for a whole day. **Table 4-4** presents a summary of the key issues raised by the participants in **Phase 2**. Photographic evidence of the stakeholder meeting is presented below.

Table 4-4: Summary of key questions from stakeholders held in 12 settlements along the TL route.

Questions raised	Responses and Clarifications
João Cangola (JC) - Poiares Settlement resident. JC requested clarification regarding the involuntary resettlement and compensation process, asking what would happen in the event of damage to third party infrastructure (housing, agricultural and livestock areas, etc.). Informed that in the past they already had a project in which part of the population was affected (cultivation fields) and has not been compensated until today.	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed, in compliance with the agency's regulations, and standards. The line to be installed cannot pass over houses, agricultural land, cemeteries and large trees. However, would be cases where this would not be feasible, whereby JICA has very specific rules, and as a result, a Resettlement and Compensation Plan (RCP) for affected parties would be elaborated to ensure that families affected by the Project have equal or better conditions than those that were present prior to Project implementation.
Mário Chivia (MC) - Poiares settlement resident. MC questioned whether the Project would deliver electricity to all areas where the transmission line passes or only to the Namibe province.	There are three (3) companies with responsibility in the electricity sector in the country, namely: PRODEL (Production), RNT (Transmission) and ENDE (Distribution). RNT will implement the transmission line between Lubango - Moçâmedes during the first phase of the Project. This will be followed by the implementation of the distribution phase, during which ENDE, in collaboration with the Huíla and Namibe Provincial Governments and municipal administrations, will evaluate energy demand and develop

Questions raised	Responses and Clarifications
	alternative distribution options from the Moçâmedes substation. However, it was emphasized that currently, the Project will only facilitate the transportation of electricity between the Arimba 220/60 kV substations in Lubango and the new 220/60 kV substation to be installed in the Aida neighbourhood, Moçâmedes.
Tchaquenda Tchilombo (TT) - Poiares resident TT reported that staffs from previous projects carried out near the settlement harassed the girls and many were left with their children and the parents fled. Showed enormous dissatisfaction with the constant escapes of paternity.	The Project contractor (EPC) will be obliged to present a policy that includes training programs on health, safety, hygiene and the environment. Staff will be informed regarding the prohibition of harassment women in the settlements, about respecting community customs and traditions, the prohibition of unethical practices and of working when under the influence of alcohol or other illicit substances.
Tchimone Tchaunga (TT) - Tchiwaya resident. **Mpeyo Tchimongua (MT) - Tchiwaya resident.** TT and MT praised the government's initiative regarding Project implementation but mentioned that the local population is currently suffering from famine as a result of recurrent droughts in the region. They also requested food support and the installation of infrastructures such as fountains, schools, medical posts, etc.	Angolan Government has policies requiring companies that execute state projects to create Social Responsibility Programs in order to safeguard communities. These concerns have been raised and will be forwarded to the Project contractor as soon as the public tender is held. RNT will advise the future contractor to implement the Social Responsibility Program in accordance with social needs and conditions identified by communities along the Project's route.
Domingos Século (DS) - Tchiwaya resident. DS praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. Requested clarification regarding the involuntary relocation and compensation process, asking what would happen in the event of damage to third party	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed, in compliance with the agency's regulations, and standards. The line to be implemented cannot pass over houses, agricultural land, cemeteries and large trees. However, would be cases where this would not be feasible, whereby JICA has very specific rules, and as a result, a Resettlement and Compensation Plan (RCP) for affected

Questions raised	Responses and Clarifications
infrastructure (housing, agricultural and pastoral areas, etc.).	parties would be elaborated to ensure that families affected by the transmission line Project have equal or better conditions than those that were present prior to Project implementation. The compensations for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Proposed the creation of working committees between RNT, TEPSCO, JICA, the Lubango Municipal Administration and the Huíla Provincial Directorates. Should a house be affected by the Project, it will be assessed and the affected parties may receive a house of equivalent or better specification. The 220 kV TL route is not the final, may be changed, and several studies such as geographical, topographical, environmental, social and cultural studies are required to identify the final route and ensure that it does not affect the population's well-being, or if it does, that it is kept to a minimum. A thorough registration process regarding any affected agricultural land, housing and other infrastructure along the proposed length of the Project route would be conducted in order to prevent any opportunism, which would result in a Resettlement Action Plan being elaborated.
Filipe Sacula (FL) - Tchiwaya settlement resident. FL praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. Expressed his concern regarding the lack of identity (ID) cards	The Tchiwaya settlement coordinators and traditional authorities must ensure that young people obtain ID cards. Employment opportunities would be available to all young people in Tchiwaya settlement and along the transmission line corridor and the substation site, however, for the sake

Questions raised	Responses and Clarifications
among the youth of the settlement and how this would affect employment opportunities.	of compliance with the law in force in Angola, and international best practices, everyone must present their respective ID cards. All salaries must be bank-based, there will be contributions to Social Security and the payment of Withholding Tax (depending on the salary) and the absence of ID card can be an obstacle to obtaining a job.
Manuel Cateva (MC) - Tchiwaya settlement resident. MC thanked the government for implementing the Project and stated that he would like to see benefits in terms of the growth of the Huíla and Namibe region.	The objective of the 220 kV TL Project is to facilitate the transportation of electricity between the Arimba 220/60 kV in Lubango and the 220/60 kV substations to be installed in Moçâmedes. ENDE may establish future energy distribution projects in collaboration with the Huíla and Namibe Provincial Governments for the communities.
Francisco Kalupe (FK) - Kapalanga resident. FK praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. Enquired about the Project schedule.	The proposed timetable for the global project construction is 30 months, however, the construction phase will start only after the conclusion and approval of the Environmental and Social Impact Assessment by the Project financier (JICA) and the Ministry of Culture, Tourism and Environment (MCTA). If the financing is guaranteed, implementation phase could begin during 2023. Currently, the project is undergoing a Technical Pre-Feasibility Analysis phase, RNT experts are studying the best alternatives options for the Project's route and technology. After determining the transmission line route, work will begin during the second quarter of 2022 to map the terrain's topography, geomorphology and locate any possibly unexploded ordnance. A contractor for the Project has yet to be identified, while engineering studies are being prepared by the Japanese firm TEPSCO. Subsequently, RNT will hold a public tender to identify a contractor that has the necessary experience to

Questions raised	Responses and Clarifications
	implement the Project, as well as the ability to do so in less time than stipulated in the requirements.
Luís Manuel (LM) - Kapalanga resident. LM praised the government's initiative regarding Project implementation and expressed gratitude regarding the associated benefits. LM requested clarification regarding the involuntary resettlement and compensation process, asking what would happen in the event of damage to third party infrastructure (housing, agricultural and livestock areas, etc.). LM requested employment opportunities for young people in the Kapalanga settlement in order to improve their social and economic conditions.	JICA takes issues of resettlement and compensation very seriously and will not provide financing until such issues are addressed, in compliance with the agency's regulations and standards. The line to be installed cannot pass over houses, hospital, schools, agricultural land, cemeteries and large trees. However, would be cases where this would not be feasible, whereby JICA has very specific rules, and as a result, a Resettlement and Compensation Plan (RCP) for affected parties would be elaborated to ensure that families affected by the transmission line Project have equal or better conditions than those that were present prior to Project implementation. The compensations for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to whom it is owed. Was proposed the creation of working committees between RNT, TEPSCO, JICA, the Lubango Municipal Administration and the Huíla Provincial Directorates. Should a house be affected by the Project, it will be assessed and the affected parties may receive a house of equivalent or better specification. The 220 kV TL route is not the final, may be changed, and several studies such as geographical, topography, environmental, social and cultural studies are required to identify the final route and ensure that it does not affect the population's well -being, or if it does, that it is kept to a minimum.

Questions raised	Responses and Clarifications
	The Project budget will take into account any negative impacts that the Project may cause. A thorough registration process regarding any affected agricultural land, housing and other infrastructure along the proposed length of the Project route would be conducted in order to prevent any opportunism, which would result in a Resettlement Action Plan being elaborated. It was proposed the creation of multidisciplinary working committees between RNT, TEPSCO, JICA, the Humpata and Lubango Municipalities Administrations and the Huíla Provincial Directorates in order to ensure a fair process regarding compensation for damage to agricultural land and potential displacement along the Project's route. A public tender will be launched to find the contractor company that will implement the 220 kV Project and 220/60 kV substation in Moçâmedes. In the specifications, the EPC will be required to contract up to 40% of local labour. The contractor must disclose these job opportunities in Jornal de Angola, local radios stations with the highest ratings, safety displays on the workers' camps, integrated professional training centres in Huíla and Namibe capital cities, among other means or platforms for dissemination, so that everyone can have access to information.
Francisco José (FJ) - Palanca resident. FJ asked for clarification regarding risks the 220 kV transmission line could pose to nearby communities.	In terms of safety, the towers would be 30-35 meters above ground level and any effects of electromagnetic fields at these altitudes would be negligible. A concerted effort will be made to avoid the lines crossing residential areas. As a safety precaution, people should not perform any activities near the towers' designated location. Smart safety, warning, and emergency sensors will be mounted on power transmission lines and the transmission system will be automatically interrupted if the cables become damaged or

Questions raised	Responses and Clarifications
	weather conditions become extreme. It is recommended that no permanent infrastructure, such as homes, schools, hospitals or churches be constructed within the vicinity of the transmission line (45 meters).
Mbwale Tchilola (MT) – Palanca resident. MT questioned whether the route of the 220 kV transmission line would run parallel with the 60 kV line or whether a different crossing point would be established. He reiterated that the armed conflict in the country ended more than 15 years ago and that the campaign to identify unexploded ordnance explosives could delay the project's execution schedule.	The 220 kV transmission line would run parallel to the 60 kV line wherever possible. The route may be changed and several studies, such as geomorphological, topography, environmental, and social studies are required to identify the final route and ensure that it does not affect the population's well-being, or if it does, that it is kept to a minimum. Demining process is critical regarding the Project as Angola has been through several years of violent conflict and the transmission line route will pass through areas that are yet unused by the population. There will be an international public tender to select the Project contractor and several firms will refuse to send bids unless the National Executive Commission for Demining inspects the area and issues a demining certificate, thus alleviating concerns regarding property and the safety of personnel. It was highlighted the importance of this process. Currently, the project is undergoing a Technical Pre-Feasibility Analysis phase, RNT experts are studying the best alternatives options for the Project's route and technology. After determining the transmission line route, work will begin during the second quarter of 2022 to map the terrain's topography, geomorphology and locate any possibly unexploded ordnance. A contractor for the Project has yet to be identified, while engineering studies are being prepared by the Japanese firm TEPSCO. Subsequently, RNT will hold a public tender to identify a contractor that has the necessary experience to

Questions raised	Responses and Clarifications
	implement the Project, as well as the ability to do so in less time than stipulated in the requirements. Meanwhile, stakeholder engagement meetings with residents of villages and neighbourhoods near the transmission line proposed route will be held continuously throughout the implementation phase of the Project and a Stakeholder Engagement Plan will be developed.
João Chivangulula (JC) - Jamba resident. JC inquired whether the existing 60 kV towers could be used for the 220 kV transmission line Project and asked about the Project's budget.	The current 60 kV line towers would not be able to support the 220 kV TL. He also drew attention to the fact that accessibility makes the initiative unfeasible, and that a Project of this nature may pose serious risk to populations situated near the Project's route.
Tchongolola Culengalenga (TC) - Onculuvala Resident. TC mentioned that the Food Aid Program provided to some communities in the region should also take into consideration the Onculuvala neighbourhood residents.	There are several Projects for the improvement of infrastructures within the scope of PIIM, which will be developed in Onculuvala settlement (including other settlements around the Humpata headquarters), gives an example of the Water Hole Project for the benefit of local communities. However, the other social complaints were noted. He invited residents of Onculuvala to visit the Administration to learn more about the various projects that have been recommended for the region under PIIM. The Government of the Province of Huíla is only providing food support to communities in the Bata-Bata region in order to work on the migration of young children to Lubango, who are constant targets of sexual exploitation.
	

Photo 1: Stakeholder engagement meeting organized in Jamba settlement.

Questions raised	Responses and Clarifications
	
Photo 2: Questions about Project during the meeting in Camponês settlement.	**Photo 3:** Participants in stakeholder meeting in Kapalanga settlement.
	
Photo 4: Female group present in the stakeholder engagement meeting in Camponês settlement.	**Photo 5:** Female group present in the stakeholder engagement meeting in Onculuvala settlement.

In order to present the preliminary results of the ESIA, with the aim of clarifying the potential environmental and socio-economic impacts of the Project and the Resettlement Process in the event that private properties are affected due to the implementation of the Project, stakeholder engagement meetings (**Phase 3**) were held with the communities mapped in the right-of-way (45 m) of the transmission line. **Phase 3** took place from 13th to 17th September 2021 (dry season) and the communities engaged were: Poaires Muhaha, Figueira, Heva de Cima, Jamba 2, Camponês, Sames and Onculuvala. The objectives of these meetings will be four-fold, namely **a**) present the potential environmental, social and cultural impacts of the Project to the all settlements near by the route (45 m – 22.5 m each side of towers implementation position) **b**) obtain feedback on issues of concern, questions about the potential environmental impacts, resettlement and compensation for damage to house, land and crops, livestock and transhumance space and expectations **c**) safety risks associated with the preparation, implementation and operation of the 220 kV transmission line and **d**) additional social baseline collection for the ESIA Report.

The all meetings were held in the respective settlements and appropriate engagement practices and tools was adopted to ensure adequate access to information and understanding of the Project potential environmental, social and cultural impacts to all participants. **Table 4-5** presents a summary of the key issues raised by the participants in **Phase 3** (the meetings were attended by 191 people, 132 male and 59 female). Photographic evidence of the stakeholder meeting is presented below.

Table 4-5: Summary of key questions from stakeholders held in **Phase 3**.

Questions raised	Responses and Clarifications
José Isaac (JI) – Poiares Muhaha resident. JI requested clarification regarding the resettlement and compensation process, asking what would happen in the event of damage to third-party infrastructure (housing, agricultural and livestock areas, etc.).	**Eduardo Ferdinand (EF)** – Holísticos JICA takes resettlement and compensation process extremely seriously and will not provide financing until such issues are properly addressed by RNT and implemented in accordance with current national legislation and JICA requirements. The line to be installed cannot pass over houses, agricultural land, schools, hospitals, cemeteries and large trees over 8 m in height. However, would be cases where this would not be feasible, for which both current Angolan legislation on resettlement and JICA guidelines have very explicit rules/guidelines, and that a Resettlement and Compensation Plan (ARAP) for potentially affected parties is currently being developed in order to ensure that families affected by the transmission line Project have equal or better conditions than those that were present prior to Project implementation. During the initial phase, only infrastructures located within a 45 m of the Project buffer or right-of-way (RoW) will be compensated, meaning that anyone located outside of this zone will not be compensated. The compensations for the loss of agricultural land and fruit trees would be determined using the Ministry of Agriculture and Fisheries' price table for agricultural products per square meter, and that the entire process would be fair, transparent and honest, thus ensuring that compensation is granted to

Questions raised	Responses and Clarifications
	whom it is owed. Between October and November, a team would map the Project's route, survey private infrastructure within a 45 m of the Project buffer, and conduct a census of the entire community, including its socioeconomic profile. Should a house be affected by the Project, it will be assessed and the affected parties may receive a house of equivalent or better specification. The 220 kV TL will be developer to ensure that it does not affect the population's well-being, or if it does, that it is kept to a minimum. **Catarino Cosmo (CC)** – RNT Should a house be affected by the 220 kV Project, it would be evaluated and the affected parties may receive a house of equivalent or better specification. Drew the participants' attention to acts of opportunism, noting that only affected and previously registered parties would be compensated for the affections of their houses, agricultural land, and other structures. If a house is completely or partially affected, the form of negotiation or compensation would only involve a single house. The financial compensation for house resettlement will be avoided as a result of lessons learned from other RNT supported projects, citing an example of how some people preferred to acquire electrical appliances and consumer goods and later found themselves unable to build a house. Urged those present to widely publicize the meeting in order to keep absent residents informed.
Ernesto Kiluke (EK) – Nambungula resident. EK mentioned the region's current social problems. He discussed experiences related to projects developed in the region, highlighting promises of community support that have yet to be fulfilled. He indicated that the community is not opposed to the	**Catarino Cosmo (CC)** – RNT The Angolan Government has policies requiring companies that are awarded public sector projects to develop Social Responsibility Programs in order to safeguard communities in areas of influence. As well as this, JICA takes resettlement and financial compensation for any damages extremely seriously and will not provide financing until such issues are properly

Questions raised	Responses and Clarifications
Project, but he pleaded for sincerity during the resettlement process in light of the local authorities and businesspersons' repeated acts of dishonesty.	addressed by RNT and implemented in accordance with current national legislation and JICA requirements. RNT is a public company responsible for the high voltage electricity transmission line as well as the improvement of the transportation system and all associated infrastructure, and urged those in attendance not to associate RNT or the stakeholder engagement meeting's objectives with promises made by other political leaders and businesspersons. Sought examples of similar projects undertaken by RNT in other parts of the country in order to reassure those present regarding concerns related to the Project's right-of-way through the Figueira region. PRODEL (Production), RNT (Transmission) and ENDE (Distribution) are the three (3) companies responsible for the country's energy sector. RNT will install the Lubango-Moçâmedes 220 kV electricity transmission line during the first phase of the Project. This will be followed by the implementation of the distribution phase, during which ENDE, in collaboration with the Huíla Provincial Government and municipal administrations, will evaluate energy demand and develop alternative distribution options from the Arimba substation. However, it was emphasized that the Project will only facilitate the transportation of electricity between the 220/60 kV East Lubango substation to 220/60 kV New Namibe substation to be installed in Moçâmedes. **Eduardo Ferdinand (EF)** – Holísticos RNT, JICA and Holísticos are not affiliated with any political party and make no promises regarding infrastructure implementation in the community. Was expressed regret that promises had remained unfulfilled. A 45 meters (RoW) buffer free of obstructions will be required along the proposed transmission line route, and this buffer of RoW will contain the

Questions raised	Responses and Clarifications
	towers and high-voltage lines, but would not contain any permanent infrastructure such as houses, churches, schools, hospitals, etc. The farmers would be able to return to their cultivation areas following the construction of the towers and lines, as long as they do not cultivate near the towers or plant fruit trees taller than 8 m.
Maria da Piedade (MP) – Camponês resident. MP requested additional information about the Project's route in order to determine whether it will pass through any of the neighborhoods represented at the meeting.	**Eduardo Ferdinand (EF)** – Holísticos The Project's route will pass near the Jamba 2, Camponês and Sames settlements invited to the meeting, but was not specify the precise location of the high-voltage towers position. The final TL route only will be presented after topography and geology work had been completed, and the geomorphologic and paedology conditions studied.
Mongalipe Chico (MC) – Heva de Cima Soba. MC praised the Project promoters for the initiative. Regarding the resettlement and compensation processes, he stated that each affected party has the right to negotiate in their own way or in the manner they believe is just. He pleaded with the community to maintain calm, emphasizing that compensation will be limited to houses and farms within a 45 meter Project buffer or those that may be impacted by other activities. Others who are unaffected will be able to maintain their normal ways of life.	**Eduardo Ferdinand (EF)** – Holísticos The Project team was grateful for the contribution of Mongalipe Chico, Soba of the Heva de Cima neighbourhood.
Raimundo Belo (RB) – Heva resident. RB alluded to the region's current social problems. He discussed his experiences with projects developed in the region that included promises of community support that were never fulfilled, including farmers whose fields were impacted by the 30 kV transmission line project that received no compensation. He stated that one of the transmission line poles is located within his	**Catarino Cosmo (CC)** – RNT The Angolan Government has policies requiring companies that are awarded public sector projects to develop Social Responsibility Programs in order to safeguard communities in areas of influence. As well as this, JICA takes resettlement and financial compensation for any damages extremely seriously and will not provide financing until such issues are properly addressed by RNT and implemented in accordance with current national legislation and JICA requirements.

Questions raised	Responses and Clarifications
property and that he has not been consulted by the Project managers, nor does he benefit from the electricity that the lines supply. He stated that the community is not opposed to the RNT promoted project, but he pleaded for sincerity during the resettlement process due to the local authorities' repeated acts of dishonesty.	RNT is a public company responsible for the high voltage electricity transmission line as well as the improvement of the transportation system and all associated infrastructure, and urged those in attendance not to associate RNT or the stakeholder engagement meeting's objectives with promises made by other political leaders and businesspersons. Sought examples of similar projects undertaken by RNT in other parts of the country in order to reassure those present regarding concerns related to the Project's right-of-way through the Figueira region. **Eduardo Ferdinand (EF)** – Holísticos RNT, JICA and Holísticos are not affiliated with any political party and make no promises regarding infrastructure implementation in the community. Was expressed regret that promises had remained unfulfilled. A 45 meters (RoW) buffer free of obstructions will be required along the proposed transmission line route, and this buffer of RoW will contain the towers and high-voltage lines, but would not contain any permanent infrastructure such as houses, churches, schools, hospitals, etc. The farmers would be able to return to their cultivation areas following the construction of the towers and lines, as long as they do not cultivate near the towers or plant fruit trees taller than 8 m.
	

Photo 1: Stakeholder engagement meeting organized in Poaires Muhaha settlement with female group.

Questions raised	Responses and Clarifications
	
Photo 2: Questions about Project during the meeting in Nambungula settlement.	**Photo 3:** Participants in stakeholder meeting in Heva de Cima settlement.
	
Photo 4: Female group present in Heva stakeholder engagement meeting.	**Photo 5:** Female group present in Camponês stakeholder engagement meeting.

Following the conclusion of the Project's Environmental and Social Impact Assessment (ESIA) and the census of the population present in the Project's Right-of-way, five (5) stakeholder engagement meetings (**Phase 4**) were held with the authorities of the provinces of Huíla (three meetings) and Namibe (two meetings) between 7th to 10th June, 2022, to present the main results (see **Table 4-6**).

Participants of **Phase 4** meetings included Namibe Vice-Governors for Technical Services and infrastructures, Bibala Municipal Administrator, Deputy Humpata Municipal Administrator for Social Area, Deputy Lubango Municipal Administrator for Technical area, Provincial Directors, Arimba Communal Administrator, Municipal and Communal Administrations Representatives, Associations Members, Public Authorities' Representatives, Traditional Authorities, NGO's, members of civil society, Businessman and general Population.

The objectives of these meetings were four-fold, namely **a**) present the main results of ESIA (The potential environmental, social and cultural impacts associated with the construction and operation of the Project on the defined route), **b**) Present the results of the census of the existing population in the Project ROW (demography, number of families and potentially affected infrastructures) **c**) obtain feedback on issues of concern, questions and expectations of the participants, **d**) Obtain additional mitigation measures, suggestions and technical recommendations for the possible resettlement process in the future and in order to enrich the ARAP under preparation.

The five (5) stakeholder engagement meetings were organised by RNT and were attended by 217 (175 male and 42 female). Women attendance to the stakeholder engagement meetings was low, with less than 15% of the participants in five (5) meetings.

To present the Project information a presentation was carried out in Portuguese, the national official language. This presentation was delivered to stakeholders during stakeholder meetings. In addition to the presentation a Background Information Document (BID) was produced and distributed to all participants, even several copies were left to administrations for later distribution to interested parties. At the meeting held at Arimba commune and Humpata municipality, there were simultaneous translation from Portuguese into Nyaneca-Humbi language in order to ensure understanding of the Project for all participants. In order to guarantee a massive participation, and the meetings were announced in Angola Newspaper between in June.

Table 4-6: Summary of key questions from stakeholders held in **Phase 4**.

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
Mahini Mapole (MM) – Residing in Jamba II neighbourhood. Mahini Mapole commended RNT's initiative for the implementation of the Project and pointed out its benefits for the future. He said that special attention should be given to the conservation of the Boers cemeteries that located inside Jamba Farm.	**Eduardo Ferdinand – Holísticos.** EF mentioned that the two (2) cemeteries mapped along the TL Project route will be scrupulously avoided. He spoke of the sentimental and cultural value that the Boers and Onculuvala cemeteries represent for the people who have their beloved ones buried there, and of the historical value of the Boers cemetery. He mentioned these cemeteries are outside the current project right-of-way and thus

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	will not be affected. For future projects and RNT will take measures to prevent the lines from passing through the spaces of cemeteries. He stressed that the exhumation processes are very difficult to follow because it is extremely complex under current Angolan legislation, as it involves the creation of multidisciplinary teams including the involvement of administrative authorities, traditional authorities, family members of the deceased and church entities, etc. **Catarino Cosme – RNT** He mentioned that the route of the transmission line is not definitive and that a set of studies will be carried out to define the final route. He said that the Project promoter wants the negative impact to be minimized as much as possible, and has presented technical solutions, such as the installation of bypass towers, etc. However, he stressed that in the future if the cost-benefit analysis shows that it is feasible to place one or two towers inside the perimeter of the cemeteries, a work committee will be created between RNT, the Humpata Municipal Administration and the provincial directorates of Huíla, in order to facilitate the process of exhumation and transfer to another cemetery to be indicated by the local authorities. However, this is not the case of this project.
Agostinho Tchiputo (AT) – Onculuvala Village Head. AT commended the Project initiative and pointed out that the youth of the Onculuvala neighbourhood have been putting pressure on the issue of employment. He suggested that stakeholder engagement meetings should be held with the families identified as	**Eduardo Ferdinand – Holísticos.** He thanked the Head Agostinho Tchiputo from the Onculuvala Village for his suggestions. He explained in detail the route of the transmission line from Arimba to Moçâmedes, and that the same route will not pass through densely populated

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
potentially affected by the Project (farmers, property and land owners, etc.). The aim is to provide a better clarification of the Project and its potential negative and positive impacts before the implementation of the reconfirmation work of the affected people and the beginning of possible compensation. AT clarified that he is not against the placement of one or two towers within the perimeter of the Onculuvala village cemetery, as long as the traditional authorities and families are previously consulted and the exhumation occurs in accordance with local tradition and other legal rules in force in Angola. He requested that RNT to share the final layout of the Project so that the traditional authorities can avoid possible defrauders, who choose to build houses in order to be compensated.	regions and pointed out that in the municipality of Humpata, from the commune of Palanca bypass, the route of the 220 kV transmission line will always be parallel to the existing 60 kV transmission line, thus avoiding social conflicts related to the occupation of habitable and agricultural land. He explained in detail the registration work of the potentially affected parties carried out in November 2021 along the route of the presented Project. He also said that for safety reasons and in order to comply with international standards, houses, schools, hospitals, church and other permanent infrastructures cannot be permitted on the 220 kV Project easement (45 m). He emphasized that the presented route is not definitive and a set of studies will be carried out to determine its final route. He highlighted the studies of soils, geology, topography, geomorphology, etc. He stressed that before the implementation of the Project, RNT, JICA and TEPSCO will also take into consideration the cost-benefit effect before the compensation decision, in order to avoid making the Project extremely expensive, due to the compensation and physical resettlement process.
Manuel Mandante (MM) – Resident of the Jamba II neighbourhood. Manuel Mandante questioned about the resettlement and compensation process should the tower be installed on his land with potential affectation to his home.	**Catarino Cosme – RNT** He mentioned that only the physical infrastructures (for example houses) that are within the Project 45-meter easement will be compensated. Therefore, people whose property is not located within this area will not be compensated. In case a house is relocated by the Project, a registration and a value assessment (benchmark)

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	based on the market price will be carried out. The affected people will be entitled to receive a house that will be built within the safety limits. It will have the same or even better conditions than the property currently existing along the Project route. Eduardo Ferdinand – Holísticos. The Project is being funded by JICA and it takes very seriously the issues of involuntary resettlement (due to damage caused to other people's infrastructure and property relocation), as such, fair compensation shall be paid. Failure to address these issues properly, and compensate people, under the Angolan Legislation in force, and where applicable, JICA's requirements, shall imply the full funding not be provided. He indicated that the 220 kV electricity transmission line planned to be installed between the substations of Nombungo, Lubango East and New Namibe cannot overhead houses, schools, hospitals and large trees, always in compliance with the recommendations from the national legislation. However, he explained that there will be situations where this cannot be avoided, so the RNT and JICA have very explicit technical standards for these situations. An Abbreviated Resettlement Action Plan is being developed for potentially affected people to ensure that families affected by the Project will have the same or better living conditions and social welfare than prior to the Project development in the region. The compensation due for lost farms and fruit trees will be according to crop price table per square

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	meter or hectare released by the then Ministry of Agriculture and Fisheries (National Agriculture Directorate), and all the terms will be duly agreed upon, signed and executed in a transparent and honest manner. In order to ensure that the potentially affected parties shall compensated accordingly. However, the value to be paid for the farms mapped to be affected will depend in the agriculture produce per species that they present and not on the annual produce. At the end of all registration process in connection with the affected farms and compensation, the monetary amount of the agricultural produce will be provided to the farmer (owner of the farm), and the deadlines for the collection of the production shall be established. In case a house is relocated by the Project, a registration and a value assessment based on the national market price (benchmark) shall be carried out and the affected parties may receive a house with the same or even better conditions than the house currently existing along the Project route. During the construction of houses, the recommendations or requests of the affected families in terms of finishing and adjustment of the rooms will also be taken into consideration.
Alexandre Kalupia (AG) – Onculuvala Resident. AG asked about the issue of employability of people of said community.	**Catarino Cosmo – RNT.** He informed that during the public tender for the Project, the RNT will include in the specifications the clause of hiring at least 40% of the local labour force for the Project corridor in order to promote employability and professional training to the youth of said region. He highlighted that it is required to

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	hire qualified and non-qualified labour, and the opportunities for non-qualified work will all be provided for the youth, as long as they meet the minimum qualifications to provide the work Eduardo Ferdinand – Holísticos. He sought examples of similar projects implemented by RNT in other parts of the country to reassure those present regarding the creation of job opportunities for young people within the scope of the Project implementation in the region.
Dário Tomás (DT) – ADPP "Ajuda de Desenvolvimento de Povo para Povo". DT questioned the safety distances of the Project in relation to houses, ploughs, schools and if the route of the Project should cross the area of the Fenda da Tundavala. He also questioned if Bibala Municipality will benefit from the Project. **Bernar Aleluia (BA) – Advisor.** BA requested the interconnection between the very high voltage electricity transmission and distribution Projects. He questioned whether the communities near the Project route will benefit from that electricity. **Remidor Nanga (RN) – Municipal Fire Chief.** RN requested possibility of power distribution to the communities living in the Project route be analysed.	**Catarino Cosme - RNT.** He mentioned that only physical infrastructure (e.g. houses and schools) that are within the Project 45 meter easement will be compensated, so infrastructures that are not within this area will not be compensated. If a house is relocated by the Project, there will be a registration and evaluation of its market value, and the affected parties will be able to receive a house that will be built within safety limits, with the same or even better conditions than the displaced person's house living along the Project route. He stressed that the Project is exclusively for the transport of electricity between the 220/60 kV Lubango East Substation and the New Namibe 220/60 kV Substation to be built in Moçâmedes. He clarified that under the Transformation Program of the National Electricity Sector three Angolan companies are responsible for providing power production and distribution services in the country, namely: PRODEL (Production), RNT (Transmission) and ENDE (Distribution). In the first phase RNT will

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	build the Lubango-Moçâmedes electricity transmission line. Then it will move to the distribution phase, in which ENDE in collaboration with the Provincial Government of Namibe and municipal administrations will analyse the demand for energy and create alternatives for its distribution from Moçâmedes Substation. However, it was emphasized that the project is exclusively for the transport of electricity between the Lubango East 220/60 kV Substation and New Namibe 220/60 kV Substation to be built in Moçâmedes. **Eduardo Ferdinand – Holísticos.** He explained in detail the route of the transmission line from Arimba to Moçâmedes. He said that it will not pass through the region of Fenda da Tundavala or Serra da Leba. He also highlighted the importance of the two (2) regions from the environmental point of view (IBA0023 of Fenda da Tundavala) and the historical-cultural heritage and tourism.
Amélia Camunheira (AC) - Bibala's Municipal Administrator. AC questioned the technical viability of the municipal seat of Bibala and the regions of Muinho and Caraculo benefiting from the energy transported by the Project.	**Catarino Cosme – RNT.** He said that the funding requested from JICA by the Angolan government includes only the power transport from the Nombungo and Lubango East substations (in the province of Huila) to New Namibe Substation in Moçâmedes (in the province of Namibe). Subsequently, additional funding will be requested for satellite projects for electricity distribution to other municipalities in Namibe. **Manuel Domingos – RNT.** The Angolan government, through the Ministry of Energy and Water, has drawn up a program for the electrification of all the country's municipalities and some nearby communes using hybrid and

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	photovoltaic plants. Experimental projects are underway in the Province of Cabinda.
Marília Inácio (MI) – Community Administrator of Aida Neighbourhood. MI stressed the concern regarding the resettlement of the population. He asked about the registration, so that the Communal Administration could begin to raise awareness among the potentially affected population. How long it will take the construction phase considering the air quality change**.**	**Eduardo Ferdinand – Holísticos.** He explained in detail the registration of potentially affected parties that was carried out in November 2021 along the route of the Project. He informed that for safety reasons and to comply with international standards, houses, schools, hospitals and other permanent infrastructure cannot be permitted in the 220 kV (45 m) and 60 kV (24 m) Project easement. He emphasized that the route presented is not the final one and that a set of studies will be carried out to determine the final route. He highlighted the studies of soils, geology, topography, geomorphology, etc. He stressed that before the Project execution, the project promoters will also take into consideration the cost-benefit effect prior to the compensation decision with regard to relevant compensation and physical resettlement process. In the EIAS report a series of mitigation measures were presented for the developer in the construction phase of the Project, in order to be taken into consideration
Jorge de Sousa (JS) – President of the Namibe Fishing Association. JS suggested that the final report of the Project should be focused on the people to be affected. And special attention should be given to the ethno-linguistic communities of the region. He also said that he expects that the implementation of the project would not make the life of the affected population more difficult (the rural aspect, the cattle traffic, the precariousness	**Catarino Cosme – RNT.** This is the 4th time what that is being carried out the stakeholder engagement meetings RNT and Holísticos have been working with the communities so that all the parties may be aware of the Project, and may know how they will be potentially affected by it, and have their feedback on the Project implementation. The Project will only compensate all the infrastructure (houses, farms, stores, etc.) that are within the 45 meters right-of-way along the

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
of intermittent rivers). At this stage it is necessary to make an inventory of the grazing areas of the communities that will be affected.	line, and that all the issues are being addressed by the Government, RNT and funding entity as well.
Carlos Cruz (CC) – Moçâmedes' resident. CC questioned the measures that will be implemented to avoid opportunism. An awareness campaign should be conducted for the people living along the route and within the 45-meter perimeter of the Project. CC asked RNT to also request JICA to provide funding for the construction of an electricity transmission line between the Novo Namibe substation and Tômbwa.	**Catarino Cosme – RNT.** Regarding the actions guided primarily by self-interested motives, only the affected and previously registered parties will receive the compensations for the relocation of their houses, farms, and other structures. He emphasized that in case of total or partial relocation of a house, the form of negotiation or compensation will only take the house into consideration. He stressed that the financial compensation in case of resettlement of houses will be avoided due to the lessons learned in other projects promoted by RNT, an example some people preferred to acquire electrical appliances and consumer goods, and later no longer had conditions to build the houses. **Manuel Domingos – RNT.** RNT is seeking funding through the African Development Bank for the electrification of the Tômbwa city. The funding will enable a transmission line to be built between the Novo Namibe substation and a future substation in the Tômbwa.
	

Photo 1: Stakeholder engagement meeting organized in Humpata.

QUESTIONS RAISED	RESPONSES AND CLARIFICATIONS
	
Photo 2: Traditional authorities in Bibala Meeting.	**Photo 3:** Questions about project in Bibala.
	
Photo 4: Vice-Governor of the Namibe Province.	**Photo 5:** Women in Moçâmedes SHM.

The **Phase 1** and **4** meetings were held in the amphitheatres of the Governments of the Provinces of Huíla and Namibe, and in the meeting rooms of the Municipal Administrations of Humpata, Bibala and Arimba. **Figure 4-1** illustrates the communities engaged in **Phase 2** and **3** of the stakeholder engagement meetings. These communities will be the subject of a census within the framework of the Abbreviated Resettlement Action Plan.

Figure 4-1: Communities engaged in phases 2 and 3 of the stakeholder meetings.

The stakeholder engagement programme was designed to cover all phases of the Project. However, RNT, JICA, TEPSCO and EPC will hand over the Project to RNT once the construction of the transmission lines and substation are completed. JICA, TEPSCO and EPC will have no responsibilities during the operation phase. In this regard, all engagement activities during the operation will be managed and promoted by RNT team.

4.2.STAKEHOLDER IDENTIFICATION CRITERIA AND PROCESS

IFC PS1 defines stakeholders as: "…persons, groups or communities external to the core operations of a project who may be affected by the project or have interest in it. This may include individuals, businesses, communities, local government authorities, local nongovernmental and other institutions, and other interested or affected parties" (IFC, 2012). In line with the principles of IFC PS1, stakeholders are divided into two (2) types:

- "Affected communities – persons, groups and other entities within the Project Area that are directly influenced (actually or potentially, positively or adversely) by the Project and/or have been identified as most susceptible to change associated with the Project, and who need to be closely engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measures;
- Non-community stakeholders who may be able to influence decisions on the Project, or have an interest in the Project".

To develop an effective SEP, it is necessary to identify stakeholders and understand their needs and expectations for engagement, and their priorities and objectives in relation to the proposed Project. This information is then used to tailor engagement to each type of stakeholder. As part from this process, it is particularly important to identify individuals and groups who may find it more difficult to participate and those who may be differentially or disproportionately affected by the Project because of their marginalised or vulnerable status.

Stakeholder identification, especially the vulnerable groups or individuals that are not highly visible or well represented, is an important first step in any engagement process, as well as an ongoing aspect of engagement throughout the life of the Project. It should be noted that this SEP focuses on stakeholders who do not have formal relationships with TEPSCO, RNT, EPC and its contractors and the Project and who, thus, may wish to use this SEP for information and guidance. The strategy of stakeholder identification and involvement arises from the need to know the most relevant concerns of stakeholders that should be taken into account in the Project implementation. In this context, several in-depth interviews shall be conducted and discussion groups shall be undertaken with the potentially affected parties and stakeholders.

The identification of the affected parties and stakeholders for engagement in this 220 kV TL Project and Moçâmedes substation construction was undertaken based on the process presented below. This process was based on the social information collected during on-site survey (including meetings with the main stakeholder groups), meetings with the local authorities, and meetings with the traditional authorities and by analysing potential stakeholder groups, in particular those which:

- Are expected to be directly or indirectly affected by the Project construction (subsistence farmers, villagers, pasture areas, etc.) and other infrastructures installed nearby the TL route

(e.g. houses, hospitals, schools, leisure sites, sacred or cultural places, etc.). An emphasis was given to those residing in the area of influence of the Project;

- Are directly involved in the regional planning and management, in the electricity transmission line sector, in the agriculture and forestry sector management and in the environment preservation (Government of the Provinces of Huíla and Namibe, Administration of the following municipalities: Lubango, Humpata in the Huíla Province and Moçâmedes and Bibala in Namibe);
- Communities or organizations, residing in or based in the Project's Area of Influence used for the ESIS, with emphasis on those based in Huíla (Lubango and Humpata municipalities) and Namibe (Bibala and Moçâmedes) and who are likely to be affected by the Project's activities;
- Have an important role as entities (public or private) providers of data and baseline information, including Non-Governmental Organisations (NGOs) and Community-Based Organisations; and
- Stakeholders that attended consultation events during the site visits, or contacted Holísticos or the RNT - E.P. directly, with questions or concerns over the course of the ESIS process.

Other criteria that have guided the selection process of people or entities to be involved were related to what is desired with the kind of expected involvement (see **Table 4-7**), namely:

1. **Inform** the affected parties and stakeholders about the vision, objectives and main advantages for implementing the Project;
2. **Gather** relevant environmental and social baseline information;
3. **Listen** to the affected parties and stakeholders in relation to their desires, expectations, criticisms, suggestions and obtain inputs that may be a lesson for the construction of the 220 kV TL Project between Lubango and Moçâmedes;
4. **Ensure active involvement and participation** of the affected parties and stakeholders in defining new strategies for the Project.

4.3. STAKEHOLDER GROUPS AND ISSUES OF CONCERN/INTEREST

Table 4-7 lists the key stakeholders based on understating of the location of the Project and the stakeholders' issues of concern and interests related to the proposed Project route as well as series of meetings and site visits to the proposed sites during the identification of appropriate land for the Project and development of the ESIS report.

Table 4-7: Identification of Key Stakeholders and Issues of Concern/Interest in Project.

Description	Key Stakeholders	Issues of concern/ interest
Stakeholder Group: National and Regional Authorities		
National government is responsible for establishing policy, granting permits or other approvals for the Project, and monitoring and enforcing compliance with Angolan Law throughout all stages of the Project life-cycle.	**National Institutions:** - Ministry of Culture, Tourism and Environment (National Directorate for Prevention and Environmental Impact Assessment and National Institute for Biodiversity and Conservation Areas). - Ministry of Energy and Water (RNT – E.P, PRODEL and ENDE). - Ministry of Transport. - National Institute of Civil Aviation (INAVIC). - Ministry of Agriculture and Fisheries. - Ministry of Economy and Planning. - Comissão Executiva de Desminagem (CED). - Comissão Nacional Intersectorial de Desminagem e Assistência Humanitária (CNIDAH). - Instituto Nacional de Desminagem (INAD).	- Issuing environmental installation license and requirements; - Energy transport, distribution and use; - Meeting the goals of the National Development Plan (2018-2022). - Responsible for demining sector.
Provincial government are responsible for the implementation of legislation, and development plans and policies at the provincial level. This includes issuing authorization for land concession and physical resettlement. The municipal administration also plays a role in the implementation of physical resettlement operations.	**Regional Authorities (Huíla)**: - Government of the Province of Huíla; - Lubango Municipal Administration; - Humpata Municipal Administration; - Provincial Office for infrastructure and Technical Services; - Provincial Office for Environment, Solid Waste Management and Community Services; - Provincial Office of Agriculture, Livestock and Fisheries; - Provincial Office of Culture, Tourism, Youth and sport; - Provincial Office of Health; - Provincial Office of Transport; - Provincial Police Command; - ENANA (Mukanka International airport direction). **Regional Authorities (Namibe)**: - Government of the Province of Namibe; - Moçâmedes Municipal Administration; - Bibala Municipal Administration; - Provincial Office for infrastructure and Technical Services;	- Social impacts of the Project implementation; - Land use planning; - Energy provision for the development of the both provinces; - Potential job opportunities for the local communities; - Inspection of environmental issues. - Monitoring of the compensation program in case of allocation of agricultural fields; - Security of the State's special Project.

Description	Key Stakeholders	Issues of concern/ interest
	- Community Services; - Provincial Office of Agriculture, Livestock and Fisheries; - Provincial Office of Culture, tourism and Environment; - Provincial Office of Health; - Provincial Office of Transport; - Provincial Police Command: - ENANA (Welwitschia Mirabilis airport direction).	
Stakeholder Group: Financial Institutions		
Financial Institutions engaged in the business of dealing with financial and monetary transactions. These institutions will be involved in financing this Project by processing salaries and providing another financing services.	**National Institutions (Public and Private):** - *Banco Internacional de Crédito (BIC);* - *Banco de Poupança e Crédito (BPC);* - *Banco Sol;* - *Banco de Comércio e Indústria (BCI);* - *Banco Millennium Atlântico;* - *Banco de Fomento de Angola* (BFA) **International Financing Institutions**	- New Projects arising from additional energy provision; - Potential socioeconomic development of the region; - Social impacts of Project implementation and operation; - Payment of wages and others services.
Stakeholder Group: Community Members		
Community members with greater influence among local and regional communities, i.e. teachers, medical staff, religious leaders, members of political parties.	- Respected community members near the TL route including teachers, nurses, doctors, politicians and religious leaders, in Lubango, Humpata, Bibala and Moçâmedes cities.	- Job opportunities; - Energy access; - Road access; - Socioeconomic development.
Community groups that have specific livelihood activities near the TL route and/or can be directly affected by Project implementation, i.e. agriculture, crafts, others.	- Aldeia Poaires; - Area of Figueira; - Area of Capalanca; - Area of Calumue; - Area of Heva; - Area of Palanca; - Area of Humpata. -	- Job opportunities; - Energy access; - Road access; - Socioeconomic development.
Stakeholder Group: Traditional Authorities		
Local community leaders acting as representatives of their local community. Sobas are traditional village leaders. Their role is to support local communities and liaise with government authorities.	- Leaders/elders (Traditional Authorities – Seculos, Regedores and Sobas); - President of the Residents' Committees; - Religious authorities.	- Job opportunities; - Energy access; - Socioeconomic development; - Noise and vibrations; - Social license for the project (endorsement by local populations); - Cultural heritage; - Road access.
Local community members that can be affected by Project implementation.	- Women; - Youth; - Small-scale farmers; - Small entrepreneurs (panel beater workshop).	

Description	Key Stakeholders	Issues of concern/ interest
Stakeholder Group: Higher Education and Vocational Training Institutions		
Organisations with direct interest in the Project as they are located in close proximity to the transmission line route alignment and are likely to benefit from energy provision in future.	- *Instituto Médio Politécnico do Lubango*; - Instituto Superior Politécnico Independente; - Instituto Superior Politécnico Tundavala; - Escola Superior Pedagógica do Namibe; - Academia de Pescas e do Mar; - Universidade Mandume Ya Ndemufayo.	- Energy access; - Noise and vibrations; - Road access; - Job opportunities; - Socioeconomic development.
Stakeholder Group: Community Organizations		
Agricultural Cooperatives Agricultural Cooperatives with direct interest in the Project implementation, and its social and environmental aspects.	- Fazenda Jamba; - Fazenda Trifruta.	- Energy access; - Socioeconomic development; - Allocation of economic activity.
Community-based organizations Organisations with direct interest in the Project, and its social and environmental aspects and that are able to influence the Project directly or through public opinion.	- Church organization. - Environmental Associations.	- Socioeconomic development; - Social license for the project (endorsement by local populations); - Cultural heritage; - Environmental issues.
Stakeholder Group: Vulnerable Groups		
Vulnerable groups may be affected by the Project by virtue of their physical disability, social or economic standing, limited education, lack of employment or access to land. Appropriate engagement practices and tools will be adopted to ensure adequate access to information and participation.	**Settlements:** - Poaires Muhaha. - Poaires Kapande. - Onculuvala. - Heva de Cima. - Kapalanga. - Jamba 2. - Nombungo. - Aída. - 11 de Novembro.	- Job opportunities and procurement process; - Energy access; - Socioeconomic development. - Noise and vibrations; - Social license for the project (endorsement by local populations); - Cultural heritage; - Road access.
Stakeholder Group: NGOs, CBOs and special interest groups		
NGOs with direct interest in the Project, and its social and environmental aspects and that are able to influence the Project directly or through public opinion. NGOs may also have useful data or insights into the local and national issues raised by the Project. International NGOs include organisations based within and outside Angola with an interest in the Project. They include international NGOs, multilateral and	**Huíla province:** - Church organisations and other relevant stakeholders (Adventista do 7º Dia, Igreja Católica, IECA, IURD, IESA, Assembleia de Deus Pentecostal, Igreja do Bom Deus); - NGO DW - NGO OXFAM - Human right and anti-corruption organizations; - Member from Political parties;	- Human resources procurement; - Physical resettlement; - Contract awarding and use of public funds; - Inspection of environmental issues. - Monitoring of the compensation program in case of allocation of agricultural fields; - Cultural heritage;

Description	Key Stakeholders	Issues of concern/ interest
bilateral organisations. Opposition political parties.	- Members of Lubango and Humpata Municipal Auscultation Council. **Namibe province:** - Church organisations and other relevant stakeholders (Adventista do 7º Dia, Igreja Católica, IECA, IURD, IESA, Assembleia de Deus Pentecostal, Igreja do Bom Deus); - NGO COSPE. - NGO ADECO. - NGO INADECO and Caritas; - Human right and anti-corruption organizations; - Political parties; - Members of Moçâmedes and Bibala Municipal Auscultation Council.	- Road access; - Social license for the project (endorsement by local populations).
Stakeholder Group: TEPSCO and RNT Contractor and Sub-contractor Workforces and Services Providers		
Companies, organisations, businesses and individuals with direct interest in the Project e.g. running businesses or providing services and supplies to the Project.	- TEPSCO Contractor workers; - Sub-contractor workers; and - Trade union representatives. - Local service providers (e.g. restaurants, local shops, transportation providers).	- Job opportunities; - Business; opportunities; - Provision of services; - Energy access; - Socioeconomic development.
Stakeholder Group: Media		
Public and Private Social Media Institutions that can keep up with all Project phases, particularly during installation and construction activities.	- Televisão Pública de Angola (TPA) (National TV); - Jornal de Angola (Daily national newspaper); - TV Zimbo (TV Station); - O País (Daily newspaper); - Radio Namibe; - Radio Lubango.	- Job opportunities; - Energy access; - Socioeconomic development; - Human resources procurement; - Contract awarding and use of public funds.

4.4. STAKEHOLDER ANALYSIS AND MAPPING

The identification of stakeholder groups for this Project was made through publicly available information, local knowledge from Holísticos' social team and data collected during the field visits to the Project area as illustrated in **Table 4-8**. The interest groups have been "mapped" according to their influence, interest and probable position in relation to the Project. This assignment is based on knowledge of the social, cultural, political, environmental, and factors associated with the development of the Project areas between Huíla and Namibe provinces. Once the interest groups were

identified, their position, interest and influence regarding RNT - E.P were evaluated. The position has been defined as the degree of acceptance by the interest group towards the Project. The criteria are presented in the tables below.

Table 4-8: Assessment of Position Criteria.

Assessment	Position
In favour	The interest group's position in relation to the Project is favourable; given that it perceives that, it has or will have a positive performance in relation to its topics of interest.
Neutral	The stakeholder's position in relation to the Project is neutral, indefinite. You may have the expectation that he/she will have a position to minimize the existing impacts. However, he/she needs more information, since it is not clear to him/her how the Project will be developed in the future.
Against	The position of the group of interest in relation to the Project is unfavourable, since it identifies more negative aspects than positive ones in the current or future development of the Project.

The interest has been defined as the stakeholder's interest degree that he/she has on the issues associated with TEPSCO and RNT - E.P. The evaluation criteria are presented in **Table 4-9** below.

Table 4-9: Interest Evaluation Criteria.

Assessment	Position
Low	The interested party does not know or recognizes few links between the Project and their own interests, and shows little interest in knowing more about it.
Average	The interested party recognizes some relations between the Project and its interests.
High	The interested party recognizes a set of common interests with the Project and shows a strong interest to know more information about it.

Finally, the influence has been defined as the degree of articulation with other actors and the capacity to generate mobilization as seen on the **Table 4-10** below.

Table 4-10: Influence Evaluation Criteria.

Assessment	Position
Low	The interested party has little capacity for mobilization and/or few networks and relationships with local actors.

Assessment	Position
Average	The interested party has the ability to articulate and mobilize media, exerts influence in social networks with important connections with local actors such as inhabitants, workers, tourists, politicians, among others.
High	The interested party has a high capacity for articulation and mobilization with significant local networks and actors such as inhabitants, workers, tourists, politicians, among others.

The analysis of the stakeholders is essential, since it provides the basis for designing the relationship strategies with each interest group in order to achieve the greatest possible participation and social acceptance. To the extent that as the participation and acceptance grows, social impacts and risks may be minimized in a greater proportion. Likewise, the mapping helps to define which interest groups that TEPSCO and RNT E.P. should contact and how to manage the risks. This section of the SEP focuses on the stakeholder mapping identified for the early stages of the Project. This exercise was done following the methodology described previously. In the **Table 4-11** below, the interest groups' position, interest and influence have been identified and analysed.

Table 4-11: Key Stakeholders Analysis according Position, Interest and Influence.

Key Stakeholders	Potential Position (Against, Neutral, In favour)	Interest (Low, Average, High)	Influence (Low, Average, High)
Stakeholder Group: National and Regional Authorities			
- Ministry of Culture, Tourism and Environment; - DNPAIA - National Directorate for Prevention and Environmental Impact Assessment; - INBAC - National Institute for Biodiversity and Conservation Areas.	Neutral	Average	High
- Ministry of Energy and Water (MINEA); - PRODEL – E.P. (Electricity Production Company); - RNT – E.P. (Electricity Transmission Company); - ENDE – E.P (Electricity Distribution Company).	In favour	High	High
- Ministry of transport; - INAVIC (National Institute of Civil Aviation); - Ministry of Economy and Planning; - Ministry of Agriculture and Fisheries.	In favour	Average	Average
- Demining sector: • Comissão Executiva de Desminagem (CED); • Comissão Nacional Intersectorial de Desminagem e Assistência Humanitária (CNIDAH); • Instituto Nacional de Desminagem (INAD).	In favour	Average	High
Regional authorities (Huíla and Namibe) High level: - Government of the Province of Huíla;	In favour	High	High

Key Stakeholders	Potential Position (Against, Neutral, In favour)	Interest (Low, Average, High)	Influence (Low, Average, High)
- Government of the Province of Namibe; - Lubango Municipal Administration; - Humpata Municipal Administration; - Bibala Municipal Administration; - Moçâmedes Municipal Administration.			
Regional authorities (Huíla and Namibe provinces): - Provincial Office for infrastructure and Technical Services; - Provincial Office for Environment, Solid Waste Management and Community Services; - Provincial Office of Agriculture, Livestock and Fisheries; - Provincial Office of Culture, Tourism and Youth; - Provincial Office of Health; - Strategic Objectives Security Police Command).	In favour	High	Average
Stakeholder Group: Financial Institutions			
National Financing Institutions (Public and Private): - Commercial Banks (BIC, BPC, BCI, BFA, Banco Millennium Atlântico, Banco Sol, etc.).	In favour	Average	Low
International Financing Institutions.	In favour	Average	High
Stakeholder Group: Community Members			
- Respected community members including teachers, nurses, doctors, politicians and religious leaders in Lubango, Humpata, Bibala and Moçâmedes cities.	In favour	Average	Average
- *Poaires Village;* - *Area of Figueira;* - *Area of Capalanca;* - *Area of Calumue;* - *Area of Heva;* - *Area of Palanca;* - *Area of Humpata.*	In favour	High	Low
Stakeholder Group: Higher Education and Vocational Training Institutions			
- Instituto Médio Politécnico do Lubango. - Instituto Superior Politécnico Independente. - Instituto Superior Politécnico Tundavala. - Escola Superior Pedagógica do Namibe. - Universidade Mandume Ya Ndemufayo. - Academia de Pescas e do Mar.	In favour	High	Average
Stakeholder Group: Traditional Authorities			
- Leaders/elders (Traditional Authorities – Seculos, Regedores and Sobas); - President of the Residents' Committees; - Religious authorities.	In favour	High	Average
- Women; - Youth; - Small-scale farmers;	In favour	Average	Average

Key Stakeholders	Potential Position (Against, Neutral, In favour)	Interest (Low, Average, High)	Influence (Low, Average, High)
- Small entrepreneurs (panel beater workshop).			
Stakeholder Group: Community Organizations			
Settlements: - Poaires Muhaha. - Poaires Kapande. - Onculuvala. - Heva de Cima. - Kapalanga. - Jamba 2. - Nombungo. - Aída. - 11 de Novembro.	In Favour	High	Low
Stakeholder Group: Vulnerable Groups			
- Poaires Muhaha. - Poaires Kapande. - Onculuvala.	In favour	High	Low
Stakeholder Group: NGOs, CBOs and special interest groups			
There are special interest groups in the Project's area of influence: **Huíla province:** - Church organisations and other relevant stakeholders (Adventista do 7º Dia, Igreja Católica, IECA, IURD, IESA, Assembleia de Deus Pentecostal, Igreja do Bom Deus); - NGO DW - NGO OXFAM - Human right and anti-corruption organizations; - Member from Political parties; - Members of Lubango and Humpata Municipal Auscultation Council. **Namibe province:** - Church organisations and other relevant stakeholders (Adventista do 7º Dia, Igreja Católica, IECA, IURD, IESA, Assembleia de Deus Pentecostal) - NGO COSPE. - NGO ADECO. - NGO INADECO and CARITAS. - Human right and anti-corruption organizations; - Political parties; - Members of Moçâmedes and Bibala Municipal Auscultation Council.	Neutral	High	Average
- Political parties	Neutral	High	Average

Key Stakeholders	Potential Position (Against, Neutral, In favour)	Interest (Low, Average, High)	Influence (Low, Average, High)
Political parties from opposition, at provincial level, are known to monitor Projects related to infrastructure development.			
Stakeholder Group: TEPSCO and RNT Contractor and Sub-contractor Workforces and Services Providers			
- TPSCO and RNT E.P. Contractor workers - Sub-contractor workers - Trade union representatives - Local service providers (e.g. restaurants, local shops, transportation providers)	In favour	Average	Average
Stakeholder Group: Media			
- Televisão Pública de Angola (TPA) (National TV); - Jornal de Angola (Daily national newspaper); - TV Zimbo (TV Station); - O País (Daily newspaper); - News agencies and websites; - Radio Lubango and Radio Namibe; - News agencies and websites.	Neutral	High	Average

The following **Figure 4-2** shows the identified actors of the different categories of interest groups and their probable position and influence on the Project according to the qualitative analysis. The categories of interest groups were assigned in an X-Y axis according to their probable interest (X axis) and the influence (Y axis) with respect to the Project. A qualitative mapping criteria scale was applied in order to position the stakeholders on the X-Y axis. The level of influence of each interest group was determined as High, Average or Low. The probable position was determined as in favour (green), against (red) or neutral (orange).

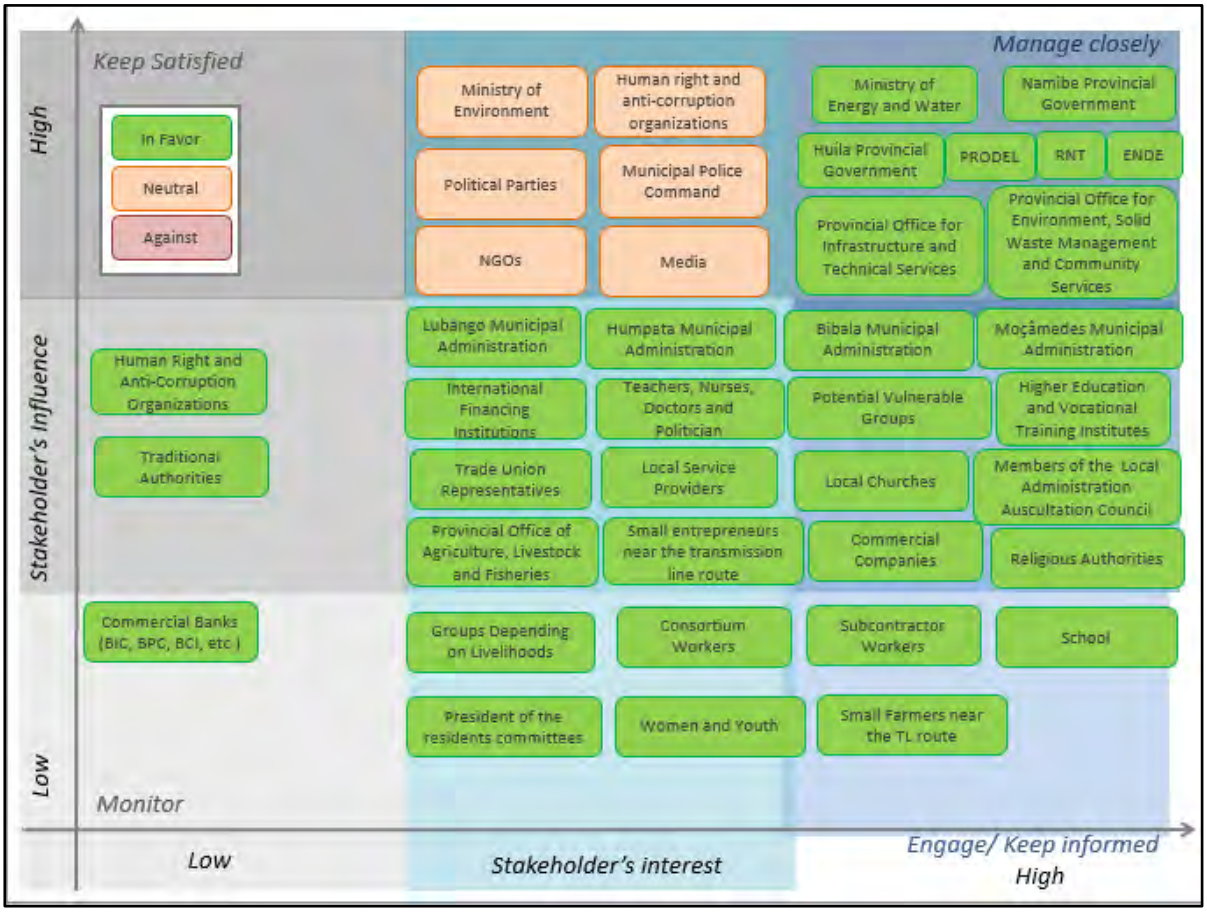

Figure 4-2: Mapping of the Interest Groups for Huíla and Namibe Provinces.

5. STAKEHOLDER ENGAGEMENT ACTIVITIES

An overview of the planned stakeholder engagement activities with breakdown by stakeholder group is provided in **Table 6-2**. This table will be updated periodically until the completion of the construction phases, as necessary.

For the engagement process to be effective and meaningful, a range of approaches tailored to the identified stakeholders will be applied. For IAP, the format of each engagement activity will meet general requirements on accessibility. The engagement events will be held at venues that can be easily accessed by community members, do not incur financial costs, and are culturally appropriate. The overall planning of engagement activities will also be based on the principle of inclusiveness, by ensuring mechanisms for engaging specific social categories (for example, women and men, young people and the elderly/retired), and vulnerable people. If necessary, assistance may be provided to enable vulnerable people to attend meetings. Engagement will be based on the following key principles of good practice:

- Timeliness to consider key issues and provide input to TEPSCO and RNT – E.P. decisions;
- Dissemination of information in readily understandable formats and using culturally appropriate techniques, at the beginning of engagement events/meetings, to ensure that stakeholders are informed correctly;
- Gender-inclusivity (for meetings/events, where it is feasible to do so, setting a target of 50% participation by both men and women respectively at each event);
- Free from manipulation and coercion; and
- Documentation to keep track of who has been consulted and the key issues raised with feedback to stakeholders.

During pre-construction and construction work, national and local authorities and the project interested and affected people might need to be updated as part of the stakeholder engagement activities. The Stakeholder Engagement Plan for the Engineering, Pre-Construction and Construction phases is shown in **Table 5-1**. The key primary methods of stakeholder engagement include:

- Meetings, with a focus on engagement with government officials at municipal and communal level; and

- Community liaison committee, with a focus on engagement at the community level. Depending on the project location local authorities might been represented by the local chief (*soba*, *seculos* and *regedores*), by a community representative (neighbourhood coordinator) or any other form of community representation.

Table 5-1: Stakeholder Engagement Programme.

Activity	Stakeholder	Purpose
Engineering and Pre-construction Phases		
EPDA and ESIS Report disclosure to national and local authorities.	Key ministries, national regulatory bodies, government agencies and institutes, provincial, municipal and communal authorities.	Present EPDA and ESIS results. Consult stakeholders on their views on the key impacts and mitigation measures.
EPDA and ESIS Report disclosure to the Interested and Affected People (develop a flyer with Project information and grievance mechanism)	Interested and Affected People.	Provide information on the Project to the whole community. Consult stakeholders on their views on key impacts and mitigation measures. Disseminate the grievance mechanism.
Information on demining activities, schedule and route alignment.	Interested and Affected People and Provincial/Municipal Authorities.	Inform stakeholder on the demining process, the associated risks and the mitigation measures planned by the project to manage safety risk.
Establishment and management of the Grievance Mechanism.	Interested and Affected People and Municipal Authorities.	Record and manage grievances during pre-construction including potential economic claims.
Construction Phase		
Work site establishment.	Sobas and community members and Municipal Authorities.	Inform affected communities of the future presence of the work sites, the timeline of planned works, the health and safety risks associated with those works and the mitigation measures planned to control those risks.
Ongoing information on construction progress.	Sobas and community members and Municipal Authorities.	Inform stakeholders of construction work progress and schedule. Give feedback on grievances received and associated resolution.
Grievance management.	Sobas and community members and Municipal Authorities.	Record and manage grievances during construction including potential economic claims.
Work site dismantlement.	Sobas and community members and Municipal Authorities.	Inform local communities of the end of works and work site remediation measures. Inform local staff of retrenchment conditions.

6. STAKEHOLDER COMMUNICATION AND DISCLOSURE OF INFORMATION

Apart from the stakeholder engagement activities that have previously taken place and have been described in the previous sections, an ongoing community participation, disclosure of information and engagement plan will be carried out. Recognizing that each stakeholder has different interests and concerns, TEPSCO and RNT - E.P. plans to collaborate with each group in the most appropriate manner. The table below establishes a framework for the groups and interested persons' participation, including the methods of participation, the information to be shared, responsibilities and the phase of the Project in which these activities should be carried out. An overview of the planned stakeholder engagement activities with a breakdown by stakeholder group is presented in **Table 6-2**. This table will be updated periodically throughout the Project's life-cycle, as necessary.

Taking into account the approach to stakeholder engagement described here, as well as the level of impact on, and influence of stakeholders, a number of consultation techniques have been selected to engage with stakeholder groups. These consultation techniques and their applications are described briefly in **Table 6-1** below.

Table 6-1: Stakeholder engagement methods.

Method	Description / Application
Phone and e-mail	Letter, phone and email are convenient communication methods for quick queries and discussions particularly with the municipal and communal administrations; stakeholders should always be provided with contact points using these methods through the distribution of flyers/posters. However, to the Project will not only rely on these methods for consultation, as many stakeholders may not have easy access to such facilities. A phone number for the grievances will be made available (+244 222 704 400/923 595 093), as well as an e-mail address (apinto@rnt.co.ao).
Website postings	Consultation via a link to established in the TEPSCO and RNT - E.P. websites (https: www.tepsco.co.jp or http://www.rnt.co.ao) is a passive form of communication and is therefore likely to attract only those who already have a keen interest, e.g. job seekers, activists, the aggrieved. It mainly serves to supplement other consultation methods particularly for interested parties in the provincial government of Huíla and Namibe, and central government in Luanda at the Ministry of Energy and Water (MINEA) website (http://www.minea.gv.ao/).
Community Information sharing meetings	Community information sharing meetings facilitate the dissemination of information about the Project and the ESIS process to the stakeholders, particularly to people less likely to read documents, and provide a forum for all stakeholders to discuss ideas, raise concerns and ask questions, without having to submit written comments and questions. The format of the meetings will depend on the stakeholders involved as well as on the regular sessions of the provincial, municipal and communal Social Auscultation Forum (when available).

Method	Description / Application
Targeted stakeholder meetings	Targeted stakeholder meetings are used to share information and facilitate focused discussions and specific dissemination of information. It also provides a forum for selected stakeholders to discuss ideas, raise concerns and ask questions, without having to submit written comment and questions. The format of the meetings (focus group meetings or one-on-one meetings) will depend on the stakeholders involved.
Advertisements, advertorials and press releases	Newspaper and flyers/poster advertisements can be effectively used to inform the broader community about the Project and ESIS process. Adverts are brief and are not intended to communicate detailed information about the Project, but rather to create awareness or provide essential information about the Project and the opportunities for involvement. These can also be used to publish the dates and venues of the public consultation event.
Dissemination of information documents	The distribution of information and/or report summaries is an important mean of providing all stakeholders with summarized information regarding the Project. These documents provide comprehensive but accessible information based on which stakeholders take appropriate action and/or comments.
Flyers/Posters	Flyers and posters are an effective and informal means of providing information to targeted stakeholders, typically those in close proximity to the Project. Normally the municipal and communal administrations are used sites were flyers and posters are provided. These documents should include the grievance mechanism and grievance forms will also be made available in the RNT - E.P and EPC worker's camp in Lubango and Moçâmedes.

Table 6-2: Stakeholder Engagement Methods and Information Disclosure.

Stakeholder Group	Stakeholder Engagement and Methods	Information Disclosure	Project Phase	Priority	Location	Person in Charge
National Authorities	Regular meetings with officers of the national government authorities listed in **Table 4-7**. The key objectives of the meetings will be: • Collaboration with governmental bodies to effectively manage environmental and social impacts of 220 kV TL Project; • Obtaining the required licenses/permits and/or design requirements (e.g. regarding water and energy supply and construction materials); • Update on Project progress; and • Opportunity to discuss issues of concern.	• Presentation by a TEPSCO or RNT E.P. representative at beginning of meetings with time for clarifications; and • Auditing/Monitoring reports as and when required and/or requested by National Government stakeholders.	Before Project implementation and as necessary, in compliance with law and local customs.	Medium	At the relevant ministries.	Project Manager with the support from the Community Liaison Officer.
Regional Authorities	Ad-hoc meetings with officers/elected members of the Provinces and Municipalities affected by the Project. The key objectives of the meetings will be: • Update on Project progress; and • Opportunity to discuss issues of concern.	• Presentation by TEPSCO or RNT E.P. representative at beginning of meetings with time for clarifications.	Before Project implementation and as necessary in compliance with law and local customs.	Medium	At the relevant local authority offices.	Project Manager with the support from the Community Liaison Officer.
Interested and Affected People (IAP): o Community Members; o Traditional Authorities;	Leaders/key members of the IAP (as detailed in **Table 4-7**) will be asked to attend meetings of the Community Liaison Committee and to select a small group of literate settlement/community representatives with a maximum number of six representatives such as an elder, a medical professional and/or a teacher, a student/youth (age 16 – 18 years), and an entrepreneur/ business	• Presentation by a TEPSCO or RNT E.P. representative at beginning of meetings with time for clarifications; • Community Grievance Mechanism;	Before Project implementation and every 6 months.	High	Lubango, Humpata, Bibala and Moçâmedes cities. Venue to be determined.	Community Liaison Officer.

Stakeholder Group	Stakeholder Engagement and Methods	Information Disclosure	Project Phase	Priority	Location	Person in Charge
o Agricultural Cooperatives; o Community-based organizations o Vulnerable groups; o NGOs, CBOs and special interest groups.	person. At least three of the group members must be female. Certain leaders will be asked to include a 'vulnerable' person in the group. Vulnerable people (e.g. the disabled, chronically sick, female-headed households or households dependent on the elderly, and the very poor) to be asked to join the group will be identified prior to the beginning of stakeholder engagement work. The key objectives of the Community Liaison Committee events will be: • Update on Project progress; • Opportunity to discuss issues of concern; • Opportunity to solicit feedback and submit complaints.	• The presentation will consist primarily of visuals (e.g. photos, maps). Any text on the slides and/or posters will be in Portuguese.			At least one event in each IAP.	
JICA (Financial Agency)	The key objectives of these events will be to: • Update on Project progress; • Provide information on grievances raised and closed.	• Regular reports; • E-mail communication.	Monthly.	High	Written communication and on Project site.	Project Manager with the support from the Community Liaison Officer.

Stakeholder Group	Stakeholder Engagement and Methods	Information Disclosure	Project Phase	Priority	Location	Person in Charge
TEPSCO and RNT - E.P. Contractor and Sub-contractor Workforces and Services Providers.	Staff members will be kept informed regularly and engaged to promote clarity in understanding of the Project and to prevent unrealistic expectations being raised in local communities. Special focus will be given to staff working on the Project and in contact with local communities. Occupational Health and Safety (OHS) and environmental training. Information on Worker Complaints Management System.	• Internal briefing notes and information boards to be issued by TEPSCO or RNT E.P. • Training to be provided by EPC. • 'Question and Answer' sheet to be prepared by RNT - E.P. and EPC for staff in contact with local communities, to help ensure that consistent answers are provided to questions raised by local community members.	Periodic.	Medium.	Construction camp and work site.	Community Liaison Officer.
Media	National and local media will be kept informed by press releases and/or press conferences as to Project developments.	• Press releases and/or press conferences to be issued periodically by RNT - E.P. • Interviews.	Periodic.	Low.	Project site and media studios.	Project Manager.

Note: The timeframe are indicative times and they may alter as the construction progresses.

7. GRIEVANCE MECHANISM

Grievance Mechanisms are important for projects where on-going risks or adverse impacts are anticipated. They serve to prevent and address individual and community grievances, reduce risk, manage expectations and assist larger processes that create positive social change. Grievances may take the form of specific complaints about impacts, damage or harm considered to have been caused by the Project, and about access to the Project stakeholder engagement process. This Grievance Mechanism (GM) has been developed with the following aims:

- **Ensure communities face no barriers to accessing and using the mechanism**: The mechanism will be well known and understood by the community and the user will not incur significant costs, effort, or any fear of reprisal, as these factors could have the result of deterring use of the mechanism. Use of the GM will not impede access to any other existing legal recourse available to the community. The mechanism must also take into account potential cultural, linguistic, physical, and literacy barriers, and seek to eliminate these in its design.
- **Establish the mechanism early on**: The mechanism shall be developed early on before issues have developed, with the aim to facilitate good community relations rather than addressing issues in a reactive, ad hoc manner.
- **Base the mechanism on a transparent, predictable process and ensure it is well publicized and understood**: The community shall be well informed about the basic steps that will be followed after they submit a grievance, along with the timeframe for each step and for the overall resolution of the complaint. There shall be consistency and predictability in the process and clarity on roles and responsibilities. As part of this process, the Project shall require contractors to be responsible and willing to coordinate with RNT – E.P. and EPC regarding any grievances presented against the companies and/or theirs employees. Monitoring and evaluation activities, including feedback from complainants on process and outcomes, will be used to identify areas for improvement in the mechanism.
- **Build trust in the legitimacy and fairness of the mechanism**: To build the trust of communities, there must be assurance that the grievance mechanism is not biased in favour of the Project but rather achieves an equitable balance of the Project's and community's interests. Where significant imbalances exist in knowledge and power, engaging third parties can help raise confidence about the impartiality of the procedure.

- **Create an organizational structure and mind-set that support the mechanism**. Allocating adequate capacity and resources to support the principles and objectives of the mechanism are an important design consideration. It will be important to ensure that these principles and objectives are well understood internally to ensure that the Project personnel have confidence in the mechanism and do not fear any repercussions of passing on reports of complaints.

For internal stakeholders (primarily onsite workers), a separate workers' Complaints Management System will be established by the EPC under supervision of RNT – E.P. This Complaints Management System will be operated by RNT – E.P Human Resources Department and by a local human resources EPC. This workers' Complaints Management System will also apply to EPC and subcontractors who will be expected to adopt it or to demonstrate that their existing workers' Grievance Mechanism/Complaints Management System is substantively similar to that operated by RNT – E.P. EPC will be expected to report regularly to RNT – E.P on the operation of their workers' Grievance Mechanisms/Complaints Management System. Once EPC and subcontractors are selected this process will be revisited so as to align with the different company procedures. If required, bridging documents will be developed. For the purposes of this SEP, external communications from stakeholders are considered to involve the following:

- **Grievances** (an issue, concern, problem, or claim (perceived or actual) that an individual or community group wants a company or contractor to address and resolve);
- **Requests** (such as information and job requests) and **Petition** (such as donation petitions).

7.1. STRUCTURE AND KEY PRINCIPLES

The Grievance Mechanism is based on the following principles and attendant TEPSCO and RNT - E.P. commitments:

Accessibility: Ensuring that the Grievance Mechanism is accessible to those who may wish to submit grievance. It includes the ability to submit a grievance verbally;

Disclosure: Publicising and explaining the Grievance Mechanism to all external stakeholders. This disclosure will be implemented in a format and language readily understandable to the local population and/or communicated orally in areas where literacy levels are low. In addition to informing

stakeholders about the Grievance Mechanism, TEPSCO, RNT - E.P and EPC will report back periodically to stakeholders on how it has been responding to the grievance it has received;

Anonymous: Complaints can be submitted anonymously, and the Project will publish the resolutions on a bulletin board near the grievance boxes at the Lubango, Humpata, Bibala and Moçâmedes Municipal Administration, including in Arimba Communal Administration.

Transparency: Clarifying at the outset who is expected to use the Grievance Mechanism and assuring stakeholders that there will be neither costs nor retribution associated with lodging a grievance. Stakeholders will be informed that grievance can be submitted anonymously and that they can request that their identity be kept confidential. The entire process – from how a grievance is received and reviewed, through to how decisions are made and, in the case of a grievance, the possibilities that exist for appeal – will be made as transparent as possible through good communications;

Efficiency: Publicly communicating and committing to a timeframe within which all recorded grievance will generate a response and ensure that all response times are met. This will help to allay frustration by informing people when they can expect to be contacted and/or receive a response to their grievances. During critical time periods, such as during the Project construction phase, it is important to have an early (if not immediate) response to time-sensitive grievances;

Fairness: Ensuring that an appeal procedure for complainants who reject TEPSCO, RNT - E.P and EPC intended action to redress a grievance is in place. The companies will establish a Grievance Review Committee (GRC) to hear appeals.

Written records: Maintaining written records of all grievances received (comments and concerns will be recorded and tracked under a wider stakeholder engagement database) as this is critical for effective grievance management. Each record will contain:

- The name of the individual or organization;
- The date and nature of the grievance;
- The date set for the resolution of the grievance;
- A description of subsequent TEPSCO, RNT E.P, EPC and/or Subcontractor actions taken;

- How and when this decision was communicated to the complainant;
- The complainant's response to the action;
- Date of acceptance by the complainant of the action to resolve the complaint;
- Date and timeframe for an appeal lodged by a complainant against RNT and EPC action;
- Date of acceptance or rejection by the complainant of the appeal decision.

The Grievance Review Committee (GRC) will be established at the municipalities affected by the Project. Their roles will be to act to resolve grievances that have not been closed out by the EPC actions with supervision from RNT – E.P. The permanent members of the GRC will include the Municipal Administrator or his/her representative (to be chairperson), an officer responsible for land issues, an officer responsible for Social Affairs and representatives from RNT – E.P and contractor. Co-opted members will include a settlement chairperson and one elder (both from the settlement/community to which a complainant belongs). The complainant will have the right to bring one other person to support him/her present his/her case to the GRC. Decisions will be reached by consensus. If a consensus cannot be reached a decision will be made by majority voting (excluding the chairperson). In the event of a tie then the chairperson's casting vote is final.

Based on the principles described above, the Grievance Mechanism involves seven (7) stages which are presented and described below and shown in **Figure 7-1**.

7.2. PROCEDURE

TEPSCO and RNT - E.P. will determine how grievances can be submitted. These will be communicated to the EPC and are expected to include:

- Locating grievance boxes in the Project workers camp or in the Lubango, Humpata, Bibala or Moçâmedes Municipal Administration and in the Arimba Communal Administration (if authorized). Complainants can submit a written grievance (anonymous or not);
- Via designated RNT - E.P. Contractor's employees, such as the Community Liaison Officer (CLO) contracted for the present Project and located at the Project workers camp, who is regularly in contact with local stakeholders (presented orally, for example during stakeholder engagement events, or in writing);

- Via email (apinto@rnt.co.ao) or via a dedicated website (https: www.tepsco.co.jp or http://www.rnt.co.ao);
- By telephone and SMS to a dedicated telephone number (+244 222 704 400/ 923 595 093).

In its disclosure of the Grievance Mechanism, TEPSCO, RNT - E.P. and EPC will explain the means to be used to submit a grievance and take immediate action to ensure that these means are in place and working. On Appendix 1 are presented evidence of the GM form applicate to the proposed Project. EPC will be expected to take action in relation to their respective grievances.

Step 1: Grievance Identification

The CLO is responsible for managing individual grievances. When a grievance is recorded (either verbally or in written form), it is recorded in the Grievance Form (**APPENDIX 1**) by the complainant and the CLO. Both parties then 'sign off' the Grievance Form. If a grievance does not relate to the Project, the CLO will contact the complainant and provide the details of the appropriate person or organisation to address the grievance raised. In case the grievance received is anonymous the CLO will record in the Grievance Form based on the information received. This process will take a maximum of one (1) working day.

Step 2: Registration and Categorisation

All grievances received verbally or in writing (anonymous or not) will be recorded by the CLO in the Stakeholder Grievance Procedure Database (**Appendix 2**) by means of the Grievance Tracking and Close-Out Form (**Appendix 3**). The CLO will assess the significance of the grievance and allocate it to one of the following risk categories:

- **Critical Priority:** potential for significant breach of TEPSCO and RNT - E.P policies and/or negative media attention or a local, isolated or 'one-off' grievance that may affect the interests of a community to the extent that livelihoods of a significant number of its inhabitants are jeopardised in the near term;
- **Medium Priority:** widespread and/or ongoing repeated grievance, for example, noise during construction or a local, isolated or 'one-off' grievance that may affect the interests of an individual, or household to the extent that livelihoods are jeopardised in the near term; and
- **Low Priority:** a local, isolated or 'one-off' grievance with no significant reputational or livelihood implications.

If unable to deal with a grievance directly, the CLO will assign it to an appropriate TEPSCO and RNT E.P employees or team for resolution. The CLO remains responsible for tracking the grievance and ensuring that it is addressed. This process will take a maximum of one (1) working day.

Step 3: Acknowledgement

Upon submission of a grievance, regardless of the method used, complainants will be sent a letter of acknowledgement within 48 hours informing them that their grievance has been received and logged. Oral acknowledgement will be provided, where appropriate, and information will be provided on the course of action to be followed, an indicative timeframe for resolution, and contact details of the person within TEPSCO or RNT E.P. assigned to deal with the grievance. In case the grievance received is anonymous the Project will publish the comment or resolution on a bulletin board next to the grievance boxes in the Project workers' camp.

Step 4: Investigation and Consultation

Following assignment of a grievance to an appropriate TEPSCO and RNT - E.P. employee or team, an investigation will be conducted into the grievance, during which field investigation as well as consultation with the complainant and RNT - E.P representatives may be carried out. The assigned individual or team will work in collaboration with the CLO to identify action(s) to resolve the grievance as appropriate. This process will take a maximum of five (5) working days. However, if the risk of the grievance is considered to be critical priority, the investigation and resolution will have high priority and needs to be resolved as soon as possible as someone's health and safety might be in danger.

Step 5: Communication of Resolution and Request for Feedback

The CLO will communicate the outcome of the investigation to the complainant and request feedback on the proposed action to close out the grievance. All grievances must be responded to within five (5) working days of being received, even if the response is just a summary of what is planned and when it is likely to be implemented, or an explanatory note clarifying why action is not required. The response must be in writing, though a verbal response will also be provided where appropriate. If a grievance was submitted anonymously (for example, through a grievance box), the CLO will make public the results of the investigation and the proposed course of action. In these cases, the results should be posted on a bulletin board in one of Municipal Administration near the complainant house (Lubango, Humpata, Bibala or Moçâmedes). All actions will be logged in the grievance database.

A proposed action to resolve a grievance must be conveyed to the complainant within 30 calendar days of receipt of the grievance. Complainants will be asked to give their response to the proposed action.

Step 6: Appeal

If a resolution cannot be achieved, the complainant can appeal to the Grievance Review Committee (GRC). The review process should not take more than three (3) working days to respond to the appeal.

Step 7: Grievance Resolution and Close-Out

When specific actions are agreed upon by TEPSCO and RNT - E.P. and the complainant, the CLO will be responsible for ensuring that these corrective actions are implemented and effective at resolving the grievance. If no further action is required, then the CLO and an assigned TEPSCO and RNT - E.P. senior employee and the complainant will close the grievance and record this action in the grievance database. TEPSCO, RNT - E.P. and the complainant will both sign a closure form.

If the complainant rejects a decision of the Grievance Committee, then recourse to judicial or administrative procedures remains open to the complainant (legal or administrative resolution of the grievance). During this process is important to populate a register log of complaints/grievances received during the construction phase. **Appendix 4** shows an example of a grievance register log.

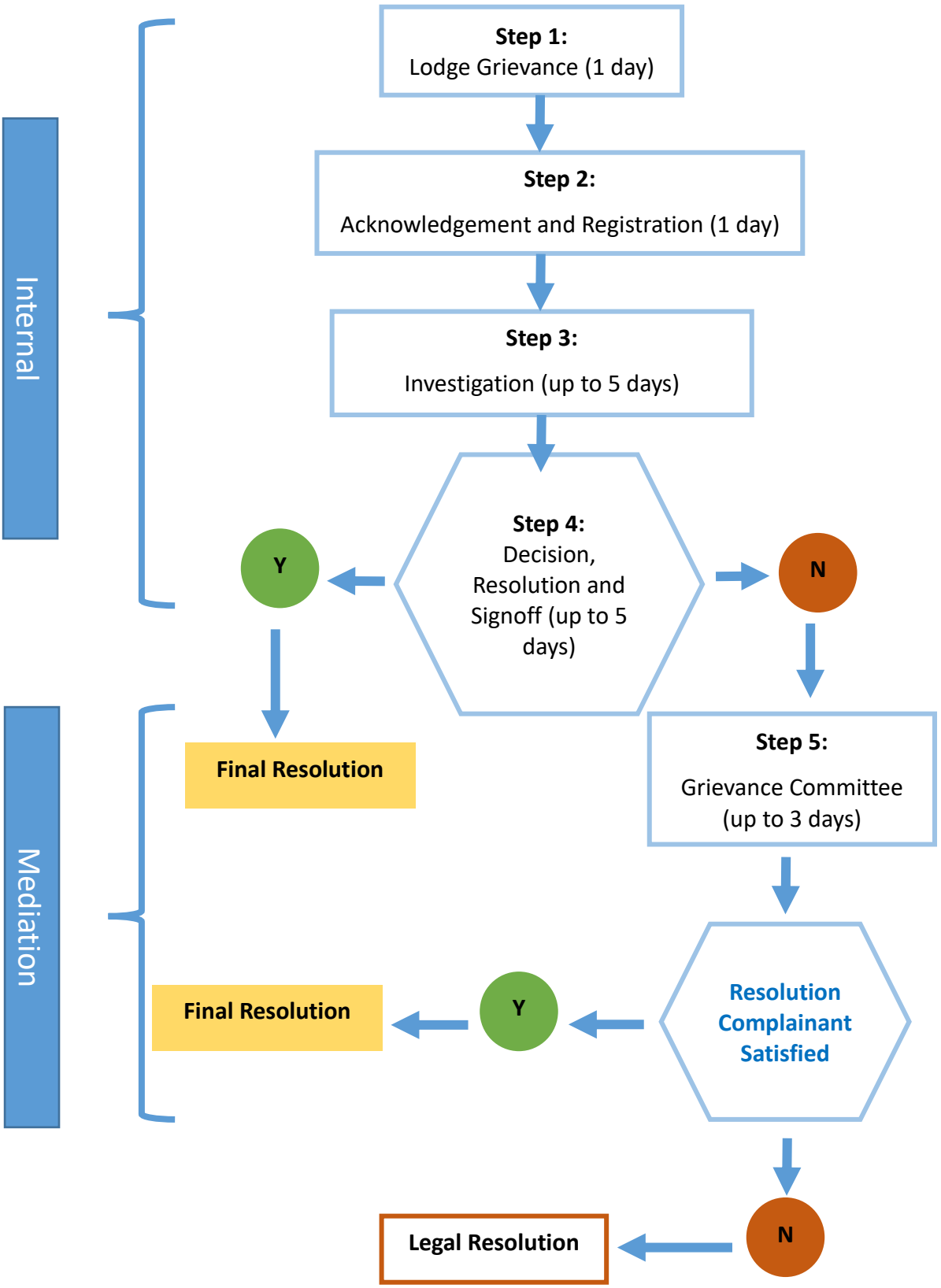

Figure 7-1: Grievance Mechanism Procedure.

8. RESOURCES AND RESPONSIBILITIES

The overall oversight responsibility for implementing this SEP lies with RNT - E.P. at the central level and TEPSCO. This responsibility will be shared with the EPC who will be implementing the Project at local level. A key task is to ensure adequate recording of stakeholder comments and existence of a clear auditable 'trail' showing the comments, their source and how they were considered throughout the construction phase. RNT - E.P. will appoint a representative to have overall responsibility for the operational management of the SEP implementation, including the Grievance Mechanism. Each Contractor will also appoint their representatives. These representatives will ensure that the activities outlined in **Table 6-2** are implemented effectively and on schedule. They will allocate enough working days to the task of implementing the SEP and will be able to call upon support staff as necessary.

TEPSCO and RNT – E.P. will appoint a Community Liaison Officer (CLO) who will have day-to-day responsibility for managing the Grievance Mechanism procedure and enough time will be made available to enable this person to manage the Grievance Mechanism procedure effectively. The CLO will work under the supervision of the Safety, Health Environment and Quality (SHEQ) Coordinator. The CLO will be responsible for aspects related to land development, cultural heritage and social/community liaison. Key stakeholder engagement tasks to be undertaken by RNT – E.P. and EPC personnel are (not in order of importance):

- Assisting in reviewing information disclosure materials and timely issuance of approvals for their disclosure;
- Sending formal written invitations to stakeholder events;
- Identifying and organising meeting/event venues with appropriate technical and welfare facilities and providing refreshments (as considered necessary);
- Arranging and managing transport for selected stakeholders (limited to IAP) so that they can attend meetings/events;
- Provision of responses to comments from members of the public, government authorities, and the media;
- Grievance mechanism administration;
- Managing information for disclosure (with periodic updates) on the Project website;

- Weekly collation and analysis of all stakeholder comments/concerns received via email or via Project website (as per the comment/concern management procedure outlined in **Section 7.1**) and reporting to senior management;
- Weekly collation and analysis of grievances received (as per the Grievance Mechanism presented in **Section 7.2**) and reporting to senior management; and
- Monthly reporting on SEP implementation progress to senior management.

An important function of TEPSCO and RNT - E.P. personnel will be to ensure that all stakeholder engagement activities are reported, evaluated and monitored. All comments from consultation events will be recorded in both a consistent and transparent fashion. Meeting/event minutes will be incorporated into the stakeholder database that will be maintained by TEPSCO and RNT - E.P.

TEPSCO and RNT - E.P. will establish a stakeholder database that includes details of key stakeholders, their participation in consultations processes and issues raised. The database will be designed to allow information to be assembled, collated and analysed. The stakeholder database is a dynamic tool that will be revised and updated, as necessary, to enable it to be used in the Project operational phase, once construction phase is complete. EPC at local level will contribute towards the development of such database.

9. MONITORING AND REPORTING

Monitoring and evaluation of the stakeholder engagement process are important elements to ensure that TEPSCO, RNT - E.P. and EPC can respond to identified issues and alter the schedule and nature of engagement activities to make them more effective. A series of key performance indicators is presented in **Table 9-1**, and performance against the indicators will show the extent of successful completion of stakeholder engagement commitments.

Table 9-1: Key Performance Indicators (KPI).

KPI	Purpose	Target	Monitoring Measure
Meetings	Inclusive consultation and active involvement of and comprehensive and representative selection of stakeholders leading to identification of issues.	A minimum of a monthly meeting with authorities and communities near the TL route.	Number of meetings held. Attendance records and meeting notes. Minutes of the meetings. Background information document. Power point presentation.
Community Liaison Committee	Inclusive consultation and active involvement of and comprehensive and representative selection of stakeholders leading to identification of issues.	Project directly disclosed to the inhabitants near the 220 kV TL route, particularly women, teachers, nurses, member from political parties and the youth.	Number of consultation events/meetings held. Attendance record and meeting notes. As appropriate: • Key stakeholders, with at least 50% women, have received and understand the information disclosed. • Key stakeholders, with at least 50% women, know where meetings are held and can attend the meetings/events. • Checked: 1) by a question to all meeting/event participants and 2) by reviewing all meetings/events attendance records. • Number and percentage of all meeting/ event records submitted and filed.
External Grievance Mechanism	Register, review and address the grievances submitted by the interested and affected parties.	100% solved grievances within the set time frame	Grievance report.

10. FINAL CONSIDERATIONS

The engagement strategy with stakeholders and parties directly affected by the 220 kV Transmission Line Project is a process that is believed to be continuous between TEPSCO, RNT - E.P., EPC and subcontractors and the potential stakeholders, which will involve a series of engagement activities throughout the useful life of the Project. This document shall be considered as the first step and a live and flexible document that may be adjusted during the implementation of the Stakeholders Engagement Plan, should this be found necessary.

In addition to monitoring and performance reviews, the Project will keep abreast of possible changes or expectations, of legal or regulatory developments that affect the activities and groups related to the SEP, as well as, of any opportunity to continue developing this SEP's efforts.

A well-planned and ongoing engagement with good resources will contribute to the success of the Project by building strong relationships with the communities surrounding the 220 kV TL and Moçâmedes Substation Project, thereby being able to manage potential risks and impacts.

11. REFERENCES

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