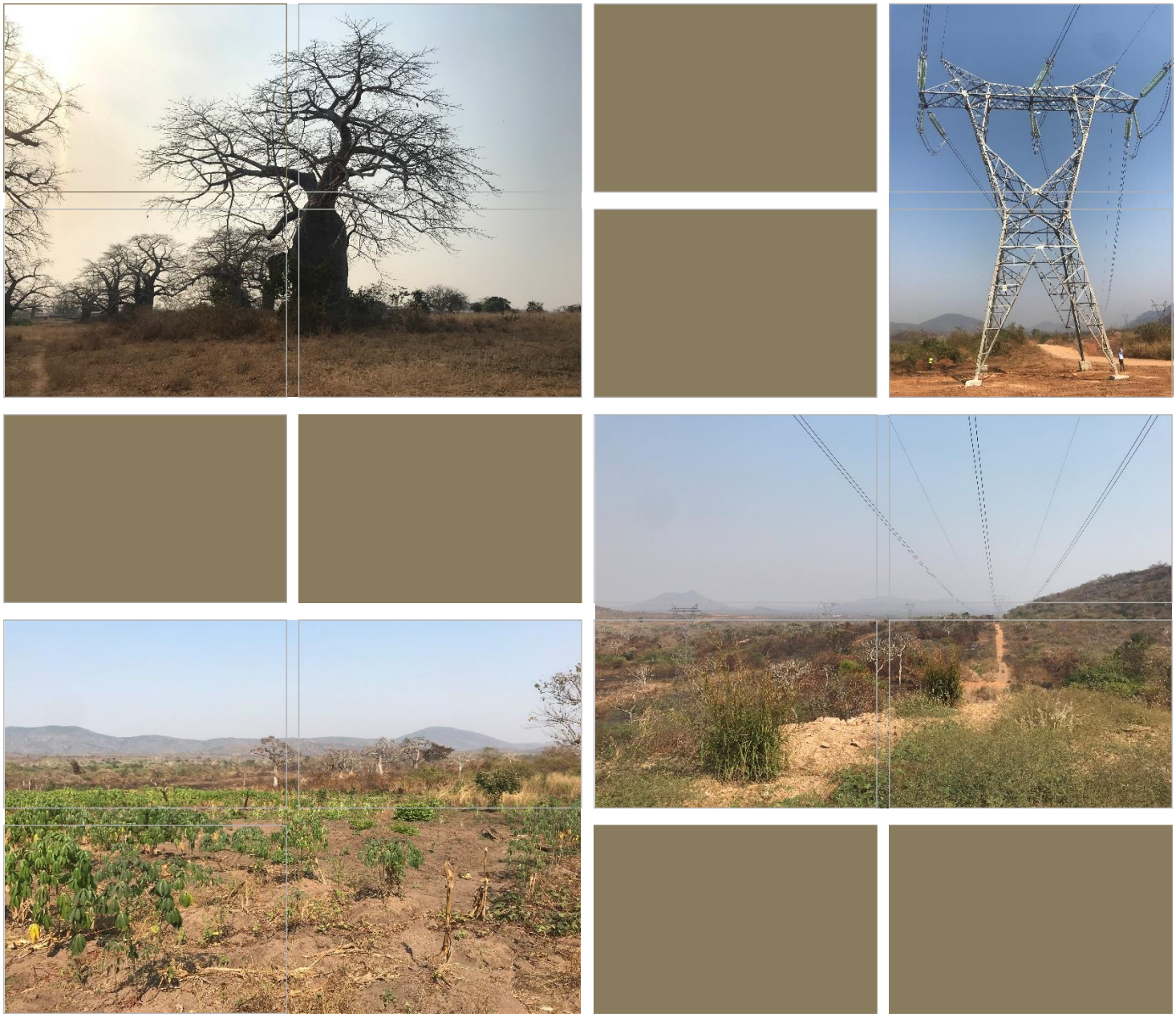


Laúca-Bita Transmission Line, Angola

Environmental and Social Impact Assessment Report

Final v3.0
March 2019

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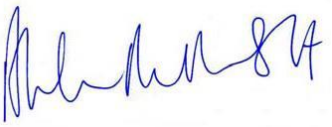
NHID

Laúca-Bita Transmission Line, Angola: *Environmental and Social Impact Assessment Report*

Final v3.0
March 2019

For and on behalf of
Environmental Resources Management

Approved by: Alastair Scott



Signed:

Position: Senior Partner

Date: 05 March 2019

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ACRONYMS

AAAC	full aluminium alloy
ACSR	Aluminium with a steel core for strength
AoI	Area of Influence
BFD	Bird Flight Diverter
BID	Background Information Document
CED	Executive Commission for Demining
CIA	Cumulative Impact Assessment
CNIDAH	National Intersectoral Commission for Humanitarian Demining and Assistance
DAEA	Department of Agriculture and Agrarian Economy
dB	Decibel
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
EHS	Environmental, Health and Safety
EMF	Environmental Management Framework
ESIA	Environmental and Social Impact Assessment
ERM	Environmental Resource Management
ERP	Emergency Response Plan
EPRP	Emergency Preparedness and Response Plan
GAMEK	Office of Utilization of the Middle Kwanza
HDV	Heavy Duty Vehicles
HPP	Hydropower projects
I&APs	Interested and Affected Parties
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IFC	International Finance Corporation
IMAS	International Mine Action Standards
Km	Kilometer
Kv	Kilovolt
INAD	National Demining Institute
LDV	Light Duty Vehicles
LRP	Livelihood Restoration Plans
MADR	Ministry of Agriculture and Rural
MW	Mega Watt
MINAMB	Ministry of Environment or Angola
MINARS	Ministry Social Assistance and Inclusion of Angola
MINEA	Ministry of Energy and Water of Angola
MRE	Mine Risk Education
NGO	Non-Governmental Organization
NHID	New Horizons in Infrastructure of Denmark
NTS	Non-Technical Summary
NTSG	Angolan National Technical Standards and Guidelines
OHTL	Overhead Transmission Line
OPGW	Optical Ground Wire
PAP	Project Affected Persons
RAP	Resettlement Action Plans
RCAP	Resettlement Compensation Action Plan

RNT	National Electricity Transmission Network Company
RoW	Right of Way
SHEQ	Safety, Health, Environment and Quality
TL	Transmission Line
VEC	Valued Environmental and Social Components

1 EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) report has been compiled for the construction and operation of the Laúca-Bita transmission line (the "Project"), which has been proposed to addresses the need to transport the energy generated in the hydroelectric power plant in Laúca, to areas of residential and industrial energy consumption located in the Luanda metropolitan area. This Project is aligned with the strategy developed in 2017 by the Government of Angola focused on the national power sector long-term vision (Angola Energy 2025) which establishes the Government's vision for development of the electricity sector in the 2018-2025 horizon, identifying priority investments in generation, transmission and interconnection, as well as the distribution and network expansion model up until 2025. The Middle Cuanza Basin where the Project will be located has been identified as a key area for development of hydropower projects to provide electricity to support the growth and development of Angola.

In August 2017, New Horizons in Infrastructure of Denmark (NHID) was awarded the contract for the design, construction and commissioning of the infrastructure for transporting energy from the Laúca River hydroelectric power station to a new substation to be built in Bita, near Luanda. The Project consists of the following components:

- 238 km 400 kV overhead transmission line) that will connect the 400 kV substation of the Laúca hydroelectric power station to a new substation (Bita) to be built close to Luanda; and

- Two 7.5km 220 kV overhead transmission lines that will connect the 220 kV substation of the Laúca hydroelectric power station to the existing Cambutas - Capanda transmission line that connects the Capanda hydroelectric power station with the Cambambe hydroelectric power station.

The planning phase is now concluded. On the 3rd December 2018, MINEA approved the route alignment and a commercial Contract was than enforced. Project layout was considered fully compliant with national regulations and both national and international engineering best practices. Executive Project (i.e. detailed design, including exact tower heights and their foundations) will be closed after the LIDAR survey and Geotechnical on-site test, during RCAP implementation.

In terms of environmental licensing, MINEA developed the EIA for the Laúca-Kilamba transmission line (400 kV) project, using EDP as a subcontractor (the "2014 EIA and SIA") and performed by SISTAMBI - Engenharia e Ambiente Lda, in partnership with EDETA- Estudos e Desenvolvimento de Tecnologias Ambientais Lda. In July 2015, and in accordance to the Angolan legal

framework, the 2014 EIA was submitted by MINEA to MINAMB. This submission covered not only the Laúca-Kilamba transmission line but also other projects in the power transmission grid (and substations) related to the Laúca Dam Hydroelectric Project.

Subsequent feedback was received from MINAMB in 2015 indicating their approval of the 2014 EIA and SIA. However, due to the fact that the Environmental Installation License fee was not paid at that time, no License was issued. Recently (December 2018), GAMEK interacted with MINAMB and a common agreement was reached – MINAMB will reissue the Environmental Installation License for the transmission line Laúca-Bita (1) and GAMEK will comply with the related legal framework. Subsequent changes in the project layout (compared to that presented in the 2014 layout) will be discussed at a later stage.

The current ESIA report is focused on the final transmission line route alignment (approved by GAMEK – December 2018) to comply with lenders requirements stated in the ESAP. The ESIA process involved the identification, prediction and evaluation of potential environmental and social impacts of the Project and outlines the proposed mitigation measures for residual impacts and enhancement measures for positive impacts which the Project will implement.

A summary of the results of the impact assessment is provided in *Table 1.1* below. The table illustrates the potential impact along with what the impact significance of the impact is before and after proposed mitigation measures. Mitigation measures that are included in this report are commitments which will be implemented by the different parties involved, i.e. NHID (including subcontractors), GAMEK and RNT.

Organisational arrangements were presented by NHID to the Lenders on the 22nd December 2018 and approved on the 18th January 2019. The ESMP details roles and responsibilities that will be assumed by each Agent as leader and/or supporter. NHID has already acknowledged its commitments in this regards and ERM understands that initial discussions with between NHID and GAMEK/RNT have indicated that they also understand their responsibilities in this regard given their prior involvement with international funded projects, although further meeting will be held over the coming weeks to finalise this on the basis of the final ESMP

(1) The Kilamba substation was renamed Bita and its location shifted approximately 2 km north of its' original location.

Table 1.1 Impact Assessment and Outcomes

Environmental / Social Variable	Project Activities/Impacts	Phase	Predicted Significance	
			Before Mitigation	With Mitigation
Soils	Loss of soil resources due to erosion	Construction	Minor	Negligible to Minor
Water Resources	Availability and Quality of Water Resources	Construction	Minor	Negligible to Minor
Air Quality	Road Traffic Exhaust Emissions	Construction	Negligible	Negligible
	Dust and PM_{10} from unpaved roads during construction activities	Construction	Major	Negligible
Noise and Vibration	Noise from construction activities affecting nearby dwellings	Construction	Negligible - Minor	Negligible
Flora and Vegetation	Disturbance to vegetation and habitat loss and fragmentation as a result of the ROW or degradation to environment and habitat	Construction	Moderate	Minor
	Disturbance to vegetation and potential grow of invasive species as result of the maintenance works	Operation	Moderate	Negligible
Fauna	Disturbance to avifauna species and degradation to environment during construction	Construction	Minor	Negligible
	Increase in bird mortality due to bird strikes during operation	Operation	Minor	Minor
Visual Amenity	Deterioration of visual amenity	Construction	Minor	Negligible
	Deterioration of visual amenity	Operation	Minor	Minor
Economy And Employment	Local employment opportunities, capacity building and economic development	Construction	Moderate	Positive
	Long term local employment opportunities	Operation	Moderate	Positive
Land and Livelihoods	Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land	Construction	Moderate	Minor
	Physical displacement of Project-Affected People during construction	Construction	Major	Minor
	Temporary loss of access to forest products from site clearing during construction	Construction	Minor	Negligible
	Permanent loss of livelihoods and household income due to permanent land take and restrictions.	Operation	Moderate	Minor
	Changes in land and property value	Operation	Minor	Negligible
Community Health and Safety	Community Safety (Road Accidents, Site Trespass, Demining)	Construction	Moderate	Minor
	Environmental Health (Noise and Air)	Construction	Moderate	Minor
	Interaction with Project Workforce	Construction	Moderate	Minor
	EMF Health effects	Operation	Minor	Minor
Worker's Health and Safety and Workers' Rights	Effects on worker health and safety and labour rights	Construction	Moderate	Minor

Environmental / Social Variable	Project Activities/Impacts	Phase	Predicted Significance	
			Before Mitigation	With Mitigation
	Effects on worker health and safety and labour rights	Operation	Moderate	Minor
Access to Infrastructure and Services	Disruption to traffic and transportation	Construction	Moderate	Minor
	Improvement of the local road networks	Operation	Moderate	Positive
Cultural Heritage	Damage of grave sites considered important by the local communities	Construction	Negligible	Negligible
Unplanned Events - Unplanned Spillages	Reduction in local soil quality	Construction and operation	Moderate	Minor
	Reduction in surface water	Construction and operation	Moderate	Minor
Unplanned Events - Community Health and Safety	Risk during stringing activities	Construction	Moderate	Minor
	Effects from unplanned spillages	Construction and Operation	Moderate	Minor
	Effects from fire and/or explosion due to dielectric oil release	Operation	Moderate	Minor
	Exposure to UXOs	Construction	Major	Positive
	Effects from transmission line snapping and transmission tower/pylon collapse	Operation	Major	Minor

Prior to mitigation measures being implemented there are only two expected impacts or risks of *major significance* during the construction phase (relating with dust and PM_{10} and physical displacement of Project-Affected People), and one impact during the operation phase (relating to an unplanned/ accidental event of the transmission line snapping or a pylon/tower collapsing).

Once mitigation measures have been put in place for all impacts the significance ratings are reduced to acceptable levels, i.e. the impacts post mitigation are classified as *negligible* to *minor* significance.

A Stakeholder Engagement Plan (SEP) has been developed (*Annex F*), which describes how the Project through the different parties involved, i.e. NHID, GAMEK and RNT shall engage external stakeholders during construction and operation, and how stakeholder engagement activities will be incorporated into the company's overall management system. Stakeholder engagement undertaken during the ESIA process included 19 project disclosure meetings with municipality and commune officials, and commune administrators and *Sobas,* as well as community members. Overall 97 people were involved in this process, amongst which 24% were women and 76% were men.

As previously stated, an ESMP has been developed (*Section 10*) to specify the standards and controls required to manage and monitor the environmental and social impacts. To achieve this, the ESMP Framework identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative impacts on the biophysical and social environment.

On behalf of GAMEK, NHID is also required by the lenders to develop and implement resettlement planning activities to mitigate adverse socioeconomic impacts from land acquisition or restrictions on affected persons' use of or access to land, including physical displacement in a manner that meets the IFC PS as well as Angola legislation. A Resettlement and Compensation Action Plan (RCAP) has been developed as a parallel process to the ESIA, and outlines the measures that NHID have taken, and GAMEK, RNT and NHID will continue to take, to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by the Project. The purpose of this RCAP is to provide a foundation for land acquisition and livelihood restoration that seeks to avoid or minimize adverse socioeconomic impacts from project-related land acquisition or restrictions on affected persons' use of or access to land, through sound planning and implementation through the detailed design (Executive Project) and into construction.

At this stage of the Project, a framework document such as this RCAP is most appropriate as the specific locations of the towers and need for access roads have not yet been fully defined. In addition, it is not possible to access land within the corridor due to the risk related to mines. The RCAP approach adopted reflects that it is not possible to undertake an asset inventory, due to the need for route finalization with the approved corridor and de-mining. The RCAP will be updated through specific stand-alone Resettlement Action Plans (RAPs) and Livelihood Restoration Plans (LRPs) as RCAP Annexes for discrete sections of the Project. This will be done as the Project footprint is finalised and de-mining activities are completed, enabling safe access to the land. These RCAP annexes will include detailed census and asset inventory information.

NHID is committed to working with the local, regional, and national authorities during the construction of this Project in order to deliver on the Project objectives in an acceptable environmental and socioeconomic manner.

1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This Environmental and Social Impact Assessment (ESIA) Report presents an assessment of the potential environmental, social and community health impacts associated with the proposed construction of the Laúca-Bita Transmission Line ('the Project') to ensure that environmental and social aspects are diligently considered and managed during the Project lifecycle.

The report has been prepared for New Horizons in Infrastructure of Denmark ('NHID') - Danish General Partnership, and presents the objectives, methodology and outcomes of the impact assessment.

NHID has been awarded the project by the Ministry of Energy and Water of Angola (*Ministério da Energia e Águas* - MINEA) on 02 August 2017, and included a contract for the design, construction and commissioning of the infrastructure for transferring and transforming energy from the Laúca River hydroelectric power station to a new substation to be built in Bita, near Luanda.

1.2 PROJECT OVERVIEW

The Project addresses the need to transfer the energy generated in the hydroelectric power plant in Laúca (with a production planned capacity of 2,067 MW), to areas of residential and industrial energy consumption located in the Luanda metropolitan area.

The Project consists of the following main components:

- 400 kV overhead transmission line (TL) (238 km) that will connect the 400 kV substation of the Laúca hydroelectric power station (and dam) to a new substation[1] (Bita) to be built close to Luanda; and

- 220 kV overhead TL (two parallel lines - each of 7.5 km in length) that will connect the 220 kV substation of the Laúca hydroelectric power station to the existing TL Cambutas- Capanda, that connects the Capanda hydroelectric power station with the Cambambe hydroelectric power station (Cambutas).

[1] The Bita substation is not a project element considered in this IA report.

1.3 IMPACT ASSESSMENT OBJECTIVES

The impact assessment process 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 this document are to:

- Identify all potentially significant adverse and positive environmental and social impacts of the Project;
- Gather baseline data to inform the assessment of impacts and to monitor changes to the environment as a result of the Project, and to evaluate the success of the mitigation measures implemented;
- Communicate the results of the impact assessment process for the proposed Project and alternatives considered;
- Ensure that the potential impacts identified during the ESIA process are assessed;
- Present the mitigation and enhancement measures which will be implemented by the Project to manage the impacts identified;
- Provide a record of comments and responses received from the Interested and Affected Parties (I&APs) during the ESIA process; and
- Facilitate an informed decision making process by the relevant authorities.

1.4 IMPACT ASSESSMENT SCOPE

The impacts of the Project were identified based on the findings of public consultation, the existing baseline conditions and professional knowledge and experience during a scoping process. Impacts were first identified as either positive or negative. The cross-sectoral issues and aspects were: health; safety; biodiversity; air quality; pollution; social aspects; water resources; climate; infrastructure, and utilities.

1.5 *STRUCTURE OF THE REPORT*

The ESIA Report is structured as follows:

- Chapter 1: Introduction
- Chapter 2: Project Description
- Chapter 3: Alternative Analysis
- Chapter 4: Administrative Framework
- Chapter 5: Impact Assessment Methodology
- Chapter 6: Screening and Scoping
- Chapter 7: Baseline
- Chapter 8: Stakeholder Engagement
- Chapter 9: Assessment of Environmental and Social Impacts
- Chapter 10: Management and Monitoring
- Chapter 11: Impact Summary
- Chapter 12: Conclusions
- References

The ESIA Report is supported by the following Annexes:

- Annex A: Maps
- Annex B1: Project Modifications Report (NHID, 2018)
- Annex B2: Electric Field Strength, Magnetic Field Strength and Magnetic Flux Density Calculations
- Annex B3: Construction Schedule
- Annex C: List of Flora and Fauna
- Annex D: Photolog
- Annex E: NHID's Safety, Health, Environment and Quality (SHEQ) Policy
- Annex F: Stakeholder Engagement Plan
- Annex G: Noise Equipment Certificate
- Annex H: Lauca-Kilamba Environmental Licencing Process Documentation
- Annex I: Roles and Responsabilties Flowchart
- Annex J: NHID Lauca – Bita Project Team Structure

1.6 *ESIA TEAM*

The team associated with the Laúca-Bita TL ESIA project is outlined in *Table 1.1.*

Table 1.1 ESIA Team

Role	Specialist Name	Company
Partner in Charge	Henry Camp	ERM
Project Director and Lender Liaison	Alastair Scott	ERM
Project Manager / Environmental Technical Lead	Rodrigo Ferreira	ERM
Social and Resettlement Advisor	Vicky Copeman	ERM
Client Liaison	Maria Quintana	ERM
Social Lead	Esmeralda Francisco	ERM
Local Coordinator (Angola)	Vladimir Russo	Holisticos
Stakeholder Engagement Specialist	Maria Rita Borba	ERM
Stakeholder Engagement Specialist	Eduardo Ferdinand	Holisticos
Biodiversity Specialist	Miguel Morais	Holisticos
Biodiversity Specialist	Pedro Vaz Pinto	Holisticos
Environmental Specialist	Victor Azevedo	ERM
Environmental Specialist	Ricardo Pereira	ERM
Environmental Specialist	Martha Silva	ERM
Air Quality Specialist	Chris HazellMarshall	ERM
Social Specialist	Anna Tabet	ERM
Water Resources Specialist	Ken King	ERM
Noise Specialist	Jamie Hogg	ERM
GIS Lead	Simone Poli	ERM
GIS Specialist	Marco Rusmini	ERM
GIS Specialist (Visual)	Aurora Finiguerra	ERM
GIS Specialist	Valeria Faresin	ERM
Cultural Heritage Specialist	Ziva Domingos	Holisticos

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

This Chapter provides a general description of the Project and presents an overview of the key elements and activities involved in the planned construction and operation phases, as well as project schedule and expected land take.

The Project consists of a 400 kV and 220kV overhead transmission line (TL). The 400 kV overhead TL (238 km) will connect the 400 KV substation of the Laúca hydroelectric power station and dam to a new substation (Bita) to be built close to Luanda. The 220 kV overhead TL (two parallel lines – each of 7.5 km in length) sectioning will connect the 220 kV substation of the Laúca hydroelectric power station to the existing transmission line, Cambutas-Capanda that connects the Capanda hydroelectric power station and dam with the Cambambe hydroelectric power station and dam.

Currently the route is approved and alignment fixed. In fact, on the 3rd December 2018, MINEA approved the route alignment and a commercial Contract was than enforced. Project layout was considered fully compliant with national regulations and both national and international engineering best practices. NHID team is now developing the detailed design (Executive Project) and topographic surveys (LIDAR) as well as geotechnical on-site surveys are currently being planned. Whilst the indicative route is agreed, the detail design (including exact tower heights and their foundations) will be dependent on the results of these surveys and the mitigation proposed to minimise social and environmental impacts during this process.

2.2 PROJECT JUSTIFICATION

Access to electricity has a wide range of social and economic benefits. For example, access to electricity can increase quality of life as well as spur economic development. However, most cities across Angola are subject to unplanned outages which lead to public dismay and disruptions to businesses and industry activities. The socio-economic implications of such an intermittent supply are most severe in densely populated areas, like in the metropolitan area of Luanda.

A strong growth of energy consumption is anticipated up until 2025, foreseeably reaching a load of 7.2 GW. This growth will result in providing power to approximately 60% of the population from the increase in residential consumption, growth of national wealth through the services sector and from the country's industrialization (MINEA, 2017).

Based on this scenario, the Government of Angola issued the national power sector long term vision in 2017 (Angola Energy 2025[1]). This assessed the main long term options and established the Government's vision for the development of the electricity sector between 2018-2025, identifying priority investments in generation, transmission and interconnection, as well as the distribution and network expansion model.

Substantial investment is being allocated to the construction and rehabilitation of hydropower projects. As per the biophysical characteristics of Angola, the Middle Cuanza Basin has been identified as a key area for development of hydropower projects to provide electricity to support the growth and development of Angola.

The Cuanza is one of the largest rivers in Angola, its total length is 965 km and its basin drains an area of 151,422 km², flowing into the Atlantic Ocean just south of Luanda. Its vast water resources are earmarked for hydroelectricity production to support the economic growth of Angola through providing power supply for industrial growth and settlement expansion in and around Luanda, and to supply irrigation development. Additionally, this reliable and cost effective power from the national grid will help to replace power supply from the diesel power stations that are characterized by high operational costs, inadequate capacity, very low reliability and high emissions.

The Cuanza Basin has been earmarked for 7,000 MW, while the country plans to achieve a four-fold increase in the country's current electrical generation to 9,000 MW by 2025 from renewable sources. Two dams exist – Cambambe (recently expanded to 960 MW) and Capanda (520 MW)[2], two more are under construction (Laúca – 2067 MW by Odebrecht, and Caculo-Cabaça – 2172 MW by the China Gezhouba Group Co. Ltd) and several others have been proposed since the 1970s (ERM, 2017). Laúca dam has been completed and filled with water in 2017, but the hydropower station is partially in operation, as some turbines are not yet equipped. Caculo-Cabaça is expected to be completed in 2020.

In order to transport and transform the energy from these hydropower stations, a complex high voltage transmission line grid (which includes multiple substations and related infrastructure) has been constructed since the 60's (with major effort since 2014) by different EPC's from China, Brazil, Spain and Portugal and is currently being expanded.

[1]Angola Energia 2025 – Angola Power Sector Long Term Vision. Available online at: http://www.angolaenergia2025.com/en/conteudo/documents (accessed 12/09/2018)

[2] Capanda dam, in operation since 2004, was initiated in 1982 by Soviet foreign trade association "Tekhnopromexport", and after the civil war, ended by the Brazilian construction firm Odebrecht. Cambambe dam, in operation since 1963, was turbines renovated 2009-2013 and expanded by Odebrecht in a consortium with Voith, Alstom and Engevix in 2013- 2016.

2.3 *PROJECT OVERVIEW*

New Horizons in Infrastructure of Denmark (NHID) – a Danish General Partnership - has been awarded the project by the Ministry of Energy and Water of Angola (*Ministério da Energia e Aguas* - MINEA) – contract dated the 02 of August of 2017 - for the design, construction and commissioning of the infrastructure for transporting and transforming energy from the Laúca River hydroelectric power station to a new substation to be built in Bita, near Luanda.

The Project addresses the need to transfer the energy generated in the hydroelectric power plant in Laúca (with a production planned capacity of 2,067 MW), to areas of residential and industrial energy consumption located in the Luanda metropolitan area.

Many other projects are underway in Angola to improve the infrastructure for electricity in the country. Examples of these similar projects are provided in *Table 2.1)*.

Table 2.1 Existing Transmission Lines within the Project Footprint

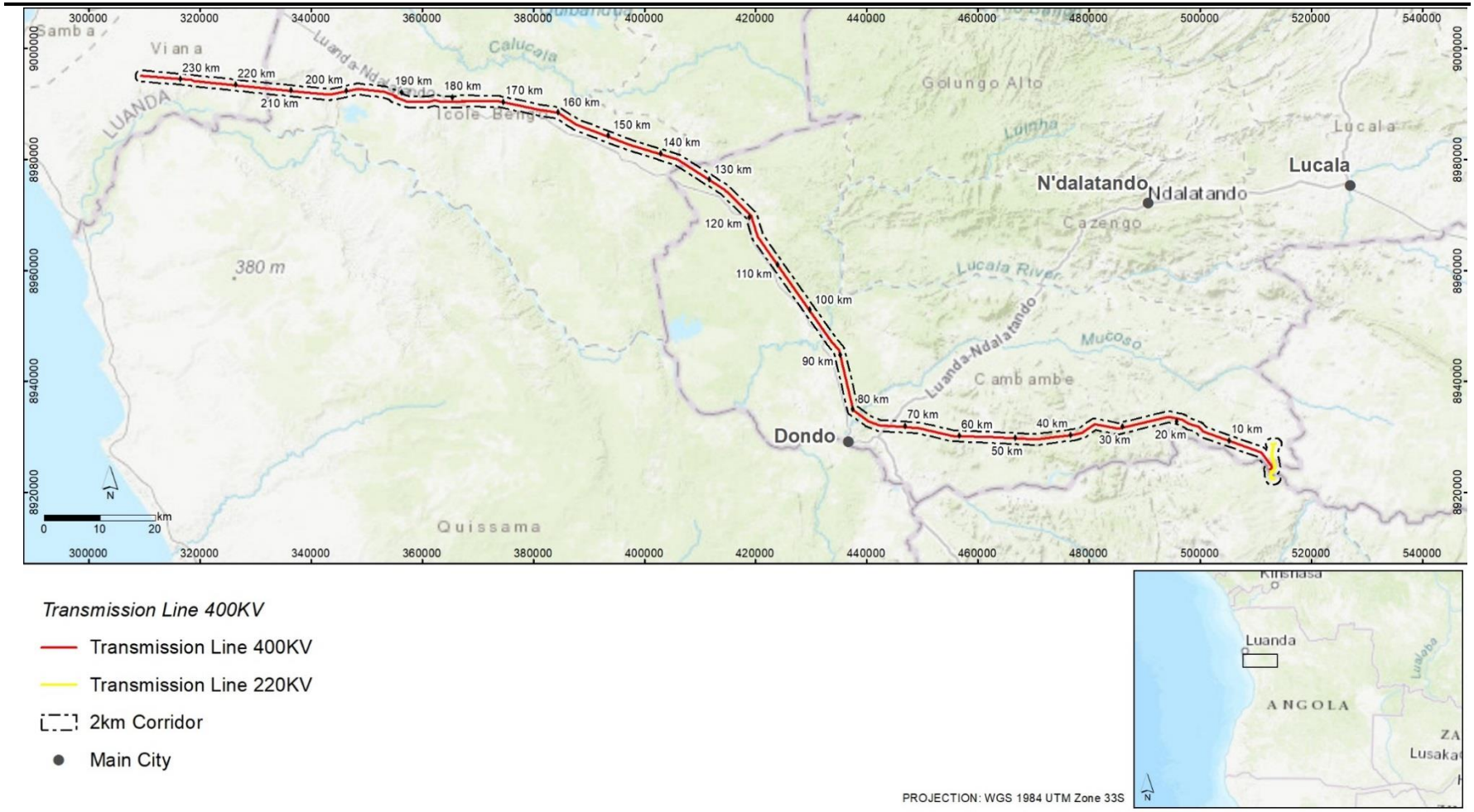
Route	kV	Length (Km)	Status	Operator / Contractor
Transmission Lines				
01 Laúca - Capanda	400	39.86	Under construction – expected conclusion: 2018	RNT
02 Laúca - Cambutas	400	75.220	Under construction – expected conclusion: 2018	RNT
03 Laúca - Catete	400	190.41	Under construction – expected conclusion: 2019	RNT/Odebrecht
04 Cambutas - Bita	400	169.42	*	RNT
05 Catete - Bita	400	57.83	Expected conclusion: 2020	RNT/Odebrecht
06 Capanda – Malange	220	125	*	RNT
07 Bita – Zango	220	27	*	RNT
08 Cacuso – Calandula	110	50	*	RNT
09 Bita - Camama	220	21	*	RNT
10 Lauca - Bita	400	238	Expected conclusion: 2020	RNT /NHID
11 Lauca / split Cambutas- Capanda	220	7,5	Expected conclusion: 2020	RNT /NHID
12 Lucala - Viana	400	222.62	Operational*	RNT
13 Cambutas - Catete	400	123.93	Operational since 2017	RNT/Elecnor
14 Cambutas - Capanda	220	71.29	Operational since 2005	RNT
Substations				
01 Extension SE Capanda Elevadora	-	-	*	
02 New SE Bita	-	-	Under construction – expected conclusion: 2020	RNT /Odebrecht
03 New SE Malange	-	-	*	
05 New SE Zango	-	-	*	
06 Extension SE Cambutas	-	-	Operational since 2013	RNT /Odebrecht
07 Extension Camama	-	-		
08 Extension Catete	-	-	Operational*	RNT /Odebrecht
09 Update Telecom systems and OPLAT	-	-	*	

Route	kV	Length (Km)	Status	Operator / Contractor
Transmission Lines				
10 Extension SE Cacuso	-	-	*	
11 Laúca 400KV	-	-	Operational since 2017	RNT /Odebrecht
12 Laúca 220KV	-	-	Operational since 2017	RNT /Odebrecht
13 Capanda	-	-	Operational since 2004	RNT /Odebrecht

Note: * Insufficient data.

Figure 2.1 shows the proposed route of the proposed Project as it crosses three provinces and six municipalities; Malanje (Cacuso municipality), Kwanza Norte (Cambambe municipality) and Luanda (Ícolo, Bengo, Viana and Belas municipalities). *Map 01 – Annex A* provides a detailed location map.

Figure 2.1 Project Location



2.4 *PROJECT ANTECEDENTS*

In order to understand the environmental and social evaluation of the proposed project, it is important to take into consideration the historical context of this transmission line.

In 2014, an initial project layout was developed by MINEA (238 km within a pre-defined 800 m wide corridor between Capanda and Luanda). An EIA was submitted by the *Gabinete de Aproveitamento do Médio Kwanza* (GAMEK) to the Ministry of Environment (MINAMB) and approved in the same year.

In 2014 MINEA and NHID started the negotiations for the construction of the transmission lines, which included the technical and financial feasibility studies by NHID. Since then the transmission line route has been through various design changes, with a view to minimize impacts to the population, by reducing the high voltage line crossings (that involve energy shortages to the population and risk to the workers), and minimizing the potential social impacts.

In 2016, using the existing project design as well as the approved ESA (from 2014), and in order to assess a potential investment interest, in alignment with MINEA, NHID concluded a technical and financial feasibility study (TDS-V1), both on the Laúca – Kilamba 400 kV and Capanda – Laúca 220 kV transmission line Consequently, the revised design (matched practically with the 2014 inception path) was shared and approved by MINEA.

Subsequently in 2017, motivated by technical reasons regarding the connections with the electricity network and other technical constraints relating to the existing lines (and those under construction), it was necessary to carry out a new study that resulted in a new economic technical proposal (TDS-V2).

Specifically, in terms of the Laúca – Kilamba 400 kV transmission line, the following key project elements were taken into consideration as drivers to change TDS-V1) (NHID, 2017):

- In the section between Laúca and Dondo the 2014 route was parallel to the Laúca Catete 400 kV transmission line. In the first section - from Laúca - the first 40 km were located outside the corridor since it was located north of the Dondo - Laúca road. In the remaining 52 km, the route was located inside the existing corridor.

- In the section between Dondo and Maria Teresa, the 2014 layout was parallel to the 400 kV transmission lines Laúca - Catete, Cambutas - Bita and Cambambe - Catete. The route runs inside the corridor, except for 10 km next to Dondo and a small drift to avoid the town of Muchau that is inside the corridor.

- In the section between Maria Teresa and Catete, the 2014 route was parallel to the 400 kV transmission line Laúca Catete, Cambutas Bita, Cambambe Catete and Lucala Viana. The route runs inside the corridor.

- In the section between Catete and Bita, the 2014 route was parallel to the 400 kV transmission line Catete Bita and Cambutas Bita. The route runs outside the corridor, while the aforementioned lines are located outside the corridor.

In terms of the Capanda – Laúca 220 kV transmission line layout, it was decided by MINEA that instead of a new 220 kV line Lauca – Capanda, (40 km in length), the best solution was to split the existing 220 kV line Capanda – Cambutas close to Laúca, and establish the connection of both parts of the Capanda – Cambutas transmission line with the Laúca sub-station.

Based on these findings, NHID changed the project layout in order to improve its technical feasibility. The outcomes were discussed with GAMEK and final layouts were presented and approved in December 2018.

These main changes can be summarized as follows (SWECO, 2016):

- 220 kV Laúca – Capanda 40 Km transmission line was excluded. Instead this connection between the hydrologic power plants was replaced by the splitting of an existing 220 kV line connecting Capanda with Cambambe, and the connection of that line with Laúca. The final solution being the construction of two lines from Laúca to the split of the existing line (17 approx. 7.5 km length), a section of the former existing 220 kV transmission line;

- The Kilamba substation was renamed Bita and its location shifted approximately 2 km north of the original location; and the transmission line route has also been changed to the same extent;

- The 400KV Laúca – Bita line will run parallel, and very close at the north to the line Laúca – Catete (almost totally implemented today) and the line Catete – Bita;

- The crossing of river Lucala was moved about 1 km to the east of the original location;

- Some segments of the line have been shifted to a lesser extent outside the original 800m corridor (defined in the EIA); and other segments shifted inside the 800m corridor, in order to be parallel with the Laúca – Catete line.

In 2016, NHID applied for credit support to EKF to finance the conclusion of the design, construction and commissioning of this infrastructure. EFK assigned an independent consultant (SWECO) to perform an environmental

and social due diligence to evaluate project compliance with Angolan E&S regulations as well as with lender requirements.

Motivated by technical reasons (connections with the national grid as well as with the alignment with existing and planned transmission line), the project design was updated in 2017 (TDS-V3), and annexed to the Commercial Contract between MINEA and NHID.

Most recently, in 2018 work has been done to prepare the project for approval by MINEA as well as further miimise the environmanal and social impacts of the project. On the 3rd December 2018 MINEA approved the route alignment. The Commercial Contract was than enforced, and was considered fully compliant with national regulations and both national and international engineering best practices. The main changes from the 2017 route alignment are summarized in *Table 2.2* (NHID, 2018[1]).

Table 2.2 Project 2018 Updates

Modification ID	Location	Motivation
Modification 1 - Entrance to CH Laúca	Lauca substation	To avoid crossings between the 400 kV lines at CH Laúca. Laúca -Bita line will be connected to the existing 400 kV Module No. 2. For this to happen, the Laúca -Capanda line will be diverted between MV0 and MV2 and will be connected to Module No. 1 (currently unequipped space). Module 1 will be constructed by NHID (whereas the existing Module 2 which will have been freed will be used by NHID to connect its line to it).
Modification 2 – Interference with the existing 400 kV Laúca - Catete Line and 220 kV Cambambe - Capanda Line	Between Vertices MV5 and MV10	• To avoid intersection and overlapping with the existing 400 kV Laúca –Catete line between Vertices MV5 and MV9 (noting that the latter had already been displaced slightly to the north, to avoid the future basin of the Caculo Cabaça dam) • To avoid intersection with the existing 220 kV Cambambe - Capanda line between Vertices MV5 and MV6 Consequently, Laúca-Bita 400 kV line route should be modified to avoid this interference. • To get the 400 kV Laúca – Catete and Laúca -Bita lines Vertices MV9 and MV10 closer together, thereby optimizing on the combined Right of Way, easing future maintenance to the Operator's personnel, and allowing for usage of the same access roads to the new constructed line.
Modification 3 – Interference with Quisuba Village	Between MV10 and MV11	To avoid passing through Quisuba village.

[1] NHID (2018) report is presented as *Annex B1*.

Modification ID	Location	Motivation
Modification 4 – Conveying the 400 kV Laúca -Bita Line Closer to the Existing Route of the Existing 400 kV Laúca –Catete Line	Between MV17 and MV20	To become closer to its paralleled existing Laúca -Catete line, considering that this will optimize on the corridor width, thereby freeing more space, and it will make maintenance inspections in the future easier for the Operator, who will become able to monitor two lines visually more easily. It will also make Laúca -Bita line in some places closer to the existing access roads[1].
Modification 5 – Avoiding Wetland Area	Between MV21 and MV23	To avoid as much as possible the swamp area near Cassolala. In order to reduce project footprint, the updated line route will pass parallel to the exiting 400 kV Laúca –Catete line.
Modification 6 – Interference with Muchau Village	Between MV23 and MV25	To avoid as much as possible passing through Muchau village
Modification 7 – Conveying the 400 kV Laúca –Bita Line Closer to Existing Route of the 400 kV Laúca –Catete Line	Between MV26 and MV28	To be closer to its paralleled existing Laúca-Catete line, for the same reasons mentioned in Modification 4[2].
Modification 8 – Swapping with the Existing 400 kV Laúca –Catete Line	Between MV31 and MV33	To avoid crossing with Laúca –Catete existing 400 kV line.
Modification 9 – Conveying the 400 kV Laúca –Bita Line Closer to Existing Route of the 400 kV Cambutas-Bita Line	Between MV33 and MV38	To become closer to the contracted, and soon to be constructed, Cambutas-Bita line. This will also result in the facilitation of the connection to Laúca -Catete and Catete-Bita lines and avoid passage over private and fenced lands[3].
Modification 10 – Swapping with Planned Catete-Bita Line	Between MV38 and MV40	To avoid crossing with Catete-Bita 400 kV planned line
Modification 11 – Crossing with Existing Lines Near Cement Factory	Between MV41 and MV43	To ensure proper crossing over the span of the existing conductors rather than crossing directly above the existing 220 kV and 60 kV towers themselves.
Obstacle – Interference with Private Land	Between MV43 and MV44	To avoid trespassing private land.

[1] For this line section, the distance between the existing Laúca -Catete and Laúca -Bita lines is reduced from an average of 700m to 100m (NHID, 2018).

[2] For this line section, the distance between the existing Laúca -Catete line and Laúca -Bita lines is reduced from an average of 350m to 100 m (NHID, 2018).

[3] it should be noted that the Laúca -Bita line will in this part inevitably cross over one 400 kV and three 220 kV existing lines between MV35 and MV36, which are: 400 kV Lucala- Viana, 220 kV Catete-Camama, 220 kV Catete-Viana and 220 kV Cambambe-Viana.

Modification ID	Location	Motivation
Modification 12 – Entrance to the Planned Bita Substation	Between MV44 and MV47	To enter to the 400 kV Module L7 at Bita Substation and avoid crossing with the planned 400 kV lines.

2.5 *ENVIRONMENTAL LICENCING PROCESS*

As previously stated, MINEA developed the EIA for the Laúca-Kilamba transmission line (400 kV) project, using EDP as subcontractor (the "2014 EIA and SIA") and performed by SISTAMBI - Engenharia e Ambiente Lda, in partnership with EDETA- Estudos e Desenvolvimento de Tecnologias Ambientais Lda. Both documents were formally approved by GAMEK on the 7th June 2015 (*Parecer Vinculativo GAMEK, Annex H*).

In accordance to the Angolan legal framework, in order to obtain the Environmental Installation License, the 2014 EIA and SIA was submitted by MINEA to MINAMB (*July 22th 2015 - Ref. 1135/GAB.MINEA/2015 – Annex H*). This request covered not only the Lauca-Kilamba transmission line but also other projects of the power transmission grid (and substations) related to Laúca Dam Hydroelectric Project.

Subsequent feedback was received from MINAMB in 2015 indicating their approval of the 2014 EIA and SIA. However, due to the fact that the Environmental Installation License fee was not paid at that time, no License was issued and no further progess was made on the licencing process for more than two years.

On the 22th October 2018, a meeting was held between DNPAIA and GAMEK with the main purpose of informing DNPAIA representatives that NHID was appointed as being responsible for the final design and construction for the Laúca-Bita transmission line, as well as that the project layout had changed since 2014 as well as the fact that the name of the substation closer to Luanda was now called Bita, instead of Kilamba. MINAMB confirmed the receipts and subsequent approval of the 2014 EIA and SIA and also agreed that upon the payment of the Environmental Installation License fee, a formal license will be issued, including environmental and social requirements that need to be implemented during the construction phase. MINAMB, as per the Angolan legal framework, will hold routine audits visits during the construction period and expects to receive bi-annual Monitoring Reports. Regarding the environmental operation license, it was agreed that MINEA should request this from MINAMB providing all the required documentation six months prior to operation commencement.

In December 2018, based on the fact that the contract with NHID entered into force (October 5th, 2018), GAMEK held a second meeting with MINAMB in order to formally request for the restart of the licencing process (refer to letter *079/GAMEK-DT/2018 dated December 4th 2018 – Annex H*).

Currently, the process is ongoing and the Environmental Installation License for construction of the Laúca-Bita transmission line is expected to be received by GAMEK in January 2018. A subsequent meeting will be convened between GAMEK and MINAMB to present the changes in alignment of the project and confirm whether any further amendments to the environmental licencing process are required.

2.6 PROJECT DESIGN GUIDELINES

The project final layout was projected based on both national and international regulations and best practices. These attributes are summarized in *Table 2.3* and *Figure 2.2*, and detailed below.

Table 2.3 Summary of Restrictions Considered

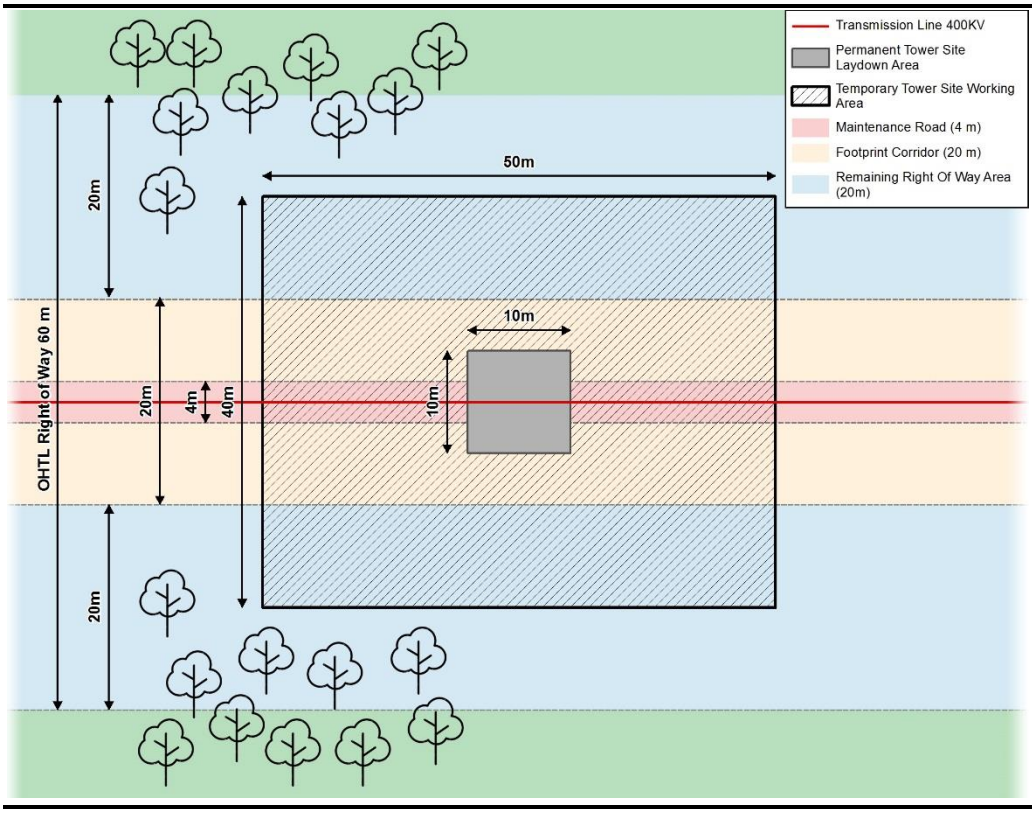
Component	Width/Area	Description	Activities	Restrictions	
				Construction Phase – NHID (12 months)	Operations Phase- RNT (50 years)
Over Head Transmission Line (OHTL) Right Of Way					
OHTL Right of Way	60 m (30 m either side)	• Corridor established for safety & security of high voltage transmission lines as required by Land Law (2004). • The Right of Way (*Faixa Confinante)* of 30 m either side along 238+15 km line length. • The entire length of the corridor will be demined. • Construction of new houses and structures will not be allowed. • NHID will hand over the management of the OHTL Right of Way soon after construction is over. This corridor is subdivided into 3 smaller corridors each with different restrictions as follows:			
• Maintenance Road of 4 m wide (2 m either side)	4 m (2m either side)	Four meter service/maintenance road under the line. Road will be totally cleared for maintenance during operation phase. Routing ongoing to ensure minimization of physical resettlement.	<u>*Construction*</u>: • Demining of entire length of 4 m corridor • Land clearance. Removal of all trees and crops. • Removal of all houses and structures. <u>*Operation*</u>: • Maintenance to keep it free of vegetation the area (mechanical) • Land control / regular patrolling of the line for inspection and maintenance	N/A	• No new trees or crops allowed • No new houses/structures allowed
• OHTL Footprint corridor (wire zone**)**	20 m (10m either side)	20 meter safety corridor free of houses and trees. This is to avoid fires and deter potential for encroachment. If needed, routing should be considered to ensure minimization of physical resettlement.	<u>*Construction:*</u> • Demining of entire length of 20 m corridor • Removal of all houses and structures. In the case of uninhabited structures, the final decision will be done on a case-by-case basis and after careful assessment	• Limitations to access agricultural areas during demining	• No construction of new houses or structures allowed • No planting of new trees allowed, only vegetation/crops of up to 6-7 meters high.

Component	Width/Area	Description	Activities	Restrictions	
				Construction Phase – NHID (12 months)	Operations Phase- RNT (50 years)
			including on site verification. • Land clearance. Removal of all trees. <u>*Operation:*</u> • Maintenance to keep permanent tower site laydown areas (see below) free of vegetation • Pruning of remaining areas • Land control / regular patrolling of the line		

• Remaining OHTL right of way area (up to 30 m wide) / Border Zone	2 corridors of 20 m either side of the OHTL Footprint corridor. (*Faixa de Proteção*)	Remaining area of the OHTL right of way where both houses/structures and trees/crops could be allowed.	<u>*Construction:*</u>
			• Demining of the entire length of the corridor
			• Vegetation clearance (pruning of trees) to ensure safe operations (freeing radius of 8 m from the conductors).
			• Existing structures / buildings can remain provided the safety distances are respected (freeing radius of 8 m from the conductors). Case by case analysis
			• No new buildings / structures allowed
			
			<u>*Operation:*</u>
			• Land control / regular patrolling of the line by RNT
			• No new buildings / structures allowed
				N/A	• No construction of new houses or structures allowed
					• Crops allowed
					• Trees allowed if clearance (8m to conductors) is respected
					• Clearances to the overhead conductors to be ensured for safe operation:
					  • *Buildings*: 8m clearance for 400 kV; 6m to 220 kV
					  • *Vegetation:* 8m clearance for 400 kV;

Component	Width/Area	Description	Activities	Restrictions	
				Construction Phase – NHID (12 months)	**Operations Phase- RNT (50 years)**
					5m to 220 kV
Project Components					
Temporary tower site working areas *(NHID)*	Average 40m x 50m per site	• Area for storage (short period – 4 days), construction and erection of the towers. Total of 631 (583 +48) tower´s sites located inside the OHTL Footprint corridor. • Area will be secured during site works of the 12 to 18 months construction period.	<u>*Construction:*</u> • Land clearance. Removal of trees and crops. May be able to maintain trees in this area, outside of tower footprint and 20 m footprint corridor • Total land clearing of tower footprint (average 10x10m)	• No access of unauthorized personnel (including communities). • No planting or harvesting allowed during all the construction period	N/A
Permanent tower site laydown areas *(RNT)*	Average 10m x 10m per site	Total of 650 (598 +42) tower´s sites located inside the OHTL Footprint corridor.	<u>*Operation:*</u> • Maintenance to keep permanent tower site laydown areas free of vegetation.	N/A	• No trees or crops allowed in the 10x 10 m area

Figure 2.2 Restrictions Considered



2.6.1 National Requirements

The following national requirements were considered:

- The Land Law (2004) defines a right of way (*faixa confinante*) of 30 m either side. This law states that restrictions within this area are to be defined by the authorities.

- The lines will be constructed considering an existing 800 m right of way pre-established by the government for the transmission lines in the region.

- MINEA - GAMEK recommendation is to avoid, as far as possible, houses/ structures inside the 60m corridor.

- Minimal vertical distances between conductors and obstacles are defined by MINEA - *ET-E- 119 - Especificação Técnica - ET-E-119-Ed.A (31.07.2014), Projectos de Linhas Aéreas de MAT e AT*[1] (following international standards) in *Table 2.4*.

[1] ET-E- 119 is an Angolan standard developed based on the following international best practices: International Commission On Non-Ionizing Radiation Protection (ICNIRP, 2010), ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric And Magnetic Fields (1 HZ

Table 2.4 Minimal Vertical Distances between Conductors and Obstacles (MINEA)

Project Elements	Quantity
Cross over areas accessible to pedestrians	13
Cross over areas accessible to agricultural equipment	13
Cross over roads, streets and avenues	16
Urban areas	16
Cross over electrified railways	16 (a)
Cross over non-electrified railways	15
Cross over non- navigable water bodies	13
Cross over navigable water bodies (H should be consider as the highest mast height to be defined by the Authorities	7. + H
Cross over 13,8 kV transmission lines or transmission lines with lightning arresters	7
Cross over telecommunication lines	7
Cross over railways associated infrastructures	7
Cross over buildings	8
Cross over protected vegetation	8

(a) Considering the crossing point at 200 m from the nearest support point

2.6.2 International Guidelines

IFC Environmental, Health and Safety Guidelines

The Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The EHS Guidelines contain the performance levels and measures that are normally acceptable to the IFC and World Bank, and measures that are generally considered to be achievable in new facilities at reasonable costs by existing technology. This information supports actions aimed at avoiding, minimising and controlling EHS impacts during the construction, operation, and decommissioning phases of a project or facility.

When host country (e.g. Angola) regulations differ from the levels and measures presented in the EHS Guidelines, projects will be expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in the view of specific project circumstances, a full and detailed justification for any proposed alternatives is required. General EHS Guidelines exist which contain information on cross-cutting environmental, health, and safety issues potentially applicable to this Project.

In addition to the General EHS Guidelines, sector-specific guidelines have also been developed. Sector specific guidelines deemed applicable to the Project will be considered in the EIA process. The Guidelines of relevance to the

– 100 kHZ) - Published In: Health Physics 99(6):818-836; 2010; and EC COUNCIL Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC). Other guidelines were considered in those cases that no technical standards were absent in the Angolan standards or when the requirements on those international guidelines where more stringent than the Angolan ones.

Project and the EIA process are *IFC EHS Guidelines for Electric Power Transmission and Distribution*.

IFC EHS Guidelines for Electric Power Transmission and Distribution

As the basis for design evaluation, the *IFC EHS Guidelines for Electric Power Transmission and Distribution (April 30, 2007)* were followed in the development of the Project (TDS-V3) with specific reference to the mitigation of potential electric and magnetic field (EMF) health risks. The discussion that follows provides a summary of the approach taken in line with the requirements of the *IFC EHS Guidelines* (*Table 2.5).*

Table 2.5 Management of EMF within Project Design

IFC EHS Guideline Recommendation	NHID Response
"Evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Average and peak exposure levels should remain below the ICNIRP recommendation for General Public Exposure".	Assessment showed compliance against ICNIRP reference levels at maximum values (directly under transmission line).
"Considering siting new facilities so as to avoid or minimize exposure to the public. Installation of transmission lines or other high voltage equipment above or adjacent to residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or offices), should be avoided".	Route optimization undertaken to minimise the impact on the number of households that were present in the previous project design versions. Micro siting undertaken in consultation with GAMEK and other relevant stakeholders (refer to Stakeholder Engagement Plan and Resettlement and Compensation Action Plan). Alternative infrastructure designs considered further to minimise potential impact.
"If EMF levels are confirmed or expected to be above the recommendation exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples include shielding with specific metal alloys, burying transmission lines, modifications to size, spacing & configuration of conductors".	Evaluation of project design. In consultation with GAMEK and based on international industry best practices, modified the route alignment to avoid household overlap as much as possible as well as the design to increase the height of transmission line infrastructure where ever possible above the minimum requirement stipulated by the international guidelines.

The *IFC EHS Guidelines* state the following recommendation for the management of EMF exposures:

> *"Evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Average and peak exposure levels should remain below the ICNIRP recommendation for General Public Exposure".*

It is noted that the *ICNIRP Guidelines* referenced in the EHS Guidelines reference the 1998 exposure levels. These were subsequently updated in 2010 as further scientific data became available. The Project has been designed to comply with the updated 2010 ICNIRP Guidelines, as summarised in *Table 2.6*.

Table 2.6 ICNIRP Recommended Guidelines on EMF (2010) for the Power Line Frequency of 50HZ

Reference level at 50 Hz*[1]	Electric Field Strength - E (kV/m)	Magnetic Field Strength - H (A/m)	Magnetic Flux Density - H (μT)**
Public exposure levels	5	$1.6 * 10^2$	$2 * 10^{-4} / f^2$
Occupational exposure levels	10	$8 * 10^2$	$1 * 10^{-3}$

* The limits from exposure to EM fields are the same for 220KV and for 400KV power lines, as the limit is defined by the frequency, and the frequency is the same: 50 HZ.

** frequency ("f") in Hz.

The EMF exposure levels of the proposed transmission structures were evaluated against the *ICNIRP Guidelines*, as shown in *Table 2.6*. The calculation of the electric fields was done based on the knowledge of electric charges at each of the line's cables. In this case a ground distance based on the minimum absolute distance imposed for this line (13 meters) was considered. This limit is respected in the design, so the minimum distance of the conductors over the ground in the point of maximum sag is forced to be 13m. The values obtained correspond therefore to the maximum values of the electric field, for the horizontal layouts for which they were calculated and that correspond, approximately to the ground level and the head level of an average man (1.80 m) from the ground. The calculation results are that the maximum value of the Electrical Field (E) in Kv/m at 1.8m from the ground calculated for the maximum voltage service line is 4.29 KV/m. This value is below the limit of 5KV/m. *Annex B2,* summarizes the electric fields data and results for the 400KV Lauca – Bita line.

In order to evaluate the maximum values of the magnetic flux density (corresponding to permanent human exposure), a three phased and balanced current was considered. The maximum values of the magnetic flow density calculated at 1.8 m from the ground, are for this value of a current (1000 A per phase), only 14.30 micro teslas. For the maximum line transport capacity (1514 MVA of the heat limit, 2185 A per phase) the magnetic flow density calculated at 1.8 m from the ground is only 31.25 micro teslas. The value calculated is well below the lower limit of 100 micro teslas. *Annex B2* provides a summary of the magnetic flux density data and results for the 400KV Lauca – Bita line.

[1] Based on the International Commission on Non-Ionizing Radiation Protection ICNIRP GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC AND ELECTROMAGNETIC FIELDS (UP TO 300 GHZ) PUBLISHED IN: HEALTH PHYSICS 74 (4):494-522; 1998. And ratified (even increasing the maximum acceptable Magnetic field density to 160 μT) in the ICNIRP document GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC AND MAGNETIC FIELDS (1 Hz TO 100 kHz) International Commission on Non-Ionizing Radiation Protection published 2010

The transverse profiles of the magnetic flow density at 1.8 m from ground level are shown for a 1000 A current per phase.

Following the same calculations, but considering the specific values for the 220 kV line, the worst case at 1.8 m from the ground is in the middle of a 450m hop, maximum current of 1000A, on flat earth (at maximum sag). The electric field is 1.68 KV/m and the magnetic flow density is 13.86 micro teslas - for the maximum line transport capacity (341 MVA of the heat limit, 896 A per phase) and the magnetic flow density calculated at 1.8 m from the ground is 12.42 micro teslas.

Additionally the number of properties within the RoW of the transmission line corridor has been identified. Note that the size of the RoW is in accordance with the international standard as defined by the International Electro technical Commission, IEC) *Table 2.7* illustrates the number of properties within each RoW and the exposure levels.

Table 2.7 ***EMF Values Calculated for Transmission Infrastructures***

Transmission Line	Approximate No. of Properties in the RoW	Electric Field Strength - E (kV/m)**	Magnetic Field Strength - H (A/m)**	Magnetic Flux Density - B (μT)***
400 kV TL (30 m servitude either side)	1400*	4.29	24.88	31.25
220 kV TL (30 m servitude either side)	70	1.68	11.63	13.86

** Estimate based on values reported by GAMEK for a line of similar voltage and length in the area.*

*** Considering the worst case: 1.8 m from the ground in the middle of a 450m hop, maximum current, on flat earth (Max. SAG)*

**** Magnetic flux density, $B = \mu H$ where $\mu = 4\pi 10\text{-}7$.*

Information contained in *Table 2.7* demonstrates that the EMF levels for the two transmission lines are compliant with the *ICNIRP Guidelines* (at maximum levels directly under the transmission line). No additional numerical occupational or public exposure limits/guidelines are included in the IFC EHS Guidelines.

2. *"Considering siting new facilities so as to avoid or minimize exposure to the public. Installation of transmission lines or other high voltage equipment above or adjacent to residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or offices), should be avoided"*;

An alternative analysis was undertaken as part of the Project design, as included in *Chapter 3*.

The metropolitan area of Luanda is densely populated with a growing population and an ever-increasing demand for space, which is being competed for (including the infrastructure required to sustain this area). Balancing the trade-offs for available space and the inevitable proximity to the

general public, NHID considered siting the facilities to avoid or minimise exposure to EMF in the following ways:

a. Hanga, Mateia, Muchau, Mbanza Calumbo II, Quissuba, Quitendele, Tari: a route optimisation process was undertaken to minimise the impact on households on the already approved transmission line corridor. Transmission structures along the corridor were moved to provide the greatest clearance possible between the public and the location of the structures (also known as micro siting); and

b. Bita Ambriz: a route optimisation process was undertaken to minimise the impact on households on the already approved transmission line corridor. The height of some transmission towers was increased and position

3. *"If EMF levels are confirmed or expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples of these techniques include:*

    - *Shielding with specific metal alloys*
    - *Burying transmission lines*
    - *Increasing height of transmission towers*
    - *Modifications to size, spacing, and configuration of conductors"*

It should be noted that although the EMF levels were not above the ICNIRP exposure limits and there was no requirement to apply additional engineering techniques, in the interest of further reducing public exposure and associated stakeholder concerns, during TDS-V3 assessment NHID evaluated alternative designs for the transmission infrastructure by maximising the height of the transmission line infrastructure wherever possible above the recommended height of 6.1m per the ITC-LAT 07 guidance.

As stated in *Section 1.4*, in order to avoid major social impacts (including the need for physical displacement) the final transmission line route alignment is not closed. Specifically nearby Quisuba and Muchau villages. Alternatives are being considered and will be discussed with GAMEK in due course (*Map 02 – Annex A*).

Technical Instruction for Overhead Power Lines ITC-LAT 07

ITC-LAT 07 is a Spanish regulation focused on the minimum safety distances, cross and parallelism for buildings, constructions and urban areas. Whilst this regulation is not applicable in Angola, it has been used as guidance in international best practice.

Section 5.12.2 Buildings, constructions and urban areas states that *"In accordance with the provisions of Royal Decree 1955/2000, of December 1, no buildings and*

industrial facilities will be built in the flight easement (line footprint), increased by the following minimum safety distance on both sides: Dadd + Del = 3,3 + Del in meters, with a minimum of 5 meters. (…) Similarly, lines will not be built above buildings and facilities industrial areas in the range defined above. However, in the cases of mutual agreement between the parties, the distances minimum that should exist in the most unfavorable conditions, between conductors of the electric line and the buildings or constructions that find under it, will be the following: On points accessible to people: 5.5 + Del meters, with a minimum of 6 meters; and On points not accessible to people: 3.3 + Del meters, with a minimum of 4 meters."

Considering that the power line footprint is a maximum 24.7 m in width, with a safety distance of 6.1m (3.3 + 2.8) each side (400KV); meaning that a strip of 36.9 m (footprint + 2 x safety distance) should be considered for the case without buildings, and with no new buildings permitted on that strip. In the case of existing buildings the safety distance considered should be 8.3 m (5.5 + 2.8) and, consequently, the strip was 41.3 m (24.7 + 2 x 8.3).

2.7 *PROJECT AREA OF INFLUENCE*

For the purposes of this impact assessment, the definition of the Area of Influence (AoI) given in IFC Performance Standard 1 is used. The AoI encompasses [(1)]:

- *'The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.*

- *Associated facilities are facilities that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.*

- *Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.'*

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 (*Figure 2.3*). This encompasses the transmission line RoW as follows:

- 1000 m either side of line for the 400 kV Laúca-Bita (i.e. 2000 m in width), including the existing substations, and those under construction; and

(1) IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts, January 1, 2012.

- 1000 m either side of line for the 220 kV line (i.e. 2000 m in width) and Laúca substation.

Note that some direct impacts may not affect receptors within the entire AoI, and will instead be confined to within the Project footprint, but this 1000 m zone is considered to be the composite AoI for direct impacts from the project.

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. It includes the municipal indirect impacts to social resources that may extend to nearby communities along the transmission lines (i.e. Cambambe, Icolo e Bengo and Viana), as well as the residents in Luanda metropolitan area that will benefict from the electricity supply. *Figure 2.4,* present the AoI's for the Project.

Figure 2.3 Project Direct Area of Influence

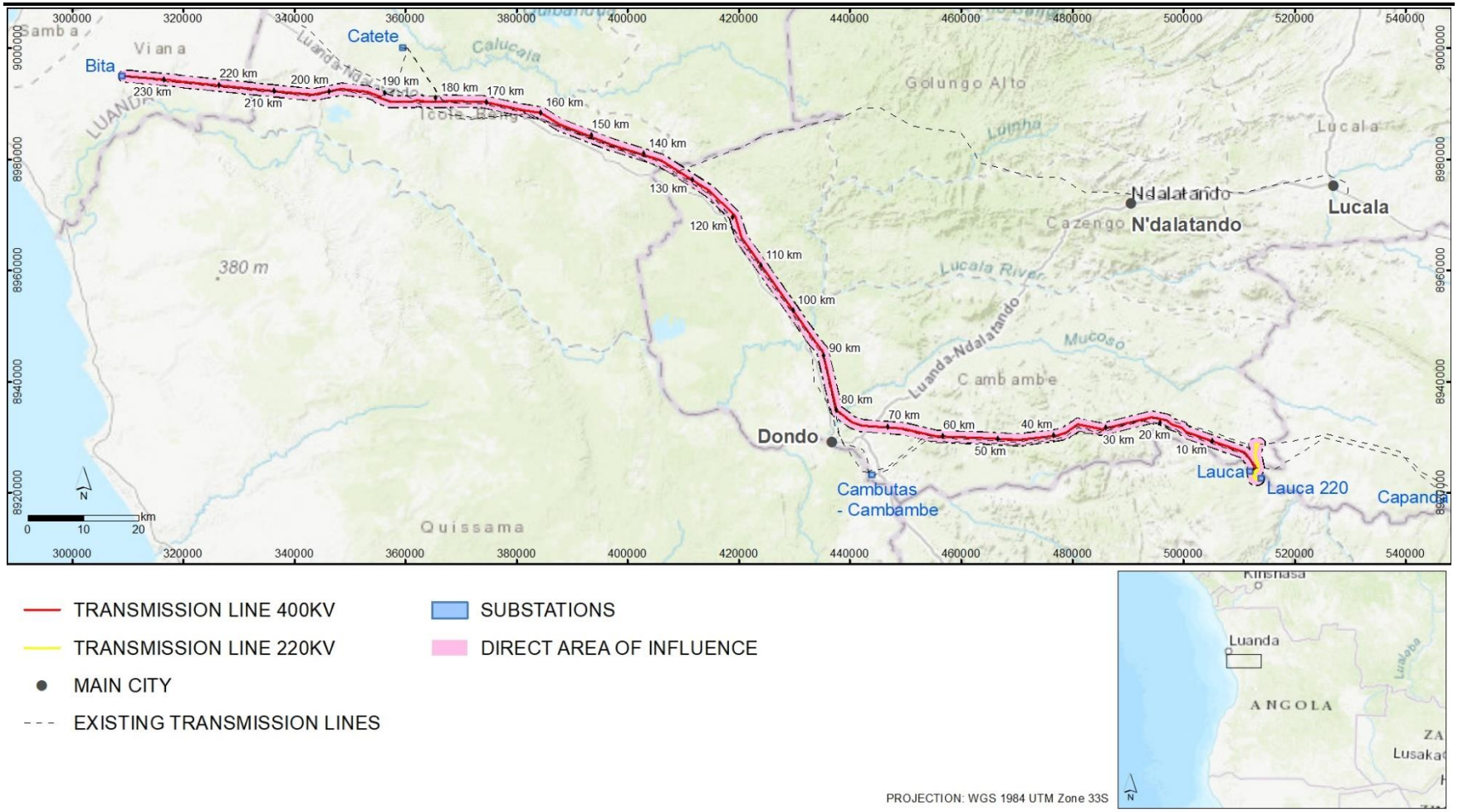
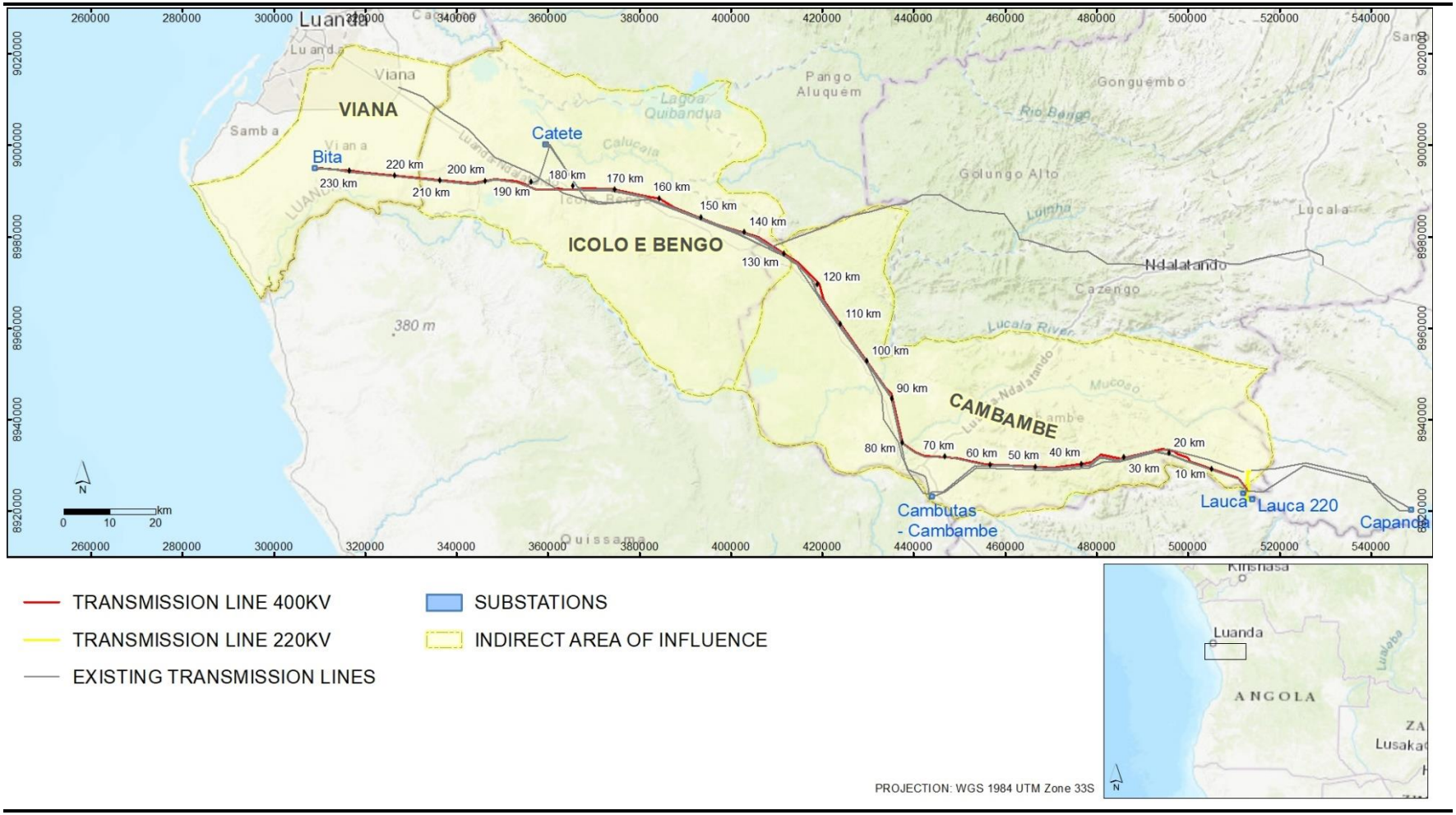


Figure 2.4 Project Indirect Area of Influence



2.8 MAIN PROJECT COMPONENTS

2.8.1 Transmission Lines

The design criteria as adopted for the conceptual design are initially based on NHID's current practices, based on studies of recently composed specifications and *in-situ* inspections of existing transmission lines. The main criteria when concluding on the adopted conceptual design has been to ensure that the various line components are designed in a safe, cost effective and reliable manner. A brief description of the transmission lines is summarized in *Table 2.8.*

Table 2.8 Main Transmission Lines Components

Project technical Specifications	400 kV Laúca - Bita	220 kV Laúca – Cambutas / Capanda Circuit
Total length of transmission line	238 km in total length, one-circuit, duplex	15 km in total length, double-circuit, simplex
Nominal System voltage	400 kV	220 kV
Maximum system voltage	420 kV	245 kV
Electrical System	Alternate	Alternate
Number of circuits	1 three phases	1 three phases
Number of conductors phase	2 (Dx)	1 (Sx)
Circuit layout	Layer	Layer
Wire	Sorbus (AAAC)	Crow (ACSR)
Ground wire	19No8	19No8
Optical Ground Wire (OPGW)	48 fibres	48 fibres
Transpositions	2	No
Height above the sea level	11 – 870 m	733 – 952 m

Project design will also include the following elements:

- Lightning Arrestors: for the lightning arrestor there are two ground wires, on top of the power line, for the entire length of the 238 km line and over the conductors, to produce an umbrella effect to protect conductors. The lightning current will be grounded using the ground cables connected to every tower steel structure. The structure is connected to the ground by specific ground connection cables and network in order to meet the MINEA specifications, namely the ET-E-112 (31 July 2014) *Malha de Terra dos Apoios de Linhas Aéreas.*

- Aircraft signalling: The project includes beacons for aircraft signalling as per the ET-E-116 (31 Jul 2014) - *Dispositivos para Balizagem Aérea Diurna e Nocturna de Linhas de MAT e AT* to be implemented as needed to fulfil the regulations and furthermore.

- Bird diverters: Devices for avifauna "BFD" (Bird Flight Diverter), consisting of spirals 30 cm in diameter, would be attached to the guard

cables at regular intervals of suitable length in each situation. The field survey ecology studies (avifauna) developed in the ESIA, and then detailed in the Executive Project, will identify the zones to be signalled with BFD. BFD devices are helically shaped, constructed of plastic, white or orange, and fit to the guard cable by winding. At one end these devices have a larger diameter ring protruding from the cable profile. This ring combined with the colour of the device significantly increases the visibility of the cables by the birds, without giving it a bulky appearance and not introducing any significant increase in relation to the area exposed to the wind.

- Dampers: Vibrations dampers are expressly considered in the project, averaging one every 200m in every cable (conductors, OPGW and Ground cable). *Table 2.9* summarizes the quantification of dampers to be included in the project.

Table 2.9 Dampers Quantification for both TL Segments

Description	400 kV Laúca - Bita	220 kV Laúca – Cambutas / Capanda circuit
Conductor dampers	7.166	276
Ground wire cable dampers	1.196	92
OPGW cable dampers	1.196	92

2.8.2 Temporary Infrastructures

Access Roads

Currently, there are no details on access roads to be used during the construction phase. It is expected that due to the proximity to other power lines and that the corridor is running in close vicinity of the main provincial roads the need for new access roads will be limited. It is also assumed that any new roads will be located within the direct AoI and the inherent construction impacts should be similar to the impacts from general construction phase activities (refer to *Chapter 9*). In this regard, among the specific mitigations and enhancement measures to implement through the project life cycle included in the ESMP (*Chapter 10*), the requirement for the development and implementation of a Traffic & Transportation Management Plan should be highlighted, as this document will include controls over prescribed routes, driver training, vehicle maintenance, speed restrictions, appropriate road safety signage, and vehicle loading and maintenance measures and vetting procedures. It also includes specification for community awareness and safety programmes.

For existing access roads, the four meter right of way 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 restored to the original condition will be undertaken.

Temporary Tower Laydown and Assembly Areas

An area of approximately 40 by 50 meters on each site will be demarcated as a temporary tower laydown and assembly area, in order to allow for a 640 tower to be installed.

Contractor Compounds

Up to four existing construction camps will be required for the three different subcontractors; in Laúca dam, Dondo, Maria Teresa and Catete, all sized for about 150 workers each. Furthermore a main warehouse / plot for containers near Viana will also be considered. It is assumed that all construction camps will be located within the direct AoI (as per *Section 2.6*).

2.9 PROJECT PHASE ACTIVITIES

2.9.1 Main Tasks

The main activities included in transmission line and substation life cycle are described below. These activities are of a technical nature and do not include any of the activities related to environmental and social management except for the payment of compensation.

- Planning and executive design phase:
    - Design principles
    - Study plot
    - LIDAR
    - Towers type design
    - Foundations type design
    - Substations extension design
    - Plant and line profile
    - Administrative project
    - Access design
    - Operational design
    - Organization and mobilization
- Construction phase
    - Administrative management occupations
    - Payment of compensation
    - Demining 60m wide corridor
    - 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
- Substation equipment supply
- Mounting substation expansion
- Commissioning
- Control of works and As Built

- Operational phase
  - Maintenance (routine)

- Decommissioning

Note that the above tasks do not include any tasks associated with environmental and social management as these are detailed in the ESMP.

Planning and executive design phase (ongoing) – This includes line route selection through discussions with MINEA to establish Bend Points for all routes which will be surveyed by the surveyor and on site measurements to accurately determine the route and substation layout. The current schedule has assumed that up to 12 months are needed for the complete detailed design stage, development of route and profile design and structure and foundation design. Subsequent to the detailed design (Executive Project), procurement, shipping, clearing and transportation activities will take place to bring the equipment and infrastructure to site. Pre-construction will include a LIDAR survey.

Construction phase – The construction of the transmission line route from surveying, establishing the site, bush clearing and access road establishment through to foundation construction and structure installation to energising. This phase is expected to take between 12 to 18 months to complete. Due to the fact that NHID is considering creating three independent constructions teams (different subcontractors), this timeframe is expected to be 12 months (July 1st 2019 to June 30th 2020). If only two contractors will be used, the construction period is expected to be 18 months.

Operational phase – The transmission line would be transferred by MINEA to RNT for operation once commissioned. This phase includes operational activities associated with the management, maintenance and control of the 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 transmission lines is 50 years.

2.9.2 Schedule for the Construction Phase

As per the contract requirement, the construction period will be 12 to 18 months (Annex B3). As stated above, efforts will be made to shorten this schedule to a minimum of 10 months of preconstruction activities and 12 months of constructive works. To achieve this goal, the total length would be divided in three tranches of 1/3 of the total length, and three different work groups would attach each trance independently.
The sections below provide an overview of key activities over selected phases of the project life cycle for both transmission lines.

2.9.3 Site Preparation Activities

NHID will set a number of method statements in order to safely construct and install the overhead transmission lines. The applicable method statements are summarised below. The construction phase involves a number of activities, which will be undertaken sequentially by up to six simultaneous different construction crews belonging to three subcontractors.

During this preliminary phase, path vertices and singular path points, identification and ground staking and mine clearance will be undertaken within a 60 m corridor. A method statement (Demining Plan) is to be prepared by the certified demining operator authorize by CNIDAH (refer to *Section 2.12*).

The site preparation phase will include a number of activities including setting out and site clearing including vegetation removal and tree felling (where necessary).

Setting Out

The team will position the intermediate towers based on the approved profile. Where required, basic access tracks will be established to each structure position by moving obstacles such as rocks, levelling high points and filling in holes. The work will be undertaken in such a way to minimise the impact on the environment and surroundings. Existing tracks will be used where possible and new tracks will be made to pole positions where existing access is not available.

Site Clearing

Where tree felling is required, all activities will be supervised by a trained member of staff in line with (*Method Statement for Vegetation Clearance* – to be

developed by NHID prior to construction activities commencement). Bush and low growth trees will be cleared by means of a front end loader. All bush and trees will be cut into smaller pieces prior to leaving the site and it is NHID's intention that the wood be placed aside the ROW at the disposal of the nearby communities for fire wood or construction. Tree clearing will be minimised and only removed as necessary.

Placement of transmission line structures will be undertaken on every tower site defined plot, an area of 40 by 50 meters on average. Within the plot the tower structure would be assembled before erection.

2.9.4 Construction Phase Activities

Construction activities for the substations and transmission lines will include the following:

- excavation on site;
- construction of the concrete bases for the transmission line pylons, including stubs implementation;
- hauling in of the pylon components and other raw materials;
- assembly and erection of the towers;
- cable stringing of the transmission line; and
- site rehabilitation.

Excavations

Foundation sizes are dependent on the soil conditions, tower type and height; with the biggest foundation footprint for steel lattice towers being 15.4 x 15.4 m. In this project only steel lattice towers will be considered.

Typical foundations for this project will be "Pila foundation type" using drillers. The drilling is the best solution to reduce the amount of ground as it consists of the extraction of a cylinder of 1 meter diameter and 6 meters high, on average per leg.

Excavations using drillers will be made for the foundations as well as to install the anchors of the towers.

In some cases, the foundation is to be "Pad Chimney". It needs excavators to open the ground to prepare the foundation solution.

Typical excavation depths for lattice towers is six meters. Excess soil will be spoiled around the structure and excess dump rock will be uplifted and removed as required. Each excavation will be inspected and tested to confirm its suitability.

The foundations are ultimately filled with concrete. Contractors are required to safeguard excavations; this may include erecting a temporary fence or

warning solution around the excavation to protect the safety of people and animals.

Concrete will be sourced from a 'ready-mix' truck which will access the site, or concrete will be mixed on site. Once the excavations have been filled, the concrete requires 28 days for total curing. Meanwhile, after eight days 80% of the final concrete mechanical resistance is achieved and tower erection could begin after this 8 days period if needed.

Typical vehicles on site at all transmission lines include trucks for material and tools transportation, pick-ups for the crews, driller machine and retro excavators as well as light duty vehicles (LDV). The crews will be different depending on the activity to be performed, *e.g.* for foundations, tower erection or cable stringing.

Lattice towers supplier is still to be formalized, and will be assembled on site as per NHID assembly procedure.

Cable Stringing and Levelling

Conventional stringing will be used throughout using custom built equipment. There are three kinds of cable: conductors, ground wire and OPGW. Cable drums carrying approximately 2000 to 4000 m of cable will be delivered to site. The conductors are made of full aluminium alloy (AAAC) or Aluminium with a steel core for strength (ACSR). Power transfer is determined by the line voltage and the current. The area of aluminium in the conductors will define the conductivity. Conductors are used singularly, in pairs or in bundles of three, four or six per phase dependent on factors such as audible noise, corona and EMF mitigation.

Large diameter running out blocks (pullers and brakes) will be fitted to all the conductor attachment points of the section to be strung and a pilot wire passed through the running out blocks. The pilot wire will be walked out from pole to pole and will then be used to pull the conductor into place. Conductor tension will be monitored throughout by a dynamometer. The puller and brake hydraulic machines apply tension to the cables to elevate them and finally adjust the tension to the design levels. The levelling process consists of elevating the cable's lowest point to the design height through topographic methods, using the levelling plan in the detailed engineering phase.

Once the cables are levelled, the last process consists of connecting the different isolated systems between anchorage towers. Jumpers are applied to connect the tranches between anchored towers. These jumpers are simple cables cut in a curve with the shape to avoid possible short-circuits between the phases in the operational period. Once jumpers are applied, electrical test can begin.

Site Rehabilitation

Site reinstatement and rehabilitation are undertaken for each component of the construction phase, which include the following activities:

- Removal of excess building material, spoil material and waste;
- Repairing any damage caused as part of the construction activities;
- Reinstating existing access roads (where applicable); and
- Replacing top soil and planting indigenous grass (where necessary).

Construction Staff

Construction staff will comprise the NHID staff of foremen and group leads, while local contractors would make up around 85% local contractors per team. There will be two independent subcontractors working in parallel in the Civil Works activities and three independent subcontractors for towers assembly and cable stringing activities.. During the peak of construction there is likely to be up to 600 workers (workers over a period of 4 months (refer to *Figure 2.4*, *Figure 2.5* and *Figure 2.6*). The intention is to fill the majority of positions from the local area; assumed to be approximately a 15/85 split in favour of local employment. In the event that construction work is undertaken in up to three different individual and independent tranches to reduce the schedule time, the number of workers would increase proportionally.

Figure 2.4 Workforce Distribution per Number of Workers

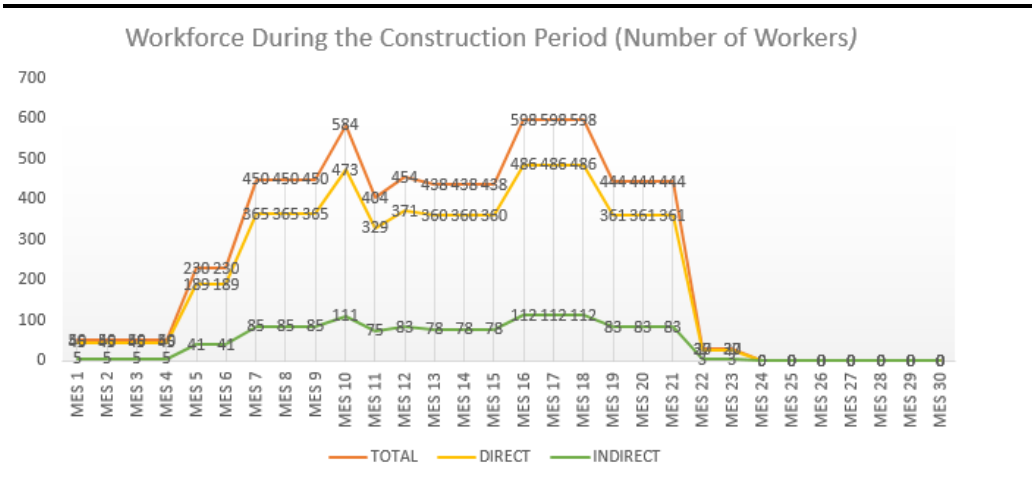


Figure 2.5 ***Workforce Distribution per Worker Nationality***

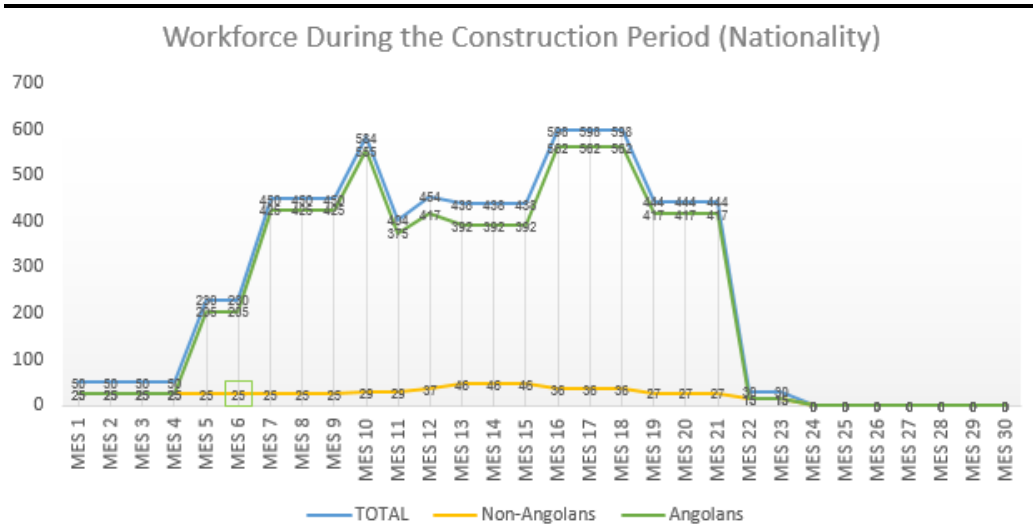
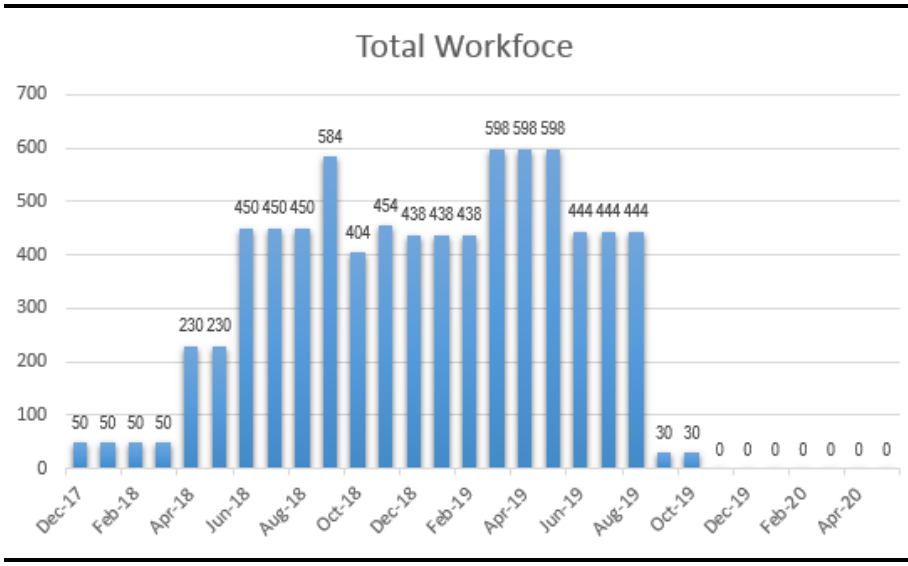


Figure 2.6 ***Construction Staff - Totals***



Transportation

As construction equipment and materials will be probably sourced outside Angola, sea shipping will be used to transport the equipment to Luanda. Once construction equipment and materials are present in Angola, terrestrial shipping will be used to convey the equipment to site. As per IFCS PS01 a risk assessment of the supply chain should be performed once the evaluation of the different scenarios starts.

2.9.5 Operational Phase Activities

RNT will have responsibility to operate the line, and will ensure that available paths (4 m for the transmission lines and 8-10 x 8-10m for towers) 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 transmission line. The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the lines.

2.9.6 Decommissioning Phase Activities

The design life of the Project is 50 years. The decommissioning procedure will be provided as part of the maintenance manual during handover of the completed Project. However, at this stage it is unknown whether NHID or GAMEK will execute this. The decommissioning procedure will include site specific rehabilitation plans for the footprint of the project. All regulatory requirements will be complied with for the decommissioning phase.

2.10 OVERVIEW OF RESOURCES REQUIRED DURING CONSTRUCTION AND OPERATION

2.10.1 Water Use

During the construction stage, NHID teams will require water for potable use, for the construction workers. For this water will be sourced from contracted water trucks and provided as bottled drinking water. Water will also be required for construction activities (and general camp domestic purposes), and will be sourced from surface water bodies.

2.10.2 Solid Waste

Construction waste will comprise general domestic waste (construction camp) including sanitary and food waste, office waste, organic material, small volumes of wastes arising from mobile plant, chiefly waste lubricating oil and packing materials (e.g. crates).

No significant solid waste streams are expected during operations. Solid waste may be generated during operations and these waste streams along with solid waste from the construction phase will be disposed at an appropriately licensed landfill sites in the region.

2.10.3 Waste Water

Wastewater, referring to any water affected in quality by construction related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment and staff); and

- Drainage over potentially contaminated areas (e.g. concrete batching/mixing areas and equipment storing areas).

Measures will be implemented to manage all waste water generated during the construction period. Sewage will be collected by licensed company and transported to the nearest sewage facilities.

2.10.4 Electricity

Electricity will be obtained from diesel generators or temporary electricity connections during the construction phase.

2.11 LAND REQUIREMENTS BY THE PROJECT

The anticipated maximum land take for the Project is 2,145.4 ha during the construction phase and a maximum of 107.4 ha during the operation phase (*Table 2.10*). It is important to note that not all of the construction area will be required at the same time. The impact the construction works will be progressive as this sequential work is completed on a consecutive lineal progress.

Table 2.10 Anticipated Maximum Land Requirement by the Project

Component	Unit Size	Land Required
Temporary		
OHTL Right of Way (60 m wide)	252 km (237+15 km) line length	1,512 ha
OHTL Footprint corridor (20 m wide)	252 km (237+15 km) line length	504 ha
Temporary tower site working areas	631 (583+48) tower´s sites Average 40mx50m per site	126.2 ha
Total (Temporary)		2,142.2 ha
Permanent		
Permanent tower footprints	631 (583+48) tower´s sites Average 10mx10m per site	6.3 ha
Maintenance road (4 m wide)	252 km (237+15 km) line length	101
Total (Permanent)		107.3 ha

Source: Prepared by ERM based on NHID input (2018).

2.12 PROJECT COST

According to NHID 2018, and as in the corresponding items in the Commercial Contract MINEA – NHID signed August 02nd 2018, the investment cost for the project, estimated in Euros (€), is One Hundred and fifty million, fifty-four thousand eight hundred and ninety one Euros and seventy one cents (150.054.891, 71 €) Euros (*Table 2.11*).

Table 2.11 Provisional Table for Construction Cost

Project Components	Costs
400 kV Laúca - Bita	138.746.765,10 €
220 kV Laúca – Cambutas / Capanda circuit	11.308.126,61 €
Total:	**150.054.891,71 €**

Source: NHID (2018).

2.13 DEMINING PROCESS FOR LAÚCA-BITA TRANSMISSION LINE

2.13.1 Institutional Background

In 1995 the United Nations (UN) deployed a peacekeeping mission (United Nations Angola Verification Mission - UNAVEM) to monitor the implementation of the 1994 Lusaka Accord between the Government of Angola and the Angolan nationalist movement *União Nacional para a Independencia Total de Angola* (UNITA). One of the initiatives was the creation of the *Instituto Nacional para Remoção de Objectos e Engenhos Explosivos* (INAROEE). INAROEE was responsible for coordinating all mine action efforts in Angola until 2003 (including the execution of demining activities). In 2003, as a consequence of the ratification of the Ottawa Treaty[1] (in July 2002), the Government of Angola reformed the institutional arrangements for mine action by separating the responsibility for the coordination of the mine action sector from the responsibility for the implementation of mine action operations. Consequently, the Government created the National Intersectoral Commission for Humanitarian Demining and Assistance (*Comissão Nacional Intersectorial de Desminagem e Assistência Humanitária* - CNIDAH) and the National Demining Institute (*Instituto Nacional de Desminagem* - INAD)[2]. Since then CNIDAH reports directly to the Council of Ministers and is responsible for the coordination, planning and organization of all actions related to demining, assistance to mine victims, as well as the social reintegration of mine victims, and incorporates Ministries of Defence, Agriculture, Health, Administration and Planning. Additionally. CNIDAH is responsible for the Angolan Mine Action Database maintenance.

INAD is a public institute, under the Ministry Social Assistance and Inclusion (*Ministério da Assistência e Reinserção Social* – MINARS), responsible for the implementation of mine action operator and is primarily responsible for demining operations and training, surveys, and Mine Risk Education (MRE).

[1] The Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction.

[2] CNIDAH is a commission that reports directly to the Council of Ministers and is responsible for the coordination, planning, and organization of all actions related to demining, assistance to mine victims, and the social reintegration of mine victims. INAD is a public institute, with autonomous finance and administration responsibilities, and is the Government of Angola's mine action operator and is primarily responsible for demining operations and training, surveys, and Mine Risk Education (MRE). CNIDAH has been receiving capacity development services from UNDP since it was established in 2002 whilst INAD is yet to receive any support from UNDP and the international donor community. CNIDAH has been receiving capacity development services from UNDP since it was established in 2002 whilst INAD is yet to receive any support from UNDP and the international donor community. Additional info available in http://www.cnidah.gv.ao/default.htm

CNIDAH's Technical Department role is particularly important. Besides being responsible for the development and maintenance of the National Standards for Demining, CNIDAH attributes also include the elaboration of special technical studies mining related, accreditation of operators, accident investigation, monitor operational activities and training, and evaluate project conduct and results and quality assurance of executed projects.
An Executive Commission for Demining (*Comissão Executiva de Desminagem* - CED) was established in 2005 to manage Angola's national development plan and is chaired by the Minister of MINARS. It supports mine clearance in areas where development projects are a priority.

In terms of the Laúca-Bita transmission line project, CNIDAH Technical Department will play an important role - the demining operator company (either a private owned company or a public entity as the specialized units in the Army) needs to be an CNIDAH' authorized operator company, following the International Mine Action Standards (IMAS) and the Angolan National Technical Standards and Guidelines (NTSGs).

2.13.2 Demining Criteria and Reconnaissance

CNIDAH is 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 (60m wide along the path) shall be certified as defined by an authorized company or entity by CNIDAH.

In terms of process, all ground assigned to the project needs be certified as mine cleared before commencement of the construction works. Based on the 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 experts and the technical 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, villages and residential areas.

All the areas within the 60 m wide strip along the path will be considered safe after the demining works, as it will be certified by the accredited operator. CNIDAH 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 60m strip. 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. This Plan should be prepared consistently with the survey and the information analysis. In Angola, the focus will be for anti-personnel mines (APM). Consequently, manual demining using metal detectors operated by trained deminers with protection should occur. In the event that specific areas considered to contain anti-vehicle mines (AVM) are identified, and the Plan will consider these special circumstances and the technology and methodologies required.

2.13.3 Accessing the Land

MINEA (GAMEK) shall grant the Contractor (NHID) the right of access and occupation of all construction sites (Commercial Contract signed between MINEA and NHID august 2017, Clause 11).

Once the contracted path is revised by the engineering team, in view to draft the Executive Project, incorporating some amendments on the contracted path to minimize impacts and to match optimally some tower positions in consequence, the revised path is to be approved by MINEA.

Subsequently, MINEA (GAMEK) will notify the project both to the Province Governor and Municipality Administrator through the territory under his competence the transmission line will run. A Municipal Commission ("*Comissão Municipal*") is created in each Municipality through which the transmission line passes. As such, the Commission are named the Administrators of affected "*Comunas*", first rank Sobas and some Municipality technicians.

This Commission will identify, with the help of the MINEA (GAMEK) technicians, the affected land, houses, land users, house families, and the corresponding impact. They will approve the list of affected people, compensation to be provided by NHID and the commitment for demining in the line strip.

2.13.4 Compensation for Potential Damage to Crops and Structures

If the Municipality Commission does not identify and define properly the compensation for the affected land culture and time of no use, the affected people have the right to claim, following the Administration hierarchy: Soba of the village, Comuna Administrator, Municipality Administrator and Province Governor. The authorities will either solve the claim or escalate the claim to MINEA and then to NHID.

If damage occurs, there are specific procedures to calculate the value of the damage, pay the compensation, and document the process. However, the Department of Agriculture and Agrarian Economy (*Departamento de Agriculturea e Economia Agraria* – DAEA) under the Ministry of Agriculture and Rural Development (*Ministerio da Agricultura e Desenvolvimento Rural* –

MADR) regularly update a table that includes the value in US Dollars for the different cultures and trees for potential compensation to peasants.

NHID would restore the land/soil after the passage of heavy machinery, vegetation removal, and breaking up soil.

2.13.5 Occupational and Community Health and Safety

In order to minimize potential risks associated with demining activities, NHID will align with the demining contractor, a set of control measures (e.g. safety perimeter, safety distances to maintain, equipment, tools, etc.) following the ISO9001:2008 standard. Concomitantly, besides all the specific measures to be included in the Demining Plan, NHID will make sure that operations will be performed by the demining accredited operator in accordance with international regulatory requirements such as International Mine Action Standards (IMAS) and the Angolan National Technical Standards and Guidelines (NTSGs).

3 ALTERNATIVE ANALYSIS

3.1 INTRODUCTION

3.1.1 Overview

This Chapter 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, construction and operation.

A significant portion of the transmission line route will be located within an existing transmission line corridor. There will however be greenfield development involving expansion and/or extension of the corridor. As part of the design process, NHID investigated various options to minimise the impact on the public and the environment, which are further elaborated in this Chapter.

3.1.2 Approach

For the purpose of this alternative analysis, both the no-go as well as the 220 kV and the 400 kV transmission lines were evaluated separately, contingent to different decision-making processes.

The key environmental, social, technical and economic factors were evaluated and considered based on the following criteria:

- ***Location alternatives*** - Where possible, re-route the transmission lines so that no structures/properties were close to or under the lines (re-siting the facilities). Resettlement would be considered as a last option; and

- ***Technology alternatives*** - Should re-routing not be an option due to space or other factors, consideration of different technologies (e.g. transmission towers height) would be investigated. These options were evaluated against EHS, technical and economic criteria.

Consequently, both siting alternatives and technology were evaluated individually and in combination, as follows:

- From an environmental, health and safety perspective (environmental issues, resettlement including physical as well as economic displacement, health concerns, community safety and aesthetics);

- From a technical perspective (constructability, impacts on timing and schedule for construction, maintenance / repair of infrastructure, making changes to infrastructure, disturbance to other infrastructure and accidental damage); and

- From an economic feasibility perspective (construction costs, maintenance costs and resettlement costs).

3.1.3 No-Go Scenario

This Project is being consider as a component of the national power sector long-term vision in 2017 (Angola Energy 2025) to transport and transform the energy from the middle and lower Kwanza hydropower stations (existing and under construction). The Cuanza Basin has been earmarked for 7,000 MW, while the country plans to achieve a four-fold increase in the country's current electrical generation to 9,000 MW by 2025 from renewable sources. This Strategy includes solar, wind and thermal power generation facilities across the country, but in this specific region, based on the biophysical conditions, hydropower is clearly preponderant.

Complementary, substantial investment is being allocated to the construction and rehabilitation of linear infrastructures to transport that energy, mainly to Luanda metropolitan area. This intricate distribution system is composed of a complex high voltage transmission line grid (which includes multiple substations and related infrastructure) that has been constructed since the 60's (with major effort since 2014). It is also important to underline that substantial sections of the proposed line are being considered within existing transmission line corridors that between Laúca hydropower station and Luanda.

Based on this scenario, the no-development option would mean that this component of the national strategy would not be fully implemented despite the energy generation upstream. In the short term, this scenario ensures the status quo in the biophysical and socio environment along the project area, considering that the majority of the line is being planned within existing corridors.

The implications of this would be until a certain point no additional reliability and security of electricity supply in the Luanda Metropolitan area – the need for additional transmission lines would be considered, since the energy will be continuously being produced in the upstream dams. The area would continue experiencing unstable electricity supply associated with load shedding and outages due to demands exceeding supply. The proposed project is key in realization of one of the objectives of Angola Energy 2025. The No Project option will therefore in the medium and long term dent the availability of electricity power in those urban and per urban areas, derailing the progress being made towards realization of vision 2025. Given the nature of the project, and that the level of impacts associated with the project are low and that there

is high probability of mitigation of these negative impacts, the "no-go" option is not the most viable option in this instance given the consequences for development in the Luanda Metropolitan area.

3.1.4 Analysis Criteria for the Transmission Line Routes Alternative Analysis

The analysis of alternatives involved the evaluation certain sensitivities associated with the various options. *Table 3.1* summarizes the sensitivity criteria used for the alternative analysis. Each sensitivity aspect was assigned a score and the score was used as a basis for comparison between options. The comparison in presented and discussed.

Table 3.1 Environmental and Social Sensitivity Criteria Used to Evaluate Alternatives

Category	Score	Social Sensitivity				Environmental Sensitivity	Aesthetic	Community Health & Safety
		Physical and Economic Displacement	**Community Infrastructure and Resources**	**Socio-Economics and Income-Generating/ Subsistence Livelihoods**	**Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage**			
High	4	Dense permanent housing (larger populations) or areas highly significant for livelihoods which are not available elsewhere.	Substantial or highly significant infrastructure present (e.g. school, hospital, medical centre etc.).	Area is essential for principal livelihoods.	Presence of large number / highly sensitive intangible / living cultural heritage sites. e.g., pilgrimage sites, modern tombs, graves or cemeteries or religious buildings.	Landscapes that: • feature concentrations of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels; *and* • feature ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of naturally occurring species in natural patterns of distribution and abundance; *and* • feature rare, threatened, or endangered ecosystems, habitats or *refugia*.	Major changes affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view. Contrast may dominate the view and be the major focus of viewer attention.	Severe health effects for a large portion of the community

Category	Score	Social Sensitivity				Environmental Sensitivity	Aesthetic	Community Health & Safety
		Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage			
Medium	3	Small-medium groups of houses, priority areas used frequently for livelihoods, or businesses potentially requiring economic resettlement.	Some infrastructure present with some alternatives available.	Area is significant for principal livelihoods.	Individual grave sites.	Landscape features that include ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of naturally occurring species in natural patterns of distribution and abundance.	Clearly perceptible changes in views at intermediate distances, resulting in a either a distinct new element in a significant part of the view, or a more wide ranging, less concentrated change across a wider area. Contrasts may attract attention but should not dominate the view of the casual observer.	Moderate health effects for a larger portion of the community and severe health effects for a small portion of the community

Category	Score	Social Sensitivity				Environmental Sensitivity	Aesthetic	Community Health & Safety
		Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage			
Low	2	Individual houses or small communities, non-priority areas used for livelihoods.	Some infrastructure present although typically accessed at alternatives sites.	Area is used for livelihoods.	Intangible cultural heritage sites known to be used, e.g. views or landscapes.	Ecologically important areas that do not form part of recognized protected areas	Minor changes in views, at long distances or visible for a short duration, perhaps at an oblique angle, or which blends to an extent with the existing view. Contrasts may be seen but should not attract the attention of the casual observer.	Non-permanent health effects for a larger portion of the community and moderate health effects for a small portion of the community

Category	Score	Social Sensitivity				Environmental Sensitivity	Aesthetic	Community Health & Safety
		Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage			
Negligible	1	No significant human land use for livelihoods / housing.	No significant areas used to collect resources or house infrastructure.	Area only occasionally used for livelihood activities.	No significant culturally-sensitive areas.	Other areas not considered sensitive.	Change which is barely visible, at a very long distances, or visible for a very short duration, perhaps at an oblique angle, or which blends with the existing view. Acceptable contrasts are primarily natural ecological changes.	Non-permanent health effects for small portion of the community.

3.2 RESULTS

3.2.1 220 kV Transmission Line

Background

The 220 kV transmission line is comprised of two parallel lines each of 7.5 km in length that will connect the 220 KV substation of the Laúca hydroelectric power station to the existing Cambutas – Capanda transmission line. The design is a direct consequence of the power distribution strategy between the different hydropower projects (HPP) in the region; specifically Capanda, Laúca and Cambambe HPPs.

In 2016 the design approach was to construct a 39km 220 kV transmission line between Capanda and Laúca which would have included an extension of a 220 kV panel in the Capanda substation (Option 1). During the project design evaluation, an alternate approach was decided that involved connection of the Laúca substation at the voltage level of 220 kV with the 220 kV circuit at Cambutas – Capanda (Option 2). This is the scenario that was considered for this ESIA.

Discussion

Table 3.2 illustrates the results of the environmental and social analysis of both alternatives for both construction and operation phases)[1]. *Table 3.3* summarises the comparison of the technical and financial criteria.

Using the ranking, Option 2 is preferred from an environmental and social perspective.

Although for both options, the environmental and social sensitivity, as well as potential heath and community safety risks are generally low. The preferred option is the 220 kV Laúca substation - Cambutas / Capanda Transmission Line. This option is mostly based on the extension of the existing infrastructure and would be developed on a less sensitive area of land. The results are similar for the technical and financial aspects.

[1] For Option 1 the E&S screening was based on secondary data analysis, including satellite imagery assessment.

Figure 3.1 220 kV Transmission Lines Alternatives

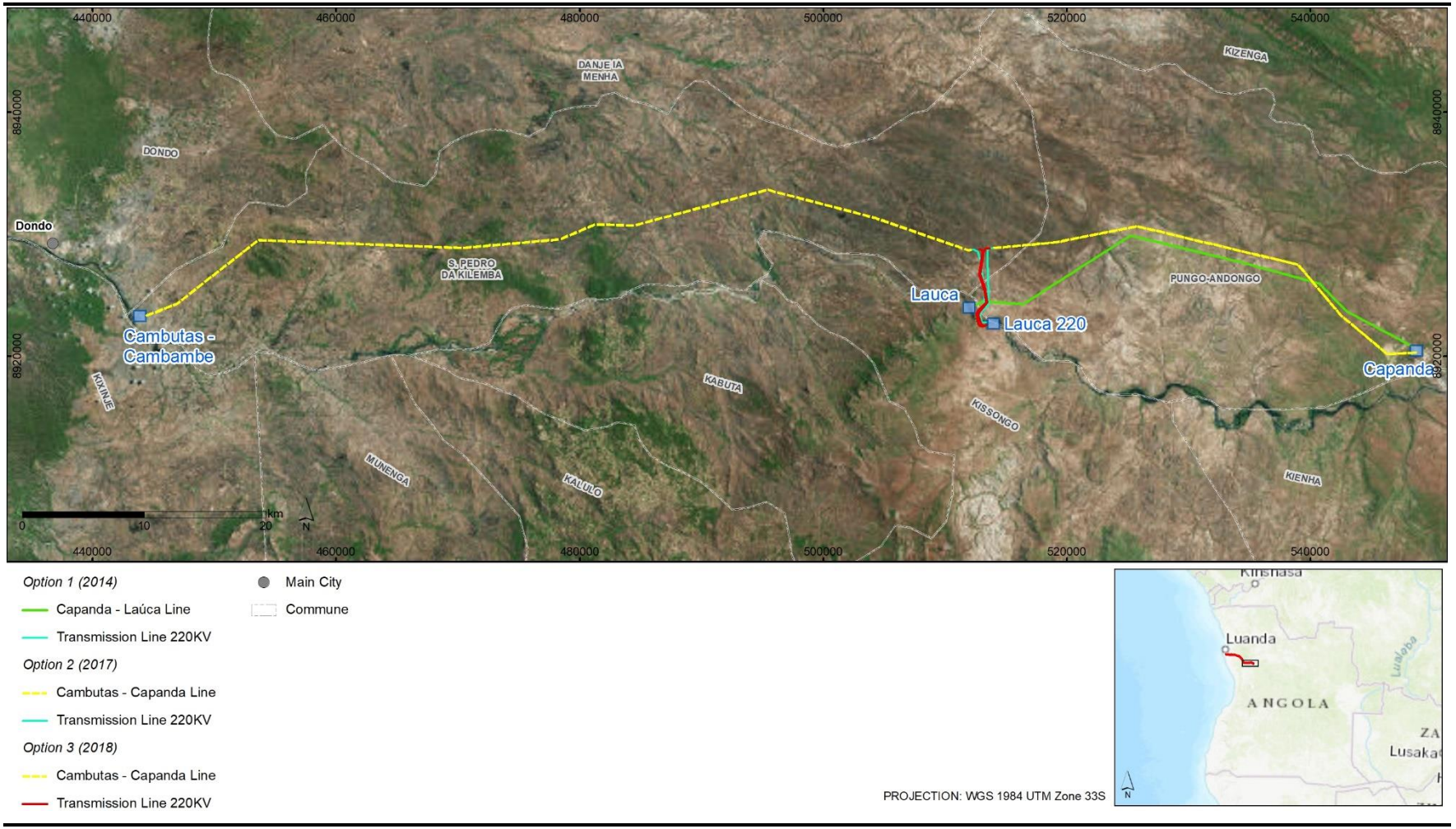


Table 3.2 Comparison of Environmental and Social Sensitivities of the 220 kV Transmission Line Alternatives

Topic	Option 1: 220 kV transmission line between Capanda and Laúca (39 Km)		Option 2: 220 kV Laúca substation - Cambutas / Capanda Transmission Line (7.5 Km)	
	Analysis	Scoring	Analysis	Scoring
Environmental Sensitivity	This option would include the construction of an additional transmission line between Capanda and Laúca; areas which are not considered sensitive. Due to the extension of the proposed transmission line, the potential impacts on vegetation can be tentatively considered as low. Potential noise and air quality sensitive receptors are very sparse.	2	This option excludes the construction of an additional transmission line between Capanda and Laúca – instead a connection from Laúca to an existing transmission line between Capanda and Cambutas. This presents a much less intrusive approach in terms of environmental context. Additionally, due to the indirect impacts for Laúca HPP construction activities, this area is not considered sensitive. Habitats are mainly composed by grasslands as a result of the forest exploitation. No significant crossings with superficial drainage lines.	1
Physical and Economic Displacement	Individual and disperse houses, non-priority areas used for livelihoods.	2	No significant human land use for livelihoods / housing.	1
Community Infrastructure and Resources	No significant areas used to collect resources or house infrastructure, mainly agriculture and forestry.	2	No significant areas used to collect resources or house infrastructure.	1
Socio-Economics and Income-Generating / Subsistence Livelihoods	Area is used for livelihoods by the locals.	2	Due to its location (quite close to Laúca substation) the area only occasionally used for livelihood activities.	1
Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	No significant culturally- sensitive areas. However the extension of the proposed transmission line increases the likelihood of such findings. No detailed analysis has been performed so far.	1	As per the ESIA baseline (Chapter 7), no significant culturally- sensitive areas.	1
Aesthetics	Low impact as a result of the extension of the medium voltage transmission line. The fact that the extension would cross areas where other linear projects are absent in the vicinity, increases the potential significance.	2	There are already other overhead transmission lines in the area.	1

Topic	Option 1: 220 kV transmission line between Capanda and Laúca (39 Km)		Option 2: 220 kV Laúca substation - Cambutas / Capanda Transmission Line (7.5 Km)	
	Analysis	Scoring	Analysis	Scoring
Community Health & Safety	There are health effects associated with exposure to EMF. The *IFC EHS Guidelines on Transmission and Distribution* refer to the ICNIRP Guidelines (since updated in 2010) which includes exposure guidelines for public and occupational exposure (related to short term/acute effects; e.g. stimulation of nerve and muscle tissue and the induction of retinal phosphines). The EMF levels associated with the overhead transmission lines are compliant with these values. As the RoW would be cleared, this precautionary approach means this option poses no further health risk (e.g. concern related to health effects from long term exposure, although causal link not scientifically proven). Based on the very low density of residential dwellings in the area, the risk is negligible. Overhead transmission structures are clearly marked and have security mitigation measures to prevent harm to the community, both during construction and operation phases. The line napping and causing injury is a potential risk (although considered to be low). The line hardware used on the overhead transmission line is rated or designed higher than the conductor ultimate tensile strength and the conductor is only pulled to 20% of its ultimate tensile strength. Therefore, the likelihood of a transmission line snapping is possible but unlikely. Specifically during operation, due to the transmission servitude being maintained, this risk is not material.	1	Same as Option 1. Considering the extension of the transmission line, the impacts are even lower on Option 2.	1
TOTAL SCORE:	11		**7**	

Table 3.3 Comparison of Technical and Financial Aspects of the 220 kV Transmission Line Alternatives

Category	Topic	Option 1: 220 kV transmission line between Capanda and Laúca (39 Km)	Option 2: 220 kV Laúca substation - Cambutas / Capanda Transmission Line (2*7.5 Km)
Technical	**Constructability**	Construction process is fairly straight forward with material and labour that is freely available. Access to the construction site would be relatively easy, mainly through the servitude corridor that would be cleared.	**Due to the extension of the transmission line to be constructed (less access roads to be open), this Option is preferable.**
	Impact on construction schedule	Overhead transmission lines can be constructed in 8 to 10 months but past experience has shown that clearing the servitude delays construction further (provided there are no extraordinary issues to resolve).	**Due to the extension of the transmission line to be constructed (less area to be cleared and demined), this Option is preferable.**
	Maintenance of infrastructure	Structures are easily accessible with spares and labour to perform maintenance readily available. Skills required to maintain this type of infrastructure are already available in country (RNT) requiring no special training or resourcing.	**The proximity to Laúca HPP and the shorter length of the transmission line would make this Option preferable.**
	Making changes to infrastructure	It is relatively easy to make changes to the infrastructure with minimal outages required.	Both in Laúca and Capanda HPP have other pathways to export energy, i.e. during maintenance the impact of outages would be similar.
	Accidental damage	The structures are clearly marked and visible so it is difficult to damage accidently. Vulnerability to Wildfires and vandalism can be significant.	**The proximity to Laúca HPP reduces substantially the likelihood of occurrence of unplanned events.**
Economic	**Construction costs - Materials and labour**	Material and labour are readily available to construct this type of infrastructure.	**The shorter length of this transmission line would push down the overall cost of construction.**
	Maintenance costs - Materials and labour	Like construction costs, maintenance costs are predictable.	**The shorter length of this transmission line would push down the overall cost of construction.**
	Resettlement costs - Physical displacement	No physical displacement is envisioned for this alternative.	Same as Option 1.
	Resettlement costs - Compensation	Economic compensation may be required for the placement of the Overhead Transmission Line towers.	**Considering the extension of the transmission line, the likelihood of financial displacement is lower on Option2, i.e. lower economic compensation potential impact.**

Note: bold text – most feasible; regular text – less feasible.

3.2.2 400 kV Transmission Line

Background

As noted in *Chapter* 2, most of the effort in terms of alternative analysis was focused on the 238km 400 kV transmission line that will connect the substation of the Laúca hydroelectric power station to the Bita substation near Luanda.

Three route options were evaluated:

- 2014 route as described in the original ESIA approved by MINAMB (Option 1);
- 2017 route developed following further refinement (Option 2); and
- 2018 route following even further refinement and the route that is evaluated in this ESIA (Option 3).

Discussion

Based on the criteria defined on *Table 3.1,* the alternative analysis is presented on *Table 3.4*. *Table 3.5* presents the comparison of technical and financial criteria.

In terms of environmental context the differences between the three considered alternatives is minimal (*Figure 3.2).* Using the ranking, Option 3 is preferred from an environmental and social perspective. The factors that influenced the evaluation are, among others: need for vegetation clearing (as some route alternatives are almost entirely within the existing 800m corridor); water bodies crossing; and proximity to sensitive receptors (for air quality and noise).

With regards to social factors, Option 3 is clearly the preferred option, as it avoids areas where physical resettlement would be required in particular the villages of Muchau and Kissuba in Cambambe municipality.

Figure 3.2 ***400 kV Transmission Lines Alternatives***

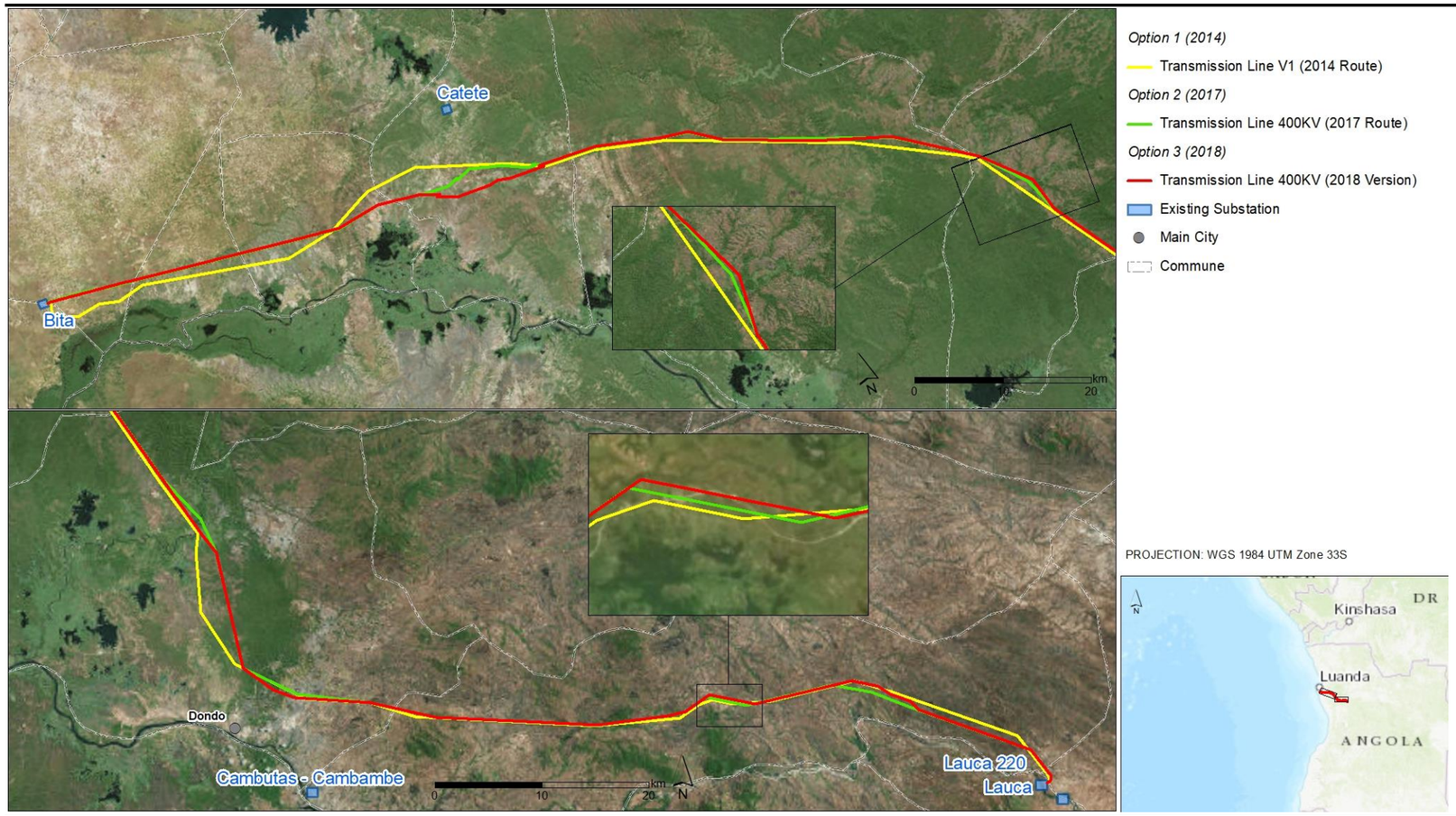


Table 3.4 Comparison of Environmental and Social Sensitivities of the 440 kV Transmission Line Alternatives

Topic	Option 1: 2014 transmission line route (ESIA approved by MINAMB) - TDS-V1		Option 2: 2017 transmission line route TDS-V2		Option 3: 2018 transmission line route (evaluated in the present ESIA) - TDS-V3	
	Analysis	**Scoring**	**Analysis**	**Scoring**	**Analysis**	**Scoring**
Environmental Sensitivity	Environmental aspects were evaluated by an ESIA process – no environmental or social significant impacts were observed[1].	2	The location of Bita substation shifted about 2 km north from its original location; and the TL route has changed to the same extent: no significant environmental changes should be noted. The distance to Kwanza river increased significantly (closest point in 2104 was 1.2 Km and in 2017 was 2.2 Km). The 400KV Laúca – Bita line will run parallel, and very close to the line Laúca – Catete (almost complete) and the line Catete – Bita. This proximity would have a less negative impact, as it would minimize the need for vegetation clearing and additional water bodies crossing, minimize barrier effect to fauna, not expose additional sensitive receptors to potential noise and air quality impacts. Close to Mazozo the 2017 line is closer to the Kwanza river (approx. 1.2 Km). No significant risks were identified. The crossing of river Lucala was moved about 1 km to the east of the original location. It would be preferable to design the crossing closer to the existing ones. However due to the fact that no major impacts are expected in the river banks, this change is not considered as having a major significance. This new route alignment will cross small lagoons/wetlands	2	Proposed changes are focused on the route alignment in two specific locations – Kisuba and Muchau villages, as well as in the route alignment between Bengo and Bita. No significant potential environmental impacts should be noted. To avoid as much as possible the swamp area near Cassolala, this updated version will pass parallel to the exiting 400 kV Laúca –Catete line.	2

[11] "*Os resultados do presente Estudo de Impacte Social permitem concluir que o projecto da linha Laúca-Kilamba, a 400 kV, que se integra num conjunto de projectos mais vasto relacionado com o AH de Laúca e com a Interligação Centro e Sul, não apresenta impactes sociais negativos importantes, tendo em conta as medidas de mitigação definidas. Tendo ainda em conta os impactes positivos que apresenta, pode considerar-se como um projecto socialmente sustentável*" (EDP, 2014). The results of the present ESIA allow us to conclude that the Lauca-Kilamba 400 kV line project, which is part of a wider set of projects related to the Lauca AH and the Central and Southern Interconnection, has no social impacts taking into account the mitigation measures defined. Taking into account the positive impacts it presents, it can be considered as a socially sustainable project.

Topic	Option 1: 2014 transmission line route (ESIA approved by MINAMB) - TDS-V1		Option 2: 2017 transmission line route TDS-V2		Option 3: 2018 transmission line route (evaluated in the present ESIA) - TDS-V3	
	Analysis	Scoring	Analysis	Scoring	Analysis	Scoring
			near Cassoalala. No significant biodiversity values were identified, but mitigation measures during construction should apply. Some segments of the line have been shifted to a lesser extend outside the original 800m corridor (defined in the EIA); and other segments shifted inside the 800m corridor, always to maintain the parallel with the Laúca – Catete line. As stated before, bringing the route closer to the existing 800 m corridor is generally considered positive in terms of environmental impacts.			
Physical and Economic Displacement	The 2014 ESIA did not provide a detailed assessment of extent of physical and economic displacement. However, the route alignment does not cross any settlements.	3	Significant changes noted. The line crosses the settlements of Kisuba and Muchau, in the municipality of Cambambe. This is in addition to the approximately 62 sensitive receptors that have been identified which include houses and ancillary structures.	4	Re-routings of the proposed transmission line has been designed to avoid the displacement of physical structures to the extent possible around the settlements of Kisuba and Muchau, in the municipality of Cambambe. These two re-routings have reduced the number of sensitive receptors at risk of removal inside the 20 m OHTL footprint corridor to 62 physical structures. Additional re-routings and minor path options are also being considered. However, of approximately 62 sensitive receptors that were initially identified along the OHTL RoW, the current estimate is that this number may be reduced to approximately 30 structures inside the 20 m OHTL footprint corridor that would need to be removed.	2

Topic	Option 1: 2014 transmission line route (ESIA approved by MINAMB) - TDS-V1		Option 2: 2017 transmission line route TDS-V2		Option 3: 2018 transmission line route (evaluated in the present ESIA) - TDS-V3	
	Analysis	**Scoring**	**Analysis**	**Scoring**	**Analysis**	**Scoring**
Community Infrastructure and Resources	No significant areas used to collect resources or house infrastructure; mainly agriculture and forestry.	2	No significant changes should be noted.	2	No significant changes should be noted.	2
Socio-Economics and Income-Generating / Subsistence Livelihoods	Area is used for agricultural livelihoods by the locals.	3	No significant changes should be noted.	3	No significant changes should be noted however the re-routings and minor path options considered further reduce the impact.	2
Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	No significant culturally- sensitive areas identified.	2	No significant changes should be noted.	2	No significant changes should be noted.	2
Aesthetics	No significant negative impacts were identified in the 2014 ESIA.	2	Bringing closer the transmission line route to the existing lines is a significant positive impact.	1	Very localised changes without any impact in terms of aesthetic values.	1
Community Health & Safety	No significant negative impacts were identified in the 2014 ESIA.	2	No significant changes should be noted.	2	By avoiding Kissuba and Muchau villages as well as disperse houses and farms between Bengo and Bita, the community health and safety related impacts will be substantially minor.	1
TOTAL SCORE:	**16**		**16**		**12**	

Table 3.5 Comparison of Technical and Financial Aspects of the 440 kV Transmission Line Alternatives

Category	Topic	Option 1: 2014 transmission line route (ESIA approved by MINAMB) - TDS-V1	Option 2: 2017 transmission line route TDS-V2	Option 3: 2018 transmission line route (evaluated in the present ESIA) - TDS-V3
Technical	**Constructability**	Construction process is fairly straight forward with material and labour that is freely available. Access to the construction site would be relatively easy; mainly through the servitude corridor that would be cleared.	**Similar to Option 1. However due to the fact that a significant portion of the TL will run closer to the existing TL (i.e. within the 800m existing corridor), this Option is preferable.**	**Same as Option 2. Rerouting in Muchau, Kissuba and Bengo/Bita will not have a major effect in terms of constructability.**
	Impact on construction schedule	Overhead transmission lines can be constructed in 12 to 18 months but past experience has shown that clearing the servitude delays construction additionally (provided there are no extraordinary issues to resolve).	Same as Option 1. Although due to the fact that the TL will run within the existing corridor (i.e. less vegetation clearing will be need), this Option is preferable.	**Same as Option 2. Rerouting in Muchau, Kissuba and Bengo/Bita will not have a major impact in terms of on construction schedule. Efficient operationalization of the RCAP can have a positive impact.**
	Maintenance of infrastructure	Structures are easily accessible with spares and labour to perform maintenance readily available. Skills required to maintain this type of infrastructure are already available in-country (RNT) requiring no special training or resourcing.	**Same as Option 1. However, the proximity to Laúca HPP and the shorter length of the transmission line would make this Option preferable.**	**Same as Option 2.**
	Making changes to infrastructure	**It is relatively easy to make changes to the infrastructure with minimal outages required.**	**Same as Option 1.**	**Same as Option 1.**
	Accidental damage	The structures are clearly marked and visible so it is difficult to damage accidently. Vulnerability to Wildfires and vandalism can be significant.	**Same as Option 1. However, the proximity to existing transmission lines reduces substantially the likelihood of occurrence of unplanned events.**	**Same as Option 2.**
Economic	**Construction costs - Materials and labour**	Material and labour are readily available to construct this type of infrastructure.	**Same as Option 1.**	**Same as Option 1.**
	Maintenance costs - Materials and labour	Like construction costs, maintenance costs are predictable.	**Same as Option 1.**	**Same as Option 1.**
	Resettlement costs - Physical displacement		This option suggests an increased resettlement cost associated with physical displacement.	**Rerouting in Muchau, Kissuba and Bengo/Bita will reduce physical displacement significantly.**
	Resettlement costs - Compensation	Need for significant compensation for loss of crops and trees along the route considering the restrictions to cultivation due Project activities and the sensitivity of stakeholders to such restrictions. The number of affected farmers requiring compensation has not been assessed.	Similar to Option 1. It is noted that the number of affected farmers requiring compensation for loss of crops and trees has not been assessed.	**Similar to Option 1. It is noted that the number of affected farmers requiring compensation for loss of crops and trees has not been determined**

Note: bold text – most feasible; regular text – less feasible.

4 LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 INTRODUCTION

This Chapter details the institutional and legislative framework with which the proposed Project will comply, and the National (Angolan) laws deemed relevant for the successful implementation of all environmental components of the proposed Project. Furthermore, where no local standards exist, applicable standards for international lending organizations are referred to; specifically those provided in the International Finance Corporation's (IFC) Performance Standards on Environmental and Social Sustainability (2012) and the IFC Environmental, Health and Safety (EHS) Guidelines.

4.2 POLITICAL AND ADMINISTRATIVE FRAMEWORK

The legal system in place in Angola is based on civil law. This implies that all legal obligations are codified into a written collection of laws. This legal framework is different from a common law system, which relies heavily on prior court decisions (judicial precedent). Thus, in Angola, legislation is the primary source of law. However, in many areas of the country customary law still plays an important role.

The law in Angola retains a degree of fluidity, responding to changing circumstances and State priorities. As such, the civil law legal system in place requires companies to be aware of all laws in existence that may potentially affect operations in Angolan territory. This implies that procedures must be put in place to identify relevant and applicable laws, incorporate legal obligations into daily operations and, as importantly, establish a monitoring framework to capture the dynamic nature of law making in the country.

4.2.1 *Political System*

Following independence in 1975, the Constitution was amended in 1992 before the first democratic elections. The executive branch of the government consisted of the President, the Prime Minister and Council of Ministers. The Council of Ministers, (comprising all ministers and vice ministers) met regularly to discuss policy issue.

Since the new constitution was adopted in 2010, the Angolan political system is a presidential republic, whereby the President of Angola is both head of state and head of government, and of a multi-party system. Executive power is exercised by the government and elections take place every five years. Legislative power is vested in the President, the government and parliament; which has 220 members also elected every five years.

The Constitution defines environmental rights under the Article 39, stating that every citizen has the right to live in a healthy and unpolluted environment, as well as the duty of defending and preserving it. Therefore, the State must adopt the necessary actions to protect the environment and the flora and fauna species throughout the entire national territory, to maintain the ecological equilibrium, to define the right localization of the economic activities and to guarantee the rational utilization and exploration of every natural resources, ensuring the sustainable development and respecting the future generations.

4.2.2 Administrative Division

Angola has a three-level administrative structure, as listed below:

- Province (*província*): administratively, Angola consists of 18 provinces, seven of which are along the coast. Each of these provinces is headed by a provincial governor;
- Municipality (*município*): Angola has a total of 164 municipalities; and
- Commune (*comuna*). The lowest administrative level is the commune. Angola has a total of 518 communes.

The provincial government has a special body (Provincial Stakeholder Engagement and Social Concertation Council) which aims at providing support at provincial level, in terms of discussion and decision-making of relevant socioeconomic policies for the province. This council includes, amongst others, local authorities, religious institutions, private sector, labour organizations, professional organizations, civil society representatives and a member of the Provincial Youth Council.

Each provincial level is headed by an official; the Governor for the province, the Municipal administrator and the Communal administrator. They are all appointed by and accountable to the Central government.

4.2.3 National Administrative Organizations Pertinent to Energy Projects

Ministry of Water and Energy

This Ministry was restructured under Decree No. 116/14 of May 30th. It is the Executive Ministerial Department that formulates, conducts, executes, and controls the Executive policy in the domains of energy and water. MINEA produced a long-term strategy "*Angola Energia 2025*" setting out strategic objectives for the country which represents the main strategic challenges for the development of the energy sector. The 2025 vision for the energy sector aims to meet the needs of the country and given these needs and the timeframe available, optimize the well-being through ambitious goals and efficient resource allocation.

The Program of Transformation of the Electric sector was created with the objective of fostering the operational optimization of all the value chain, in order to obtain a progressive efficiency improvement of each one of the new companies and to develop/strengthen the necessary competencies of workers of the Angolan electric sector. 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 Directorates of Electric Energy; Local and Rural Electrification; Renewable Energy; and Water Supply).

GAMEK

The *Gabinete de Aproveitamento do Médio Kwanza* (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 N. º 14/86 of 17 March 1986. GAMEK is currently the institution responsible for the management of the Middle Kwanza Basin.

According to Article 3 of the Joint Dispatch N. º 14/86 of 17th March 1986, the main attributes of GAMEK are as follows:

- Coordinate and control the execution of enterprises within Cambambe and Capanda;
- Promote studies, preparatory works and projects related to the rationale utilization of the water resources in the Middle Kwanza basin; and
- Promote the actions that are procedurally required for the undertakings to be set up and developed following previously approved plans.

The Article 4 states that GAMEK is additionally responsible for the following:

- Promotion of activities for the collection and treatment of data required under the General Plan for the Utilization of the Middle Kwanza, as well as elaboration of projects and plans for the enterprises and submission of them to ministerial approval;

- Promotion of enterprises execution once respective plans and projects are approved;

- Coordination and control of enterprise execution;

- Report on the provision of services of national or foreign agencies and companies, for consultations, project proposals obtainment, supplies, execution of the enterprises; and make respective adjudications and contracts;

- Establishment of the necessary liaison mechanisms with Foreign Trade and Banking agencies in order to allow a quick resolution of the problems that arise in these areas;

- Participation in the negotiation of contracts for the financing of works or supplies;

- Selection and proposal of solutions to all problems that arise for the development of the enterprises, using national and foreign organizations or companies, and to promote their execution once they have been approved;

- Representation of the Government in all acts related to the development of the undertakings under its responsibility;

- Establishment of proposals for the adoption of measures to protect the environment against pollution and other factors of ecological imbalance that the execution of the projects and the execution of the works may eventually cause;

- Establishment of proposals for the adoption of special measures for conservation, maintenance and physical protection of facilities, equipment and other assets considered vulnerable during the execution phase of the projects;

- Compliance with the safety, hygiene and occupational safety program; and

- Execution of all necessary acts to carry out their duties.

The management structure of GAMEK include; the General Director, the Deputy General-Director, and the Board of Directors, the latter consisting of the General Director, the Deputy General-Directors, Heads of Departments and a representative of the party and union structures.

The internal divisional structure of GAMEK includes three departments, namely; the Technical Department, the Planning and Finance Department, and the Administrative Department, with the following objective:

- Technical Department - responsible for promoting and elaborating studies and projects of any type necessary to carry out the projects, as well as their planning, coordination and inspection.

- Planning and Finance Department - responsible for ensuring the completion of financial, accounting and statistical operations, as well as GAMEK's planning tasks.

- Administrative Department - responsible for ensuring the administrative and logistical support for the operation of GAMEK.

Among other development projects[1], 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 Malange North of Angola. The Capanda dam has a total electric generating capacity of 520 MW.

Specifically for this project, as per the general roles and responsibilities flowchart presented by NHID to the Lenders and approved on the 18 January 2019 (*Annex I*), DAR will be GAMEK representative as Engineering Services Manager (part of the Supervisory Board).

Other Public Entities

Besides GAMEK, there are other public entities with relevant roles in terms of power related projects. With the publication of the Presidential Decree N. º 305/14 of 20 November 2014 the two (2) electricity companies were closed: *Empresa Nacional de Electricidade* (ENE-EP) and *Empresa de Distribuição de Electricidade de Luanda* (EDEL-E.P.). At the same time, three (3) new companies were established with corresponding organic statutes approved, namely:

- *Empresa Pública de Produção de Electricidade* (PRODEL -E.P.);

[1] Currently there is an ongoing World Bank Group assistance to the National Water Resources Institute (INRH) in the preparation of the Integrated River Basin Development Plan for the Kwanza River. This assistance is integrated on the WB's Water Sector Institutional Development Project in Angola, which began in 2008, aiming the rehabilitation of water supply systems and water rehabilitation assets, new networks and household connections, and capacity building of national- and provincial level agencies involved in water supply, capital investment, and water resource management. The Integrated River Basin Development Plan for the Kwanza River will establish the rules and procedures for water management in the Kwanza basin as well as define the appropriate structures for its implementation.

- *Empresa Rede Nacional de Transporte de Electricidade* (RNT-E.P.); and
- *Empresa Nacional de Distribuição de Electricidade* (ENDE-E.P.).

PRODEL (Electricity Production Public Company)

PRODEL-E.P. 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-E.P. core business includes the production of hydroelectric energy, thermal and renewable energy. Within the organisation structure, there is a specialized department for Quality, Health, Safety and Environment (QHSE).

RNT (National Electricity Transport Network Public Company)

RNT-E.P. is the result of the extinct ENE Transportation Business Unit corporation assets, developing its activities throughout the whole national territory. The main objective of the National Electricity Transportation Network 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.

ENDE (Electricity Distribution National Public Company)

The main responsibility of ENDE-E.P. 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.

Ministry of Environment

The Ministry of Environment (MINAMB) was restructured by Presidential Decree N. º 85/14 of April 24, and it is the government body responsible for the development, management, implementation, and control of the Government´s environmental policies, as regards to the protection, preservation, and conservation of the environmental quality, pollution control, conservation areas, and appreciation for the natural heritage, as well

as the preservation and rational use of the natural resources. The main tasks of the Ministry of Environment in the field are, among others, the following:

- Coordinate sustainable management strategies and policies of natural resources such as ensuring environmental sustainability;
-
- Coordinate national response actions to global environmental problems, notably through the implementation of international conventions and agreements;

- Make the environmental licensing of activities likely to cause significant environmental and social impacts;

- Develop and coordinate national programs in the field of conservation of natural ecosystems;

- Promote programs of nature conservation areas, natural parks, areas of the biosphere and the protection and landscape preservation;

- Promote necessary measures for ensuring biosafety and biodiversity in order to ensure the protection of the environment and quality of life;

- Conduct training and awareness campaigns for consumers and companies in environmental technologies and new talent; and

- Encourage companies to use clean technologies.

Therefore, these attributes are executed by central executive services. Specifically, the National Directorate for Prevention and Environmental Impact Assessment (DNPAIA) is accountable for evaluating environmental impact studies and the National Directorate of Environment (DNA) is accountable for the conception and implementation of urban management policies and strategies. MINAMB is responsible for evaluating environmental impact studies (ESIA) of projects susceptible to causing potential social and environment impact. This assessment includes the realization of one or more shareholder engagements in order to present the Environmental, Social and Health Impact Assessment report and facilitate an open dialogue.

The most relevant institutions within the Ministry of Environment with regards to the environmental licensing of projects with impacts on the natural resources is the DNPAIA.

Ministry of Agriculture and Forestry

The Ministry of Agriculture and Forestry proposes policies and development strategies on agriculture and rural engineering, as well as measures to protect and rehabilitate degraded agricultural land (Presidential Decree n.º 15/18 of January 25). In terms of energy related projects, the Agriculture Land

Management Office (*Gabinete de Gestão de Terras*) and are particularly important.

Agriculture Land Management Office (Gabinete de Gestão de Terras)

This 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.

National Agriculture Directorate

Proposes policies and development strategies on agriculture and rural engineering, as well as measures to protect and rehabilitate degraded agricultural land.

Forestry Development Institute

Ensures promotion, coordination, and execution of forestry, fauna, rural, and technology transfer policies.

4.3 NATIONAL REGULATORY FRAMEWORK

This Section presents an overview of the national laws, guidelines and policies of relevance to the proposed Project (*Table 4.1).*

Table 4.1 National Legislation Relevant to the Project

General
Judgement of the Constitutional Court n.° 111/2010 (30/01/2010) - Constitution of the Republic of Angola
Environmental Management
Law n.º 5/98 (19/06/1998) – Environmental Framework Law
Decree n.º 59/07 (13/07/2007) – Environmental Licensing
Decree n.º 51/04 (23 / 07 / 2004) on Environmental Impact Assessment
Decree n.º 1/10 (13/01/2010) – Environmental Auditing
Executive Decree n.º 92/12 (01/03/2012) – Terms of Reference for the Development of Environmental Impact Studies
Biodiversity
Law n.º 6/17 – Law of Forests and Wild Fauna
Environmental Pollution
Presidential Decree n.º 194/11 (07/07/2011) – Liability for Environmental Damage
Health and Safety
Decree n.º 31/94 (31/05/94) – Occupational Hygiene and Safety System
Labour
Law n.º 7/15 (15/06/15) – General Labour Law
Waste Management
Presidential Decree n.º 190/12 (12/08/2012) – Solid Waste Management
Presidential Decree n.º 160/14 (18/06/2014) – Medical Waste and Health Services
Energy

Law n.º 14-A/96 (31/05/1996) – Electricity General Law
Decree n.º 47/01 (20/07/2001) – Electric Energy Production Regulation
Decree n.º 41/04 (02/07/2004) – Regulation of Licensing of Production
Water
Law n.º 6/02 (21/06/2002) – Water Law
Presidential Decree n.º 82/14 (12/04/2014) – Regulation on General Rules of Use of Water Resources
Presidential Decree n.º 261/11 (6/10/2011) – Regulation on Water Quality
Presidential Decree n.º 126/17 (13/06/2017) – National Water Plan
Presidential Decree n.º 83/14 (22/04/2014) – Regulation on Public Water Supply and Wastewater Sanitation
Land Use and Resettlement
Law n.º 9/04 (09/11/2004) – Land Law
Law n.º 3/04 (25/07/2004) –Law on Territorial and Urban Planning
Decree n.º 58/07 of July 13, 2007 - General Regulation Land Concession
Law n.º 2.030 of June 22, 1948 - Expropriation Law
Presidential Decree n.º 117/16 of May 30, 2016 for the Regulation for Resettlement Operations
Decree n.º 43.894 - Regulation for the Occupation and Concession of Land
Decree n.º 41/04 of 2 July 2004 - Regulation for the Licensing and Security of Electric Facilities
Decree n.º 46.847 dated 1966 - Regulation of the Protection of High Voltage Transmission Lines
Cultural Heritage
Law n.º 14/05 (07/10/2005) – Cultural Heritage Law

The laws that place legal obligations upon NHID are outlined in further detail below.

4.3.1 General

Judgement of the Constitutional Court n. ° 111/2010 (30/01/2010) - Constitution of the Republic of Angola

This Constitution was adopted by Angola in 2010 and provides guiding principles for environmental protection and management in Angola. The concept of sustainable development and environmental rights are enshrined in Articles 21 and 39 of the Constitution.

Article 21: Identifies as a fundamental task of the State to:

- Promote harmonious and sustained development throughout the national territory, protecting the environment, natural resources and historic, cultural and artistic national heritage.

Article 39: Environmental rights, enforces that:

- Every citizen has the right to live in a healthy and unpolluted environment, as well as the duty of defending and preserving it.

- The State must adopt the necessary actions to protect the environment and the flora and fauna species throughout the entire national territory, to maintain of the ecological equilibrium, to define the right localization of the

economic activities, and to guarantee the rational utilization and exploration of every natural resources, ensuring the sustainable development and respecting the future generations.

- The Law punishes acts that endanger or harm the preservation of environment.

4.3.2 Environmental Management

Law n. º 5/98 (19/06/1998) – Environmental Framework Law

The Environmental Framework Law (*LBA – Lei de Base do Ambiente*) defines the basic concepts and principles for the protection, preservation and conservation of the environment, promotion of the quality of life, and the rational use of natural resources.

Article 16 of this law stipulates that an Environmental Impact Study should be mandatory for every undertaking that has an impact on the environmental balance and on the population's quality of life. The requirements related to the management of hazardous and non-hazardous wastes are also specified in Decree N. º 39/00, in Executive Decree N. º 8/05 and in Presidential Decree N. º 190/12.

Decree N. º 59/07 (13/07/2007) – Environmental Licensing

This Decree is a complement of the LBA on aspects related to the environmental licensing. It lays down the rules that regulate the environmental licensing of activities which, by their nature, location or scale are susceptible of causing significant environmental impacts. It applies to the type of activities subject to Environmental Impact Assessment or susceptible of causing significant environmental impacts. Two types of licenses are concerned: the Environmental Installation License and the Environmental Operation License:

- The Environmental Installation License is a document issued for the purpose of authorizing the layout and the alteration of the facilities, according to the specifications contained in the Project design; and

- The Environmental Oeration License is a document issued for the purpose of starting the operation of the facilities or units, installations with all the requirements contained in the environmental impact assessment.

Article 6 of Decree N. º 59/07 describes the content of the environmental licensing application as follows:

- A description of the installation, and the nature and extent of its activities;

- A certificate from the Provincial Government declaring that the site and installations are in accordance with legislation relating to land occupation. This requirement of the decree is only applicable to onshore activities. No indication is given to an offshore Project;

- A Non-Technical Summary of the environmental impact study report; and

- A binding opinion of the entity supervising the respective activity.

It also stipulates that the applicant must attach the environmental impact study to the licensing application, and that the information provided in the environmental impact assessment, or contained in other statutory requirements, may be stated again in the environmental licensing application. The validity period of the Environmental Operation License may not be shorter than three years or longer than eight years.

Joint Executive Decree N. º 96/09 (06/10/2009) and Joint Executive Decree N. º 130/09 (26/11/2009) – Environmental Fees for Environmental Licenses.

This Joint Executive Decree from the Ministry of Finance and the Ministry of Environment approves the fees to be paid for issuing the environmental license. It also provides a table of the fees to be paid for the installation and operating licenses, as a percentage of the investment amount. This decree states that the renewal of licenses (both for installation and operating purposes) is also subject to a payment of 50 percent of the initial fee (for the installation license), and 45 percent (for the operating license).

The Joint Executive Decree N. º 130/09 replaced the Kwanza amounts (formerly set out in Joint Executive Decree n.º 96/09) by UCF (Tax Correction Unit – *Unidade de Correcção Fiscal*). Ministerial Order n. º 174/11, of November 3rd, sets the fees to be paid in UCF, and determines that currently each UCF corresponds to 88 kwanzas. However, this legal diploma is no longer applicable to Projects of the petroleum sector, since the approval of the Decree on Calculation of Environmental Fees Applicable to Projects of the Petroleum Industry.

Decree N. º 1/10 (13/01/2010) – Environmental Auditing

The Decree on Environmental Auditing aims at regulating Article 18 of the LBA on existing activities. This Decree is a tool to be used after the environmental impact assessment process and will make it possible to check whether the planned minimisation measures and Monitoring Plan have been implemented after the Project installation. It will also cater for other checks such as whether the minimisation measures have had a positive performance, whether the anticipated impacts have occurred, and how they have occurred, and whether there were other impacts that had not been anticipated. The audit process gives a company the opportunity to determine the reference

status, in order to set corrective actions to be implemented and measures to be adopted to prevent the occurrence of new non-conformances.

Executive Decree N. º 92/12 (01/03/2012) – Terms of Reference for the Development of Environmental Impact Studies

Executive Decree N. º 92/12, of 01 March 2012, establishes the guidelines and procedures to be followed during the development of Environmental Impact Studies. Article 3 establishes that the Project´s proponent must request the Application Form next to MinAmb, and complete it in accordance with Annex I, and provide in attachment a simplified description of the Project (Annex II). The content and structure of the Terms of Reference for the Environmental Impact Study are described in Annex III of said decree.

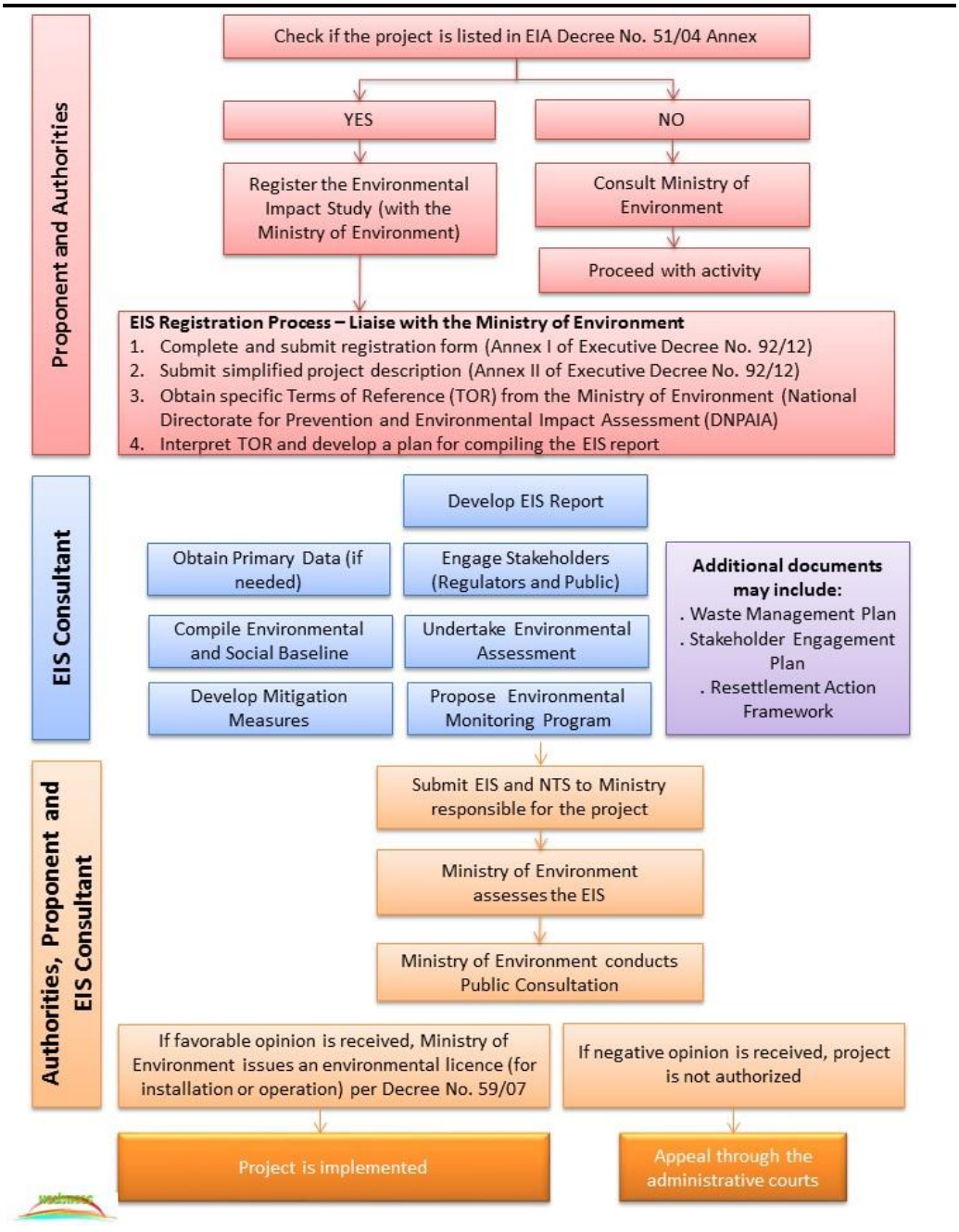
The Terms of Reference for the Development of Environmental Impact Studies for Projects (including oil and gas) have the following content:

- Identification of the entrepreneur, and the consultancy company;
- Project Description:
    - Objectives and scope;
    - Geographic location; and
    - Project specifications (description of the drilling process, and estimated fluids);
- Description of the alternatives under study;
- Area of influence of the Project; and
- Environmental diagnosis of the area of influence:
    - Physical environment;
    - Biotic environment;
    - Socioeconomic environment; and
    - Integrated analysis and synthesis of the environmental quality.
- Analysis of the Project´s environmental impacts;
- Description of the compensatory and mitigation measures, control and monitoring Projects;
- Conclusion;
- Indication of the knowledge gaps;
- Bibliography; and
- Glossary.

Figure 4.1 presents the initial screening process as well as the entire process to when the environmental license is issued, or the project is rejected. *Figure 4.2*

includes the legal timeline for the Environmental Impact Study[1] approval process.

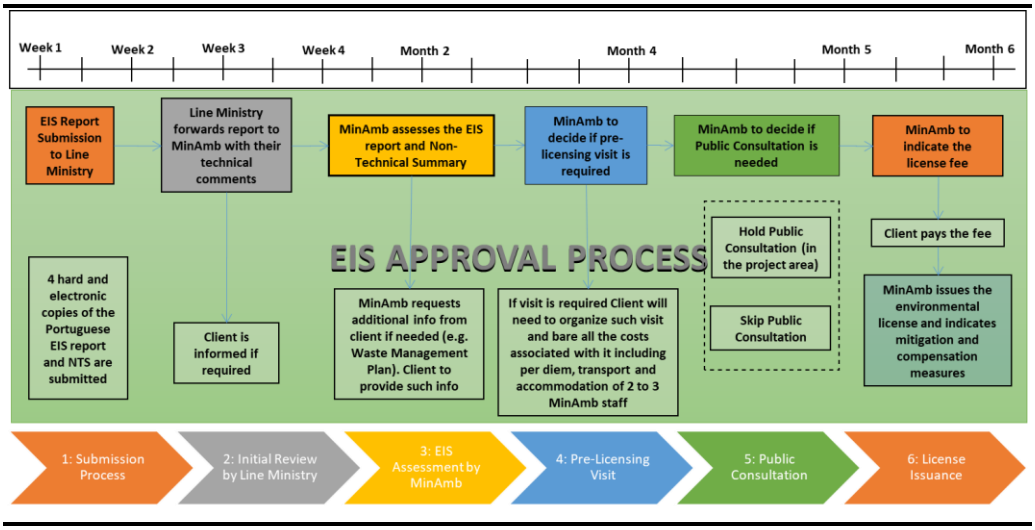
Figure 4.1 Screening and Appraisal of Environmental Permit Issuance



Source: Holisticos, 2016
Note: EIS – Environmental Impact Study; NTS – Non-Tecnhical Summary.

[1] Angolan formal designation for the Environmental and Social Impact Assessment Report. Also, NTS refers to Non-Technical Summary.

Figure 4.2 Timeline for the Environmental Impact Study Approval Process



Source: ERM & Holisticos, 2017

The main steps of this process are as follows:

- **Screening process**

  - The project proponent with support from an independent environmental consultancy company prepare the project registration based on appendices I and II of the Executive Decree N. º 92/12.
  - Both application forms and respective documents are sent to the Ministry of Environment (copies are sent to the National Directorate for Prevention and Environmental Impact Assessment and Law Department) for their assessment and comments.
  - The Ministry of Environment, after reviewing the information package, could undertake the following steps:

    - Issue the Terms of Reference for the specific project as well as request specific documentation about the project;
    - Indicate from the existing nine Terms of Reference which ones are more relevant for the project (there are three Terms of Reference for the oil and gas sector focusing on seismic, drilling and production);
    - Request a meeting with the project proponent for additional information on the project and environmental impact assessment project; and
    - Undertake a pre-licensing visit to the project site to better understand the project, and its social and environmental impacts.

  - The whole screening process could take between 7 days and one month, depending on what activities are identified by the Ministry of Environment to be implemented. This timeframe starts from the time the registration documents are submitted to Ministry of Environment; and

- No separately defined scoping phase is required in Angola. The EIA Decree n. º 51/04 requires EIAs for all public or private projects mentioned in the Annex to the Decree, with the exception of projects the government deems of vital interest to national defence or national security.

- **Environmental Impact Study Development**

  - This phase includes a number of activities related to the development of the Environmental Impact Study. Its contents and development time are dependent on the type of environmental impact study (i.e. an Angolan regulatory-based report versus an international-based standards report).
  - The EIA Decree n.º 51/04 specifies the activities that are required during the EIA process (Articles 6 and 7) as well as the contents of the EIA report (Article 9). This phase includes the following steps:

    - Undertaking field visits to obtain primary environmental and social baseline data;
    - Engaging relevant stakeholders (both regulators and public) through formal and informal meetings;
    - Reviewing all applicable legislation relevant to the project and providing an overview on the permitting process;
    - Preparing a comprehensive description of all stages of the Project;
    - Developing an adequate environmental and social management plan; and
    - Developing any additional documentation required by the Ministry of Environment and other competent Ministries such as, but not limited to, waste management plan, emergency response plan, HSE plan, stakeholder engagement plan, chemical product management plan, and operational discharges management plan.

  - The whole environmental impact study development process could take between 4 to 12 months depending on what activities are identified by the Ministry of Environment to be implemented.

- **Environmental Impact Assessment and License Issuance**

  - *Submission process:* Once completed and translated into Portuguese the EIA reports, Non-Technical Summary and any supporting documents must be sent to the relevant line ministry (i.e. ministry responsible for the project's activities). Hard and electronic copies are required;
  - *Initial Review by the line ministry:* Within five days of receiving these documents, the line ministry must forward such documentation to the Ministry of Environment;
  - *EIS Assessment by MinAmb:* The review is conducted by the Directorate for the Prevention and Evaluation of Environmental Impacts and the line ministry relevant to the project in question.

- Within 90 days from the date of receipt of the documents, the EIA Directorate (DNPAIA) in the Ministry of Environment must evaluate the EIA report and decide whether public consultation is required or not;
- *Pre-licensing visit:* Prior to organizing the public consultation the Ministry of Environment might require a pre-licensing visit to the project area to verify the conditions and confirm the information presented in the EIS report. Costs for this are to be covered by the project proponent; and
- *Public consultation:* projects must be subject to a public consultation programme organised by the Ministry of Environment, as prescribed in Article 10 of the EIA Decree 51/04. The consultation process must take place over a period of five to ten days and comprise the following steps:

    - Release of the non-technical summary of the EIA report to the interested and affected parties;
    - Consideration and appraisal of all presentations and comments relating to the proposed project; and
    - Compilation of a brief report within eight days of the completion of the consultation period, specifying the steps taken, the level of public participation, and the conclusions that may be drawn.

- *Issuance of Environmental Installation License:* If a favourable opinion is received, the Ministry of Environment shall issue an Environmental Installation License after the project proponent pays the necessary license fee. The license will be issued within 90 days.
- *Appeals:* If a negative opinion is received from the EIA National Directorate, the project cannot be authorised or licensed. The final decision must be made public. An appeal may be brought against the decision of the Minister through the administrative courts.
- *Environmental monitoring and audits:* According to Article 22 of the EIA Decree n.º 51/04, the competent environmental authority (in this case the Ministry of Environment) is responsible for monitoring the implementation of the EIA in specific projects.

Law n. º 6/17 – Law of Forests and Wild Fauna

This Law approves the Forest and Wildlife Basic Legislation, which establishes the norms that aim to guarantee the conservation and rational and sustainable use of forests and wildlife in Angola, as well as the general basis for the exercise of activities related to them. This Law applies also to biological diversity and related activities, but does not apply to aquatic biological resources, genetic resources and conservation areas that are governed by special legislation.

The Law has the following purposes:

- Establish the general principles and rules for the protection and management of forest and wildlife resources and their ecosystems;
- Ensure their sustainable, integrated and responsible use;
- Ensure the contribution of forests and wildlife, as well as related activities, to food security, meeting basic needs, generating income, employment and gradually improving the quality of life of the current generations;
- Establish general principles and criteria for access to forest and wildlife resources and their sustainable management and development;
- Contribute to the exploitation, transformation and use of forest and wildlife products, to promote Angolan companies and companies to create employment at local level; and
- Promote scientific and technological research on forests and wildlife, as well as the dissemination of knowledge, including traditional knowledge.

Article 21 defines the limits for protected forests, as areas to be protected. Specifically number 4d) states that a 100m buffer around lagoons, ponds and water reservoirs. Within the 2 km corridor, to areas were identified and a local analysis was performed (*Figure 4.3*). In both areas there is no apparent conflict.

4.3.3 Environmental Pollution

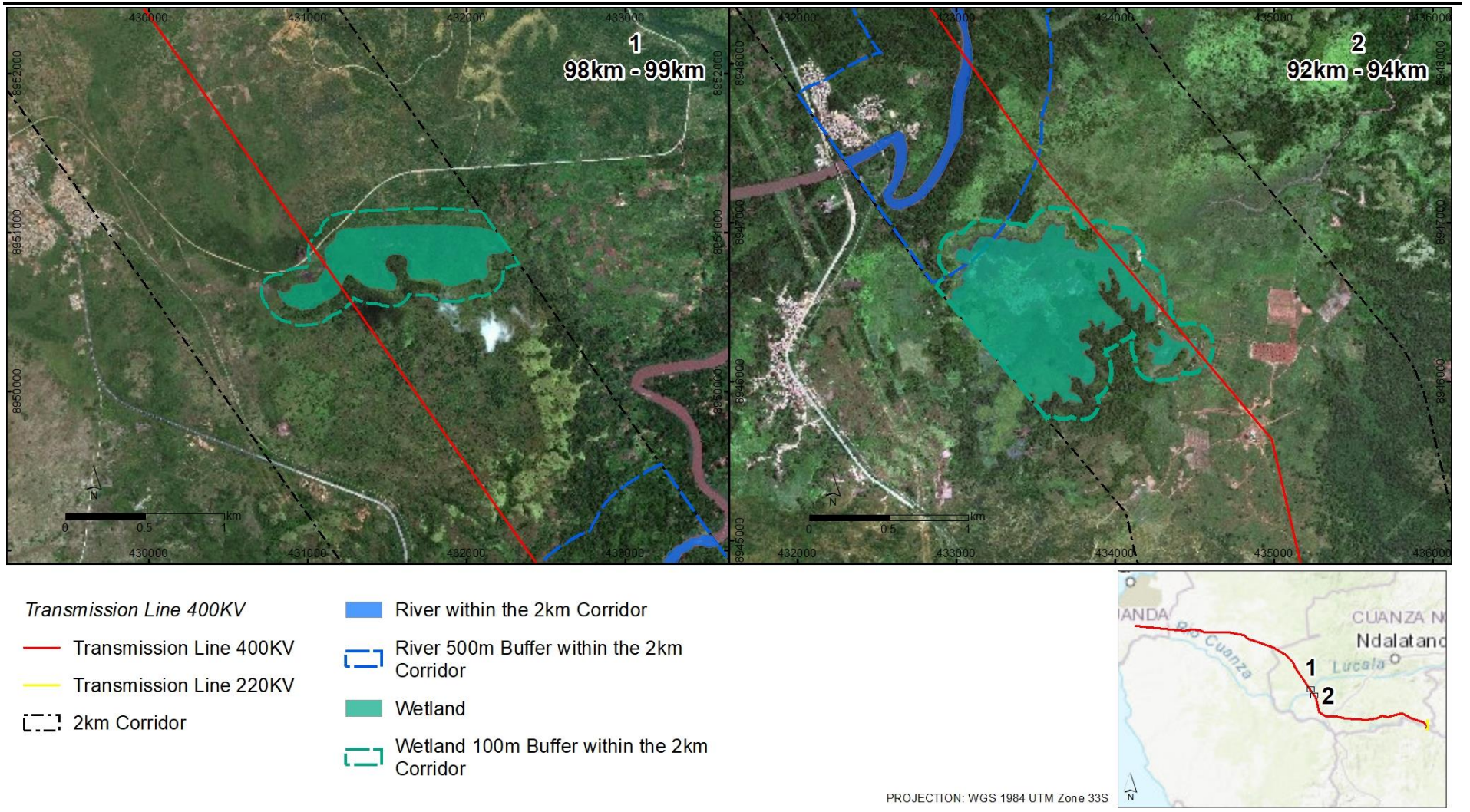
Presidential Decree N. º 194/11 (07/07/2011) – Liability for Environmental Damage

This Decree establishes the liability for the risk and degradation of the environment based on the "polluter pays" principle, to prevent and repair any environmental damage. It applies to every activity causing environmental damage, but it does not consider armed conflict, hostilities, civil war or insurrection or natural phenomena occurring exceptionally.

It applies to environmental damage or the imminent threat of such damage that is caused by pollution of a diffuse character, always if it is possible to establish a causal link between the damage and the activity of the operator which causes such damage.

It considers pollution and environmental damage as the activity that endangers human and biodiversity health due to the toxic elements released to the environment. When no environmental quality standards are available, the decree refers to the standards referred to in the ISO norms. The costs of prevention, reparation and compensation caused by a certain environmental damage must be guaranteed by the responsible for the environmental pollution. The value of the fines resulting from violation of a legal rule or requirement of the environmental license may range from the equivalent of a thousand to one hundred million US dollars.

Figure 4.3 Applicability of Law n. ° 6/17 within the Project Footprint



4.3.4 Labour

Law n. º 7/15 (15/06/15) – General Labour Law

The general labour law applies to all workers who, in Angolan territory, provide remunerated activity on behalf of an employer. The law establishes procedures and guidelines for the labour legal relationship.

4.3.5 Health and Safety

Decree N. º 31/94 (31/05/94) – Occupational Hygiene and Safety System

This decree establishes the principles that aim to promote safety, hygiene and health at work.

4.3.6 Waste Management

Presidential Decree N. º 190/12 (12/08/2012) – Solid Waste Management

This Presidential Decree affects all waste generators, and all transport companies, and waste treatment, and disposal companies. The regulation describes the waste management system, from its source to its disposal, mainly focusing on the treatment, storage, and disposal of wastes, and carriers. It also includes requirements for the storage, and handling of wastes by those responsible for generating it.

Presidential Decree N. º 190/12 sets forth detailed requirements for the segregation, storage, and containment for the different types of solid wastes, to define, and classify the wastes in hazardous and non-hazardous. These specific waste requirements will be incorporated into the standardized process of operational procedures for waste generation.

The transportation of wastes should be performed by authorized service providers, using vessels/vehicles that are appropriately adapted to ensure the safe transportation of wastes.

The carrier vessels and drivers must have the appropriate licenses, and authorizations issued by the regulatory authorities. The pilots/drivers of these vessels/vehicles must have attended training in safe driving, basic emergency response, labelling and warning signage requirements, for ships that carry hazardous wastes. The vehicles must have a Waste Manifest Form that has been completed with information related to the nature of the material being transported.

Presidential Decree N. º 160/14 (18/06/2014) – Medical Waste and Health Services

This Presidential Decree aims to regulate the medical waste produced by hospitals, medical centres, pharmacies as well as education and research institutions with a focus on the health sector.

It provides the rules and procedures for the management of medical waste including storage, transport and final destination and the need for the development of individual medical waste management plans. In its appendices, the decree presents, amongst others, the classification groups of medical waste, general waste colour labelling, biosafety measures for level 4 class materials.

4.3.7 Energy

Law n. º 14-A/96 (31/05/1996) – Electricity General Law

Establishes the general principles of the legal provisions applicable to activities of production, transport, distribution and use of electric energy.

Decree N. º 47/01 (20/07/2001) – Electric Energy Production Regulation

This Decree establishes the legal provisions of the electrical energy production activity within the scope of the Public Electric System (PES) that encompasses own production and the private supply, the latter, only developed according with the rules established in the regulation of licensing and safety of the electrical installations.

Decree N. º 41/04 (02/07/2004) – Regulation of Licensing of Production *Installations, Transmission and the Distribution of Electrical Power*

This Regulation sets out the principles and rules which must be observed in the Licensing of Electrical Installations, designed, built and operated for the purpose of producing, transporting or distributing electric power for public consumption or private, and the legal and administrative conditions that must regulate the establishment and operation of these installations.

Chapter III of this Regulation addresses the relation with third parties, rights and obligations. In this Chapter it is mentioned that the owners or lessees of land or buildings which have to be crossed by an aerial or underground electrical installation are required, as soon as it is notified by the entity, to allow the entry into their properties the persons entrusted of the studies of the construction, repair or monitoring of these installations. It is an equal obligation incumbent upon the owners or lessees of land to allow access to those installations.

Article 27 states that the applicant must compensate the owners, tenants and beneficial owners whenever the establishment of power lines results in losses. Losses are considered to be as follows:

- Immediate losses: damage to crops, damage caused by the establishment of access roads and deposit of materials and the cutting of trees required for the execution of the works;

- Permanent losses: forest damage, aesthetic, unavailability to use the soil, decreasing the possibility of building and radio disturbances; and
- Future losses: arising from the operation of the line, the transformation of rural land, near settlements, or roads on land subject to urbanisation.

Decree n. º 46 847 Regulation of the Protection of High Voltage Transmission Lines

Regulates safety and security of high voltage transmission lines. Restrictions include[1]:

- Houses and structures allowed as long as distance between transmission line axis and the top of the structure is more than 4-5m; and
- Crops and trees allowed as long as distance to the transmission line axis is more than 4m.

4.3.8 Water

Law n. º 6/02 (21/06/2002) – Water Law

The provisions of the Water Law, applicable to freshwater, makes reference to the principle of "complementarity of the water supply with the wastewater sanitation" (Article 9/1/i), and the intention to supply the "populations with uninterrupted and sufficient drinking water, for the satisfaction of their domestic needs and hygiene", to ensure the "adequate wastewater sanitation", and regulation of the "discharge of effluents" (Article 10/2), and to ensure the right to have access to water from other individuals for household purposes, and the performance of economic activities (Article 9/1/a).

The Law prohibits water pollution, particularly activities that accumulate "solid waste, waste, or any substances in locations, and conditions that contaminate, or endanger the contamination of waters" (Article 67/b). The suppliers of water for consumption must ensure that "the facilities used and the water supplied is in compliance with the requirements set up by law" (Article 70/1).

With specific focus on the discharge of effluents, Article 68 establishes that discharging of waste water or other substances and any activities likely to cause pollution or deterioration of the water in public ownership is dependent on an authorization to be granted by the institution responsible for the management of water resources in the respective basin and other competent authority.

1 Note that the restrictions adopted by GAMEK for the Project are in line with international best practice and are explained in *Section 4.5*.

Presidential Decree N. º 82/14 (12/04/2014) – Regulation on General Rules of Use of Water Resources

The Regulation on Public Water Supply and Wastewater Sanitation Activities defines the regime for public water supply and wastewater sanitation, establishing rules on assets and means associated with the systems.

Article 110 defines Water Resources Protection Areas (which includes the river margins) and the restrictions are stated in Article 111. The following restriction apply to the project: "*a) Build houses, infrastructures, or any other type of buildings that can deteriorate the margins, flow or water quality*".

Detailed analysis was performed for the two perennial rivers within the 2Km corridor (*Figure 4.4*). In these areas this restriction should be considered, i.e. positioning of permanent towers should be avoided.

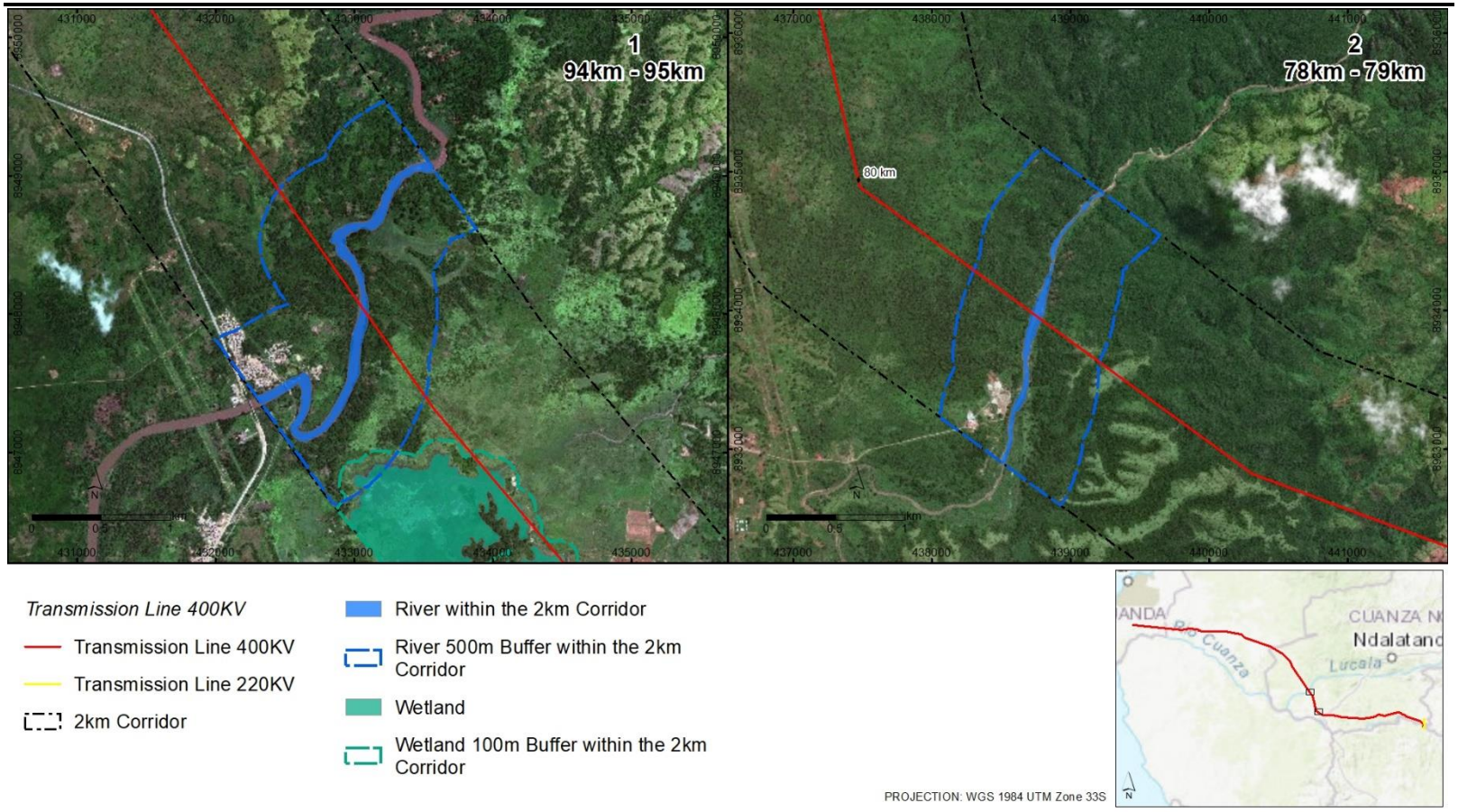
Presidential Decree N. º 261/11 (6/10/2011) – Regulation on Water Quality

It establishes the roles within the Angolan governmental administration for overseeing water quality issues and addresses water quality standards relating to human consumption and wastewater. It also indicates the role of water quality monitoring along with the standard parameters for both drinking and surface water, and emissions limits for wastewater discharge. It also regulates the control standards of wastewater discharge to waterbodies and soil, in order to preserve the quality of the aquatic environment and protect public health.

Presidential Decree N. º 83/14 (22/04/2014) – Regulation on Public Water Supply and Wastewater Sanitation

This Decree defines the regime of public water supply and wastewater sanitation activities. According to Article 5, the public water supply and wastewater sanitation systems aim essentially to contribute to the promotion of the quality of life of the population, and reduce poverty; to the promotion of the socio-economic and industrial development, and the preservation of the environment; and to provide comfort and well-being to the population, and facilitate cleanliness and public hygiene.

Figure 4.4 Applicability of Presidential Decree N. º 82/14 within the Project Footprint



4.3.9 Land Use and Resettlement

Decree n.º 58/07, General Regulation Land Concession ("Regulamento Geral de Concessão de Terrenos"), July 13 2017

This diploma establishes the legal framework for the concession of free lands within Angola and does not apply to 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. Also important to note that, as per this diploma, private parties affected by expropriations for public use or by the establishment of administrative authorities have the opting for the corresponding fair indemnity, or to participation, as stockholders, in any mixed economy associations that may be established for the utilization of activities related to the respective reserve. This Decree also establishes the regime for public expropriation for public use including compensation for improvements that the concession holder has made on the expropriated property, including conceding a parcel of land in the same judicial situation, susceptible to similar use.

Expropriation Law n.º 2.030 ("Lei das Expropriações"), June 22, 1948[1]

This diploma states that immovable assets and related rights may be expropriated for public utility purposes as set out in this law, and through payment of fair compensation. It also establishes the process for the expropriation and concession of land for public utility and the conditions and the process to determine fair compensation to the affected party. The process includes the following steps:

- Submission of application by the interested party to the Concessionaire;
- Information and opinions including other entities that should be consulted on the request;
- Temporary demarcation of the land;
- Consideration of the application and approval or rejection;
- Definitive demarcation;
- Concession contract signing;
- Concession title granting; and

[1] Whilst an inter-ministerial working group has been set up to formulate a new law, a draft has not yet been prepared. Consequently, the Presidential Decree n. º 58/07 is referred to for land to be expropriated for public utility.

- Registration of the right, in favour of the concessionaire, in the land registry.

Law n. º 9/04 Land Law ("Lei de Terras"), 2004

This legal document establishes fundamental land rights principles and categorizes State land as conferrable and non-conferrable.[1] It also defines land rights and interests in land, emphasizing that the State and local authorities may expropriate for public utility purposes. Establishes that expropriation extinguishes the land rights established on the land and determines its definitive transfer to state assets or local authorities; the latter being responsible for properly compensating the holder land rights and states that the land of rural communities may be expropriated for public utility or be subject to requisition through fair compensation. Finally, it is important to underline that it also establishes a Right of Way (faixa confinante) of 30 m either side of the transmission line (refer to art. 27).

Presidential Decree n. º 117/16 Regulation for Resettlement Operations, ("Regulamento de Operações de Realojamento"), 2016

Regulates and approves resettlement operations in the process of relocation of a group of people living in a given territory, households, residing in areas of requalification and urban reconversion, in accordance with the principles governing the Public Administration, ensuring the continuation of the public interest and the protection of the rights and interests of citizens. Establishes the admissibility of relocation, stating that the admissibility of Resettlement is the responsibility of the provincial government and the implementation is the responsibility of the municipal government. At last establishes the relocation rights and warranties and defines the procedure for Relocation Operations and Financial compensation.

Law n.º 3/04 for the Organisation of the Territory and Urbanism ("Lei do Ordenamento do Território e do Urbanismo"), 2004

Establishes the instruments for urban and rural territorial space management, as well as a system for urban and territorial planning and related policies. Also regulates the territorial planning system general framework in coordination with other instruments such as the general regime of defence, occupation and use of land, and establishes that the land use must comply with municipal and special territorial plans.

[1] *Conferrable Land*. Such land can have its property rights transmitted or constituted in accordance to use, while respecting its protection, environmental issues, and sustainable exploitation. *Non-Conferrable Land*. Such land cannot be transmitted for private use because of its public use (roads, airports, schools, hospitals, etc.).

Decree n.º 43.894 Regulation for the Occupation and Concession of Land. ("Regulamento da Ocupação e Concessão de Terrenos nas Províncias Ultramarinas")

This diploma indicates that in case of expropriation, the land owner should be informed six months in advance.

It also establishes that compensation should be given for necessary improvements that the concession holder has made on the expropriated property including conceding a parcel of land of similar use, if there is available land.

4.3.10 Cultural Heritage

Law n. º 14/05 (07/10/2005) – Cultural Heritage Law

Defines cultural heritage as the material and immaterial assets that, given its value, must be the object of protection of the right. Presents a set of activities that are considered violations against the cultural heritage.

4.3.11 Protected Areas

The establishment of protected areas (national parks, nature reserves and forest reserves) was first mentioned in a regulation (*Regulamento*) issued in 1936, and the first protected area (*Parque Nacional de Caça do Iona*) was established in 1937.

The first statute on nature conservation and on the establishment of protected areas for different purposes (initially for hunting purposes and later for nature conservation) was issued on 20 January 1955 through decree No. 40,040 (published in the Official Bulletin on 9 February 1955). Some of the above-mentioned legislation was revoked after independence by Decree No. 43/77 of 5 May 1977. At present, national policy instruments and legislation related to protect areas are inadequate and outdated. Since 2010 a bill has been prepared on Protected Areas but has not been approved by Government.

Angola has a wide range of biomes, which includes lowland rain forests in the Cabinda area (Maiombe Forest), deserts in the south-west, savannah and mountains in the central plateau of Angola and a great diversity of fauna and flora (SARDC, SADC & IUCN 1994). The level of endemism is very high, with an estimated 1,260 plant species (IUCN 1992). Angola has also a number of protected areas which were established during the colonial period in the 1930s mainly for tourism, controlled hunting, protection and scientific research. These areas were primarily considered as areas with low agricultural and economic potential, but valuable in hunting terms.

The protected areas in Angola include national parks, strict nature reserves, partial reserves, regional nature parks and special reserves.

Until 2011, 13 conservation areas were considered in Angola, established by their own legislation and totalling around 6.6 percent of the country's surface (82,832 km²). There were six national parks (4 percent), four partial reserves (2.2 percent), two natural reserves and one regional natural park (0.4 percent). Five public hunting reserves and a private one were also established, which occupied the equivalent of 7.51 percent of the total area of Angola.

In 2011, Law no. 38/11 of 29 December established three new conservation areas, namely the Luengue-Luiana and Mavinga Parks (in Cuando Cubango) and Mayombe (in Cabinda), which is the last legal instrument related to the establishment of new conservation areas in Angola. In this way, the area of the national territory covered by conservation areas increased from 6.6 percent to around 12.98 percent. The current protected areas in Angola are listed in *Table 4.2*.

Table 4.2 List of Protected Areas in Angola

Name of protected area Date of establishment	Province	Area (km²)
Quiçama National Park Established as national park by Legislative Diploma 2873 of 11 December 1957.	Luanda	9,960
Chimalavera Nature Park Established as a regional nature park by decree 352 of 15 April 1974.	Benguela	150
Buffalo Partial Reserve Established as a partial reserve by government decree 325 of 5 April 1974.	Benguela	400
Mupa National Park Established as a national park by Diploma 3527 of 26 December 1964.	Cunene	6,600
Bicuar National Park Established as a national park by Legislative Diploma 3527 of 26 December 1964. The new boundaries were redefined by decree 384 of 13 June 1972.	Huíla	7,900
Ilhéu dos Pássaros Integral Nature Reserve Established as an integral nature reserve by provincial decree 55 of 21 December 1973.	Luanda	2
Cangandala National Park Established as a national park by Legislative Diploma 4017 of 25 May 1970.	Malanje	630
Luando Integral Nature Reserve Established as nature reserve through Legislative Diploma 2873 of 11 December 1957.	Malanje/Bié	8,280
Cameia National Park Established as a national park by Legislative Diploma 2873 on 11 December 1957.	Moxico	14,450
Iona National Park Established as Porto Alexandre National Park by Legislative Diploma 2873 of 11 December 1957. It was renamed as Iona National Park with some boundary alterations by Legislative Diploma 3524 of 26 December 1964.	Namibe	15,150
Namibe Partial Reserve Established as a partial reserve by Legislative Diploma for a limited period from 12 June 1957 to 31 December 1959. Some 29,000 hectares around the city of Moçamedes were annexed from the area by government decree 480 of 28 July 1973.	Namibe	4,450
Mayombe National Park Established as a National Park Law 38/11 of December 29.	Cabinda	1,930

Name of protected area Date of establishment	Province	Area (km²)
Luengue-Luiana National Park Established as a National Park Law 38/11 of December 29.	Cuando Cubango	45,818
Mavinga National Park Established as a National Park Law 38/11 of December 29.	Cuando Cubango	46,072

Source: www.minamb.gov.ao (accessed 01 September 2018).

Angola acceded to the Convention on Wetlands of National Importance through Resolution No. 27/16 of 22 July 2016. This accession is based on the need to protect certain wetlands which have fundamental ecological functions for the regulation of water regimes and also serve as habitats for flora and fauna of particular characteristics, especially for waterfowl. In addition to acceding to the Convention, Angola proposed a set of 11 wetland sites to be considered as candidates for Ramsar sites (see *Table 4.3*) and which should be considered in the process of expanding conservation areas in Angola.

Table 4.3 Proposed Ramsar Sites for Angola

N.º	Name of Wetland	Area (ha)	Coordinates	Location
1.	Lagunas do Mangal do Lobito	259	12º 21´ 45´´S 13º 32´ 43´´E	Lobito-Benguela
2.	Saco dos Flamingos	1.616	9º 05´ 03´´S 13º 00´15´´E	Ramiros-Luanda
3.	Lagoa do Arco	7.568	15º 46´ 01´´S 12º 03´ 47´´E	Tômbwa-Namibe
4.	Parque Nacional da Cameia	1.445.000	11º 57´32´´S 21º 40´31´´E	Cameia-Moxico
5.	Complexo das Zonas Húmidas da Lagoa do Carumbo	200.000	7º 48´S 19º 57´E	Lunda-Norte
6.	Lagoa do Calumbo	1.000	9º 10´ 07´´S 13º 24´ 43´´E	Icolo e Bengo-Luanda
7.	Lagoa da Quilunda	5.111	8º 53´05´´S 13º 36´01´´E	Icolo e Bengo-Luanda
8.	Complexo de Lagunas de Santiago-Saurico	3.763	8º 43´ 37´´S 13º 24´ 49´´E	Panguila-Bengo
9.	Lagoa do Mangal do Chiloango	3.097	5º 10´37´´S 12º 07´35´´E	Cacongo-Cabinda
10.	Baixo Kwanza	97.200	9º 20´45´´S 13º 09´04´´E	Luanda
11.	Complexo das Zonas Húmidas de Kumbilo-Dirico	11.743	17º 59´18´´S 20º 46´53´´E	Dirico-Cuando Cubango

Source: www.ramsar.org (accessed 01 September 2018).

4.3.12 Other Relevant Policies and Plans

There are a number of relevant documents which are important for the development of energy projects in Angola and these include:

- The **National Biodiversity Strategy and Action Plan (NBSAP)** approved through the Resolution n. º 42/06 of July 26, 2006. This strategy incorporates measures for the conservation and sustainable use of biological diversity/resources in development policies and programs.

- The **National Policy of the Forests, Wildlife and Protected Areas** approved by the Resolution n. º 1/10 of January 14 focuses in four main axes, namely economic, social, institutional and environmental.

- The economic axis aims at promoting the economic use and profitability of forests, the social axis advocates the establishment of mechanisms for the participation of local communities, the private sector and civil society in the management and sharing of benefits resulting from the sustainable exploitation and use of forests, while the institutional axis is aimed at establishing institutional capacity building mechanisms to ensure efficiency, transparency, professionalism and confidence in the fulfilment of the mandate related to the management of forest areas. The environmental axis aims at contributing to the conservation and protection of terrestrial biodiversity, with a view to national sustainable development.

- The **Strategic Plan for New Environmental Technologies** approved through the Presidential Decree N. º 88/13 of June 14, 2013. It focuses on its guiding and framework principles, in axles and programs, namely the transverse axle, including the promotion of the environmental technologies, and incentives to the investment in environmental technologies, and the sectorial axle, including the sectors of urbanism and construction, agriculture, and forests, and the environmental technologies, in the industry, energy and water, petroleum, and transportation sectors, and the implementation of the plan.

- **National Development Plan 2017 – 2022 and Angolan Development Strategy towards 2025**. Both these documents provide guidelines and national objectives related to the planned development for the next decade. It places emphasis on directing public investments in infrastructure (energy, water, access roads, irrigation canals, etc.) on a number of water-related projects which will have an impact on shared water courses, such as construction and rehabilitation of dams for irrigation, energy production and water distribution as well as to support a number of agriculture and industrial projects.

4.4 INTERNATIONAL TREATIES AND CONVENTIONS

Multilateral environmental and social agreements are important instruments in ensuring environmental and social sustainability and safeguarding natural resources. It is in recognition of their importance that Angola has acceded to, signed and ratified, a number of multilateral environmental and social agreements over the past 30 years.

A list of the multilateral environmental and social agreements that the Government of Angola has signed, acceded to or joined as a party, and which are relevant for this energy project is provided in *Table 4.4*.

Table 4.4 List of Multilateral Environmental Agreements Ratified by Angola

International Convention Name	Applicability to Project
General	
SADC Protocol on Trade	The Protocol intends to further liberalise intra-regional trade by creating mutually beneficial trade arrangements, thereby improving investment and productivity in the region. It advocates that Member States eliminate barriers to trade, ease customs procedures, harmonise trade policies based on international standards, and prohibit unfair business practices. The Protocol should be taken into account when developing Project activities.
Environmental	
Convention on the Conservation of Migratory Species of Wild Animals	This ESIA has taken into account any potential impacts on migratory species.
United Nations Convention on Biological Diversity (CBD)(1992)	The objectives of the CBD have been considered in this ESIA.
Convention on Wetlands of International Importance especially Waterfowl Habitat (Ramsar Convention, 1971)	This EIA has taken into account any potential wetlands.
SADC Protocol on Wildlife Conservation and Law Enforcement (1999)	The principles and guidelines of the SADC Protocol should be considered when developing plans and programmes for the management of wildlife.
Hazardous Substances	
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)	The objectives of the Rotterdam Convention should be considered when developing plans and programmes for the management of relevant hazardous chemicals and pesticides.
Waste	
Basel Convention on Hazardous Waste (1989)	If applicable, obtain consent from the receiving country before the transboundary movement of hazardous waste.
Bamako Convention (1991)	Consider the content of the Bamako Convention (as well as the Basel Convention, above) if any hazardous wastes (broadly defined) are to be moved across national boundaries.
Heritage	
Convention concerning the Protection of the World Cultural and Natural Heritage (1972)	By applying international standards (such IFC Performance Standard 8) to any identification and management of cultural heritage aspects during project development, the developer will comply with the objectives of the convention.
Labour	
Abolition of Forced Labour Convention, 1957 (No. 105)	Ensure that forced labour is prohibited and that human resource (HR) policies and procedures are developed and implemented to ensure this.
Minimum Age Convention, 1973 (No. 138)	Ensure that employment policies include prohibitions on the employment of children and that such polices are adhered to.
Worst Forms of Child Labour Convention, 1999 (No. 182)	Ensure that employment policies include prohibitions on the employment of children and that such polices are adhered to.

International Convention Name	Applicability to Project
Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	Ensure that the Project recognise workers freedom of association and protection of the right to organise.
Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	Discrimination in the field of employment and occupation should be expressly forbidden.
Human Rights	
International Convention on the Elimination of All Forms of Racial Discrimination :1969	All workplace racial discrimination should be expressly forbidden.
Convention on the Elimination of All Forms of Discrimination against Women :1981 (CEDAW)	Ensure that non-discrimination against women is enshrined in HR policies and practices for the proposed Project.
Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment: 1987	Torture in all workplace should be expressly forbidden.
Convention on the Rights of the Child :1990	Ensure that employment policies include prohibitions on the employment of children.
International Covenant on Economic, Social and Cultural Rights 1976	Ensure that economic. Social and cultural rights are respected in the proposed Project.
International Covenant on Civil and Political Rights 1976	Ensure civil and political rights are observed in the proposed Project.
Climate Change	
Framework Convention on Climate Change (1992)	Implement measures to reduce greenhouse gas emissions.
Montreal Protocol on Climate Change (1987)	Implement measure to reduce emission of substances that deplete the ozone layer.
Vienna Convention for the Protection of the Ozone Layer (1985)	Implement appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from human activities which are likely to modify the Ozone Layer.
Energy	
SADC Protocol on Energy	The Protocol intends to promote the harmonious development of national energy policies and matters of common interest for the balanced and equitable development of energy throughout the SADC Region. The Protocol should be taken into account when developing Project activities.
Water	
SADC Revised Protocol on Shared Watercourses	The Protocol stresses the importance of taking a basin-wide approach to water management rather than emphasising the principle of territory sovereignty. It outlines specific objectives including improving cooperation to promote sustainable and coordinated management, protection, and utilisation of transboundary watercourses. The Protocol should be taken into account when developing Project activities.
Forestry	
SADC Protocol on Forestry	The Protocol promote the development, conservation, sustainable management and utilisation of all types of forest and trees; trade in forest products and achieve effective protection of the environment, and safeguard the interests of both the present and future generations. The Protocol should be taken into account when developing Project activities.

4.5 INTERNATIONAL LENDER STANDARDS AND GUIDELINES

IFC Performance Standards

The IFC, a division of the World Bank Group that lends to private investors, has released a Sustainability Policy and set of Performance Standards on Social and Environmental Sustainability (January 2012).

The Performance Standards are directed towards providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate and, manage risks and impacts as a way of doing business in a sustainable way; including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of direct investments for the IFC (including project and corporate finance provided through financial intermediaries), the IFC requires that its clients apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced (IFC, 2012).

The IFC Performance Standards are outlined in *Box 4.1* below.

Box 4.1 International Finance Corporation (IFC) Performance Standards

Performance Standards:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts.
- PS 2. Labour and Working Conditions
- PS 3. Resources Efficiency and Pollution Prevention
- PS 4. Community, Health, Safety and Security
- PS 5. Land Acquisition and Involuntary Resettlement
- PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PS 7. Indigenous Peoples
- PS 8. Cultural Heritage

The Performance Standards are directed towards providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate and, manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of direct investments for the IFC (including project and corporate finance provided through financial intermediaries), the IFC requires that its clients apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced (IFC, 2012).

The IFC Performance Standards, and each of their applicability to the proposed Project and this ESIA, are outlined in *Table 4.5*.

Table 4.5 International Finance Corporation (IFC) Performance Standards

Performance Standards	Applicability to Project
Assessment and Management of Environmental and Social Risks and Impacts **Performance Standard 1** underscores the importance of managing environmental and social performance throughout the life of a project (any business activity that is subject to assessment and management).	• To identify and assess environmental and social risks and impacts of the Project. • To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. • To promote improved environmental and social performance of clients through the effective use of management systems. • To ensure that grievances from Affected Communities (both directly and indirectly affected) and external communications from other stakeholders are responded to and managed appropriately. • To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.
Labour and Working Conditions **Performance Standard 2** recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by the protection of the fundamental rights of workers.	• To promote the fair treatment, non-discrimination and equal opportunity of workers. • To establish, maintain and improve the worker management relationship. • To promote compliance with national labor and employment laws. • To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the clients supply chain. • To promote safe and healthy working conditions, and health of workers. • To avoid the use of forced labor.
Resource Efficiency and Pollution Prevention **Performance Standard 3** recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.	• To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from Project activities. • To promote more sustainable use of resources, including energy and water. • To reduce project-related greenhouse gas emissions.
Community Health, Safety and Security **Performance Standard 4** recognises that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.	• To anticipate and avoid adverse impacts on health and safety of the Affected Community during the Project life from both routine and non-routine circumstances

Performance Standards	Applicability to Project
	• To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.
Land Acquisition and Involuntary Resettlement **Performance Standard 5** recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land.	• To avoid, and when avoidance is not possible, minimize displacement by exploring alternative Project designs. • To avoid forced eviction. • To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. • To improve, or restore, the livelihoods and standards of living of displaced persons. • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
Biodiversity Conservation and Sustainable Management of Living Natural Resources **Performance Standard 6** recognises that protecting and conserving biodiversity, maintaining ecosystems services, and sustainably managing living and natural resources are fundamental to sustainable development	• To protect and conserve biodiversity. • To maintain the benefits from ecosystem services. • To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.
Indigenous Peoples **Performance Standard 7 recognizes** that Indigenous Peoples are often among the most marginalized and vulnerable segments of the population and, consequently, be more vulnerable to the adverse impacts associated with project development than non-indigenous communities. This vulnerability may include loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases.	• Not applicable as there are no indigenous people as per IFC definition in the Study Area. In Angola indigenous people are the Himbas/Khoisan who are located in the Southern part of Angola and not present in the Study Area.

Performance Standards	Applicability to Project
Cultural Heritage **Performance Standard 8** recognises the importance of cultural heritage for current and future generations	• Protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented. Where relevant this includes the retention of a competent professional to assist in the identification and protection of cultural heritage. • Develop provisions for managing chance finds, requiring any chance find to be undisturbed until an assessment by competent professional is complete and management actions are identified. • Consult with affected communities to identify cultural heritage of importance and to incorporate their views into the decision making process. This should involve national and local regulatory agencies. • Allow continued access to cultural heritage sites for communities that have used the sites within living memory for long-standing cultural purposes. • Avoid or minimize impacts to, or restore *in situ,* the functionality of replicable cultural heritage. • Not remove any non-replicable cultural heritage unless the following criteria are met: there are no technically or financially feasible alternatives, the overall benefit of the Project outweigh the anticipated cultural heritage loss from removal and the removal of cultural heritage is conducted using the best available techniques. • Should not remove, significantly alter, or damage critical cultural heritage. In exceptional circumstances where impacts are unavoidable, the Project will use a process of Informed Consultation and Participation (ICP).

Industry Specific EHS Guidelines: IFC EHS Guidelines for Electric Power Transmission and Distribution, 2007

The IFC Guidelines are applicable to power transmission between a generation facility and substations located within an electric grid as well as power distribution from a substation to consumers. 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.

4.6 GAP ANALYSIS BETWEEN IFC PS AND ANGOLAN LEGAL FRAMEWORK

This ESIA is being conducted in accordance with Angolan's environmental legislation. NHID also subscribes to the requirements of the International Finance Corporation (IFC), therefore this ESIA process is designed and carried out to fulfil both.

IFC requirements are meant for situations where in-country standards and requirements are insufficient for the Lenders to make an informed decision about the full scope of environmental and social impact.

Table 4.6 below includes a generic description from the gaps and linkages between IFC PS's and Angolan Legislation. The table thus indicates how Performance Standards are to be complied with in this project.

Table 4.6 IFC Performance Standard and Angolan Legislation Gap Analysis

Performance Standard	Angolan Regulation	Is this Applicable to the Project and What are the Gaps?	Where is this Addressed in the ESIA Process?
PS 1: SOCIAL AND ENVIRONMENTAL ASSESSMENT AND MANAGEMENT SYSTEMS			
An Environmental and Social Management System (ESMS) must be established that will describe mitigation and performance improvement measures and actions proportionate with the level of social and environmental risks and impacts.	An ESMP is required, but there is no mention of its translation into an Environmental and Social Management System.	The project will require the implementation of an ESMS.	• Requirement to be included in the ESMP.
The development of a Stakeholder Engagement Plan (SEP) is recognised as a tool in such a management system.	Not required by Angolan law.	Although the legislation does require adequate public participation (after submission of the ESIA report), it does not specifically refer to the development of a SEP. It should be incorporated in this project.	• SEP to be developed. • ESIA should describe the relevant stakeholder engagement that has taken place to date. • Continued engagement will be included in the ESMP.
The risks and impact identification process will be based on recent environmental and social baseline data at an appropriate level of detail.	Implied in terms of principles and on the generic Terms of Reference, but not regulated.	Applicable and the Angolan Regulations make adequate provision for this requirement.	• Included in the SoW (ERM proposal); • Environmental and socials baseline
An organisational structure that defines roles, responsibilities and authority to implement certain tasks need to be developed.	Not required by Angolan law. The overall responsibility lies with the project proponent.	Although this is not required by Angolan law it is applicable to this project.	• Requirement to be included in the ESMP.
For projects posing potentially significant adverse impacts involve external experts to assist in the risks and impacts identification process	Not required by Angolan law.	Although the involvement of external experts are not specifically mentioned, MINAMB does state that the Team has to have sufficient knowledge. External specialists are thus automatically contracted if the	• Contracted specialists include (refer to *Section 1.6* for details about team composition).

Performance Standard	Angolan Regulation	Is this Applicable to the Project and What are the Gaps?	Where is this Addressed in the ESIA Process?
		significant adverse impacts are expected.	
Emergency preparedness and response should be developed when the project involves specifically identified elements that are likely to generate impacts.	Not required by Angolan law.	Although this is not required by Angolan law it is applicable to this project.	• Emergency Preparedness and Response Plan to be included in the ESMP.
Ongoing reporting to the I&AP's needs to be implemented.	*Law n. º 5/98 (19/06/1998) – Environmental Framework Law.* The Environmental Framework Law (*LBA – Lei de Base do Ambiente*) defines the basic concepts and principles for the protection, preservation and conservation of the environment, promotion of the quality of life, and the rational use of natural resources. *Decree N. º 59/07 (13/07/2007) – Environmental Licensing* This Decree is a complement of the LBA on aspects related to the environmental licensing. It lays down the rules that regulate the environmental licensing of activities which, by their nature, location or scale are susceptible of causing significant environmental impacts. *Executive Decree N. º 87/12 (24/02/2012)* – Public Consultation process for projects subject to environmental impact assessment. *Executive Decree N. º 92/12 (01/03/2012) – Terms of Reference for the Development of Environmental Impact Studies* Executive Decree N. º 92/12, of 01 March 2012, establishes the guidelines and procedures to be followed during the development of Environmental Impact Studies.	Applicable and the Angolan Regulations make adequate provision for this requirement.	• Throughout the project life cycle via public and authorities meetings (stakeholder engagement);
External grievance mechanisms need to be established to receive and facilitate resolution of I&AP's concerns about the project and its environmental and social performance.	Not required by Angolan law.	Although this is not required by Angolan, law a grievance mechanism should be incorporated within this Project.	• Requirement to be included in the ESMP (and RCAP).

Performance Standard	Angolan Regulation	Is this Applicable to the Project and What are the Gaps?	Where is this Addressed in the ESIA Process?
PS 2: LABOUR AND WORKING CONDITIONS			
Recognises that the pursuit of economic growth through employment creation and income generation should be balanced with the protection of basic rights for workers.	2010 Constitution and *General Labour Law No. 7/15 of June 15th*	Applicable and the Angola Regulations make adequate provision for this requirement.	• Requirement to be included in the ESMP.
Occupational health and safety requires the minimisation of the causes of hazards in a manner consistent with good international industry practice, including the World Bank Group EHS Guidelines.	*Decree N. º 31/94 (31/05/94) – Occupational Hygiene and Safety System* This decree establishes the principles that aim to promote safety, hygiene and health at work. *General Labour 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".	Yes this is applicable and the Angolan Regulations make adequate provision for this requirement. The Angolan Regulations do not, however, refer to the use of the WB EHS Guidelines and this shall be done additionally.	• *Section 9.4* includes Health Impact Assessment • Requirement to be included in the ESMP.
PS 3: RESOURCE EFFICIENCY AND POLLUTION PREVENTION			
Implement measures for improving resources and material consumption minimisation.	Not required by Angolan law. *Presidential Decree n.º 88/13 of June 14 which approves the New Technologies Strategic Plan.* Provides guiding and framework principles for the promotion of the environmental technologies, and incentives to the investment in environmental technologies, to reduce pollution and maximize resources efficiency.	Although this is not required by Angolan law this should be incorporated within this Project	• Requirement to be included in the ESMP.
Consider alternatives to reduce project related Green House Gases (GHG) emissions during design and operation.	Not required by Angolan law for this type of projects. Legislation exists for the oil and gas industry.	Although this is not required by Angolan law this should be incorporated within this Project.	• *Section 9.2.3* includes Air Quality Assessment. • Requirement to be included in the ESMP
Avoid, or where not possible minimise, the release of pollutants and generation of hazardous and non-hazardous waste materials.	*Law n. º 5/98 (19/06/1998) – Environmental Framework Law.* *Presidential Decree N. º 190/12 (12/08/2012) – Solid Waste Management* This Presidential Decree affects all waste generators, and all transport companies, and waste treatment, and disposal companies. The regulation describes the waste management system, from its source to	Applicable and the Angolan Regulations make adequate provision for this requirement.	• *Section 9.2.3* includes Air Quality Assessment • Requirement to be included in the ESMP

Performance Standard	Angolan Regulation	Is this Applicable to the Project and What are the Gaps?	Where is this Addressed in the ESIA Process?
	its disposal, mainly focusing on the treatment, storage, and disposal of wastes, and carriers. It also includes requirements for the storage, and handling of wastes by those responsible for generating it.		
PS 4: COMMUNITY HEALTH, SAFETY AND POLLUTION PREVENTION			
Recognises that project activities, equipment and infrastructure bring benefits to communities including employment, services and opportunities for economic development. However, the project can also increase the potential for community exposure to risks from development.	*Law n. º 5/98 (19/06/1998) – Environmental Framework Law.* Executive Decree No. 51/04 of July 23rd – *Environmental Impact Assessment* Establishes a set of procedures that must be followed during the execution of Environmental Impact Studies with approval from the competent body of the State as well as the standards for the public consultation.	Yes this is applicable and the Angolan Regulations make adequate provision for this requirement.	• Requirement to be included in the ESMP
Where project activities pose risks of adverse impacts on the community health and safety, the developer is required to make available relevant information to affected parties and government authorities so that they can fully understand the nature and extent of the risks. This includes the details of an Emergency Preparedness and Response Action Plan.	Executive Decree No. 51/04 of July 23rd – *Environmental Impact Assessment* Establishes a set of procedures that must be followed during the execution of Environmental Impact Studies with approval from the competent body of the State as well as the standards for the public consultation. *Decree N. º 59/07 (13/07/2007) – Environmental Licensing* *Executive Decree N. º 92/12 (01/03/2012) – Terms of Reference for the Development of Environmental Impact Studies*	Yes this is applicable and the Angolan Regulations make provision for most of this requirement. However, an Emergency Preparedness and Response Action Plan is not a requirement and shall be incorporated additionally.	• *Section 9.4* includes Community health and safety Assessment • Requirement to be included in the ESMP • Emergency Preparedness and Response Plan to be prepared prior to construction.
PS 5: LAND ACQUISITION AND INVOLUNTARY RESETTLEMENT[1]			
Consultation needs to take place with host and affected communities during involuntary resettlement.	Not required by Angolan law	Although this is not required by Angolan law this should be incorporated within this Project.	• A SEP to be developed as well as a Resettlement and Compensation Action Plan; • Requirement to be included in the ESMP

[1] Please refer to the RCAP for a specific IFC PS05 and Angolan legal framework gap analysis. Through the ESIA report mention is made regarding specific topics (eg. noise, air quality, waste).

Performance Standard	Angolan Regulation	Is this Applicable to the Project and What are the Gaps?	Where is this Addressed in the ESIA Process?
PS 6: BIODIVERSITY CONSERVATION AND SUSTAINABLE MANAGEMENT OF LIVING NATURAL RESOURCES			
Recognises that protecting and conserving biodiversity in all its forms is fundamental to sustainable development.	*Resolution n. º 42/06 of July 26 - National Biodiversity Strategy and Action Plan (NBSAP)* *Decree N. º 59/07 (13/07/2007) – Environmental Licensing* *Executive Decree N. º 92/12 (01/03/2012) – Terms of Reference for the Development of Environmental Impact Studies* *Law n. º 6/17 – Law of Forests and Wild Fauna* This Law approves the Forest and Wildlife Basic Legislation, which establishes the norms that aim to guarantee the conservation and rational and sustainable use of forests and wildlife in Angola, as well as the general basis for the exercise of activities related to them. This Law applies also to biological diversity and related activities, but does not apply to aquatic biological resources, genetic resources and conservation areas that are governed by special legislation.	Yes this is applicable and the Angolan Regulations make provision for most of this requirement.	• Biological Environment (*Section 7.3*)
Where the project has potential impacts on legally protected or critical habitats, consultation with relevant authorities, specialists and communities must be undertaken.	*Resolution n. º 42/06 of July 26 - National Biodiversity Strategy and Action Plan (NBSAP)* *Decree N. º 59/07 (13/07/2007) – Environmental Licensing* *Executive Decree N. º 92/12 (01/03/2012) – Terms of Reference for the Development of Environmental Impact Studies*	Yes this is applicable and the Angolan Regulations make provision for most of this requirement.	Stakeholder engagement (*Section 5*)
Ecosystem services are the benefits that people derive from ecosystems. Priority ecosystem services need to be identified in collaboration with I&AP's in accordance with the SEP.	Not required by Angolan law	Although this is not required by Angolan law, priority ecosystem services should be identified in collaboration with I&AP's for this project.	• To be included in the Biodiversity baseline
PS 7: INDIGENOUS PEOPLES			
Recognises that indigenous groups in a project area can be at particular risks which may include loss of identity, culture, traditional lands and natural resource based livelihoods.	Not required by Angolan law	No indigenous people are located within the vicinity of the project are.	• Not applicable to this project as there are no indigenous people as per IFC definition in the Study Area.

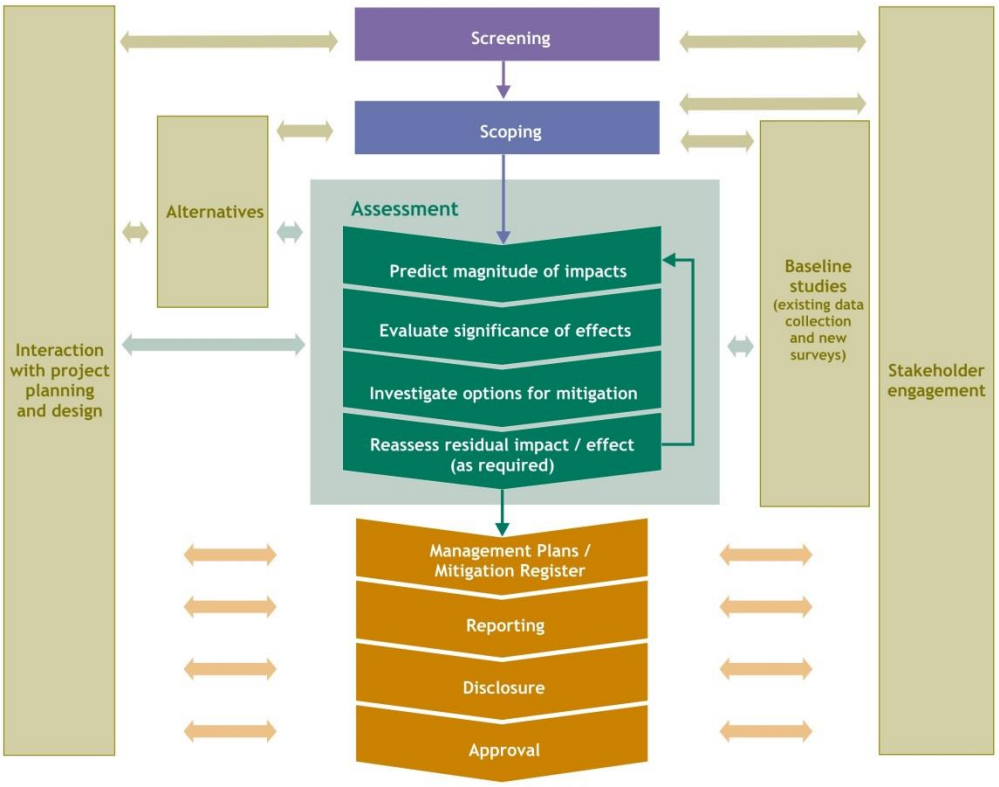
Performance Standard	Angolan Regulation	Is this Applicable to the Project and What are the Gaps?	Where is this Addressed in the ESIA Process?
Recognises the need for early engagement with indigenous groups, should they be affected, to build longer term processes of consultation, informed participation and good faith negotiation.	Not required by Angolan law	No indigenous people are located within the vicinity of the project are.	• Not applicable to this project.
Establish means for the full development of these people's own institutions and initiatives and in appropriate cases, provide the resources necessary for this purpose.	Not required by Angolan law	No indigenous people are located within the vicinity of the project are.	• Not applicable to this project.
PS 8: CULTURAL HERITAGE			
Recognises the importance of cultural heritage for current and future generations and is consistent with the convention concerning the protection of the world's cultural and natural heritage.	*Law n.º 14/05 (07/10/2005) – Cultural Heritage Law* Defines cultural heritage as the material and immaterial assets that, given its value, must be the object of protection of the right. Presents a set of activities that are considered violations against the cultural heritage.	Applicable and the Angolan Regulations make provision for most of this requirement.	• *Section 7.4* and *9.4* includes baseline (based on primary and secondary data), impact assessment and mitigations • Requirement to be included in the ESMP.

5 IMPACT ASSESSMENT METHODOLOGY

5.1 INTRODUCTION

This Chapter describes the methodology used to conduct the impact assessment. The methodology follows the overall approach illustrated in *Figure 5.1*. The assessment has been undertaken following a systematic process that predicts and evaluates the impacts the Project or Project activities could have on aspects of the physical, biological, or social environment, and identifies measures that the Project will take to avoid, reduce, mitigate, or offset for adverse impacts and to enhance positive impacts. The steps in the assessment process are described in the following sections.

Figure 5.1 Impact Assessment Process



Source: ERM (2016).

5.2 IMPACT ASSESSMENT STEPS

5.2.1 *Scoping*

Scoping has been undertaken with the following objectives:

- Identify the Project's Area of Influence (and thus an appropriate Study Area);

- 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 a terms of reference or plan for a detailed assessment of impacts.

This stage is intended to ensure that the impact assessment focuses on those issues that are most important for design, decision-making and stakeholder interest. The findings of the scoping process are summarised in *Chapter 6*.

Table 5.1 presents the resources/receptors considered in the scoping together with the changes that might indicate a Project-related impact.

Table 5.1 Resources and Receptors and Impacts Considered in Scoping

Resources/Receptors	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 transmission lines will require the use of hazardous materials such as insulating oils and gases (SF_6 and fuels) in addition; the use of herbicides will be used to maintain the right of way 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 transmission line servitudes; there is also land that is used for grazing or informal cultivation.
Avian Species	Considering that the majority of the project will be taking place in non-urban areas (only the last portion to the west will be within the urban setting of Luanda), 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 transmission lines including electrocution, 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/Receptors	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 is not required for the Project AoI; however, there is the potential for impacts on existing land access and distribution.
Economy and Livelihoods	Economic resettlement and compensation is required as part of the development of the transmission line route.
Demographic Patterns	There is the potential for population influx as construction workers move to the Project AoI to gain employment during construction.
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 concern and inconclusive evidence 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 addressed.
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 Luanda. 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.

5.2.2 Project Description

In order to fully understand the project features and activities, with particular reference to the aspects which can impact on the environment, a detailed, technical project description was prepared. Details of the Project facilities as well as planned activities are provided in *Chapter 2*. The Project description was prepared in close collaboration with the NHID team.

5.2.3 Baseline Conditions

To provide a context within which the impacts of the Project can be assessed, a description of physical, biological, and social conditions that would be expected to prevail in the absence of the Project are characterised. The description of the baseline conditions is provided in *Chapter 7.*

5.2.4 Stakeholder Engagement

An effective impact assessment requires engagement with relevant stakeholder throughout the key stages. This assists in understanding

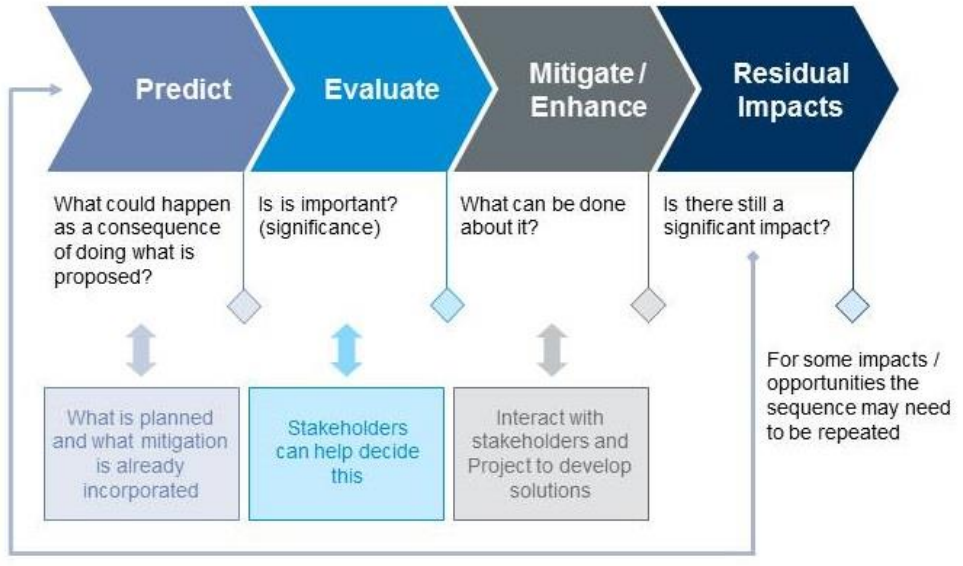
stakeholder views on the Project and in identifying issues that should be taken into account in the prediction and evaluation of impacts. Details of the stakeholder engagement activities undertaken for this Project to date are presented in *Chapter 8*.

5.3 IMPACT ASSESSMENT METHODOLOGY

Impact identification and assessment starts with scoping and continues through a structured impact assessment process. The principal steps are summarised in *Figure 5.2* and comprise:

- *Impact prediction* to determine what could potentially happen to resources and receptors as a consequence of the Project and its associated activities;
- *Impact evaluation* to evaluate the significance of the predicted impacts by considering the magnitude of the effect and the sensitivity, value, and importance of the affected resource or receptor;
- *Mitigation and enhancement* to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts; and
- *Residual impact evaluation* to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 5.2 Impact Assessment Steps



Source: ERM (2016)

5.3.1 *Prediction*

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts are considered in the assessment process typically results in a wide range of prediction methods being used, including quantitative, semi quantitative and qualitative techniques. The prediction also relies on professional experience and judgement.

5.3.2 *Evaluation*

Once the prediction of impacts is complete, each impact is described in terms of its various relevant characteristics (*e.g.* type, scale, duration, frequency and extent). The terminology used to describe impact characteristics is shown in *Table 5.2.*

Table 5.2 Impact Characteristics Terms

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect)	Direct Indirect Induced
Extent	The 'reach' of the impact (e.g. confined to a small area around the Project Footprint, projected for several km etc.)	Local Regional International
Duration	The time period over which a resource/receptor is affected	Temporary Short term Long term Permanent
Scale	The size of the impact (e.g. the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	No fixed designation, intended to be a numerical value or a qualitative description of intensity.
Frequency	A measure of the constancy or periodicity of the impact	No fixed designation, intended to be a numerical value or a qualitative description

The definitions for the type designations are shown in *Table 5.3.* Definitions for the other designations are resource/receptor specific and are discussed in the resource/receptor specific impact assessment chapters presented later in this report.

Table 5.3 Impact Type Definitions

Designation	Definition
Type	
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g. between occupation of a plot of land and the habitats which are affected).
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g. viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g. influx of camp followers resulting from the importation of a large Project workforce).

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains unplanned events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale, as described in *Table 5.4.*

Table 5.4 Definition of Likelihood

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur at normal operating conditions (i.e. it is essentially inevitable).

Once an impact's characteristics are defined, the next step in the impact assessment phase is to assign each impact a 'magnitude'. Magnitude is a function of some combination of the following impact characteristics:

- Extent
- Duration
- Scale
- Frequency

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. As discussed above, the magnitude designations themselves are universally consistent, but the descriptions for these designations vary on a resource/receptor-by-resource/receptor basis. The universal magnitude designations are:

- Positive
- Negligible
- Small
- Medium
- Large

In the case of a *positive* impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the IA to indicate that the Project is expected to result in a *positive* impact, without characterising the exact degree of positive change likely to occur.

In the case of impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilised, but the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterising the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity, vulnerability and importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered when characterising sensitivity/vulnerability/importance, such as legal protection, government policy, stakeholder views and economic value.

As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity/vulnerability/importance designations used herein for all resources/receptors are:

- Low
- Medium
- High

Significance

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterised, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in *Figure 5.3.*

Figure 5.3 *Impact Significance*

		Sensitivity / Vulnerability / Importance of Resource / Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Source: ERM (2016)

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity, vulnerability and importance designations that enter into the matrix. *Box 5-1* provides a context for what the various impact significance ratings signify.

Box 5-1 *Context of Impact Significance*

An impact of *negligible* significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of *minor* significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.

An impact of *moderate* significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

An impact of *major* significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of IA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

Embedded Controls

It is important to note that impact prediction and evaluation have taken into account any embedded controls (i.e. physical or procedural controls that are already planned as part of the Project design, regardless of the results of the impact assessment process). An example of an embedded control is a standard acoustic enclosure that is designed to be installed around a piece of major equipment. This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

5.4 MITIGATION AND ENHANCEMENT MEASURES

Once the significance of an impact has been characterised, the next step is to evaluate what mitigation and enhancement measures are warranted. For the purposes of this assessment, the following order or hierarchy was applied for development of mitigation:

- *Avoid at Source, Reduce at Source:* avoiding or reducing at source through the design of the Project (e.g. avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity).

- *Abate on Site:* add something to the design to abate the impact (e.g. pollution control equipment, traffic controls, perimeter screening and landscaping).

- *Abate at Receptor:* if an impact cannot be abated on-site then control measures can be implemented off-site (e.g. noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site).

- *Repair or Remedy:* some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.

- *Compensate in Kind, Compensate Through Other Means:* where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

The priority in mitigation for the Project is to first apply mitigation measures to the source of the impact (*i.e.* to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to

the resource/receptor via abatement or compensatory measures or offsets (i.e. to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

5.5 RESIDUAL IMPACT

Once mitigation and enhancement measures are specified the next step in the IA Process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures.

5.6 MANAGEMENT AND MONITORING AND AUDIT

The final stage in the impact assessment process is development of a management plan for implementing controls and mitigation and also monitoring the effectiveness. Monitoring is done to verify that: *a)* impacts or their associated Project components remain in conformance with applicable standards; and *b)* mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

An Environmental and Social Management Plan (ESMP), which is a compilation of all actions identified in the impact assessment, is provided in *Chapter 10*. This includes mitigation measures, compensatory measures and offsets and management and monitoring activities.

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/receptors. Potential impacts have been classified in one of three categories:

- No interaction: where the Project is unlikely to interact with the resource/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/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/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/receptors relevant to the Baseline environment 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/activity and a resource/ receptor. The completed Potential Interactions Matrix is presented in *Figure 6.1,* 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 6.1*).

  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/receptors with interactions that have been identified as likely, but which are not likely to lead to significant impacts are presented in *Table 6.1.* Interactions that are likely to lead to significant impacts are presented in *Table 6.2* and will be the focus of the impact assessment.

Figure 6.1 Potential Interactions Matrix

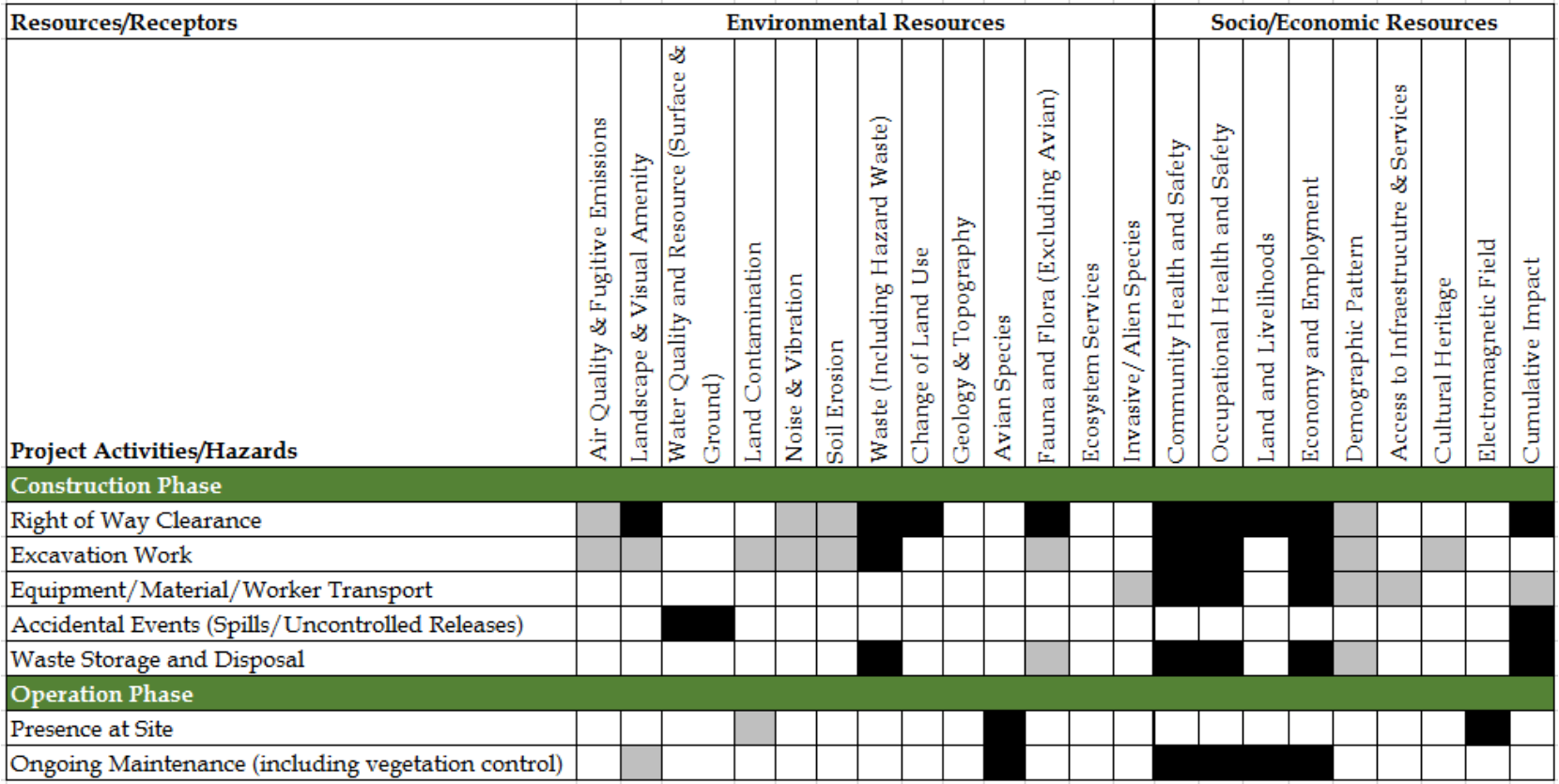


Table 6.1 Interactions Identified as Likely, but are not Likely to Lead to Significant Impacts Following Mitigation

Topic	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 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 not expected during construction or operation. The size of the Project workforce will be relatively small, and will be divided into two or three teams that will work on different sections. 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 Project Area of Influence (AoI).
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.
Invasive/Alien Species	Whilst the transportation of equipment and workers during the construction period has the potential to facilitate the transfer of alien or invasive plant species, this risk can be effectively minimised through the implementation of the construction ESMP.

Table 6.2 Interactions that are Likely to Result in Significant Impacts

Topic	Justification for Potential 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, construction yards and access roads, 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 (including hazardous waste and materials) and Land Contamination	The construction and operation of the transmission lines will require the use of hazardous materials such as insulating oils and gases (SF_6 and fuels). In addition, the 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.
Change of Land Use	There will be a change in land use for some sections of the transmission lines. Whilst some sections of the lines are proposed within existing transmission line corridors/servitudes; there is also land that is used for grazing or agricultural cultivation.
Avian Species	Although a portion of the project development will be taking place within the urban setting of Luanda, and hence the potential for avian collisions is relatively small, the majority of the project will be developed across naturalized areas. 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.
Flora and Fauna (excluding avian)	Based on secondary information analysis as well as imagery analysis, the land cover is clearly dominated by a vegetation mosaic which has been influenced by anthropogenic activities. Frequent fire episodes and intense agriculture are the main drivers for limited non-avian terrestrial biodiversity (refer to *Section 7.3* for detailed biological baseline description). In terms of aquatic biodiversity, the project is not likely to have significant impacts on water bodies or perennial tributaries. It should be noted that while the Kwanza river is an important feature for aquatic biodiversity, it is not included in the Project AoI. Mitigation measures should focus on the tributaries, mainly in the proximity of the Lucala river.

Community Health and Safety	Community health and safety impacts during construction and operation of 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 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.
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 (refer to *Section 9.4*).
Land and Livelihoods	Physical resettlement is expected to occur in some sections of the transmission line route, primarily in the eastern portion in the municipalities of Belas and Viana. 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.
Electromagnetic Field	Whilst there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmission lines, there is inconclusive evidence over the potential health effects associated with exposure to EMF. The EMF levels associated with the overhead transmission line of the Project are compliant with international EMF good practice and recommended exposure limits, which do not allow physical structures within the servitude buffer. As the RoW would be cleared, this precautionary approach means this option poses no further health risk (e.g. concern related to health effects from long term exposure, although causal link not scientifically proven).
Cumulative Impacts	There is a potential for cumulative impacts related to the project, in relation to other existing lines within the Project AoI, This is likely to be most applicable to potential impacts linked with avifauna. In the areas closer to Luanda, 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.

7 EXISTING BASELINE

7.1 INTRODUCTION

This Chapter provides a description of the current baseline conditions in the Project Area of Influence (AoI). The baseline characteristics of the biophysical and socioeconomic conditions are used as the basis of prediction of possible effects and also to monitor changes during construction and operation.

The baseline was determined through the review of existing secondary information, such as published reports and Environmental and Social Impact Assessment (ESIA) reports, as well as primary data collection in the way of field surveys.

7.1.1 Approach

The following describes the approach for determining the baseline conditions for physical, biological, and social resources and receptors.

Overview of Field Surveys

To inform the description of the baseline, field surveys were conducted over two period:

- 08 June and 31 July 2018; and
- 01 and 05 October 2018.

The first survey was undertaken by a combined physical, biological, and social study team which collected and categorised both primary and secondary data. The second survey focused mostly on the biological aspects.

To plan the survey, maps of the Project AoI were created and the key environmental and social resources were located and analysed. This analysis was used to develop the survey plan and target locations.

The following surveys were performed during field work activities:

- Flora and Habitats (primary data collection, including vegetation mapping ground-truthing);
- Fauna (primary data collection);
- Noise (primary data collection);
- Water resources, soils, land use and landscape (screening); and
- Ground-truthing on 1000 m either side of line for the 400 kV and 220 kV line (i.e. 2000 m in width).

Social surveys were also performed and included the following tasks:

- Stakeholder identification;
- Social demographics and other characteristics (secondary and primary data collection); and
- Identification and geolocation (potential) of problematic locations (shared with NHID).

During the surveys, a number of engagements were held with stakeholders at the community level (Project disclosure meetings, village profiles, focus group discussions) and government level.

Bio-physical Baseline Studies

Under the scope of the biophysical components, field visits to several pre-identified locations were undertaken in order to survey the baseline conditions and identify the main potential impacts of the mentioned project from the start of the transmission line in Laúca Hydropower Dam (Malanje province) until the Bita proposed substation (Luanda province).

In order to better systematize the data collection and subsequent analysis, in view of the description of the ecosystems to be crossed and vulnerability and accessibility, all possible routes within the approved 500 m corridor were assessed.

Considering the linear extension of the area to be affected, and the variations in the vegetal cover, the route was subdivided into three sections:

i) Laúca-Quilemba-Cambambe;
ii) Cambambe-Maria Teresa-Catete; and
iii) Catete-Bita.

The sections were traversed through existing access roads.

Before the survey, a literature review was undertaken on the vegetation cover of the area under assessment, and together with analyses of satellite images, this information was used as a basis for the fieldwork. After the desktop analysis, field visits were held in order to collect data for ground-truthing. The different vegetation/habitat types as well as the flora component were analysed.

The occurrences of the main plant and animal species (mammals, birds, reptiles and amphibians) were recorded with the assistance of field guides, scientific references, satellite material and other bibliographic resources available. Survey locations are presented in *Figure 7.1* and described in *Table 7.1.*

Figure 7.1 Biodiversity Survey Locations



Table 7.1 Biodiversity Survey Sites Description

Location	Coordinates (Lat/Long)		Notes
Laúca	9°43'12.00"S	15° 6'48.00"E	Savannah and muxito.
Laúca Line	9°42'9.00"S	15° 5'20.00"E	Open Savannah.
Caculo Cabaça entrance	9°39'42.00"S	14°58'44.00"E	Savannah and miombo bush, rocky hill. Hood vulture observed.
Quilemba	9°40'12.00"S	14°49'18.00"E	Savannah and mix thicket on rocky hill.
Bongo	9°40'45.00"S	14°39'9.00"E	Savannah with dense areas.
Alto Dondo	9°40'1.00"S	14°31'30.00"E	Savannah.
Cazela	9°38'36.75"S	14°26'23.61"E	
Cassoalala 1	9°31'28.00"S	14°23'17.00"E	River thicket, Lucala river.
Cassoalala 2	9°30'36.30"S	14°23'5.41"E	Near Lucala river.
Cassoalala 3	9°29'27.05"S	14°22'16.50"E	Near lagoon.
Zenza	9°17'54.00"S	14°13'11.00"E	Dense dry thicket and muxito.
Barraca	9°11'27.00"S	13°59'12.00"E	Degraded agricultural land.
Mazozo	9° 4'27.00"S	13°36'26.00"E	Degraded savannah.
Kassako	9° 6'41.38"S	13°20'20.77"E	Rural area with agricultural fields.
Bita	9° 5'18.85"S	13°15'54.30"E	Urbanised area.

Note: In order to be technically consistency, locations were the same for both surveys.

Social Baseline Studies

The geographical focus of this baseline is a socioeconomic Study Area which was defined as:

- *All the settlements totally or partially within a 500 m corridor (250 m either side of the centreline) running the entire length of the transmission line from the municipality of Cambambe (Cuanza Norte Province) to Belas (Luanda Province).*

As most surveyed settlements are located close to the lands they cultivate, it is expected that most of the impacts, including land-based impacts, will occur within this corridor. Some settlements may be located further away from the 500 m corridor and still have cultivated land within the corridor. Affected settlements located outside the 500 m corridor, if any, will be identified during the household surveys as part of the implementation of stand-alone Resettlement and Compensation Action Plan (RCAP) annexes (ie. RAPs/LRPs) for specific sections of the line as part of the resettlement and compensation process.

Information at a national and provincial level has been gathered from secondary sources using publicly available information. Data presented for the socioeconomic Study Area has been gathered from publically available secondary sources along with primary data gathered during a field visit to the Study Area in July 2018.

The fieldwork undertaken in July 2018, over a period of 18 days, included a high-level settlement survey, key informant interviews, focus group meetings and ground truthing of points of interest encompassing 16 of the 18 settlements within the 500 m corridor (see *Table 7.11*). Two settlements (Koba and Quitendele) were not surveyed during the July 2018 fieldwork because representatives and/or data were not available at time of visit. These settlements were surveyed later on October 22nd (Quitendele) and 31st (Koba).

The field work focused on high level socioeconomic information including demographic estimates (e.g. population size, age and gender distribution estimates, etc.), main livelihood activities and land uses, land tenure, health and education and access to basic infrastructure and services. The list of engagement activities undertaken and number of people interviewed/consulted in each of these settlements and municipalities is presented in the engagement log Annex to the ESIA.

As such, the socioeconomic information presented in the baseline focuses to the extent possible on the Study Area (i.e. the 500 m corridor) based on a combination of data collected during the field visits and additional secondary sources. Information is provided at a higher level (provincial and national) as applicable when local level information is not available or when the general information applies at the local level. It should be noted that specific information relative to land affected households (land ownership status, asset inventories, etc.) was not included in the scope of the ESIA fieldwork. This information will be collected as part of the RAPs/LRPs implementation (RCAP annexes) and resettlement and compensation process.

Limitations

The primary and secondary data was collected in order to inform the assessment of impacts and development of mitigation measures. There remain some areas that faced limitations during the process of data collection due to data availability at time of the survey and/or inexistence of detailed data from official sources. These limitations area as follows:

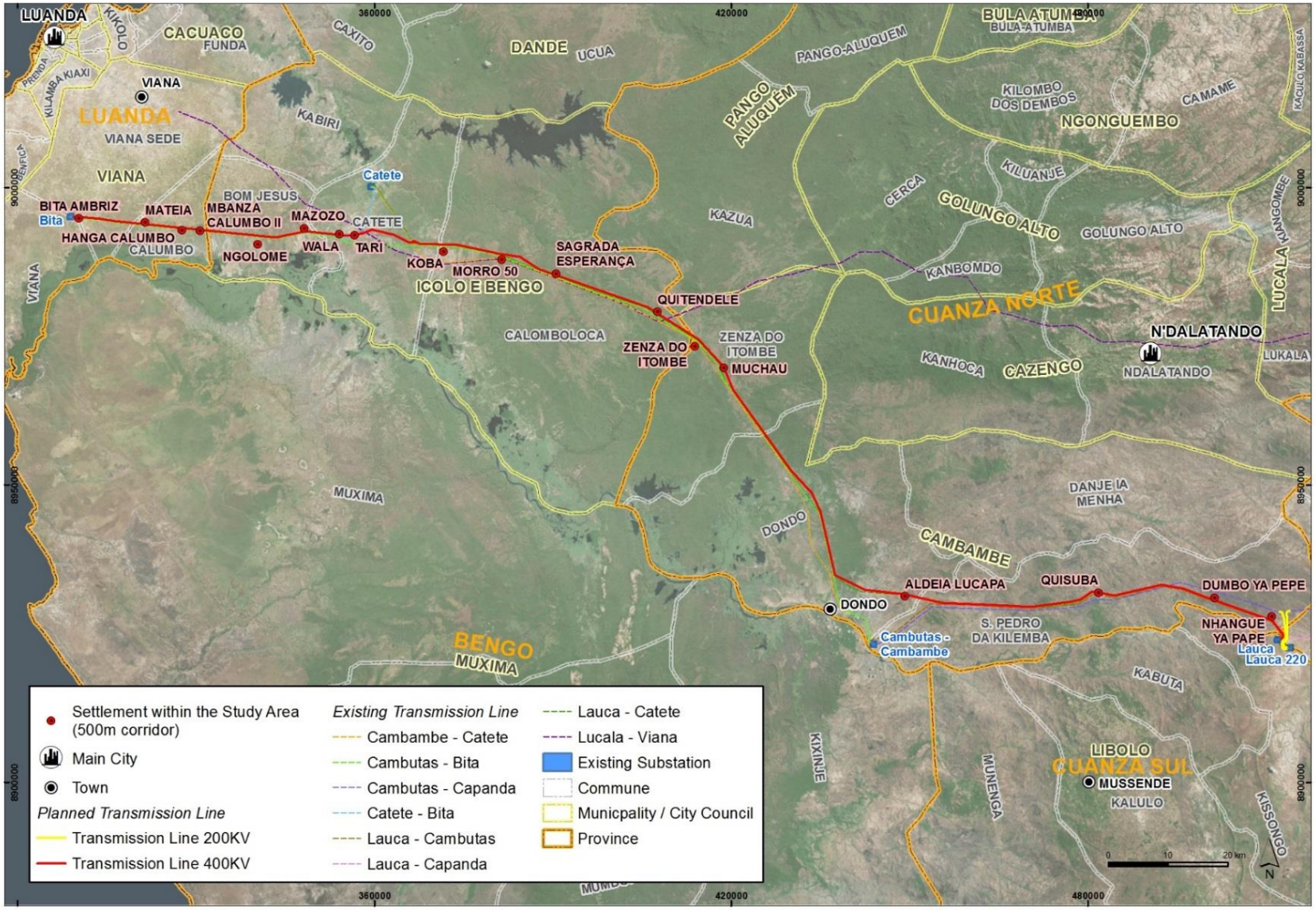
- Some settlements located further away from the 500 corridor and outside the Study Area may potentially be affected if they use land inside the 500 m corridor. This information could not be confirmed during the field survey due to time constraints. However potentially affected settlements located outside the Study Area, if any, will be identified during the Resettlement and Compensation Action Plan (RCAP) Annexes household field surveys. This being said, since the survey area is quite homogenous in terms of population and socioeconomic characteristics, the findings presented for the Study Area are considered applicable to settlements of similar sizes outside the Study Area.

- Primary data was collected mainly through key informant interviews with village chiefs (*sobas)* and community coordinators, and complemented

with focus groups discussions in the communities.The purpose of the ESIA field survey was to collect high-level socioeconomic information to inform impact assessment. As such, specific socioeconomic information relative to land affected households (land ownership status, asset inventories, livelihoods, education, vulnerabilities, etc.) was not included in the scope of this fieldwork and will be covered in the RCAP surveys.

- Project design information, although available at the time of writing, is subject to minimal changes resulting from the final topographic surveys (LIDAR, etc.). On the other hand, the current Project design with respect to the proposed transmission line route has been adapted to integrate two primary re-routings as well as some additional paths to minimize displacement of physical structures as much as possible.

Figure 7.2 Overview of the Social Study Area



7.2 PHYSICAL ENVIRONMENT

7.2.1 Climate

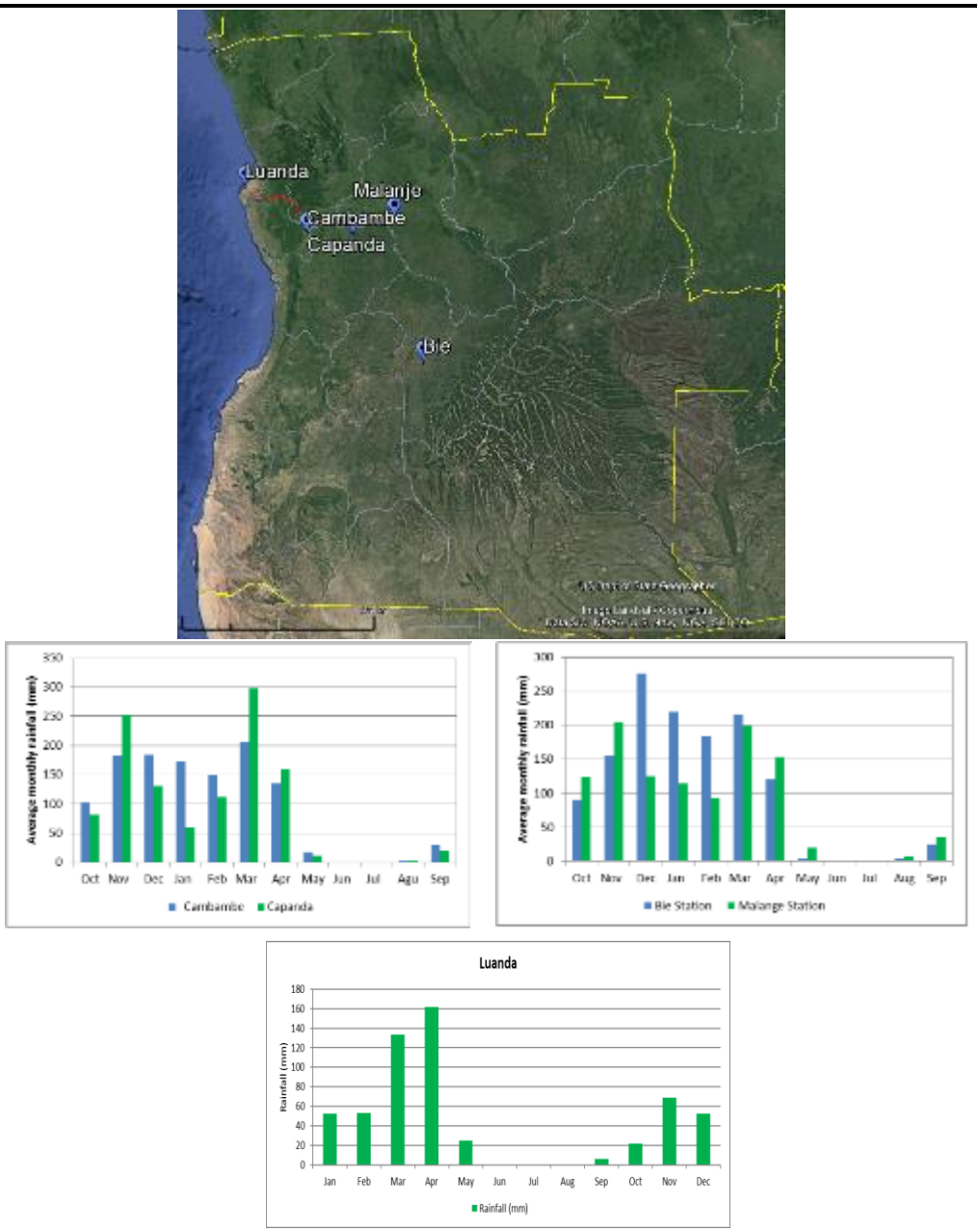
The climate in the area is generally tropical and tempered by sea and altitude, however it varies considerably with latitude.

Average monthly rainfall measured in Luanda, Bié, Capanda and Cambambe is plotted in *Figure 7.3* and *7.4*. Annual rainfall exceeds 1800 mm inland and is over 1500 mm in the highest parts of the highlands, but decreases rapidly towards the coast due to the effects of the cold Benguela Current.

The dry season lasts from May to September (when monthly totals are less than 60 mm) and the wet season from October to April (when average precipitation is around 160 mm). The driest quarter is June to August, when mean precipitation is less than 10 mm, often with long periods of no rain. The wettest quarter is January to March, when about 40% of the mean annual rain falls. The rainfall distribution is characterized by two rainy peaks: the first between November (185 mm) and December and the second in March.

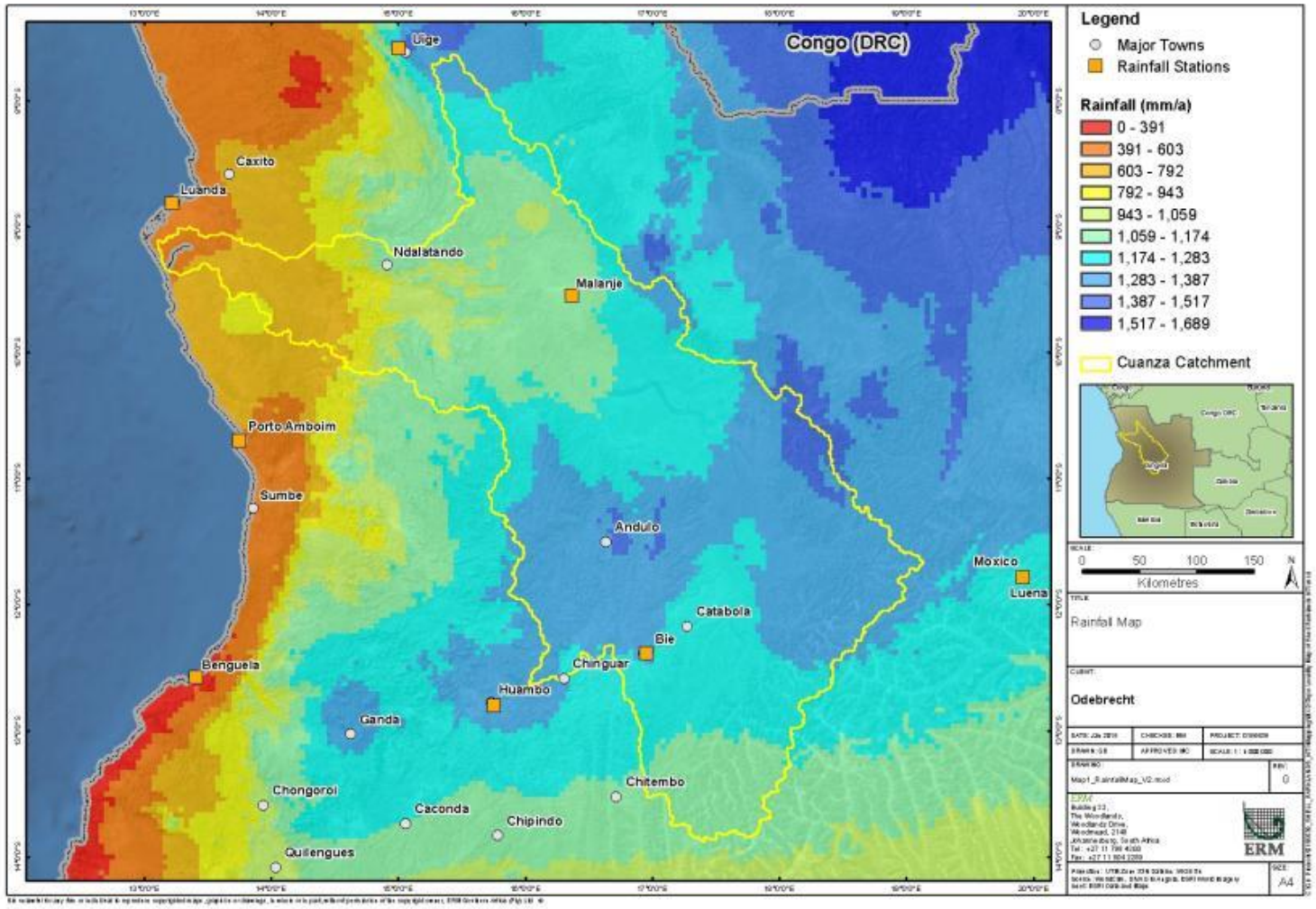
Temperatures are moderate to high, with a hot summer (January to April) and a very mild winter (June to August). Maximum temperatures range between 30.1°C and 34°C at Capanda with the highest temperatures occurring in September. Mean temperatures are between 20.1°C and 23°C, with a long-term mean of 21.9°C. The data show little seasonal difference in mean temperatures: June, July, and August are the coldest and driest months, and December through to March are the warmest and wettest. Minimum temperatures at Capanda are between 16.3°C and 8.7°C. In Luanda, the difference between the average mean and highest temperatures is lower than in other areas; approximately 8°C from December to June, and 7°C from July to November.

Figure 7.3 ***Average Monthly Rainfall at Cambambe, Cambutas, Malanje, Luanda and Bié***



Source: http://www.inamet.gov.ao and Google Earth ® (accessed 02 September 2018).

Figure 7.4 Distribution of Rainfall in the Cuanza Basin



Source: ERM (2017).

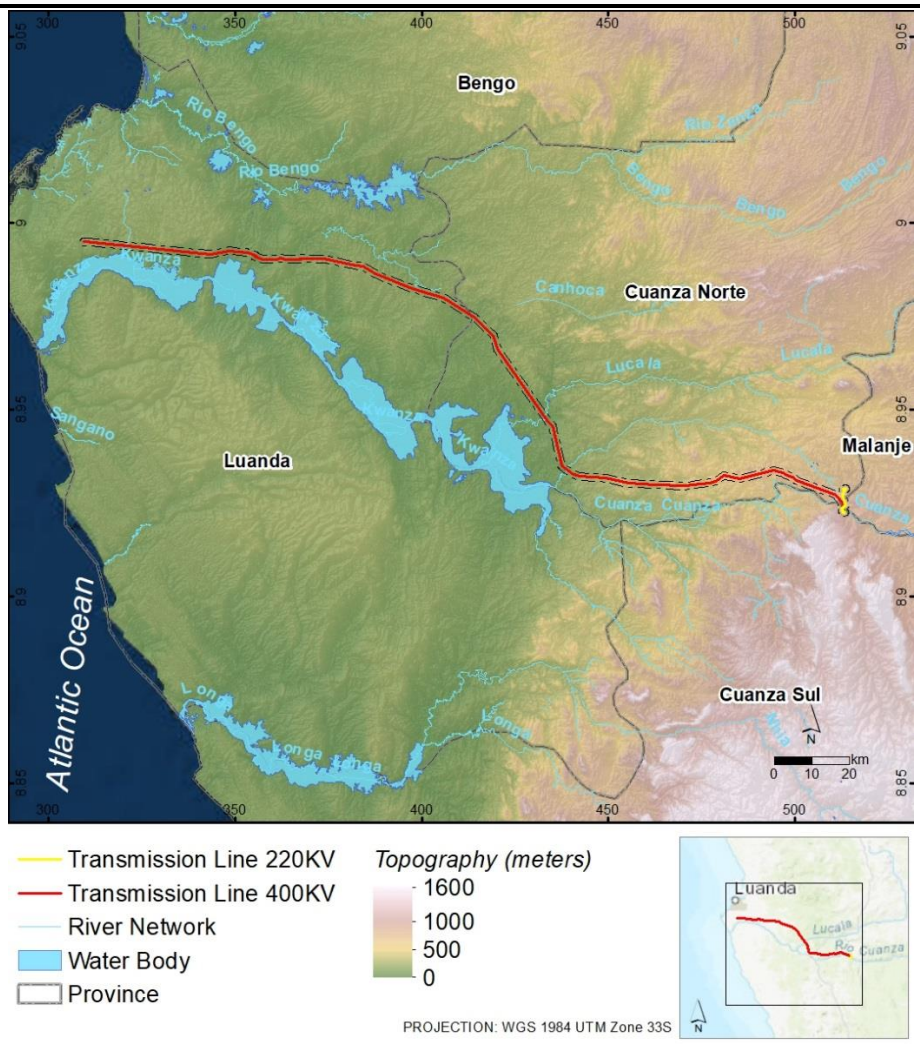
7.2.2 *Topography*

The topography of Angola is diverse and ranges from flat coastal plains in the west to an interior highland plateau in the east. The mostly flat coastal plain stretches inland for ~48 to 160 km into a belt of rolling hills and a series of scattered mountains (*Figure 7.5).*

The interior highland plateau is characterised by broad tablelands above 1,000 m in altitude, with mountain ranges in the centre and south of the country over 2,400 m above mean sea level (amsl). The highest point in Angola is Mt. Moco, which sits at 2,620 m above sea level in the Huambo region, while other major peaks include Mt. Mejo (2,583 m) in the Benguela region and Mt. Vavéle (2,479 m) in Cuanza Sul (Nations Encyclopaedia, 2018).

The proposed transmission line will traverse the inland plateau approximately 930 m amsl near Aldeia Muta, descending as it extends westwards into Cuanza Norte. The topographic profile flattens out westwards towards Luanda, ending at an altitude of 60 m amsl.

Figure 7.5 ***Topography of Angola***



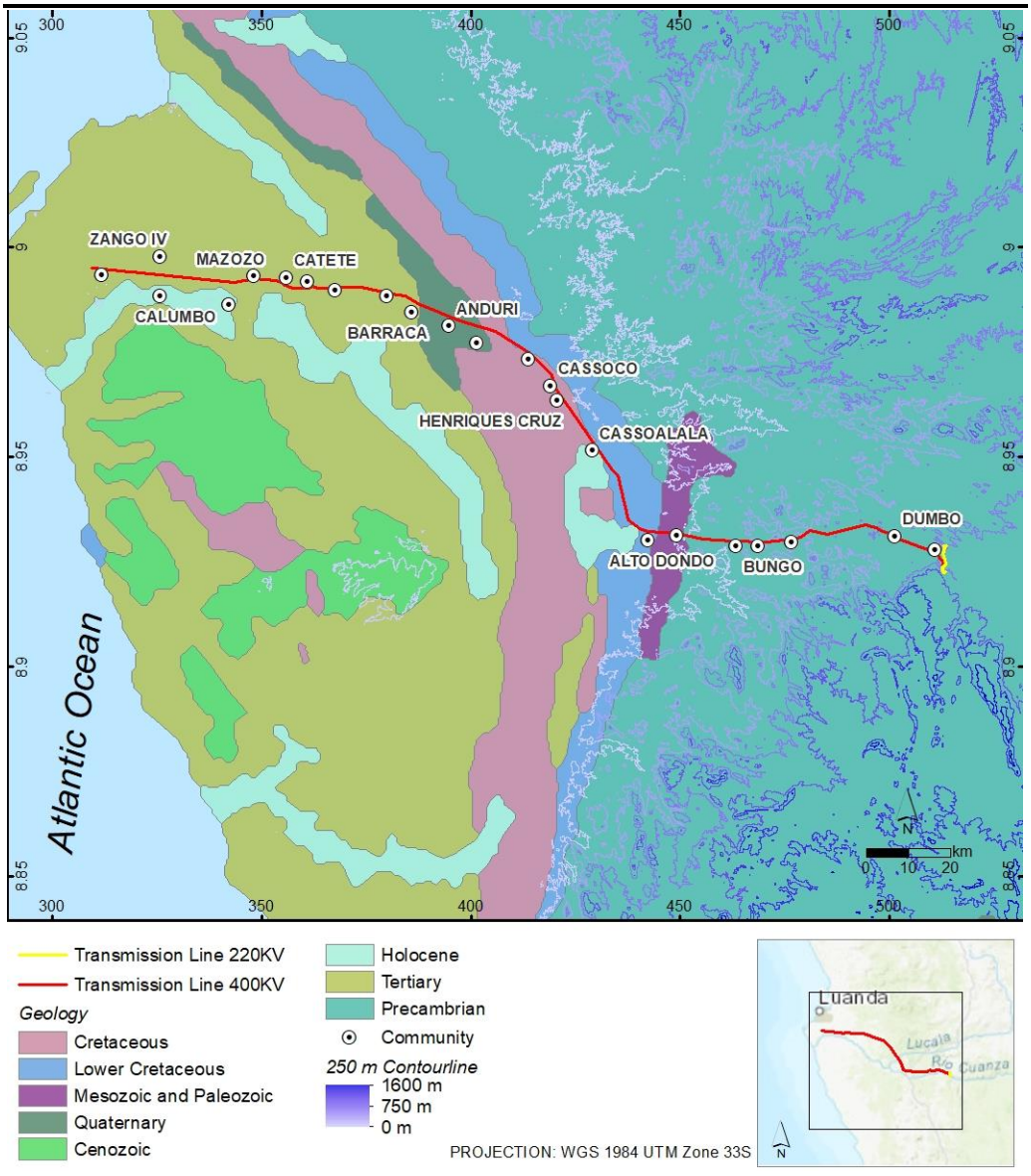
Source: DEM https://asterweb.jpl.nasa.gov/gdem.asp

7.2.3 *Geology*

Lithology

The geology of Angola can be subdivided into five main regional geological units which range in age from the Archaean (oldest) to Quaternary (youngest) and which are host to a distinct combination of mineral deposits (*Figure 7.3;* Pinheiro, 2010). The oldest geological units are Lower Proterozoic to Archaean rocks from the Angolan, Maiombe, Cassai and Bangwelo shields and the Kwanza horst. These include granite-gneissic terrains and meta-volcano sedimentary (greenstone) belts in south-central Angola (Cassinga and Menongue), as well as the Cunene basic (ultrabasic) complex which covers 20 000 km² of the south-western part of the Angolan shield (Pinheiro, 2010).

Figure 7.6 Geology of Angola



Source: https://catalog.data.gov/dataset/surficial-geology-of-africa-geo7-2ag

Upper Proterozoic fold belts of Pan African age (600 million years (Ma)) occur along the margins of Angola's Precambrian shield, the most important being the West-Congo, Damara and the Maiombe-Macongo ("Precambrian Metasedimentary" in *Figure 7.7)*. Dominant rock type amongst these are quartzitic metasandstones, schist-limestones metasandstones, metaconglomerates and quartzites (DNA, 2005).

Mesozoic to Palaeozoic sediments comparable to the Karoo Supergroup elsewhere in Southern Africa occur mainly in the Cassanje Graben, a north-central to north-western geographical depression located in the north of Angola (Pinheiro, 2010).

A diverse series of sub-volcanic and volcanic units including kimberlites, carbonatites, basalt, dolerites, syenites, trachytes and phonolites occur along a south-west to north-west trend line across the Lucapa corridor in the northeast of Angola (Pinheiro, 2010). Sediments characteristic of the Karoo Supergroup (Carboniferous – Jurassic: 358 – 145 Ma) including argillaceous limestones, sandstones and shales are present along the edges of the Congo Basin in the north and east of Angola (*Figure 7.3*). These can be up to 500 m in thickness and are intruded by Jurassic dolerite dykes.

Cretaceous to Tertiary (145 – 0.25 Ma) aged sedimentary units of the Kalahari Group include argillaceous sandstones with marine and evaporitic deposits. These cover much of the south-eastern part of Angola (*Figure 7.3*; DNA, 2005). The youngest rocks present in Angola are the Quaternary to Tertiary (0 – 66 Ma) sedimentary units which make up nearly half of Angola, including the entire eastern region. These units include sand, quarzitic sandstone and gravel and can be up to 1,200 m thick (Pinheiro, 2010; DNA, 2005).

The proposed Laúca - Bita transmission line will traverse a range of geological units including: (1) metasedimentary rock types of the Precambrian in the eastern region south of Cuanza Norte and (2) Cretaceous – Tertiary to Quaternary unconsolidated sediments between the central region and Luanda.

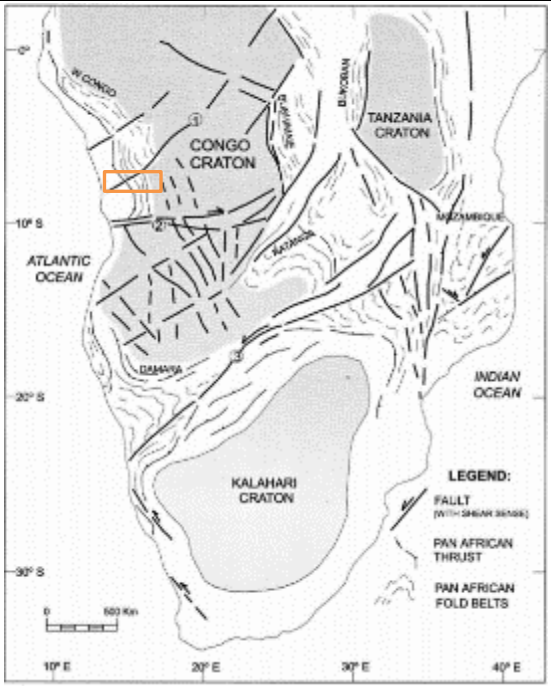
These lithological units are overlain by various soil types that are derived from the parent material, as discussed in *Section 7.2.4*. These soil types influence the agricultural potential of these areas and therefore the land use. The metasedimentary, sedimentary and unconsolidated sediments located along the proposed transmission line host various aquifers, which are characterized by various properties and subject to different stresses (*Section 7.2.5).*

Structural Geology

Angola is largely underlain by the Congo Craton and is therefore structurally stable (*Figure 7.7*). The Congo and other cratons including the Kaapvaal, Zimbabwe, Tanzania, and West African Cratons are ancient Precambrian cratons making up the modern continent of Africa. These cratons were formed

between about 3.6 and 2.0 billion years ago and have been tectonically stable since formation.

Figure 7.7 ***Main Cratonic Blocks in Southern Africa.***



Source: Pereira et al., 2003.
(Orange box – approximate project location)

The Congo Craton and the South American extension thereof, the São Francisco Craton, are stable Archaean blocks that formed a coherent landmass until the opening of the South Atlantic Ocean during the break-up of Gondwana (c. 2000 – 130 Ma) (Ernst et al., 2013). They stabilised during the Trans-Amazonian and Eburnian orogeny (2,200 to 2,000 Ma) and have been affected by a long series of orogenic events since (Pedreira and De Waele, 2008).

The Congo Craton is covered by the Palaeozoic (540 Ma) Congo Basin, and bound on the west by a Pan African thrust and fold belt known as the West Congo Belt. Structural deformation along this belt consisted largely of folding and thrusting during which the northwest-trending West Congo belt was thrust northeast against the western edge of the Congo Craton (Alvarez and Maurin, 1991). This resulted in the formation of tight asymmetric east–northeast-verging folds that contain a prominent axial-planar schistosity.

During this orogeny, Neoproterozoic high-grade metasediments of the Zadinian and Mayumbian Groups were thrust eastwards over Neoproterozoic greenschist facies diamictites that represent the basal portion of the West Congolian Group. Undeformed carbonate and clastic strata of the upper West Congolian Group i.e. east of the fold and thrust belt (Fig. 11; Maurin, 1993; Tack et al., 2001).

The majority of the proposed transmission line will be located above Neoproterozoic crustal basement that forms the western margin of the Congo Craton. The eastern-most section of the transmission line closest to the Cuanza dam is located on the Congo Craton.

Based on this geological context, Angola is one of the least seismically active in the Region, even for stable continental regions (SCRs) in the world (Neto *et al*., 2018)[1]. Concise seismic analysis have been performed for the different dams in the region (e.g. Laúca and Cambambe) and data confirms this low tectonic activity (SRK, 2013). The medium Kwanza river area is part of a zone marked by the presence of profound continental faults, with the nearest tectonic fault being the Horst Kwanza, which separates two other important geological structures, namely the "Maiombe Shield", located on the north-west of the region, and the "Angola Shield" on the south-west.

7.2.4 Soils

Soil Types

The geology, topography and climate of an area all play a role in determining the soil types present. Soils are derived from the weathering of rock, therefore the physical and chemical properties of the rock directly influence the types of soils present.

The geology of Angola is characterised by Precambrian basement and metasedimentary rock types in the western regions *(Section 7.2.3*). Sedimentary rock types of the cretaceous to tertiary and Karoo super group in the north-western area (Persits et al., 2002). Young sediments of the Kalahari group are mainly found in the central and southern regions of Angola especially in the lowlands of the south-eastern regions (Holger et al., 2009). Quaternary unconsolidated sediments are predominantly found in the central and north-eastern region (Persits et al., 2002).

Climate also influences the chemical and physical properties of soils. Climates characterised by periods of prolonged or heavy rainfall tend to leach soils, depriving them of nutrients. Tropical areas are characterised by hot and wet conditions that contribute to the breakdown of rocks, leading to the presence of deeper soils than that of arid areas. The Angolan climate is semi-arid along coast and in the south, while the north and east has cool dry winters and hot, rainy summers.

A map of the soil types in Angola is presented in *Figure 7.8*. The dominant soil types present in Angola are acrisols, arenosols, ferralsols, gleysols and luvisols (*Figure 7.2*), distributed as follows:

[1] The maximum known earthquake had a magnitude of 6.0 Ms, while events with magnitudes of 4.5 have return period of about 10 years. Events with magnitude 5 and above occur with return period of about 20 years (Neto et al., 2018).

- Arenosols, sandy-textured soils that lack a significant soil profile development, dominate the northern, western, eastern, southern, and central regions of Angola. These have been derived from clastic and carbonate-rich sediments that have accumulated in highlands area of Angola and are generally very prone to erosion;

- Ferralsols, generally red and/or yellow soils where colours are derived from the accumulation of metal oxides, including iron and aluminium, and which are generally low in organic matter and nutrients. These soils are presented in the northern, western, and central regions of Angola;

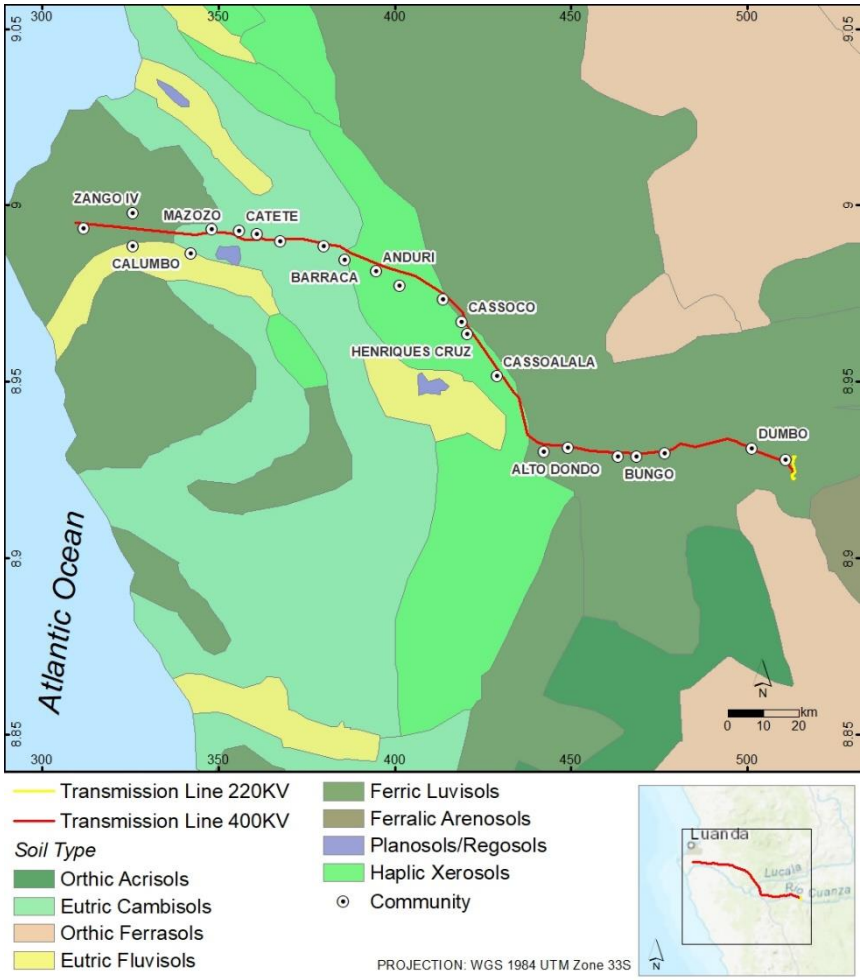
- Gleysols, wetland soils that are generally found in low-lying, swampy areas that have poor drainage are therefore generally saturated for long periods of time and develop red, brown or yellow patches at the surface and grey to blue patches deeper below the surface. These are present in the eastern region including the Cuando River System;

- Luvisols, well-drained and nutrient-rich soils which are largely devoid of clay or iron minerals are present in the western region of Angola, particularly along the slopes of the plateau; and

- Other soil types such as alisols, acrisols, calcisols, cambisols, fluvisols, nitrosols, regosols, vertisols and podzols are locally present in small areas.

The proposed transmission line traverses the western region of Angola which is characterised by three main soil types: ferric luvisols, eutric cambisols and haplic xerosols (*Table 7.3)*.

Figure 7.8 Soil Types in Angola (FAO System)



Source: 02 Soil: ISRIC, World Soil Information, http://africasoils.net/services/data/soil-databases/

Table 7.2 Summary of Soils Types in Angola

Region of Angola	Soil Type
Central	Arenosols, Ferralsols, Alisols
Western	Arenosols, Ferralsols, Luvisols, Leptosols, Acrisols, Calcisols, Cambisols Fluvisols
Eastern	Arensols, Gleysols
Northern	Arenosols, Ferralsols, Fluvisols , Nitisols Regosols
Southern	Arenosols, Vertisols, Podzols

Table 7.3 Distribution of Soil Types along the Transmission Line Route

Soil Type	Area (ha)	Area (%)
Ferric Luvisols	25,647	40
Eutric Cambisols	13,333	20
Haplic Xerosols	25,552	40
Total	**64,532**	**100.0**

Potential for Soil Erosion

The potential for soil erosion is assessed based on a number of factors including the type and physical properties of soil, the topographic slope, and the vegetation cover. The potential for erosion for the area of the proposed transmission line as well as the dominant contributing factors are presented in *Table 7.4* (ESDAC, 2018).

Table 7.4 Potential for Soil Erosion along the Transmission Line Route

Transmission Line Section (km)	Corresponding towns / villages	Erosion Potential	Contributing Factor(s)
0 – 17 km	Hydropower dam to Dumbo	Medium – low	Extensive vegetation cover
17 – 55 km	Dumbo to Bungo	Medium	Rainfall and topographic slope
55 – 73 km	Bungo to Dundo	Medium – low	Rainfall and physical soil properties
73 – 227 km	Dundo to Luanda	Low	Extensive vegetation cover

Anthropogenic factors such as land use practices may contribute to soil erosion and outweigh the effects of natural factors. The most common factors include overgrazing, deforestation, and cultivation (Jones et al., 2003). Additional factors observed along the route of the proposed transmission line that may contribute to erosion include significant vegetation clearing for construction activities, including the construction of transmission lines (*Figure 7.9*).

Figure 7.9 ***Example of Vegetation Clearing which Contributes to Soil Erosion Potential (Km 38)***



Source: ERM (2018)

Agricultural Potential

The agricultural potential of the land along the route of the proposed transmission line was assessed using the following information:

- The typical soil types found in each section;
- The agricultural potential of these soil types as determined by the FAO (2018) and ISRIC (2018); and
- The current land use, as estimated from the interpretation of land-cover modelling and preliminary in-field observations.

Various different soil type are present along the footprint of the proposed transmission line (*Table 7.3)*. Typical properties of these soil types have been detailed by the FAO (2008) and ISRIC (2018), as well as factors relevant to their agricultural potential, including their mineral chemistry, nutrient content, drainage (permeability), and structure (horizons) (*Figure 7.10*).

Table 7.5 ***Agricultural Potential of Dominant Soil Types along the Transmission Line Route***

Soil Type	Agricultural Potential			Kp
	High	Medium	Low	
Luvisols	X			from Kp 0 to Kp 79 from Kp 118 to Kp 127 from Kp 211 to Kp 238
Cambisols	X			from Kp 159 to Kp 210
Xerosols			X	from Kp 80 to Kp 158

The current land use along the route of the proposed transmission line also provides an indication of the agricultural potential. The current land use was determined using a combination of field observations and the interpretation of

publicly available high resolution satellite imagery (refer to *Section 7.5.1* Lanscape and Map 04 – Land Cover for a detailed land use analysis). Agricultural activities observed include the cultivation of crops including cassava (*Figure 7.10*) and palm trees (*Figure 7.11*), and the low-intensity farming of goats and pigs. Based on these data and observations, the dominant land use along the route of the proposed transmission line is interpreted to be small-scale subsistence farming, which is of medium to high agricultural potential.

Figure 7.10 Example of Cassava Cultivation along the Transmission Line Route (km 34)



Source: ERM (2018)

Figure 7.11 Example of Palm trees Planted along the Transmission Line Route (km 34)



Source: ERM (2018)

7.2.5 Hydrogeology

Overview

Angola hosts three main types of aquifers: unconsolidated aquifers, sedimentary intergranular or fractured aquifers, and basement aquifers. The

unconsolidated aquifers are hosted in quaternary alluvium and vary from low to high productivity depending on the host lithology (e.g. whether dominated by permeable sands and gravels or low permeability fine-grained deposits), the thickness, and the lateral extent. Alluvial sediments in river valleys form the most productive aquifers in Angola, with recorded borehole yields of 15 to 50 l/s (DNA, 2005). The largest alluvial aquifers are found in the provinces of Huíla, Benguela, Cuanza-Sul, Bengo and Zaire in the centre and northeast of the country (*Figure 7.12*; DNA, 2005).

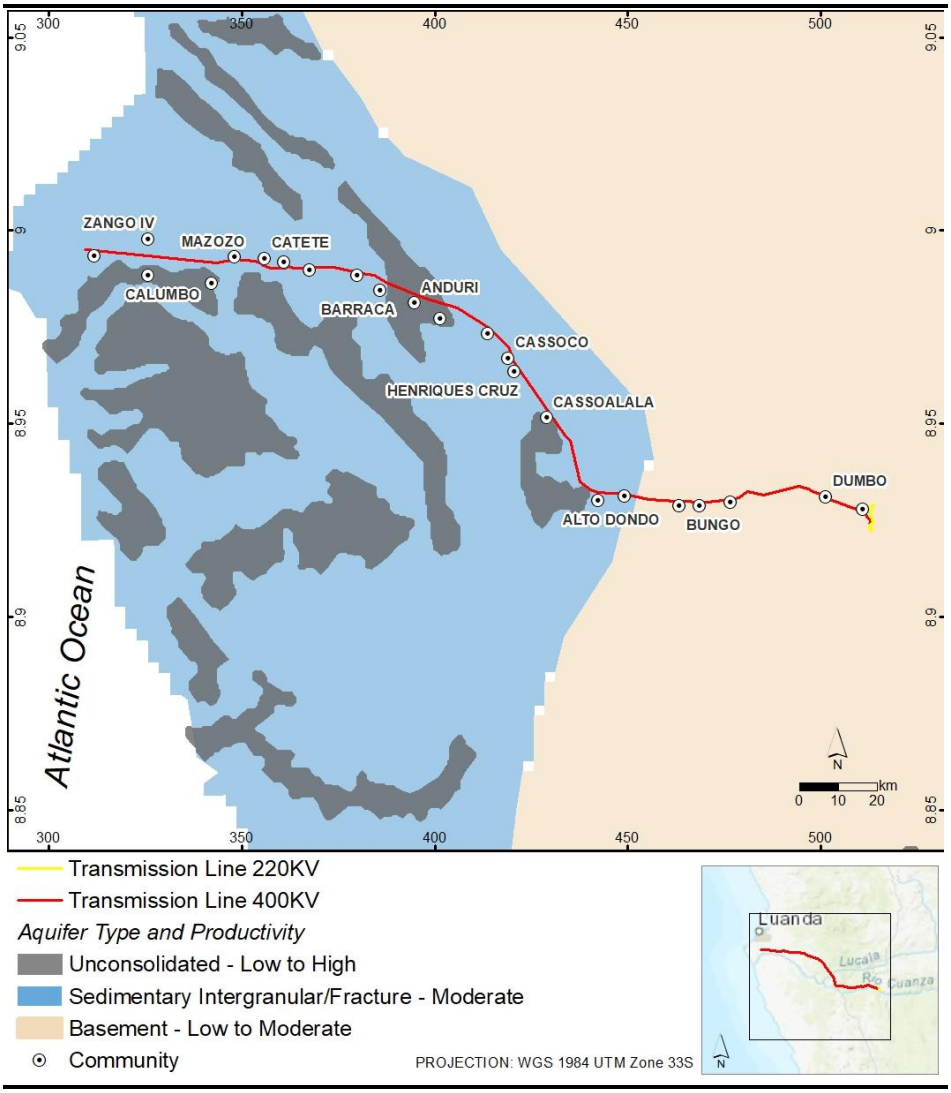
Sedimentary aquifers are of Tertiary to Quaternary age and hosted in the Kalahari Group sediments in the southeast of the country (*Figure 7.12*). These are moderately to highly productive. The water table in the Kalahari Group is shallower in the north, becoming deeper towards the south where it may be completely dry (Groundwater Consultants Bee Pee (Pty) Ltd, SRK Consulting (Pty) Ltd, 2002). Sedimentary aquifers of the Karoo Supergroup (inland) and a Jurassic to Cretaceous group of unnamed aquifers along the coast are characterized by argillaceous sandstones and are moderately productive.

Basement aquifers of Precambrian age can be subdivided into two types: metasedimentary aquifers and crystalline basement aquifers. The metasedimentary aquifers are characterised by quartzites, sandstones, conglomerates, limestones, dolomites, greywackes and volcanic rocks of the Pan-African orogeny found mostly in the west of the country (*Figure 7.12*; DNA, 2005). These generally host productive aquifers yielding between 3 and 6 l/s (DNA, 2005).

Basement rocks from the Crystalline Basement aquifers host small aquifers which are generally low to moderately productive. Different lithologies within the basement complex have different hydrogeological properties, however groundwater is generally limited to where the rocks are fractured and/or weathered. Generally the most common yields of boreholes in granites and gneisses is less than 1 l/s, especially where boreholes are less than 50 m deep (DNA, 2005). The basic rocks in Angola such as gabbros and norites are the most productive aquifers with yields of between 3 and 5 l /s (DNA, 2005).

The proposed transmission line will traverse basement units hosting low to moderately productive aquifers along the interior portion, and sedimentary hosted intergranular aquifers of moderate productivity closer to the coast (*Figure 7.12*). No evidence of significant groundwater abstraction was observed along the route of the proposed transmission line. Cultivated crops such as cassava rely on rain for irrigation.

Figure 7.12 Hydrogeological Map of Angola



Source: 04 Hydrology: River Network and Water body: Geofabrik, https://www.geofabrik.de/data/download.htm, September 2018

7.2.6 *Surface Water*

Overview

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 (Geological Society, 2005).

The proposed transmission line is located within the Cuanza River Basin, which arises in the centre of Angola and flows northwest before reaching the Atlantic Ocean near Luanda. The headwaters are located approximately 80 km southeast of Chitembo on the Bié Plateau at an elevation of 1,500 m. The

Cuanza River is 960 km long and the basin covers roughly 51,000 m^2 stretching 300 km north-south and 170 km east-west and draining much of central Angola. The Cuanza Rivers gives its name to two provinces of Angola: Cuanza Norte, which lies on the river's north bank, and Cuanza Sul, on the south bank.

Major tributaries of the Cuanza River include the Cutato and the Lucala Rivers. The Cutato River flows to the north-east of Benguela past the town of Cutato. The source of the Lucala River is in Uíge Province. From here it traverses Malanje Province, drops over the Calandula Falls, and finally joins the Cuanza River near Massangano in Cuanza-Norte Province.

During much of its upper and middle course, the Cuanza is broken at intervals by rapids, and flows in a well-defined valley. The lowest fall is that at Cambambe (20 m), below which the river is navigable by small steamers to the sea over a distance of approximately 255 km. Navigation along this lower section of the river is, however, impeded by shifting sandbars near the mouth and by low water levels during the dry season. The Luanda-Malanje railway provides an alternative form of transport along much of the area.

Economic Importance

The Cuanza River hosts several hydropower dams that provide electricity for Angola, including the Capanda Dam in Malanje Province (constructed from 1987 to 2007), the Cambambe Dam on the border between Cuanza-Norte and Cuanza-Sul Provinces (constructed from 1959 to 1963), and the Laúca Dam on the borders of Cuanza-Norte, Cuanza-Sul and Malanje Provinces (construction started in 2012) (Wikipedia, 2018[1]). Combined, these dams produce ~2070 MW of electricity (Hydro Review, 2014). In addition to hydroelectricity, these dams provide water for the irrigation of sugarcane and other crops in the lower Cuanza valley.

Current Development

The proposed Laúca – Luanda transmission line will cross several rivers along the proposed route (*Table 7.6).* These rivers include major rivers, minor rivers, ephemeral rivers, floodplains, and wetlands/marshes, although these were not verified in the field. The two major rivers along the route are the Mucoso and Luinha Rivers located ~78.5 and 95 km west of the Cuanza dam along the proposed route of the transmission line.

Existing sources of potential surface water contamination that may impact the quality of the water in these rivers was identified using publicly available high resolution satellite imagery and is also listed in *Table 7.6*.

[1] Available at https://en.wikipedia.org/wiki/Cuanza_River. Accessed August 2018

Table 7.6 Surface Water Bodies along the Transmission Line Route

ID	Region	Water body type (interpreted)	Potential Pollution
WB01 – Cuanza River	Steep Valley	Major river	No visible source of pollution
WB02 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB03 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB04 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB05 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB06 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB07 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB08 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB09 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB10 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB11 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB12 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB13 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB14 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB15 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB16 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB17 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB18 – Drainage line	Flat Area	Drainage line	No visible source of pollution
WB19 – Drainage line	Steep Valley	Drainage line	No visible source of pollution
WB20 – River	Steep Valley	Ephemeral river	No visible source of pollution
WB21 – Mucoso River	Steep Valley	Ephemeral river	No visible source of pollution
WB22 – Flood Plain	Flood Plain	Flood Plain	No visible source of pollution
WB023 – Lucala River	Flood Plain	Major river	No visible source of pollution
WB024 - Wetland	Flood Plain	Drainage line	No visible source of pollution
WB025 - Wetland	Flood Plain	Drainage line	No visible source of pollution
WB026 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB027 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB028 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB029 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB030 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB031 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB032 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB033 –Drainage line	Flood Plain	Drainage line	Open pit mine
WB034 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB035 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB036 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB037 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB038 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB039 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB040 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB041 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB042 - Drainage line	Flood Plain	Drainage line	Up-gradient mining areas
WB043 - Drainage line	Flood Plain	Drainage line	Up-gradient mining areas
WB044 - Drainage line	Flood Plain	Drainage line	Small up-gradient town
WB045 – Calucala River	Flood Plain	Drainage line	No visible source of pollution
WB046 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB047 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB048 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB049 - Drainage line	Flood Plain	Drainage line	No visible source of pollution
WB050 – River	Flood Plain	Ephemeral river	No visible source of pollution
WB051 – River	Flood Plain	Ephemeral river	No visible source of pollution

ID	Region	Water body type (interpreted)	Potential Pollution
WB052 – River	Flood Plain	Minor river	Surrounding development
WB053 – River	Flood Plain	Minor river	Upgradient development
WB054 – Drainage line	Flat/Coastal	Drainage line	No visible source of pollution
WB055 - Drainage line	Flat/Coastal	Drainage line	No visible source of pollution
WB056 - Drainage line	Flat/Coastal	Drainage line	Upgradient development
WB057 - Drainage line	Flat/Coastal	Drainage line	Upgradient Township
WB058 - Drainage line	Flat/Coastal	Drainage line	Upgradient development
WB059 - Drainage line	Flat/Coastal	Drainage line	Upgradient Township
WB060 - Drainage line	Flat/Coastal	Drainage line	Upgradient Township
WB061- Drainage line	Flat/Coastal	Drainage line	Upgradient development
WB062 - River	Flat/Coastal	Drainage line	Upgradient Township
WB063 - River	Flat/Coastal	Drainage line	Upgradient Township

Figure 7.13 Surface Water Bodies Traversed by the Transmission Line Route (1 of 3)

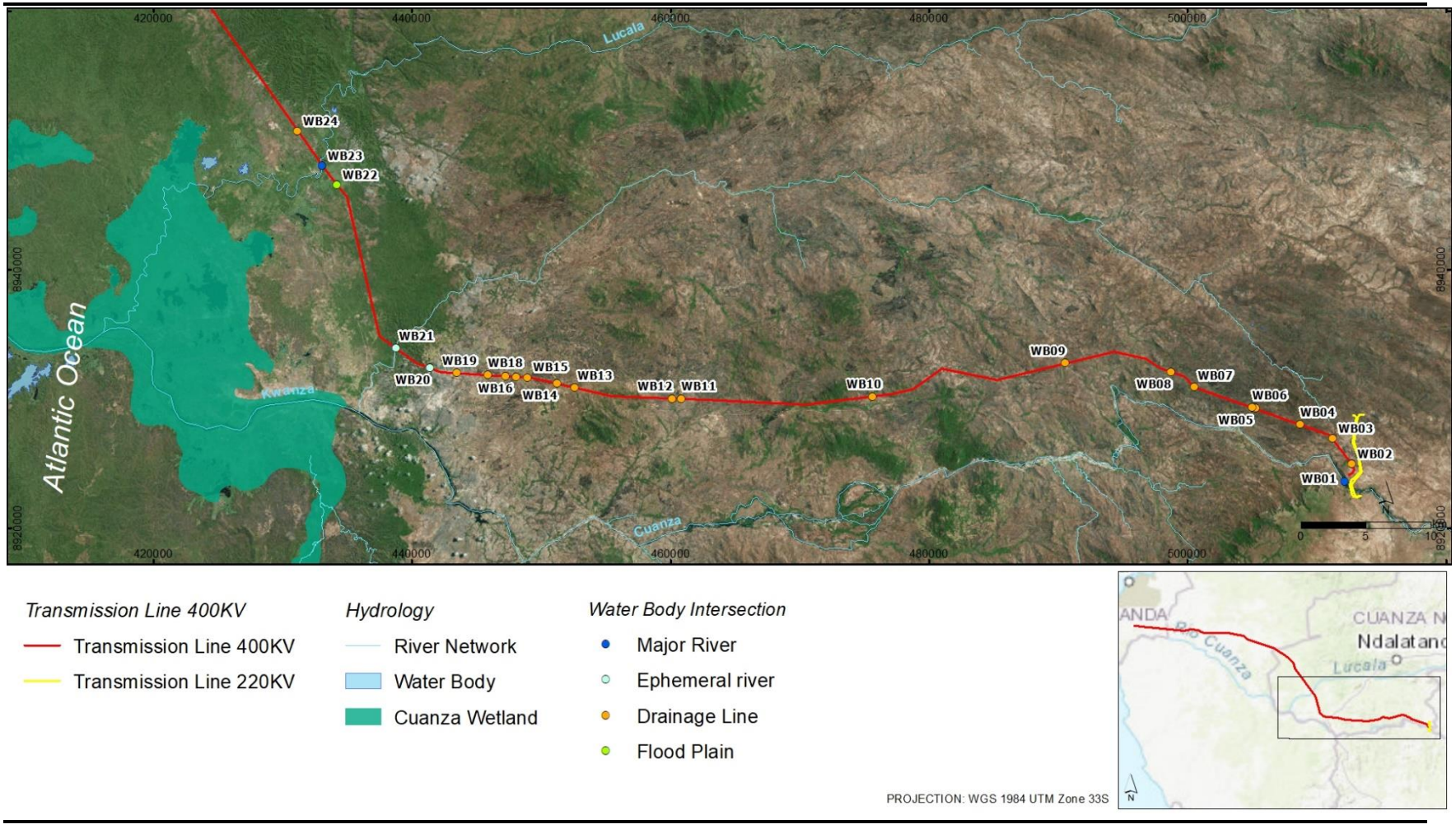


Figure 7.14 Surface Water Bodies Traversed by the Transmission Line Route (2 of 3)

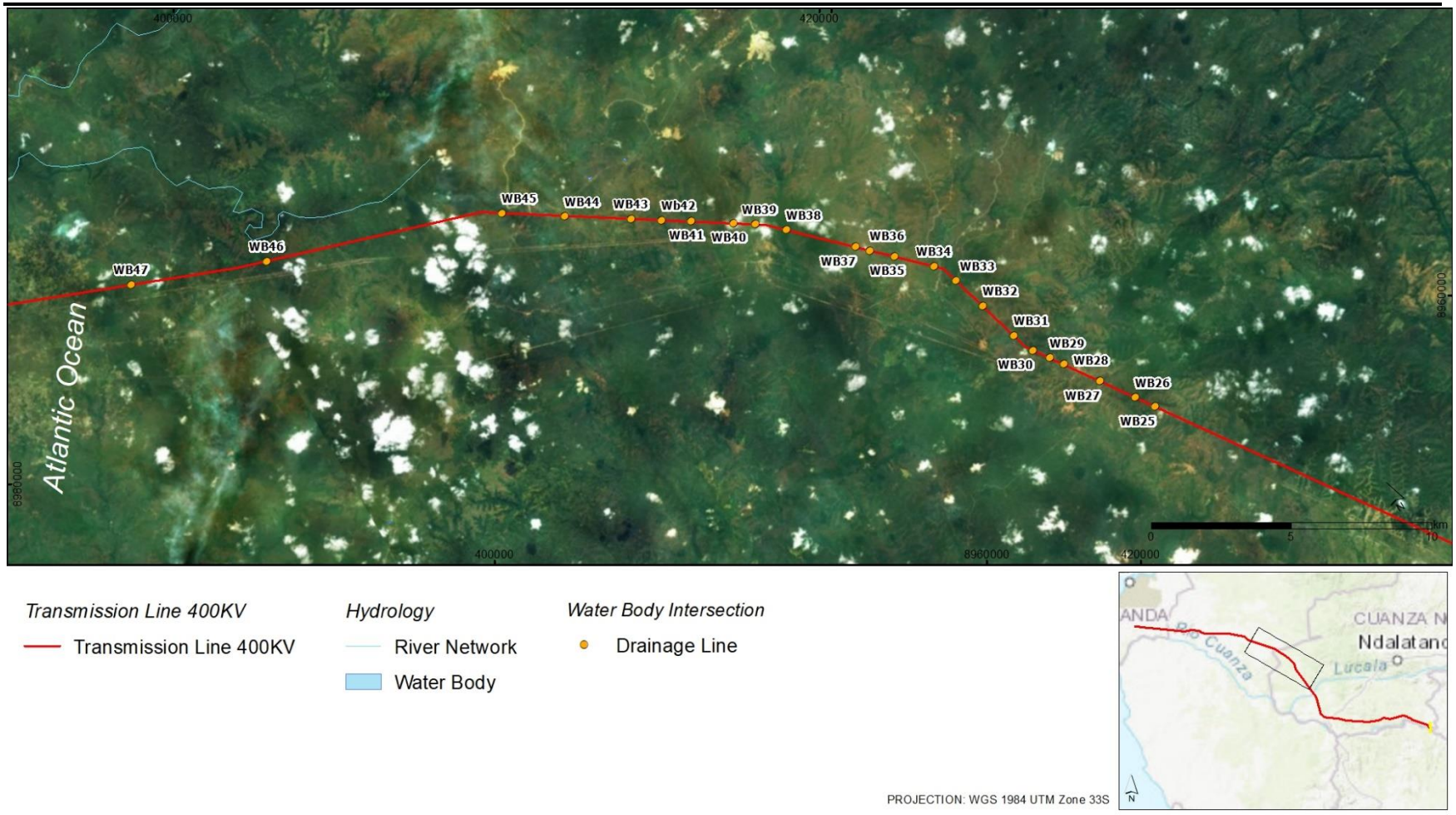
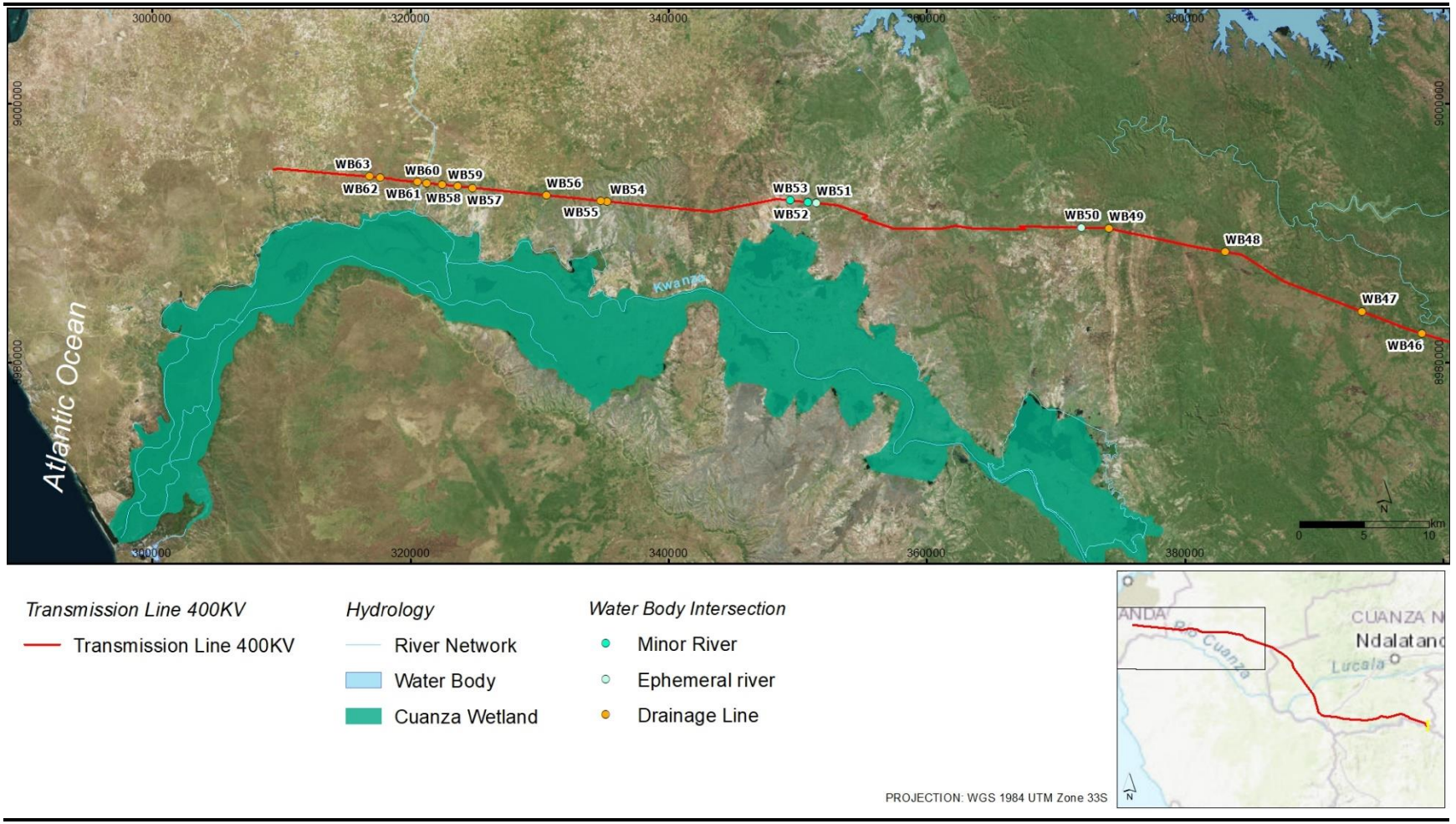


Figure 7.15 Surface Water Bodies Traversed by the Transmission Line Route (3 of 3)



7.2.7 Air Quality

Introduction

Construction activities associated with the proposed transmission line have the potential to impact on air quality. These impacts need to be considered in terms of the existing airshed, with more focus on areas where the baseline airshed is close to or in excess of air quality standards. No impacts are anticipated in the operational phase, as there are no significant sources of emissions. During the construction phase, impacts are expected to be mitigatable, and therefore not significant. On this basis, it has not been deemed necessary to undertake baseline monitoring, and instead professional judgement has been used to determine the baseline airshed.

Sources and Pollutants of Interest

The primary sources of emissions are:

- Nitrogen dioxide (NO_2) and particulate matter (as PM_{10}) from construction traffic exhaust emissions;
- PM_{10} and dust from construction vehicles on unpaved roads and access tracks;
- PM_{10} and dust from construction compounds, including concrete batching; and
- PM_{10} and dust from construction activities, including land stripping and excavation works.

NO_2 is emitted from combustion sources. These are almost exclusively man-made and include road traffic, industry, electricity generation using fossil fuels, cooking fires etc. For this reason NO_2 will only be elevated in built up areas, in particular around heavily trafficked roads, in urban centres and close to dense industry. The proposed transmission line route does not pass through such areas. Along the route there are a number of small towns and villages through which construction traffic will pass. However these are not considered to be of sufficient size to have NO_2 concentrations close to air quality standards. Similarly, the transmission route at its western end does not pass through heavily urbanised areas of Luanda, and as a result, NO_2 concentrations are again not expected to approach air quality standards. On this basis, baseline NO_2 will be well below air quality standards throughout the route and the airshed is considered to be undegraded.

PM_{10} and Dust

Baseline PM_{10} and dust is influenced by a wide range of emissions, including man-made and natural sources.

Emissions arise from road traffic exhaust emissions, unpaved roads, industry, agriculture, electricity generation using fossil fuels, cooking fires etc. Natural

sources include bare earth and regional dust blown in from nearby arid areas and deserts.

Along the route it is anticipated that there will be several locations where the PM_{10} and dust baseline is elevated close to and frequently above air quality standards. These locations include in villages and towns where there are unpaved roads, at individual properties close to unpaved roads and properties close to agricultural activities. It is also likely that PM_{10} and dust baseline will be elevated at the western end of the transmission route in southern Luanda. On this basis, baseline PM_{10} and dust airshed is considered to be degraded at several locations.

7.2.8 Noise

Introduction

In terms of human settlement, the baseline environment along the transmission line corridor is mainly rural with occasional small settlements. A number of isolated dwellings are located close to the western end of the corridor, near to Bita Tanque and the location of the proposed Bita substation. The corridor passes close to (within 100 m of) the rural outskirts of Catete City (again to the western end of the corridor).

Noise Monitoring Locations (NMLs) were chosen at intervals along the corridor and are expected to be representative of the typical baseline noise environment at settlements and isolated properties situated close to the corridor.

The noise monitoring locations are shown in



Figure 7.16 to *Figure 7.21.* A photograph of the noise monitoring equipment is shown in *Figure 7.22.*

Figure 7.16 Noise Monitoring Locations



Source: GoogleEarth ®. Accessed 11/2018.

Figure 7.17 Noise Monitoring Location, NML 1



Source: Google Earth ® - accessed 29 August 2018

Figure 7.18 Noise Monitoring Location, NML 2



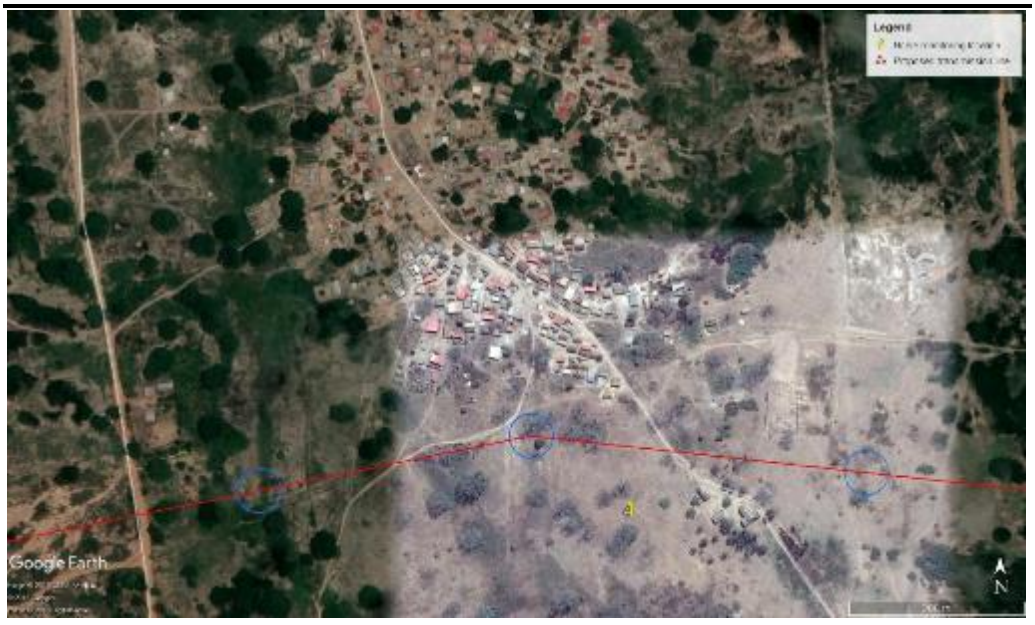
Source: Google Earth ® - accessed 29 August 2018

Figure 7.19 Noise Monitoring Location, NML 3



Source: Google Earth ® - accessed 29 August 2018

Figure 7.20 Noise Monitoring Location, NML 4



Source: Google Earth ® - accessed 29 August 2018

Figure 7.21 Noise Monitoring Location, NML 5



Source: Google Earth ® - accessed 29 August 2018

Figure 7.22 Example Noise Monitoring Setup



Methodology

Noise monitoring was carried out using a Rion NL 52 Class 1 sound level meter (SLM). The SLM microphone was located in generally free-field conditions (i.e. at least 3.5 m from the nearest hard reflective surface) at a height of approximately 1.5 m above the ground.

The calibration level was checked following the survey; no significant drift (i.e. > 0.5 dB) was noted. A copy of the SLM calibration certificate is appended in *Annex G.*

Standard noise metrics including L_{Aeq}, L_{A90} and L_{Amax} were recorded for each measurement. In addition, meteorological data such as wind speed and direction were recorded.

To minimise the influence on the measurements from sources of interference such as wind passing over the diaphragm of the microphone or rain falling on the microphone windshield, measurements made during rainfall events and wind speeds of greater than 5 m/s were avoided.

Results

Measured noise levels from the baseline noise survey are presented in *Table 7.7*.

Table 7.7 Baseline Noise Level Measurements

NML	Location	Date	Time	Duration (mins)	Measured Noise Level, dB(A)					
					L_{eq}	L_{90}	L_{10}	$L_{max,f}$	L_{min}	Observed Sources of Noise and Notes
1	Settlement adjacent to road leading to Laúca Hydroelectric Power Station	10/07/2018	10.50	15	41	30-39 (1)	37-49 (1)	58	28-38 (1)	People talking, babies crying, animals (chickens & goats), occasional cars passing, wind rustling vegetation.
2	Settlement approximately 1.5 km east of Aldeia Lucapa	11/07/2018	12.15	5	47	27-39 (1)	42-55 (1)	71	24-35 (1)	People cleaning clothes, animals (chickens), occasional cars passing.
3	Settlement approximately 2.5 km north of Cassoco	13/07/2018	12.05	5	35	31	38	50	28	Insect noise, occasional distant road traffic.
4	Mazozo	13/07/2018	14.52	15	38	28	36	65	25	People talking, cattle, wind rustling vegetation.
5	Close to proposed Bita substation site. A number of isolated dwellings are located close to the transmission line corridor in this area.	14/07/2018	11.52	15	28	21	33	48	19	Birds, bees, distant talking and fire crackling.
		14/07/2018	12.21	15	30	21	31	56	19	Birds, wind rustling vegetation.

1) Range of 1 minute measurements

Discussion

The noise environment at settlements along the transmission line corridor is generally influenced by local activities within settlements; including animals and people, as well as birds, occasional cars and vegetation blowing in the wind.

Measured daytime noise levels, L_{Aeq}, were generally in the range 35 – 41 dB, with a higher level of 47 dB recorded at one location (NML 2).

At NML 5, close to the proposed Bita substation and representative of the noise environment at the more isolated properties found in that area, measured L_{Aeq} noise levels included little human activity. Consequently they were somewhat lower, ranging between 28 and 30 dB.

Noise monitoring was not carried out during the night as significant night-time noise effects from the construction and operation of the Project are not expected.

7.3 BIOLOGICAL ENVIRONMENT

7.3.1 Flora and Habitats

In general and according to Diniz (2002), the vegetation of the Middle Kwanza basin reflects marked xerophytic conditions, since it integrates into the coastal and sublittoral areas. The plant formations were primitively from the dominance of the grasses and shrubs, partly made up of species of deciduous foliage, with more or less dispersed arboreal and arborescent elements.

It should be highlighted as dominant elements of dense thicket formations, the species of *Grewia*, *Combretum*, *Dichrostachys*, *Strychnos*, *Bascia*, *Diplorhynchus*, *Bauhinia*, with the widely disseminated *Senegalia welwitschii*. In some places of expressive micro-rearing, the bush gave way to dense dry forest, with a great profusion of trees, dominated by *Adansonia digitata*, *Albizia versicolor*, *Pterocarpus tinctorius*, *Diospyrus mespiliformis*, *Cynometra leonensis*, *Hymenostegia laxiflora*, *Combretum comporum* and *Senegalia welwitschii*.

On the other hand, the bases of the valleys, in correspondence with the alluvial areas, cover of forest galleries, dominated by tall trees where the following stand out: *Milletia versicolor*, *Diospyros mespiliformis*, *Albizia glaberrima*, *Ceiba guineensis*, *Pterocarpus tinctorios* and *Adansonia digitata*.

The middle zone of the Lucala River, in the middle Cuanza, comprises the escarpment reaches from the Calandula Waterfall (1000 msl) to the last rapids before the Lower Cuanza Zone (about 56 mamsl). The area is characterised by high gradient channels with extensive falls, torrential cascades, and deep runs and pools over rocky substrates. Woody riparian cover is also extensive.

These habitats are also present in the project AoI, and are described in detail below.

Habitat Features

The transmission line will essentially cross one major ecosystem: tree and shrub savannah with some dense forest mosaic in some areas. Although this segment is included in the miombo domain, the main characteristic elements (*Brachystegia*, *Julbernardia* and *Isoberlinia*) are not evident on the ground. The typical miombo species only appears upstream of the Laúca area. This ecosystem presents some floristic composition variations in terms of species diversity and tree or shrub density associated with humidity levels, climate, soil and degree of anthropic intervention.

As expected, near human settlements, the vegetation mosaic is different from the more naturalized areas, *i.e.* instead of shrub savannah with a significant arboreal element, small sized cultivated fields, usually associated with family subsistence farming and some medium size farms, are prevalent. Along the drainage lines (including the Lucala River) small gallery-type forests occur - in some places thickets of thorny bushes develop and are almost impenetrable.

Away from the inhabited areas, the vegetation shows a strong and natural development, while along the roads and close to the inhabited areas there is a high level of degradation usually as result of human activity. It is important to note that some remote areas far from inhabited places also have an intense timber-harvesting activity, which results in removal of large strips of vegetation to create a dense network of rough tracks that enables access to logging areas, mainly in zones of forest. Large clearings are also visible as a result of farming, mainly for cassava and banana crops.

The following is a description of the vegetation and habitats along segments of the transmission line route.

Laúca - Quilemba – Cambambe Segment

This segment begins with a smooth undulating relief in the Laúca area that gradually becomes more accentuated in the middle of the route, becoming mountainous with numerous rocky outcrops. The natural vegetation previously constituted by open forest and shrub and tree-savannah subsists in small dispersed patches, since the occupation of the soil for agricultural purposes determined a more or less marked savannah formation, resulting in a vegetal cover corresponding to typical formations of savannah with shrubs and some disperse trees.

The savannah consists mainly of tall grasses with tall trees and shrubs, sometimes forming masses or small discontinuous forests. Rock formations often appear in rocky outcrops and small patches of gallery forest in temporary valleys or waterlines.

The most abundant grasses (*Hyparrhenia rufa, Hyparrhenia cymbaria, Heteropogon contortus, Digitaria milangiana, Andropogon gayanus and Panicum maximum*) are generally resistant to the frequent burning of anthropic origin in the region every year, especially during dry season. The tree and shrub species are all very resistant to savannah fires.

The main tree-shrub elements in this segment are *Adansonia digitata (*baobab*), Sterculia quinqueloba, Piliostigma thonningii, Cochlospermum angolense, Diplorhinchus condilocarpon, Entada abyssinica, Erythrina abyssinica, Gymnosporia senegalensis, Ozoroa paniculosa, Senegalia sieberiana, Combretum* sp. amongst others (*Figure 7.23*).

Small gallery-forest patches with arboreal species are also frequent especially in intermittent water lines whose characteristic species are generally *Albizia glaberrima, Ficus thonningii, Ficus sp., Ceiba pentandra* and *Diospyros mespiliformis*. Some climbing shrubs such as *Mucuna pruriens, Landolphia owariensis* and *Diplorhynchus condilocarpon* hanging over the trees and shrubs are characteristic in galleries and forest cores. The edaphoclimatic conditions in the galleries meant that a large part of them were occupied for the planting of trees of anthropic origin, especially the dissemination of palm trees (*Elaeis guineense*) and mango trees (*Mangifera indica*), as well as others. Sometimes there is the interposition of some elements of the savannah in the gallery and vice versa.

In the cracks and at the base of the rocky outcrops, plants can be seen well adapted to these conditions, such as *Aloe* sp., *Xerophyta capillaris*, in addition to some shrubs that also adapted to this wild environment.

The vegetation shows signs of anthropic degradation, especially near community villages. Several family subsistence fields are frequent along the route, with the main crops being manioc (*Manihot utilissima*), maize (*Zea mays*), beans (*Phaseolus vulgaris*) and others not very expressive crops.

Cambambe - Maria Teresa – Catete Segment

After Cambambe, towards Zenza do Itombe, the gradual transition from a relatively high and rugged relief begins to flatten outwards towards the coast is quite impressive. The flattening is occasionally interrupted by valleys that drain in several directions, made up of stains of faint forest galleries. This relief transition is also accompanied by a gradual change in the vegetation cover – dominated almost by dense baobab (*Adansonia digitata*) groves that cover considerable areas (*Figure 7.24*).

Besides the baobab (*Adansonia digitata*) with enormous biomass, other tree species such as *Sterculia setigera, Sterculia quinqueloba, Commiphora africana, Senegalia nigrescens, Senegalia sieberiana, Ceiba pentandra, Ficus thonningii, Diospyros mespiliformis* and *Albizia versicolor* are also present and appear to be typical of this formations. The shrub vegetation consists of *Piliostigma thonningii, Ozoroa paniculosa, Combretum celastroides, Grewia flava,*

Cochlospermum angolense, Dichrostachys cinerea, Carissa edulis, Ximenia americana, Boscia urens and *Diplorhinchus condilocarpon*. The herbaceous communities are quite variable both in terms of structure and flora composition. These changes are mainly triggered by soil type and land use, mainly the fire regime. Dominant species are *Digitaria sp., Setaria welwitschii, Eragrostis fascicularis, Anthephora cristata, Cynodon dactylon, Schmidtia pappophoroides, Panicum maximum*, among others.

Figure 7.23 Example of Dominant Vegetation in the Laúca-Cambambe Segment with Baobab Trees (Foreground) and Acacias (Background)



Along this segment, subsistence agricultural fields are also evident, especially in the productive soils of the alluvial areas. Manioc (*Manihot utilissima*), banana (*Musa sp.*), palm oil trees (*Elaeis guineense*) and papaya (*Carica papaya*) plantations are often seen. Some fruit trees such as mangoes (*Mangifera indica*), cashew (*Anacardium occidentale*) and tamarind (*Tamarindus indica*) should also be mentioned as an important element of anthropic use in this section.

It is also worth mentioning the occurrence of impenetrable patches of *Dichrostachys cinerea* (sicklebush), especially between Calomboloca and Catete, which extend a little beyond this locality towards Luanda.

Figure 7.24 Baobab Trees are Also Dominant in the Cambambe-Catete Segment



Catete – Bita Segment

This segment corresponds to the coastal flattening, characterized by the marked human activities and the subsequent savanization of the vegetation. Savannah communities occupy large patches of land, most of which result from the agricultural occupation of the land, which was naturally covered by dry forest.

The arboreal element continues to be dominated by baobabs (*Adansonia digitata*) associated with *Sterculia setigera, Hyphaene guineense* and *Euphorbia conspicua*, which are components of the original vegetation cover. Some shrubs are also frequent, especially *Strychnos cocculoides, Strychnos innocua, Maerua angolensis, Combretum psidioides, Salvadora persica, Capparis sp., Calotropis procera, Balanites angolensis, Carissa edulis, Ximenia americana, Boscia urens* and *Sarcostema viminale*. Plants such as *Cissus quadrangularis* and *Pergularia daemia* are often found in the edges of these shrub formations. The dense patches of *Dichrostachys cinerea* also cover large areas.

The herbaceous formations are quite diversified – main species are *Heteropogon contortus, Digitaria milangiana, Digitaria monodactila, Eragrostis superba, Dichanthium papillosum, Setaria welwitschii*, among others.

In areas with intensive agricultural activity the savannah took on the steep aspect accentuated with trees and shrubs gathered in tufts. The occurrence of cashew nut trees (*Anacardium occidentale*) and mango trees (*Mangifera indica*) are frequent in these areas. These trees are indicative of the traditional human occupation of the land. Manioc (*Manihot utilissima*) is also widely dispersed on a small scale.

Due to climatic (more arid) and edaphic (sandy soils) conditions, in the areas in the proximity of Bita (*Figure 7.25*), the arboreal element becomes scarce with the increasing soil aridity which results in the sporadically emerging of baobab trees (*Adansonia digitata*) and quissona (*Euphorbia conspicuous*).

Figure 7.25 Evidence of Arid Climate along Catete-Bita Segment



Sensitive Species

Based on the results from field surveys along the proposed transmission line cooridor and subsequent data analysis, a floristics list was determined (*Annex C)*. Several endangered species were identified, according to the Angolan List of Threatened Species.

No species were identified that are referenced in the IUCN Red List of Threatened Species Red List[1].

Invasive Alien Species

During the field surveys, some invasive species were recorded, such as *Chromolaena odorata, Tithonia diversifolia, Opuntia ficus-indica* and *Cardiospermum grandiflora. Chromolaena odorata* (*Annex C*), the most frequent one, is widespread throughout the proposed route, while the other two are colonized in the clearings, along the roadsides and near the localities. Changes in the environmental conditions along the route may create favourable conditions for the massive and rapid dissemination of these plants and others, supplanting the natural vegetation and altering the composition of the native vegetation.

[1] http://www.iucnredlist.org/ Accessed on 09/09/2018.

7.3.2 Fauna

Mammals

A wide diversity of mammals occur in the Cuanza Basin although abundance of larger mammals is low due to over-hunting during the war for food and currently for both subsistence and for commercial purposes (e.g. bush meat). This wide diversity can be attributed to the wide variety of habitats in the area, good habitat condition and low population numbers.

Surveys in the Laúca Dam area recorded 40 mammal species (Holísticos, 2013). Leopard and hippopotamus (both listed as Vulnerable by IUCN) are recorded in the middle Cuanza area (based on surveys for Laúca Dam ESIA). Hippopotamus are recorded in Capanda Dam upstream from Laúca Dam and the Cuanza River downstream, and could be expected to adapt to living in dams (provided sufficient suitable grass and forage is available).

Of note, is the record of footprints of forest buffalo along the Cuanza River, although such animals are very scarce and likely to see refuge in forest and wooded patches. Other notable large mammals recorded in the Laúca area include waterbuck.

Widely distributed species recorded in the area include aardvark, yellow baboon, common duiker, blue duiker (*Figure 7.26*), bushbuck, genet, serval, water mongoose, white tailed mongoose, rock hyrax and tree hyrax, thick tailed galago, vervet monkeys, warthog and bushpig. Small mammals included rodents such as giant pouched rat, cane rat, squirrels, hares, mole rats and porcupine and several bats (Holísticos 2013).

Figure 7.26 Blue Duiker Poached near the Project Area



Very little is known about Angolan bats, both in terms of occurring species and their distribution in the country. The existing knowledge is mostly based on few specimens collected in the 19th century and early 20th century and stored in the mammal collection of ISCED, Lubango, and these are often of problematic identification (Monadjem et al 2010).

Surveying bats often requires specialized acoustic equipment such as ultrasound recording devices, but in addition, the absence of baseline data in Angola against which to compare files obtained, makes this option ineffective. It is likely that bat recordings from northern Angola would not allow species identification in most cases. The use of nets is also problematic as it would not be efficient to catch most bat species, that rely on echolocation, and the effort needed to survey bats with nets would not fit into the project program due to time and logistic constrains. Instead, the team collected data opportunistically and tried to locate signs of colonies in specific rock outcrops and large trees along the project line.

As result of this research effort no bat colonies were identified although individual species of the Angolan fruit bat (*Lissonycteris angolensis*) and the Angolan epauletted fruit bat (*Epomophorus angolensis*) were observed. The Angolan epauletted fruit bat, which is one of the most common species, was observed near riverine ecosystems such as the Lucala river. Neither the Angolan fruit bat (*Lissonycteris angolensis*) nor the Angolan epauletted fruit bat (*Epomophorus angolensis*) are considered as endangered or critically endangered by the IUCN.

It should be noted that apart from reptiles and rodents, the likelihood of occurrence for the other fauna species within proposed corridor for the transmission line is considered very low as these areas are already highly disturbed areas by human presence and activities (e.g. agriculture activities, roads, houses). During the survey conducted along the proposed transmission line no mammal species were observed. Local population and hunters have confirmed that no mammal species have been observed in the area. This is partially due to the fact that the proposed transmission line route is heavily impacted by human activities including other transmission lines and agricultural fields.

Birds

Bird Habitats

A summary of the habitats available for existing birdlife along the transmission line of the route can be grouped into five main groups, namely:

- Savannah and open or degraded forest with elements of miombo. This zone is present only in the Laúca area and along the first 10 km of the route, disappearing as the altitude decreases.

- Dry forest with more or less dense shrub cover. It corresponds to the area most represented in the project approximately between Laúca and Catete, and is only interrupted in some places by patches that are assigned to zones 3 and 4.

- Areas of dense dry forest. Area represented somewhat irregularly but mainly in the section between Cassoalala and Zenza do Itombe, and characterized by patches of closed forest.

- A fluvial or riverine area, characterized by the proximity to rivers or permanent water lagoons, and wetland plains. It is a component mainly represented in the area of the Cuanza River near Laúca, crossing the Lucala River and the lagoon areas near Catete.

- Mosaic of savannah and steppe with shrub layer sometimes dense but semi-arid. This area is in the westernmost areas of the project, after Catete.

Bird Species

A list has been drawn up of 147 bird species, which correspond to those considered to be most likely to be present in the area affected by the project. The list was drawn up on the basis of previous field visits that focused on the Laúca Dam project area and other visits to several sites near the Project transmission line route, and completed with more recent surveys along the proposed line to update the information.

The list of species presented in *Annex C* should be considered as indicative and only contains species that have already been confirmed in the area or whose occurrence is considered highly probable.

The number of species presented may be considered high and will reflect the fact that the transmission lines crosses several distinct habitats and includes a gradient of almost 1000 meters.

Endemic Bird Species

The presence of three endemic species to Angola was confirmed in the Project AoI:

- Grey-striped francolin (*Pternistis griseostriatus*);
- Red-crested turaco (*Tauraco erythrolophus*); and
- Red-backed mousebird (*Colius castanotus*).

The grey-striped francolin is relatively uncommon and in the project area it is present mainly in areas of dense dry forest, thickets and closed gullies. It has a wide range from Luanda to the southern part of Angola and has a population estimated between 7,500-35,000 mature individuals.

The red-crested turaco, a symbol of Angola's birdlife, is relatively common in the escarpment zone and in the project area it is associated with the densest thickets and riparian forests along the middle segment. This species has a very large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (IUCN, 2018). The global population size has not been quantified, but the species is reported to be locally common (del Hoyo et al. 1997).

The red-backed mousebird is quite common throughout the Project's implementation area, including in degraded and urban areas. It ranges as far north from the border with the Democratic Republic of Congo to the southern part of Angola (Benguela and Huíla Provinces).

It is also possible that four other endemic species occur in the dense dry forest zone, but this is unconfirmed. These are the white-fronted wattle-eye (*Platysteira albifrons*), Monteiro's bush-shrike (*Malaconotus monteiri*), Gabela helmetshrike (*Prionops gabela*) and Hartert's Camaroptera (*Camaroptera harterti*).

Threatened Bird Species

Three species in the project area were registered as being of conservation concern, according to the updated lists of the International Union for Conservation of Nature (IUCN Red List). The existing data based on previous visits included the southern ground-hornbill (*Bucorvus leadbeateri)* listed as VU (Vulnerable) and the bateleur (*Terathopius ecaudatus)*, the latter classified as EN (Endangered). A more recent survey allowed the observation of one

individual of hooded vulture (*Necrosyrtes monachus)* soaring over the proposed line on the road between Laúca and Caculo Cabaça. The hooded vulture is a rare bird, possibly on the verge of extinction in Angola, and listed as CR (Critically Endangered) by the International Union for Conservation of Nature (IUCN Red List).

Potentially Affected Bird Species

While habitat destruction is generally limited by being confined to firebreaks and a direct affected area, on the other hand, transmission lines are recognized as posing significant risks to many bird species, with collisions and electrocution often cause death or serious injury. For some avifauna species this type of risk may even compromise the viability of some populations and lead to their disappearance in certain areas.

Among the species listed for the Project area, those of greatest concern are the storks such as the woolly-necked stork, given its size and tendency to join in large flocks and the marabou stork (*Leptoptilos crumenifer*us) for its very large size. Several species of birds of prey may also be affected due to their size, namely the African fish-eagle (*Haliaetus vocifer*), the palm-nut vulture (*Gypohierax angolensis*), the bateleur (*Terathopius ecaudatus*) and the brown-snake eagle (*Circaetus cinereus*).

One very particular case must be stressed in relation to the presence of rare and critically endangered hooded vultures (*Necrosyrtes monachus*), when one individual was recorded recently in the area. Vulture species typically have large wing spans and casualties following collisions with power lines have been often documented. This species nests on top of hills and cliffs and not in the tree canopies. At the moment little is known about the numbers and movements of local population of vultures, and even if there is any existing breeding locally or if the individual observed was a vagrant.

Other birds that can also be reached, although small in size, are those that form large flocks such as wattled starling (*Creatophora cinerea*), village weaver (*Ploceus cucullatus*) or red-billed quelea (*Quelea quelea*).

Although they have not yet been confirmed, there is still the possibility of occurrence in the area of the project of migratory species, mainly aquatic and occurring near areas of surface water, particulay in those years where precipitation is above normal and lagoons are formed, and that may be negatively impacted by the transmission line. It is important to mention that in years with heavy rains (which result in the formation of big lagoons), migratory species might occur in the project area. Ongoing monitoring was included in the ESMP particularly in the flooded areas near Lucala river.

In summary, the three species most susceptible to the direct risks are:

- Woolly-necked stork because of the real possibility of suffering high population mortality in the event of a collision of a flock with the transmission line; and
- Hooded vulture and bateleur because both are vulnerable to collisions with lines due to their large wing span and that these species listed in the IUCN Red List as Critically Endangered and Near Threatened respectively.

Amphibians

Amphibians are an important faunal group to assess, particularly due to their potential as good bio-indicators. Most species have very specific habitat requirements and have a permeable skin that easily absorbs toxic substances. These traits make amphibians very susceptible to environmental disturbances, hence are good indicators of environmental stress. Therefore, the health of a given amphibian community can be seen as indicative of the health of the local biosphere.

On the other hand, a few limitations of an amphibian inventory should also be considered. One of these limitations results from the fact that the particular nature of the project proposed, power transmission line, 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 characterise the habitats present. Other limitations derive from the almost complete absence of reliable historical local data, making it difficult to develop a species list.

However, considering all of the above, the amphibian survey (which focused mostly on frogs), provides a good indicator for local amphibian diversity and habitat characterisation. Because frogs are essentially nocturnal animals, the surveys were conducted after sunset in and around the established camping sites. An effort was made to explore drainage lines, ponds and moist areas, where amphibians could be located. The list of species common in the project area is presented in *Annex C*.

None of the amphibian species recorded in this study are listed on the IUCN Red List as being of conservation concern, as all identified taxa are classified as Least Concern. The conservation status of many Angolan amphibians is based on relatively limited data. None of these species are endemic to Angola.

Reptiles

The 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 chains, 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, a few problems subsist which can severely constrain the results of reptile surveys. The first and most obvious limitation is the cryptic nature of all but a few reptile taxa. Recording a fair representative array of reptile species in a given study area often requires intensive trapping methodologies and an effort sustained over a long period. For example, some reptile categories such as most snakes, legless lizards and burrowing reptiles are seldom detected, regardless of methodologies used.

The other significant constraint derives from the lack of reliable information about reptile distribution in Angola, other than very old outdated publications, while recent herpetological studies have mainly been carried out in the desert biome of the southwest.

In spite of all these limitations, an effort was made to compile a herpetological list, which is believed to be useful in providing complementing data and helps better characterising the study area from a faunal perspective. The list of species common in the project area is presented in *Annex C*.

Considering the difficulties in performing herpetological surveys and detecting much of the diversity present, in addition to the practical impossibility of resorting to intensive trapping techniques across the entire study area, the species listed in *Annex C* is considered to be representative of the reptile fauna of the Project area. It should be noted that the lizards and the chameleon are common and widespread species across Angola.

Out of the ten species, two of them are endemic to Angola (Schack's Agama and Mucoso's Agama). The Schack's Agama is still a poorly resolved taxon that until recently was considered a subspecies of rock agama (*Agama planiceps*), but recent molecular and morphological data suggest it is best recognized as a full species. It is nevertheless widely distributed in Angola along the escarpment and in the plateau on rocky outcrops. It is highly tolerant species to human presence, and often thrives in and around local villages.

Mucoso's Agama is a little known Angolan endemic species which is restricted to the western coastal plain, but common and not threatened. It was described from a specimen collected west of Dondo along the Kwanza river, and had recently been recorded in several sites in Luanda province but it was unclear how far north it would reach.

It should be noted that neither of these endemic lizards are currently considered to be of conservation concern.

7.3.3 *Protected Areas*

National Protected Areas

There are no formally protected areas in the Project AoI and there are no known plans for the establishment of protected areas by the Ministry of Environment.

Internationally Recognised Areas

The AoI does not include any internationally recognised areas (e.g. Important Bird Areas (IBAs), Ramsar wetlands).

7.3.4 *Critical, Natural and Modified Habitats*

Overview

As per the IFC Performance Standards:

*"Habitat is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment. For the purposes of implementation of this Performance Standard, habitats are divided into **modified**, **natural**, and **critical**."*

In terms of Modified and Natural habitats, their classifications are as follows:.

- ***Modified habitats** occur where a large proportion of non-native (alien) plant and/or animal species occur, and/or where human activity has substantially modified the area.*

- ***Natural habitats** are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.*

The term 'Critical Habitat' is defined by the IFC Performance Standards[1] as an area with high biodiversity value. This includes areas that meet one or more of the following criteria[2]:

- Criterion 1: Critically endangered (CR) and/or endangered (EN) species.
- Criterion 2: Endemic and/or restricted-range species.
- Criterion 3: Migratory and/or congregatory species.
- Criterion 4: Highly threatened and/or unique ecosystems.
- Criterion 5: Key evolutionary processes.

[1] http://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD=AJPERES
[2] http://www.ifc.org/wps/wcm/connect/a359a380498007e9a1b7f3336b93d75f/Updated_GN6-2012.pdf?MOD=AJPERES

Criteria 1, 2 and 3 are focused on species occurrence, whilst **Criteria 4 and 5** focus on ecosystem and landscape characteristics[1].

The IFC Performance Standards describe 'Tiers' of Critical Habitat, based on relative vulnerability (degree of threat) and irreplaceability (rarity or uniqueness). For Criteria 1 to 3, both qualitative and quantitative thresholds are provided to assign critical habitat into either Tier 1 or Tier 2. *Box 1.1* details important definitions for the Critical Habitat screening and Table 4.1 shows the relevant thresholds.

The scale at which a critical habitat determination takes place depends on underlying ecological processes for the habitat in question and is not limited to the footprint of the Project. The determination of critical habitat for Criteria 1, 2 and 3 is based on a Discrete Management Unit (DMU). This is an area with a definable boundary in which the biological communities have more in common with each other than they do with those outside that boundary.

'*A discrete management unit may or may not have an actual management boundary (e.g. legally protected areas, World Heritage sites, Key Biodiversity Areas, IBAs, community reserves) but could also be defined by some other sensitive ecologically definable boundary (e.g. watershed, interfluvial zone, intact forest patch within patchy modified habitat, seagrass habitat, coral reef, concentrated upwelling area, etc.). The delineation of the management unit will depend on the species (and, at times, subspecies) of concern*'.

Box 7.1 Criteria 1 to 3 Definitions (Excluding Marine Component)

Criterion 1: Critically Endangered (CR) or Endangered (EN) Species

1) Listed on the IUCN Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and

2) In instances where nationally or regionally listed species' categorisations do not correspond well to those of the IUCN (e.g. some countries more generally list species as "protected" or "restricted"), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment.

Criterion 2: Endemic and/or restricted-range species

[1] The determination of critical habitat can also include other recognised high biodiversity values evaluated on a case-by-case basis. This is specified by paragraph GN56 of Guidance Note 6, which provides the following seven examples: i) Areas required for the reintroduction of CR and EN species and refuge sites for these species (habitat used during periods of stress (e.g.flood, drought or fire); ii) Ecosystems of known special significance to EN or CR species for climate adaptation purposes; iii) Concentrations of Vulnerable (VU) species in cases where there is uncertainty regarding the listing, and the actual status of the species may be EN or CR; iv) Areas of primary/old-growth/pristine forests and/or other areas with especially high levels of species diversity; and v) Landscape and ecological processes (e.g. water catchments, areas critical to erosion control, disturbance regimes, e.g. fire, flood) required for maintaining critical habitat.

1) An endemic species is defined as one that has ≥ 95% of its global range inside the country or region of analysis[1].

2) Restricted-range species are defined as follows: i) For terrestrial vertebrates, a restricted-range species is defined as those species which have an extent of occurrence of 50,000 km² or less; ii) For freshwater systems, standardized thresholds have not been set at the global level. However an IUCN study of African freshwater biodiversity determined thresholds of 20,000 km² for crabs, fish, and molluscs and 50,000 km² for dragonflies and damselflies. These can be taken as approximate guidance values, although the extent to which they are applicable to other taxa and in other regions is not yet known; and iii) For plants, restricted-range species may be listed as part of national legislation. Plants are more commonly referred to as "endemic" and the definition provided in GN79 would apply.

Criterion 3: Migratory and Congregatory Species[2]

1) Migratory Species: Any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem).

2) Congregatory Species: i) Species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis; ii) Species that form colonies; iii) Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for nonbreeding purposes (e.g. foraging, roosting); iv) Species that move through bottleneck sites where significant numbers of individuals of a species pass over a concentrated period of time (e.g. during migration); v) Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (e.g. wildebeests distribution); vi) Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere.

Table 7.8 Quantitative Thresholds for Critical Habitat Tiers for Criteria 1, 2 and 3

Tier 1 Critical Habitat	Tier 2 Critical Habitat
1. Occurrence of Critically Endangered (CR) and / or Endangered (EN) Species	
(a) Habitat required to sustain ≥ 10 % of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a Discrete Management Unit (DMU) for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species	(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally-important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally / regionally important concentrations of an EN, CR or equivalent national / regional listing.
2. Occurrence of Endemic and/or Restricted-Range Species	

[1] IFC GN79-80.
[2] IFC GN85-86.

Tier 1 Critical Habitat	Tier 2 Critical Habitat
(a) Habitat known to sustain ≥ 95% of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g. a single-site endemic)	(b) Habitat known to sustain ≥ 1% but < 95% of a global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and / or based on expert judgment.
3. Occurrence of Migratory and/or Congregatory Species	
(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95% of a global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1% but < 95% of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and / or based on expert judgment. (c) For birds, habitat that meets Birdlife International's Criterion A4 for congregations and / or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥ 5% of the global population for both terrestrial and marine species/ (e) Source sites that contribute ≥ 1% of the global population of recruits.

Source: IFC Performance Standard 6, 2012

Criterion 4 is triggered by ecosystems that are threatened, support unique assemblages of biome-restricted species, or are recognized for high conservation value, including protected areas. No quantitative thresholds are indicated by the PS6 Guidance Notes; nonetheless, quantitative categories and criteria may be applied to evaluate ecosystem status if data allows it (e.g. Rodriguez et al, 2011).

Lastly, Criterion 5 applies to landscape-level features that can influence key evolutionary processes. Key landscape features such as unique topography that creates unique habitats and areas important for climate change adaptations should be identified using literature review and through expert consultation.

Box 7.2 Criteria 4 and 5 Definitions (Excluding Marine Component)

Criterion 4: Highly Threatened and/or Unique Ecosystems
IFC GN90 defines highly threatened or unique ecosystems as: i) at risk of significantly decreasing area or quality; ii) with a small spatial extent; and/or iii) containing unique assemblages of species including assemblages or concentrations of biome-restricted species (i.e. species whose distributions are largely or wholly confined to one biome).

Criterion 5: Key Evolutionary Processes
IFC GN95 suggests that this criterion is defined by: i) the physical features of a landscape that might be associated with particular evolutionary processes; and/or ii) sub-populations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history (i.e. EDGE species (1) or Evolutionary Significant Units (2) at population level). IFC GN96 also provides the following examples of spatial features that are associated with evolutionary processes: a) level of isolation (e.g. islands, mountaintops, lakes are associated with populations that are phylogenetically distinct); b) extent of endemism (areas of high endemism often contain flora and/or fauna with unique evolutionary histories); c) spatial heterogeneity; d) presence of environmental gradients (ecotones produce transitional habitat which has been associated with the process of speciation and high species and genetic diversity); e) edaphic interfaces; and f) connectivity between habitats (e.g. biological corridors).

Findings

Table 7.9 summarizes the results of the Critical Habitat Assessment (CHA). The CHA, is based on available information, supplemented by field surveys and input from experienced Angolan biodiversity experts. The assessment indicates that critical habitat designations under Criteria 1 to 5 are not justified.

Table 7.9 Summary of Critical Habitat Assessment

Trigger Species - Habitat	Tier	Comments
Criterion 1. Occurrence of Critically Endangered (CR) or Endangered (EN) Species(1)		
Hooded Vulture (*Necrosyrtes monachus*) IUCN Status: CR	Not CH	One individual observed and photographed recently. Local status not known. Might or not breed in the region, or might be a vagrant. However the habitat does not sustain ≥ 10 % of the global population of this species nor the project area presents evidence of larger concentrations of this species. In addition, it should be noted that vultures are wide-ranging species, and single observations do not trigger critical habitat, based on item d) for criterion i) in *Table 1.18*.
Gabela helmetshrike (*Prionops gabela*) IUCN Status: EN	Not CH	Reporting on occurrence is vague and not common in the project area. No confirmed presence of the Gabela helmetshrike.
Criterion 2. Occurrence of Endemic and/or Restricted-Range Species		
As discussed in Section 7.3.1 and 7.3.2, three bird species and two reptile species were preliminary identified as potentially triggering Criterion 2 as follows. Further analysis confirmed that Criterion 2 was not triggered for these species. Angola supports a relatively high number of endemic/or restricted-range species. However, these are largely confined to the escarpment forests and highlands. As noted in Section 7.3.2, habitats within the Project Direct AoI are heavily impacted and are not predicted to sustain ≥ 1% of endemic flora, mammals, reptiles or amphibians.		
Grey-striped Francolin (*Pternistis griseostriatus*)	This species has been downlisted to Least Concern because published evidence indicates that it has a large range and probably has a moderately large population (Mills, 2010; BirdLife International, 2016). Not CH.	Although present in dry thickets on the coastal plain, it is uncommon on the project site, and the habitats present are estimated to sustain much less than 1% of the global population.
Red-crested Turaco (*Tauraco erythrolophus*)	This species has a very large range and is reported to be common within its restricted area (Dean, 2001; Mills, 2010; BirdLife International, 2016a). Not CH.	Relatively uncommon on the project site, and mostly in the vicinity of forest patches. The area must include considerably less than 1% of the global population for the species.
Red-backed Mousebird (*Colius castanotus*)	This species has a very large range and is reported to be common within its restricted area (IICT, 2013; BirdLife International, 2016b). Not CH.	Relatively common along the project route, but the habitats present likely contain much less than 1% of global population of the species.

Trigger Species - Habitat	Tier	Comments
Schaack's Agama (*Agama schaacki*)	This species has a large range in Angola and is reported to be common within its restricted area (Holisticos, 2013a, 2013b, 2013c & 2018). Not CH.	Relatively common along the project route, but the habitats present likely contain much less than 1% of global population of the species.
Mucoso's Agama (*Agama mucosoensis*)	This species has a large range in Angola and is reported to be common within its restricted area (Holisticos, 2013a, 2013b, 2013c & 2018). Not CH.	Relatively common along the project route, but the habitats present likely contain much less than 1% of global population of the species.
Criterion 3. Occurrence of Migratory and/or Congregatory Species		
No species confirmed as triggers for Criterion 3		
Criterion 4. Presence of Highly Threatened and/or Unique Ecosystems		
No species confirmed as triggers for Criterion 4		
Criterion 5. Key Evolutionary Processes		
Existing evidence does not support any CH qualification under Criterion 5		
No other Endangered or Critically Endangered species were identified within the AoI.		

In terms of Natural and Modified Habitats (*Table 7.10*), and as per the definitions provided in PS6 paragraphs 11 and 13, by being areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition, forest and wetlands were considered as natural habitats. Cultivated croplands and plantations and Savanah were considered as Modified Habitat (as per IFC PS06) because human activity has substantially modified those areas and also due to the high proportion of non-native (cultivated) plants.

Table 7.10 Habitat Type in the Project AoI (as per IFC PS6)

Habitat Unit	Basis for Habitat Classification	
	Modified Habitat	**Natural Habitat**
Natural Habitat		
Forest	N.A.	Natural habitat but impacted by human activities particularly logging and vegetation removal for agriculture.
Wetland	N.A.	Natural habitat but impacted by human activities particularly logging and vegetation removal for agriculture. Despite the disturbance, human activity has not essentially modified these area's primary ecological functions.
Modified Habitat		
Cultivated croplands and plantations	Cassava and corn plantations and other horticulture crops. Natural species occurrence is almost incipient.	N.A.

Habitat Unit	Basis for Habitat Classification	
	Modified Habitat	Natural Habitat
Savanah	Areas of mixed woodland grassland ecosystem and herbaceous layer consisting primarily of grasses, often slashed and burned (annual fire cycle).	N.A.
Urban settlement	Transformed urban environment due to urban expansion. Plant species present are mostly restricted to food plants and ornamentals.	N.A.

The broad terrestrial habitat units (as per IFC Performance Standard nomenclature) are recognised in the Project AoI as illustrated in *Figure 7.27, Figure 7.28 and Figure 7.29*.

Figure 7.27 PS6 Classification of Habitats Map (1 of 3)

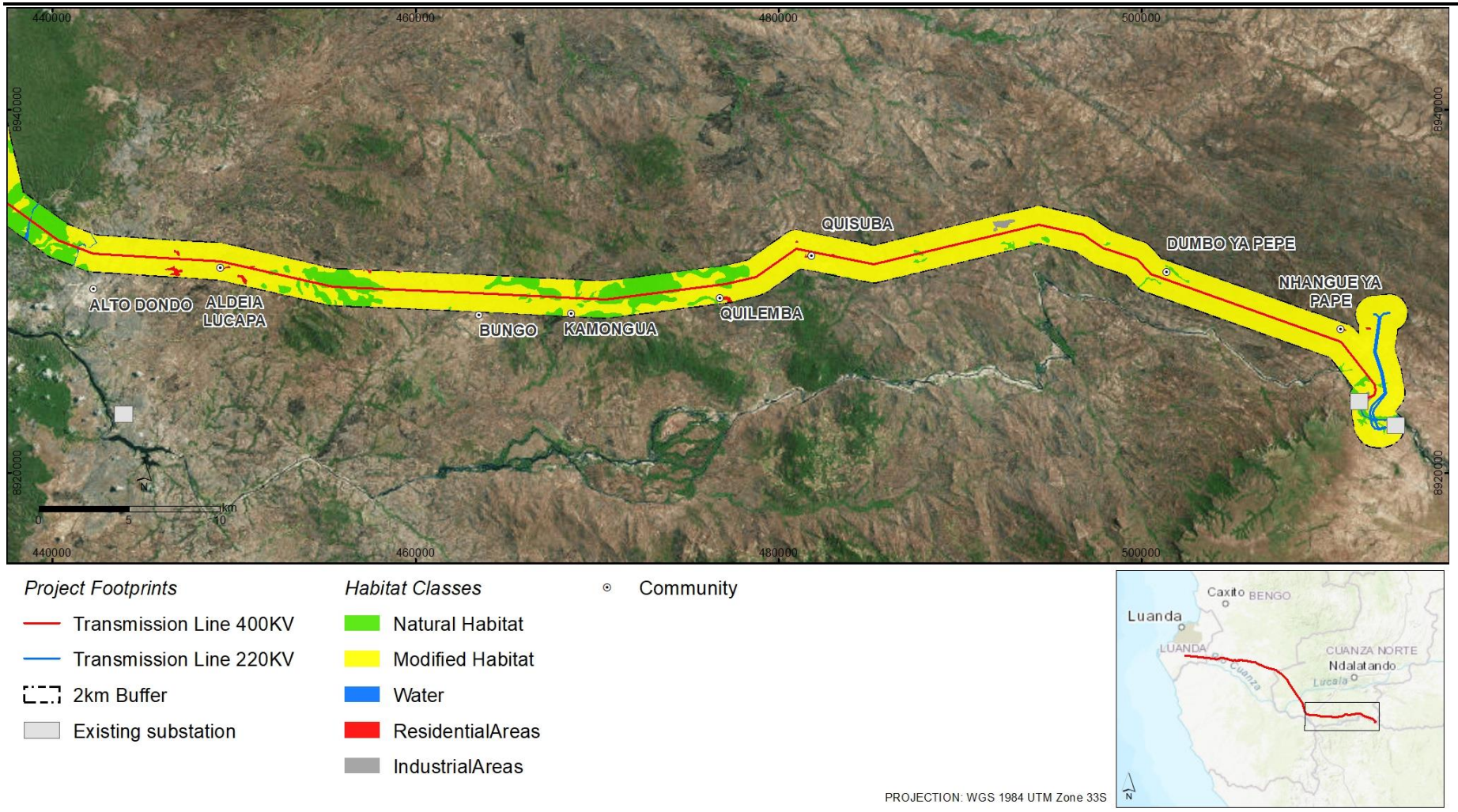


Figure 7.28 PS6 Classification of Habitats Map (2 of 3)

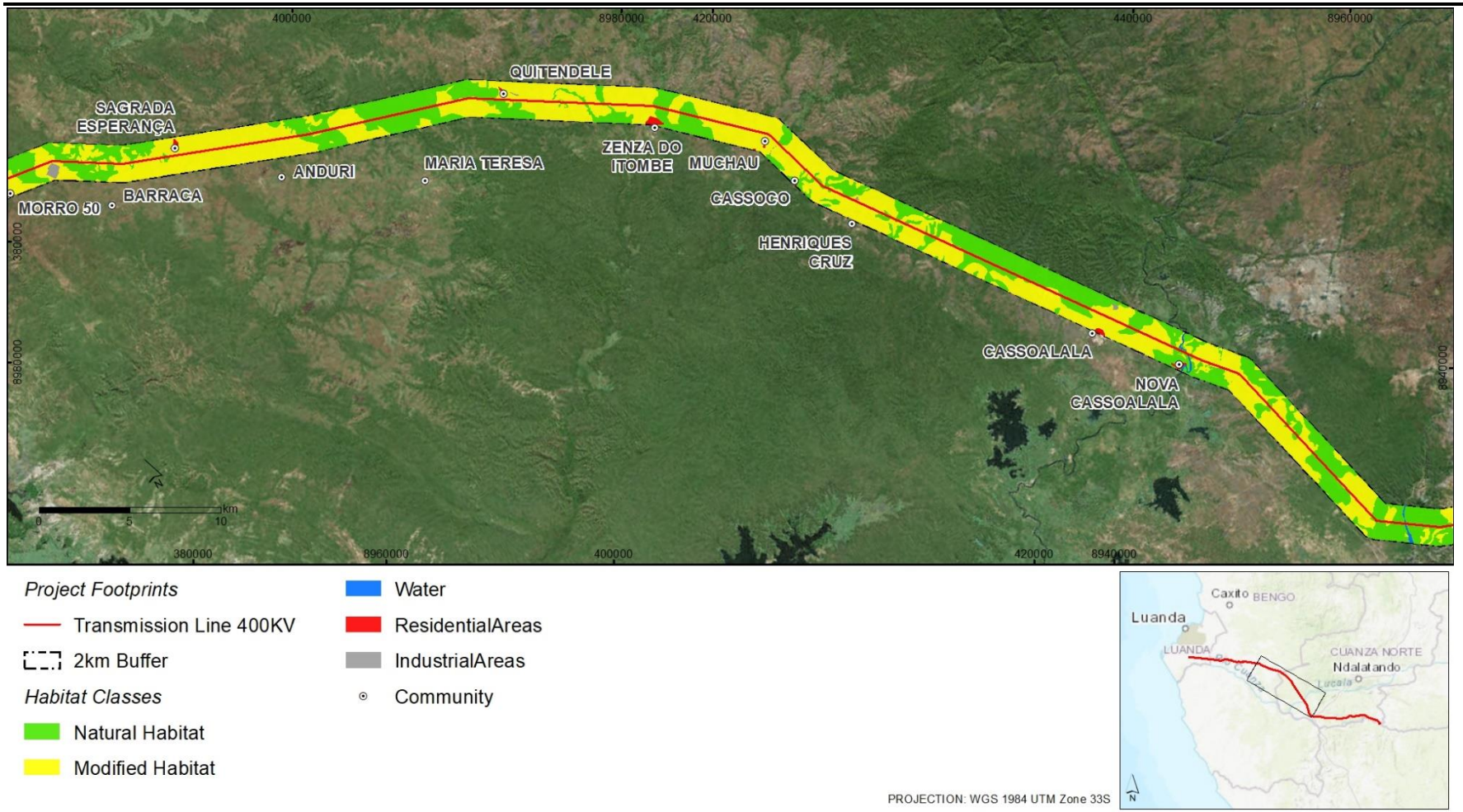
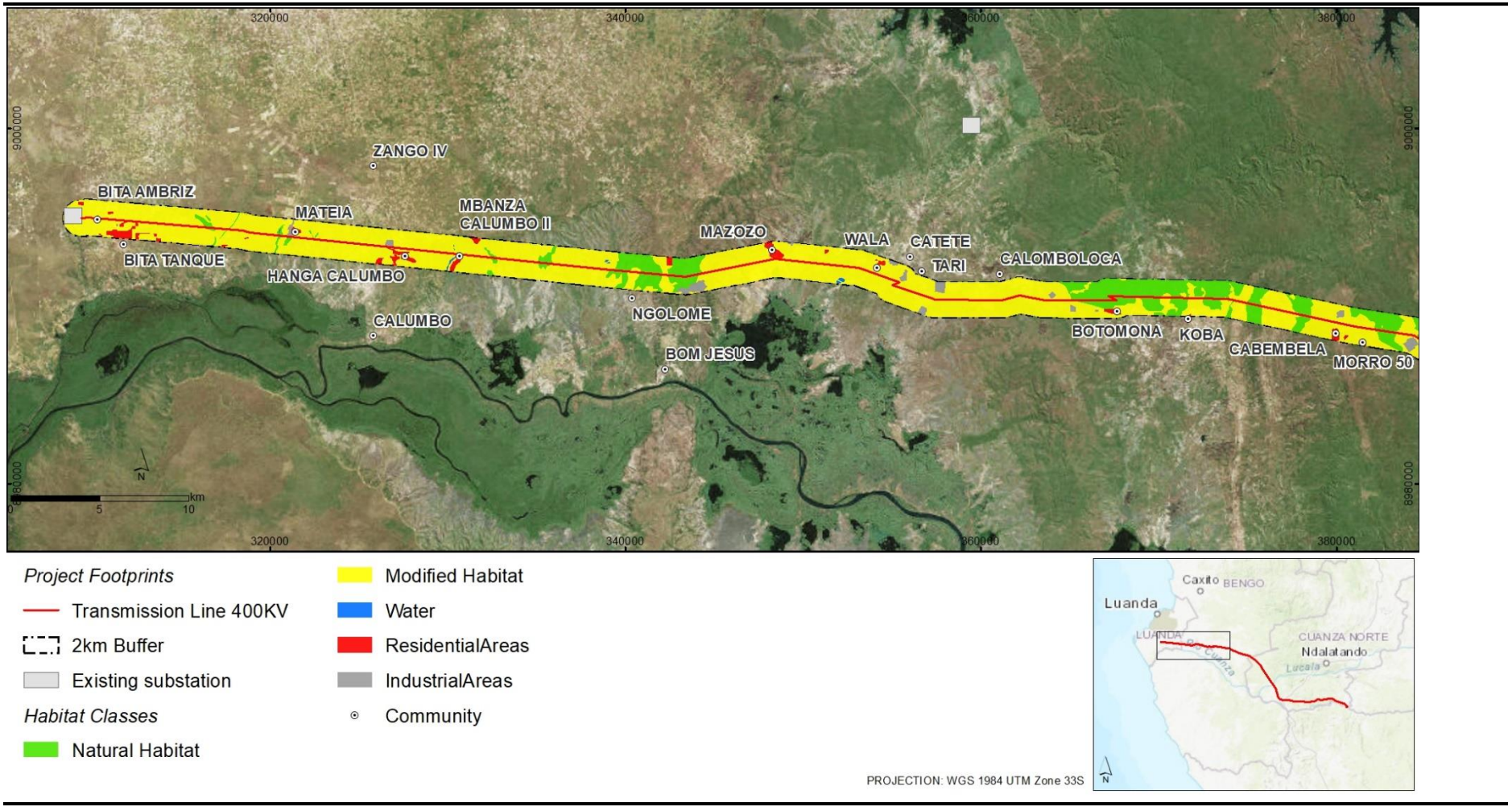


Figure 7.29 PS6 Classification of Habitats Map (3 of 3)



7.3.5 Ecosystem Services

Considering the rural setting of the Project area, communities rely on the use of natural resources for their livelihoods. This might include the collection of timber and firewood, the production of charcoal, fishing, honey production, harvesting of plants and fruits (food, medicines, ornamental) and bushmeat hunting. These activities may be for self-consumption as well as for selling.

Local communities are also very likely highly dependent on water resources (for cooking, drinking water, laundry), that are provided by the Kwanza River tributaries. It is unknown whether any access to groundwater resources is currently possible for communities potentially affected by the Project.

Based on the land use mapping as well as on the vegetation mapping (*Annex A*), within the project AoI there are no particularly important areas for ecosystem services delivery.

Particularly important areas are the forested areas, mostly located around the Lucala River, which will not be directly affected by the project. These forests provide a wide range of ecological, political, economic, social and cultural services which include the following:

- Provisioning services: timber used for construction; timber products 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 underground water; and habitat for a number of biodiversity species;

- Regulating services: climate regulation by the means of carbon capture and storage as well as protection from soil erosion in certain areas of the project, particularly in mountainous areas;

- Cultural services: health benefits for people living near the forested areas and the existence of cultural and spiritual associations between the people and the forest; and

- Supporting services: biodiversity resources including providing habitat; water and nutrient cycling; as well as primary production.

7.4 SOCIAL BASELINE

This section provides an overview of socio-economic conditions in the two provinces in Angola where the Project is located, namely Cuanza Norte and Luanda provinces. It also provides a more detailed description of the 18 settlements of the Study Area located along a 500 m corridor of the 236 km long Laúca-Bita transmission line, the potential routes of which are shown in *Figure 2.1.* The Study Area for the social baseline is explained in detail in *Section 7.1.1.* Information is presented in this section at a settlement, commune and municipality level, with reference to other levels (i.e. provincial and national) where relevant.

7.4.1 *Overview*

Following independence from the Portuguese, Angola went through almost thirty years of civil war (1975 - 2002). It is estimated that 1.5 million people were killed by the conflict, and four million displaced. Infrastructure was destroyed and landmines were prevalent throughout the country which have to date killed or injured an estimated 80,000 people. An extensive demining process has been ongoing and remaining contamination is now predominately located in rural, underdeveloped areas. (1) Much of the land being released is used for agriculture, which is of critical importance for acutely poor communities reliant on subsistence farming. The demining process is usually carried out either by the Angolan army or by private demining companies, and is mostly manual using metal detectors. The demining operator is in both cases authorized by the National Intersectorial Commission for Humanitarian Demining and Assistance (CNIDAH) and the National Demining Institute (INAD) to guaranty alignment with the UN International Mine Action Standards (IMAS), including community safety considerations according to ISO9001:2008. (2) Health and safety considerations adopted by demining operators are described in more detail in *Section 2*.

Since the end of the war the political situation has been stable: general elections occur every five years and the 220 seats in parliament are filled. Each province can elect up to 5 people (for a total of 75 representatives) and the additional 145 are elected nationally. Each party provides a list of their eligible candidates.

[1] Mine Action in Angola Landmine-Free by 2025, Katherine Lawson 2017
https://www.chathamhouse.org/sites/default/files/events/2017-06-15-landmines-angola-appg.pdf
[2] Client Information

The current estimated population in Angola is 28 million people (25 million according to the 2014 Census) [1], the population growth rate is 3.4 %[2], and life expectancy is 61.2 years. [3] Angola is placed 150 out of 188 countries by the United Nations Development Program (UNDP) Human Development Index (HDI) for 2016, with an index of 0.533. [4]

The Study Area crosses central western Angola east to west, and passes through a landscapes which is dominated by areas of savannah.

The settlements in the Study Area (i.e. close to the transmission line route) are mostly located along or a short distance from the main road, and present homogeneous characteristics with slight differences from rural to peri-urban areas where urban residential expansion is common due to the proximity of larger centres. The main urban centres along the area of study are Dondo (Cambambe municipality), Catete (Icolo e Bengo municipality), and larger peri-urban areas in the municipalities of Viana and Belas, close to the municipality of Luanda.

Population size differs, but main livelihoods are quite homogeneous, with the predominance of subsistence agriculture (including animal herding) along the entire transmission line route, from Lauca to Bita. Other economic activities including small scale trading and temporary informal jobs (*biscatos*) are found mainly in the settlements located in the municipalities of Viana and Belas, and in the outskirts of Catete commune (Icolo e Bengo municipality).

Access to health and education services are limited throughout the transmission line route. Key sensitivities have been identified close to the transmission line route (within approximately 250 m each side of the proposed 400 kV transmission line route) that should be considered as the transmission line route. These sensitivities have been identified through desk-based review of satellite images, field ground truthing and stakeholder feedback and encompass specific agricultural land uses, infrastructure and isolated buildings and farms. These sensitive receptors are discussed in detail in the Resettlement and Compensation Action Plan (RCAP).

An overview of the socioeconomic characteristics found throughout the settlements in the Study Area is presented in *Table 7.11*.

[1] National Institute of Statistics (Angola). Angola Population and Housing Census 2014.
[2] World Factbook, CIA.
[3] World Health Organization – Angola: WHO statistical profile. Access: August 2018. Available at http://www.who.int/gho/countries/ago.pdf?ua=1
[4] UNDP. Human Development Reports 2016. Accessed at: http://hdr.undp.org/en/countries/profiles/AGO

7.4.2 *Governance and Administration*

Local Administrative Structure

Angola is composed of eighteen (18) provinces (*províncias)* which are further divided into 164 municipalities (*municípios*) and 518 communes (*comunas*). Each province is formed of municipalities and communes.

Governors of the provinces are appointed by the national government, and municipal administrators are appointed by the governor of the province in which the municipality is located. The municipal administrator in turn appoints commune administrators. There are no formal institutions below the commune.

The provinces are responsible for the promotion and orientation of socio-economic development, provincial planning, social support, education, healthcare, environment protection, etc. They also play a role in the execution of decisions made by central authorities regarding regional/local matters, and supervise public institutes and companies of provincial/local importance. Municipalities are responsible for municipal and urban planning, agriculture and rural development, primary healthcare, municipal police and sanitation. [1]

Municipalities rely on commune administrators to plan and implement policies at the community level. In communities, local leadership is provided by the *soba* or community coordinator whose role is to liaise with commune administrators to address community issues. As described further below, *Sobas* are selected by the community they represent.

Administrative Structure and Settlements in the Study Area

The transmission line route passes through the municipalities of Cambambe (Cuanza Norte Province), Icolo e Bengo, Viana, and Belas (Luanda Province). *Table 7.11* in *Section 7.4.2* shows the administrative units crossed by the transmission line route.

The list of settlements included in the Study Area and their municipality and commune affiliation is presented in *Table 7.11* below. Some of the settlements in the Study Area are smaller settlements associated with larger settlements located outside the 500 m Study Area. These "associated settlements" are marked with an asterisk (*) in the table below and the name of the main settlement is also mentioned.

Table 7.11 Settlements in the Study Area

Municipality	Commune	Settlement
Cuanza Norte Province		

[1] Angola Profile, OECD (October 2016). Access: August 2018. Available at: https://www.oecd.org/regional/regional-policy/profile-Angola.pdf

Municipality	Commune	Settlement
Cambambe	Zenza do Itombe	• Quitendele • Zenza do Itombe • Muchau
	San Pedro da Quilemba	• Aldeia Lucapa • Quisuba • Dumbo Ya Pepe • Nhangue Ya Pepe
Luanda Province		
Icolo e Bengo	Bom Jesus	Ngolome (*) (Bom Jesus)
	Catete	• Mazozo • Tari • Wala (*) (Catete)
	Calomboloca	Koba (*) (Calamboloca)
	Cassoneca	• Sagrada Esperança (*) (Barraca)
	Cabembeia	Morro 50 (*) Cabembeia
Viana	Calumbo	• Mbanza Calumbo II • Hanga Calumbo
	Kikuxi	Mateia
Belas	Quenguela	Bita Ambriz

Source: ERM 2018

Local Decision-Making

Communes are administrative units further divided into *bairros*, sectors, and *blocos*.

In rural areas, these subdivisions are also called communities (*comunidades*) or *aldeias*, while in peri-urban areas it is most usual to find references to *bairros* (neighbourhoods). Peri-urban *bairros* are located close to urban centres and present a mix of urban and rural characteristics.

In Angola, traditional leadership plays an important role in local governance. The chief, known as *soba*, is the local governing authority in rural and most peri-urban areas. The *soba* is chosen by the elders from the lineage of chiefs, among the men who were raised to be *sobas*. Traditionally, the *soba* works together with village elders to address various matters at the local level, including land administration and management. The *soba* often has the support of a secretary (*secretário*) who is in charge of the community statistics. The secretary is normally a young male from the community who has attended school.

The *soba* often continues to serve as the sole governing authority for the population, particularly in remote areas where the local government's capacity and resources are limited.
In these areas, the relationship between the formal government officials (commune and municipal administrators) and the traditional authorities is critical to a population's relationship to formal government. (1)

[1] USAID. Strengthening land tenure and property rights in Angola: Land Law and Policy. May 31, 2007.

In areas where the *soba* is no longer the main local authority, most common within and proximal to peri-urban areas, there are other positions that exercise the role of liaison with the commune and municipal local authorities, such as coordinators (*coordenadores*), who work as social mobilizers. There can also be *bairro* coordinators and resident committees (*comissoes de moradores*). Coordinators are appointed by the government of the commune and are usually chosen from the party local leadership.

There are cases in which the *soba* continues to be respected as local authority but the role of engaging with commune and municipal authorities is undertaken by the community coordinator. There are also cases where the *soba* is ill or has recently passed away and the new chief has not been appointed yet.

Table 7.12 Main Local Authority Representatives in Study Area Settlements

Municipality	Settlement*	Main Community Authority
Cuanza Norte Province		
Cambambe	Nhangue Ya Pepe	*Soba*
	Dumbo Ya Pepe	*Soba*
	Quissuba	*Soba*
	Aldeia Lucapa	*Soba*
	Muchau	*Soba*
	Quitendele	*Soba*
	Zenza do Itombe	*Soba*
Luanda Province		
Icolo e Bengo	Sagrada Esperança	*Soba*
	Mazozo	*Soba*
	Koba	*Soba*
	Morro 50	Coordinator
	Tari	Coordinator
	Wala	Coordinator
	Ngolome	Coordinator**
Viana	Hanga Calumbo	Coordinator
	Mbanza Calumbo II	Coordinator
	Mateia	Coordinator***
Belas	Bita Ambriz	Coordinator

Source: ERM Social Field Survey (2018)

Notes: (*)Soba recently died and new soba to be appointed; (***) Soba is ill, community coordinator is currently the main point of contact.

Planning and Development

In Angola the main development plans are sectorial plans and provincial plans. For the period 2018- 2022, the National Development Plan combines the information prepared by the provincial governments and therefore separate provincial plans are no longer available. The province of Luanda has a Master plan, which has not yet been fully disclosed and more local development plans do not generally exist. Key relevant plans are presented as follows.

Energy

The Lauca-Bita transmission line project is included in the national strategy defined in the 2018-2022 National Development Plan (PDN) as one of the key projects to develop the country's economy and provide energy to industrial and urban areas. The PDN 2018-2022, approved in April 2018, defines the national strategy plan divided in the following axis: [1]

- Human development and welfare;
- Economic development;
- Infrastructure;
- Consolidation of peace, democracy, governance, state reform and decentralization;
- Territorial development; and
- Stability and territorial integrity, and strengthening of Angola's regional and international role.

The policies within Axis 3 - Infrastructure, focus on expanding access to energy in urban areas, main municipalities and rural areas. The main priorities of this policy are, amongst others, to increase the electrification rate and to strengthen the national energy network systems

Agricultural Development

The provinces of Luanda and Cuanza Norte are integrated into the Program of Acquisition of Agro-Livestock Products (PAPAGRO), launched in November of 2013. PAPAGRO aims to improve the distribution and marketing of agricultural production through the forming of cooperatives and associations and development logistics and distribution centres with the goal to increase the economic income associated with agricultural production and to contribute to the fight against hunger and poverty.

7.4.3 Demographics

National

Angola's current population is estimated to be 28 million, three million more than the population identified by the 2014 national census.
Despite the country's rapid post-war economic growth based on oil production, more than 40% of the population lives below the poverty line and unemployment is widespread, especially among the young-adult population. Only about 70% of the population is literate, a figure which reduces to 60% for the female population. The average age for first pregnancy is 19.2 years old, but it is considerably lower in poorer areas as identified during the field work in the Study Area. The country's high maternal mortality rate (477 deaths/ 100,000 live births, 2015 estimate) can be a result of lack of access to trained

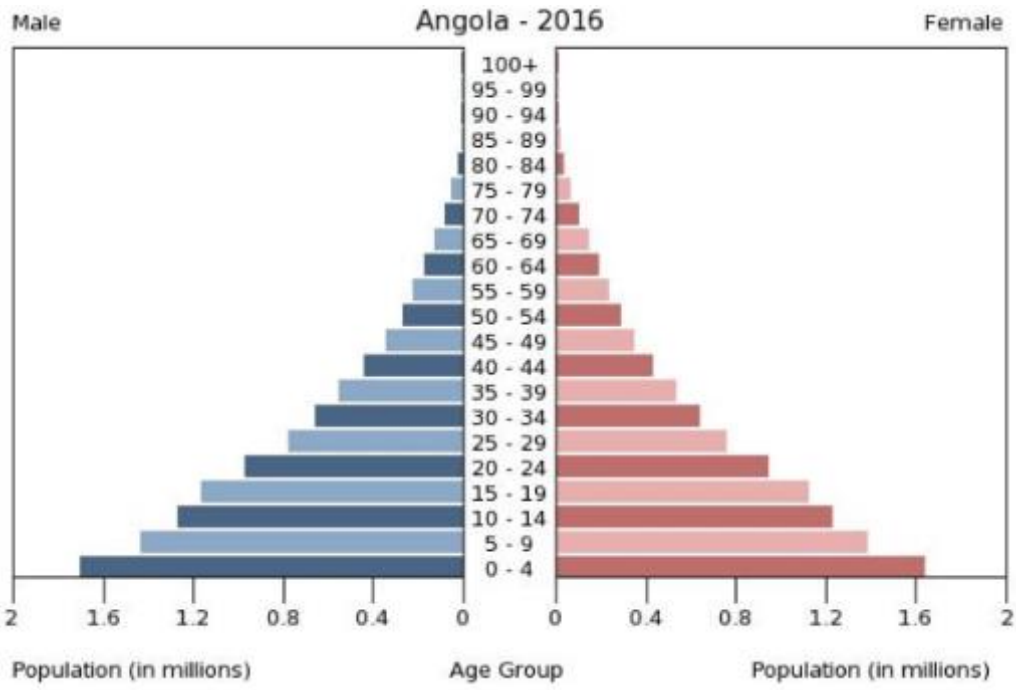
[1] 2018-2022 National Development Plan. Access: August, 2018. Available at https://www.info-angola.com/attachments/article/4867/PDN%202018-2022_MASTER_vf_Volume%201_13052018.pdf.

health care personal assisting women during delivery. Infant mortality rate is 67.6 deaths/1,000 live births (2017 estimate). [1]

Based on the national census conducted in 2014, 52% of the population are female and 48% male; 47% are children below 14 years old, and 2.4% are over 65 years old. [2] The country's average population growth is 3.4 [3], with a life expectancy at birth of 60 for men and 65 for women. [4]

The national birth rate is at 44.2 births/1,000 population (2017 estimate) and the death rate is 9.2 deaths/1,000 population (2017 estimate)[5]. *Figure 7.30* illustrates the country's population distribution by age group and gender.

Figure 7.30 Age Distribution by Age and Gender in Angola (2016, estimate)



Source: The World Factbook, CIA.

The majority of the population lives in the coastal western part of the country where urban areas account for the highest concentration of people. The urban

[1] The World Factbok, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.
[2] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014.*
[3] 3.52% as estimated in 2017 places Angola as the world's secong highest population growth rate, behind South Sudan. The World Factbook, CIA.
[4] World Health Organization – Angola: WHO statistical profile. Access: August 2018. Available at http://www.who.int/gho/countries/ago.pdf?ua=1
[5] The World Factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.

population is 65.6% (2018) and annual urbanization rate is estimated to be 4.32% (2015-2020 estimate). (1)

Provincial

The population of Luanda province corresponds to 23% of the country's population, whereas Cuanza Norte's corresponds to 1.3%. Demographic density is 347 and 21 people per square kilometre in Luanda and Cuanza Norte, respectively. Both provinces present the same male/female ratio of 49% male and 51% female. In Luanda province, 97.5% of the population reside in urban areas, while in Cuanza Norte the urban population is 61%. (2)
The average number of persons per household in Cuanza Norte province is 7.0, in Luanda province is 4.7, while the national average is 4.6. Both provinces have a relatively young population as 48% in Cuanza Norte and 66% in Luanda are 24 years of age or below. (3)

Municipal

The four municipalities in the Study Area, Cambambe (Luanda province), Icolo e Bengo, Viana, and Belas (Luanda province), comprise around 10.7 % of the country's population.[4] The 2014 Census does not provide data on urban and rural population distribution by municipality; however, during the field survey conducted in July 2018 it was observed that settlements in the Study Area within these four municipalities are predominantly rural and dispersed.

The most populated of the four municipalities in the Study Area is Viana located in the far west of the transmission line route with 5.9% of the country's population, followed by Belas (4.1%). Both have a population of over one million inhabitants. Icolo e Bengo and Cambambe have a population of less than 90,000, representing less than 1% of the country's population. *Table 7.13* shows the profile of the four municipalities, including the percentages of male and female, as well as the percentage in relation to the country and province total population. No official sources for population data at the commune level were identified.

[1] The World Factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.
[2] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014*; *Resultados Preliminares do Recenseamento Geral da População e da Habitação de Angola 2014*.
[3] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014*; *Resultados Preliminares do Recenseamento Geral da População e da Habitação de Angola 2014*.
[4] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014*; *Resultados Preliminares do Recenseamento Geral da População e da Habitação de Angola 2014*.

Table 7.13 Population in the Municipalities in the Area of Study

Municipality	Total population	% male	% female	% of Provincial population	% of Country population	Demographic density (people/km²)
Cuanza Norte Province	***427,971***	***49.0%***	***51%***	***-***	***1.6%***	***21***
Cambambe	88,951	49.8%	50.2%	20.8%	0.3%	17
Luanda Province	**6,542,944**	***49%***	***51%***	***-***	***25.3%***	***347***
Icolo e Bengo	74,644	50.8%	49.2%	1.1%	0.3%	24.4
Viana	1,525,711	49%	51%	23.3%	5.9%	2,202
Belas	1,065,106	49%	51%	16.3%	4.1%	1,018
Angola	**25,789,024**	***48%***	***52%***	***-***	***100%***	***20.7***

Source: Census 2014, Final and Preliminary Results

Settlements

As summarized in *Table 7.14*, 18 settlements were included in the social field survey conducted in July 2018 (including two settlements surveyed separately in October 2018), across the two provinces (Cuanza Norte and Luanda), four municipalities (Cambambe, Icolo e Bengo, Viana, and Belas), and nine communes crossed by the transmission line 500 m corridor. The total population within all settlements surveyed is approximately 19,000 which accounts for around 0.07% of the national population. The population of the municipalities crossed by the Study Area in each province is presented in *Table 7.13* above.

The demographic and other characteristics of the settlements surveyed are very much influenced by their location and rural or peri-urban status. Settlements located closer to the Bita Substation, in the western portion of the transmission line, in the municipalities of Viana and Belas, and those located closer to larger population centres present a mix of urban and rural characteristics, whereas settlements located in the east further from municipal centres are more rural. Close to the transmission line there are two large population centres: Dondo (Cambambe municipality) and Catete (Icolo e Bengo municipality). Each centre is a focus of administration, employment and commerce, and access to healthcare and education services.

The most populated settlements along the transmission line are located in the western portion of the transmission line, specifically Tari (Icolo e Bengo municipality) and Mateia (Viana municipality) with a population of approximately 3,500-4,500 people, as shown in *Table 7.14* below. These settlements belong to the municipalities of Icolo e Bengo and Viana respectively. In contrast, the least populated settlements are Dumbo Ya Pepe and Muchau, both in the municipality of Cambambe in the eastern portion of the line close to the Lauca station, with a population of less than 110 people.

Table 7.14 Population in the Study Area Settlements

Municipality	Commune	Settlement	Population size*	Location/Type
Cuanza Norte Province				
Cambambe	San Pedro da Quilemba	• Aldeia Lucapa • Quisuba • Dumbo Ya Pepe • Nhangue Ya Pepe	Over 200 residents 345 residents 54 residents 525 residents	rural rural rural rural
	Zenza do Itombe	• Quitendele • Zenza do Itombe • Muchau	1,778 800 residents 103 residents	rural rural rural
Luanda Province				
Icolo e Bengo	Bom Jesus	• Ngolome (Bom Jesus)	495 residents	rural
	Catete	• Mazozo • Tari • Wala	2,600 residents 4,203 residents 667 residents	rural peri-urban peri-urban
	Calomboloca	• Koba	1,780	rural
	Cassoneca	• Sagrada Esperança (Barraca)	190 residents	rural
	Cabembeia	• Morro 50	n/a	peri-urban
Viana	Calumbo	• Mbanza Calumbo II • Hanga Calumbo	348 residents 1,175 residents	rural peri-urban
	Kikuxi	• Mateia	3,550 residents	peri-urban
Belas	Quenguela	• Bita Ambriz	250 residents	peri-urban

Source: ERM (2018).
Notes: (*) As informed by soba or community coordinator during social field survey.

Based on demographic estimates obtained through engagement with village sobas and community coordinators, it is assumed that the age profile of surveyed settlements within the Study Area is similar to the national profile with the largest age group represented by children under 15 years of age (40-45%), followed by 16-60 years, and a small number of people over 60.

Similarly, in terms of distribution of men and women, the profile of the settlements surveyed is also assumed to be similar to the national profile, with a predominance of women over men. Both in the rural and peri-urban settlements surveyed women continue to focus on the home and money management is undertaken by men. In rural areas women also focus on helping in the field in addition to taking care of the home, while men are in charge of hunting, fishing and harvesting of forestry products. This division of labour is further detailed in *Section 7.4.9* on livelihoods and income.

Women interviewed in the Study Area believe they work harder than men by taking on the responsibility of working alongside their husbands in the fields,

managing the household and raising their children. They also stated they do not have any leisure time and there are no leisure activities in which women can participate. The men's main leisure activity is football.

Migration and Population Change

During the civil war years, an estimated 550,000 Angolans fled the country.

It is believed that most have returned home since 2002. A 2012 UN study found the conditions in Angola to be stable for several years and invoked a cessation of refugee status for Angolans, and some of those who were still living in exile returned voluntarily to the country through UN repatriation programs. (1)

Internal displacement due to conflict was high during the civil war, when population fled conflict zones towards areas closer to Luanda. Internal displacement nowadays are mainly the result of infrastructure development promoted by the national government or disasters.

International refugees and asylum seekers from the Democratic Republic of the Congo accounted for 35,873 people in 2018. Angola's net migration rate is 0.2 migrant(s)/1,000 population (2017 estimate). (2)

International refugees were not identified in the surveyed settlements.

7.4.4 Ethnicity, Language and Religion

Ethnicity and Language

The majority of Angola's population is Umbundo ([3]) (37%), followed by Quimbundo (25%), Bacongo (13%), mestiço ([4]) (2%), European (1%), and other (22%). (5)

The main ethnic groups in settlements of the Study Area are Quimbundo, Umbundo, Bacongo, and Chokwe. As shown in *Table 7.15*, Quimbundo is the majority group in 56% of the settlements, followed by Umbundo (19%)[6]. Bacongo is the majority in the settlements of Hanga Calumbo and Bita Ambriz in the municipalities of Viana and Belas respectively, and Tchokwe in one (Morro 50). Other ethnic groups mentioned are Ngonya, Nganguela, Nyaneca, and Kwanhama. No conflicts or tensions between groups have been reported. Ethnic groups are primarily based on family history and identity with no clear differences between groups.

[1] The World Factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html
[2] The World factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html
[3] Or Ovimbundo, depending on data source.
[4] Mixed European and native African.
[5] The World Factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html
[6] Summary to be updated once data on 2 additional surveys is available

Table 7.15 Major Ethnic Groups in Surveyed Settlements

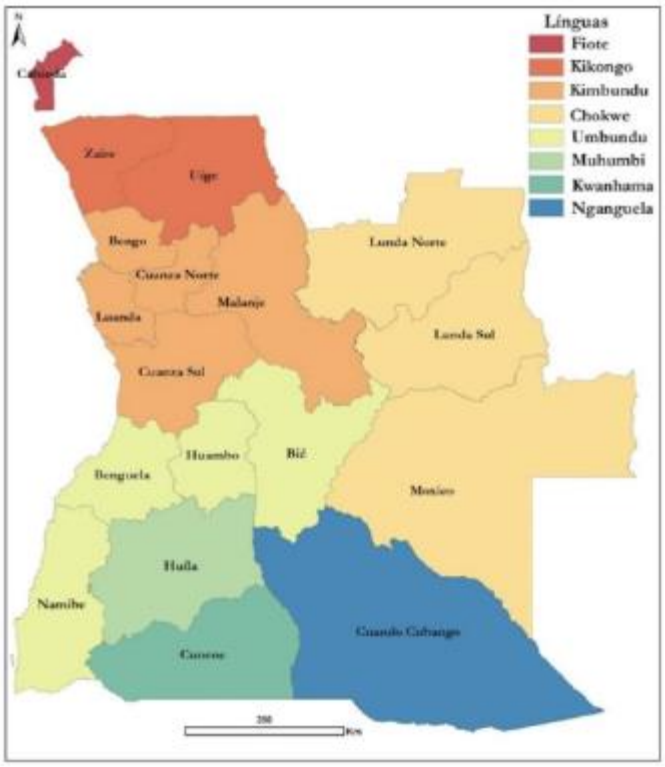
Municipality	Settlement	Majority Group[1]
Cuanza Norte Province		
Cambambe	Nhangue Ya Pepe	Quimbundo
	Dumbo Ya Pepe	Quimbundo
	Quissuba	Quimbundo
	Aldeia Lucapa	Quimbundo
	Muchau	Quimbundo
	Quitendele	Quimbundo
	Zenza do Itombe	Quimbundo, Ovimbundu, Tchokwe
Luanda Province		
Icolo e Bengo	Sagrada Esperança	Umbundo
	Koba	Quimbundo
	Mazozo	Quimbundo
	Morro 50	Tchokwe
	Tari	Quimbundo
	Wala	Quimbundo
	Ngolome	Umbundo
Viana	Hanga Calumbo	Bakongo
	Mbanza Calumbo II	Quimbundo
	Mateia	Umbundo
Belas	Bita Ambriz	Bacongo

Source: ERM Social Field Survey (2018)

While the official language is Portuguese, more than 60 different Bantu-group languages are spoken across Angola. The main spoken languages in Angola are Portuguese spoken by 71.1% of the population, Umbundu by 22.9%, Quicongo by 8.2%, Quimbundo by 7.2 %, Chokwe by 6.5%, and the remaining of the population speak a variety of other languages. *Figure 7.31*, illustrates the main languages spoken in each province. In the two provinces of the Study Area, Cuanza Norte and Luanda, Quimbundo are shown as the main language spoken. However, during the field work it was identified that Portuguese is widely spoken, including among women.

[1] Quitendele and Koba to be added

Figure 7.31 Languages Spoken in Angola by Province



Source: 2014 Census.

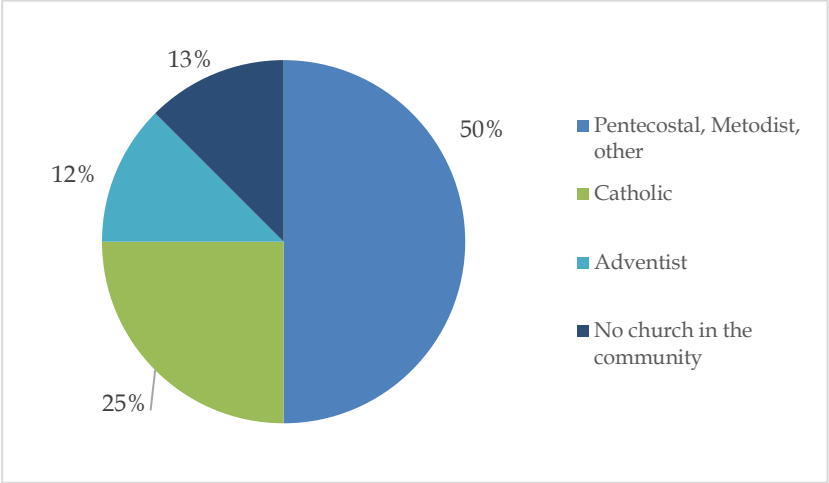
Religion

In Angola, the majority of the population is Christian (41% Catholic and 38% Protestant), 12.3% declared as having no religion, 0.6% are Animists, 0.4% Muslims, 0.2 Jewish, and 7.4% other religion. (1) The population in the settlements surveyed is predominantly Christian.

Religion in the settlements of the Study Area is often associated with place of worship. (2) With the exception of Dumbo Ya Pepe (municipality of Cambambe), all surveyed settlements have churches, usually at least one Catholic and one Protestant (or Evangelical). The main churches identified are Roman Catholic, Adventist, Methodist, and Pentecostal. *Figure 7.32* illustrates the distribution of main churches across the settlements.

[1] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014. Resultados Preliminares do Recenseamento Geral da População e da Habitação de Angola 2014.*
[2] I. e. When asked about Religion, respondents informed which church they attend.

Figure 7.32 Main Churches along Surveyed Settlements within the Study Area



Source: ERM Social Field Survey (2018)

7.4.5 *Gender and Gender Rights*

Angola's Constitution establishes a right of non-discrimination on the basis of sex and provides for the equality of men and women within the family and the country ratified the Protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa, referred to as the "Maputo Protocol." This Protocol guarantees a wide range of rights for women and calls for an end to gender-based violence and discrimination against women. Angola is reported to have medium levels of discrimination against women in social institutions. Although there is reportedly lower levels of discrimination in son bias [(1)], higher levels of discrimination are found in terms of women's access to resources and assets. [(2)]

One of the main challenges for women in Angola, particularly in areas, relate to lack of access to education and exclusion from decision-making. Rural women are rarely represented in politics, even by women leaders. [(3)]

Regardless of the source of land access (e.g. inheritance, lease, purchase), Angolan women generally do not have land access equal to men. Traditional succession practices generally establish that family land passes to sons and male relatives of the deceased. Under traditional customary tenure practices, women usually have access to land through their status as a daughter or wife. As the system evolves to more individualized rights, the evolutionary process often omits identifying the land rights of women.
As a result, not only do women fail to obtain the benefits of the more individualized rights, they may simultaneously lose their traditional right of

[1] "Son bias" is a term used by the Social Institutions and Gender Index (SIGI) to measure unequal treatment between sons and daughters at the household level including differential investments in care and nurture of boys and girls.
[2] Social Institutions and Gender Index 2014 Edition. Access: August 2018. Available at https://www.genderindex.org/country/angola/
[3] Search For Common Ground. Women's rights in Angola. Access: August, 2018. Available at https://www.sfcg.org/womens-rights-in-angola/

access. In some areas, the *sobas* may support the rights of widows' rights to their husbands' land, or the rights of a divorced women seeking land from their fathers. However, the women's success depends on the active support of the sobas as opposed to settled principles of customary law. [1]

7.4.6 Community Networks

No strong support systems were identified in the surveyed settlements throughout the Study Area. In a few cases, specifically the settlements of Nhangue Ya Pepe and Dumbo Ya Pepe (eastern portion), and Mateia (western portion), families reported that they receive financial support from relatives who live in larger urban centres such as Dumbo or Luanda. In Tari (Icolo e Bengo municipality) and Mateia (Viana municipality) in the eastern portion, the community coordination offices also offer occasional financial support to the poorest households.

Support such as food provisions or share land use is more common than financial support, however is not widespread across the surveyed area.

No external support from regional and local governments, nor from non-governmental organisations (NGOs) or local association was identified in the Study Area at time of survey (July 2018).

7.4.7 Land Use and Ownership

Land Tenure

Under the Angolan Constitution, all land is State owned and may be either classified as State land of the Public Domain or State land of the Private Domain. State land of the Private Domain is considered "conferrable" land for which the property rights can be transferred.

Angolan land law recognizes several land rights regimes and interests in land including the "useful customary rights domain" which refers to the collective rights of occupation, possession, management, usage and exploitation that families or households in rural communities enjoy over the communal rural land they occupy and exploit. Rural communal land is considered as part of the "Public Domain" and is therefore not conferrable unless if determined otherwise by traditional authorities allowing the alteration and concession of Rural Community Land.

The exercise of customary rights is free and right holders are exempt from payments and fees of any kind.

[1] USAID. Strengthening land tenure and property rights in Angola: Land Law and Policy. May 31, 2007.

Most of Angola's population, including population living in the surveyed settlements, is unfamiliar with the formal land laws and considers its rights and obligations related to land governed by principles of customary and traditional practices. These principles and practices can differ from one place to the other, however, they share general characteristics: [1]

- *Land ownership*: by customary law, land is regarded as owned by a universal deity and living occupants' ancestors. The land is held by the community (or individuals) and managed by the community leader, the *soba*.

- *Land management and administration:* the *soba* is the main figure responsible for land allocation to individuals and households, establishment of areas for common use, definition of rules regarding communal land and associated resources, as well as for managing land disputes. The *soba* oversees land transactions and the inheritance of land.

In rural areas, including the surveyed settlements, all households are entitled to one parcel of land for individual agricultural use and one parcel for residential use. Inheritance is the main source of access to rural land, which can also be accessed by leasing, borrowing, and sharecropping; all these types of access were identified throughout the Study Area. The *soba* also allocates land to individuals and households, and he will take into consideration the size of the household and land availability when defining the size of the parcel.

In general, in urban/peri-urban areas, land access is less dependent on inheritance and allocation by the *soba* and more dependent on the land market. This was found in Mateia and Hanga Calumbo (Viana municipality), and Bita Ambriz (Belas municipality). Individuals and households looking for an area initially stay with relatives, rent, and ultimately buy a plot. In areas where the *soba* is no longer present, land matters are overseen my residential committees (*comissao de moradores*), often represented by community coordinators (*coordenadores*). These institutions are informal and have strong ties to political parties, nonetheless they are respected by local residents in a similar way to *sobas* in rural communities.

The residential committees in the surveyed settlements work closely with local government institutions when handling land requests.

In relation to land tenure and property rights in Angola, women do not have equal land access to men[2] .This is due to the fact that under traditional inheritance practices, land passes to sons and male relatives of the deceased, i.e. if the male household chief dies, his heirs are his sons (if any) or other male relatives such as brothers or nephews. Despite being known as the main traditional practice applied in Angola's remote rural areas, the social survey

[1] Social field survey (July 2018); USAID. Strengthening land tenure and property rights in Angola: Land Law and Policy. May 31, 2007.
[2] USAID. Strengthening land tenure and property rights in Angola: Land Law and Policy. May 31, 2007.

identified cases in which land tenure by women are relatively strong, especially in peri-urban areas such as settlements of Hanga Calumbo and Bita Ambriz, where women (*mamas*) are the main rights holders (and managers) of farming parcels. In these cases, these women are knowledgeable about who holds rights to each plot and the agreements between land holders and land users (if shared, rented).

Land Use

The growth and expansion of peri-urban and municipal centre boundaries in the municipalities of Belas, Viana and Icolo e Bengo have resulted in progressive changes of the land use patterns, and a gradual change in the occupational and livelihood patterns of people (livelihoods are described further in *Section 7.4.8*).

Nevertheless, the land coverage along the transmission line route remains mostly composed of savannah and forest, with occasional agricultural areas of seasonal and permanent crop production, and even fewer areas of industrial use. Within a 2 km corridor along the proposed transmission line, GIS analysis indicates that the land consists of savannah (34.7%), forest (24.7%), and savannah with agricultural patches (27%). Mosaic agriculture represents 6.1%, while residential and industrial areas are 1.3% and 0.7% respectively.

Land use in the Study Area is homogeneous in the rural areas, differing in peri-urban areas due to proximity of urban centres and the ongoing urban expansion. However, small scale agriculture of seasonal crops, especially cassava, is found in patches throughout the transmission line route; other seasonal crops identified in the Study Area include sweet potato, beans, peanut and maize. Permanent crops found in the Study Area are banana, papaya, mango and lime. *Table 7.16* describes the types of land uses found in the different municipalities in the Study Area along the transmission line route. A graphic overview of land uses along the transmission line route is presented in *Figure 7.33* below. A detailed presentation of the land cover and different land use types along the transmission line route is included in *Annex A – Map 4.*

Table 7.16 Land Use by Municipality

Municipality	Commune	Land uses	Key Sensitivities (*)
Cuanza Norte Province			
Cambambe	São Pedro da Quilemba Dondo Zenza do Itombe	Mixed land use with rural characteristics and predominance of small scale agriculture. Predominance of small scale agriculture of seasonal crops (i.e. cassava, beans, sweet potato, maize) and few areas with permanent crops. Settlements mostly rural with peri-urban areas close to Dondo and Zenza do Itombe.	All settlements along the transmission line route are rural and dependent on subsistence agriculture.
Luanda Province			
Icolo e Bengo	Calomboloca Cassoneca Catete Bom Jesus	Mix land use mostly with rural characteristics near the communes of Calomboloca, Cassoneca and Bom Jesus; and peri-urban characteristics near Catete. Small and large scale agriculture. Rural, peri-urban and urban residential areas. Industrial areas close to Catete.	Poultry farms in Ngolome and Koba, near Project line. Government residential project between Catete and Calomboloca. University campus planned next to poultry farm in Bom Jesus (Ngolome settlement).
Viana	Kikuxi Calumbo	Mixed land use with urban and peri-urban characteristics. Areas of residential expansion and areas of small scale agriculture of seasonal (cassava) and permanent (mango) crops.	Area of residential expansion in Mateia settlement. Large farms along Project line near Mateia settlement.
Belas	Quinguele	Mixed land use with peri-urban characteristics. Areas of residential use with both permanent and weekend houses (including *quintas*), and areas of small scale agriculture (i.e. cassava, mango trees).	Area of residential expansion in Bita Ambriz and 4 de Fevereiro. Weekend *quintas* and seasonal and permanent crops in Bita Ambriz.

Source: ERM Social Field Survey (2018)
Notes: (*) Key sensitivities identified along surveyed settlements. May not be fully comprehensive.

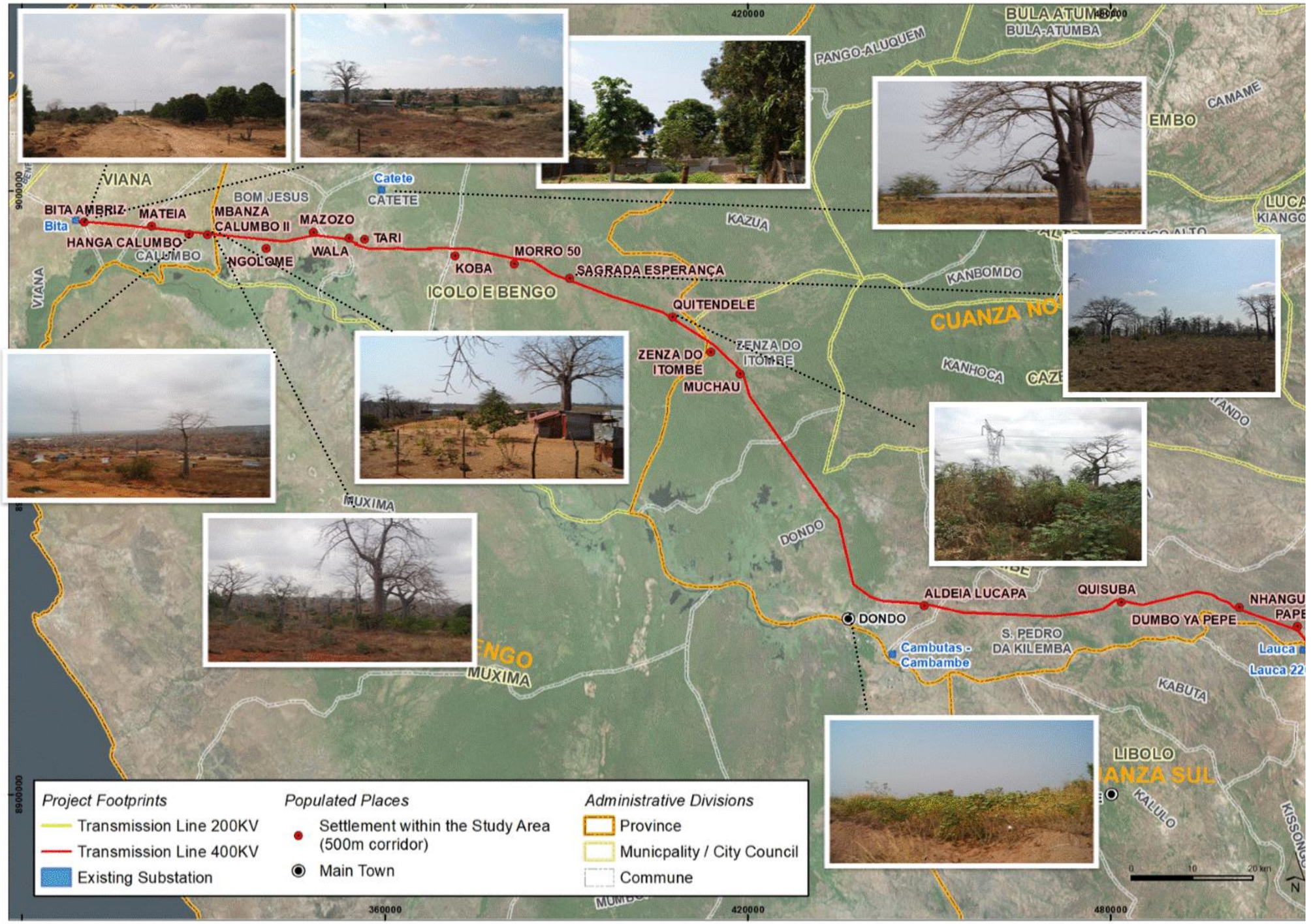
Within the 60 m corridor, directly affected by the transmission line right of way, 37.2% of the land cover is indicated by GIS analysis to be savannah, 24.2% is forest, and 27.3% savannah with agricultural patches. *Table 7.17* shows the area and percentage of land affected within the 500 m Study Area corridor (250 m each side) and the 60 m right of way (30 m each side) by land cover type. This table reflects the routing activities that have reduced the percentage of industrial and residential areas in the 60 m corridor in comparison to the wider 500 m corridor.

Table 7.17 Area and Percentage of Land Affected in the Study Area

Land cover type	500 m corridor			60 m corridor		
	Area (m^2)	Area (ha)	%	Area (m^2)	Area (ha)	%
Bare land	63,000	6.3	0.05	1,500	0.2	0.02
Forest	29,901,000	2,990.1	24.15	3,716,000	371.6	24
Industrial Areas	488,000	48.8	0.40	19,000	1.9	0.12
Mosaic Agriculture	6,470,000	647	5.22	670,000	67.0	4.32
Mosaic Vegetation	5,703,000	570.3	4.60	649,000	64.9	4.2
Residential Areas	475,000	47.5	0.39	20,000	2.0	0.14
Savannah	45,295,000	4529.5	36.58	5,791,000	579.1	37.22
Savannah with agricultural patches	34,761,000	3476.1	28.07	4,242,000	424.2	27.32
Water	283,000	28.3	0.23	367,000	36.7	2.38
Wetland	385,000	38.5	0.31	38,000	3.8	0.28
Total	**123,824,000**	**12,382.4**	**100.00**	**15,513,500**	**1,551.4**	**100.00**

Source: ERM (2018)

Figure 7.33 Land Use in the Study Area



7.4.8 *Economy and Employment*

Overview

Angola's economy is significantly dependent on natural resources such as oil and diamonds. Oil production and its supporting activities account for approximately 50% of the country's GDP, more than 70% of government revenue, and more than 90% of the country's exports. Subsistence agriculture provides the main livelihood for most of the people, but half of the country's food is still imported. [1]

Despite having a relatively high GDP per capita of US$6,499, pushed by oil revenues, Angola is a fairly poor and unequal country with more than half of the population living in poverty and consumer inflation rising to more than 30% after being sharply reduced from 325% in 2000 to 9% in 2014. With a Human Development Index of 0.533 and an Education Index of 0.482, Angola is ranked 150 and 146, respectively, out of 188 by the United Nations Development Program in terms of development levels and education attainment(2) .

Table 7.18 Key Economic Indicators (2016)

Indicator	Value
GDP per capita at Purchasing Power Parity	$6,499
Inflation (CPI)	34.7%
Unemployment	6.6%
Gini Index	42.7
Poverty[3]	55.7%
HDI	0.533
UN Education Index	0.482

Source: Bertelsmann Stiftung's Transformation Index (BTI) (2018)

Employment

Employment Rates and Sectors

The national employment rate, (the proportion of the population aged 15 years or more, which is economically active) was 40%, in 2014. In the provinces crossed by the Project, the employment rate was approximately 47% in Cuanza Norte and 37% in Luanda.

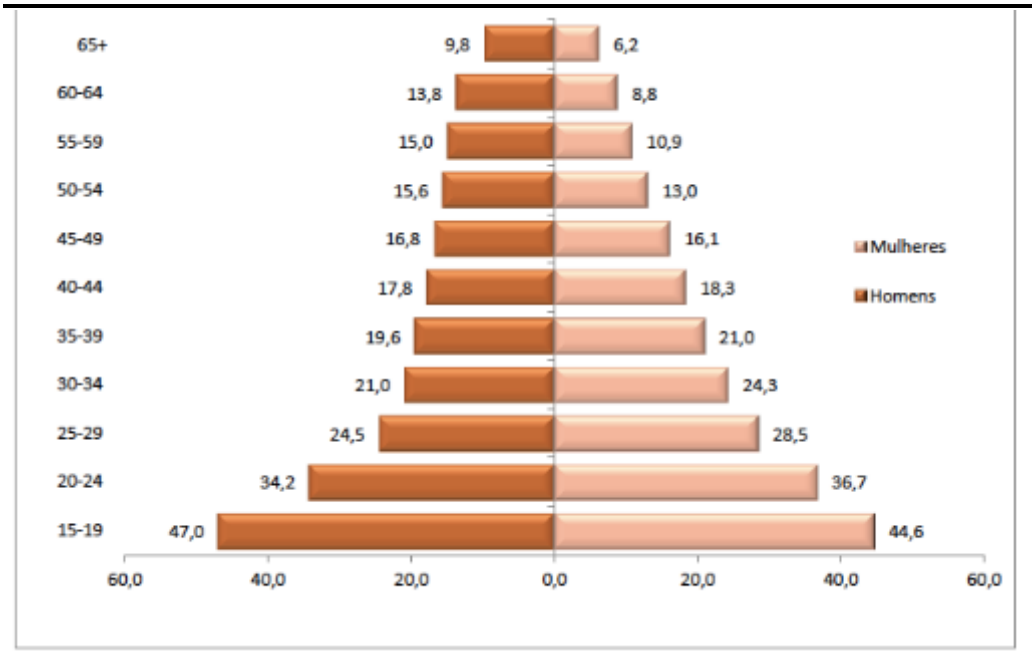
At the national level, unemployment was 24% in 2014, affecting mainly the young adult population of 15-24 years old, as illustrated by *Figure 7.34.* In 2014, the unemployment rate was between 18-24.2% and 30-33% in Cuanza Norte and Luanda, respectively.

[1] The World Factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html

[2] The Human Development Index (HDI) considers life expectancy, education, and per capita income as indicators of development. The Education Index corresponds to the education component of the HDI. It is calculated using mean years of schooling and expected years of schooling.

[3] Percentage of population living on less than $3.20 a day (at 2011 international prices).

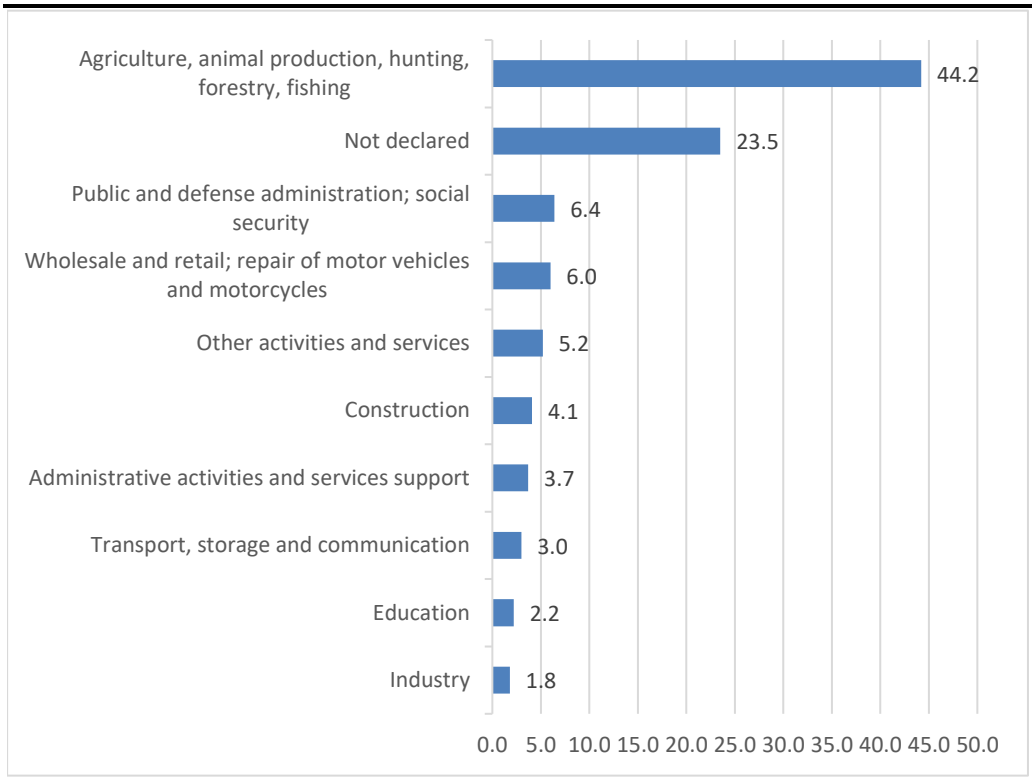
Figure 7.34 National Unemployment Rate by Age and Gender (2014)



Source: 2014 Census

Main sources /sectors of employment in the municipalities of the Study Area follow the national profile, with the predominance of the agriculture sector and related activities (i.e. forestry, hunting, animal husbandry, and fishing). As shown in *Figure 7.35* below, 44.2% of employment at national level is related to agriculture.

Figure 7.35 Employment by Main Activity in Angola (2014)



Source: 2014 Census (Translated)

Agriculture plays an important economic role in this region, especially in the area nearby Laúca (eastern portion) and the central section of the transmission line route, with agricultural production being used mainly for household nutrition. Beyond subsistence agriculture, the main economic activities along the Study Area can be divided into the three different geographic sections as follows:

- *Closer to Laúca* in the eastern part, in the municipality of Cambambe, the main economic activities consist of commercialization of agricultural production surplus (eg. cassava) and of firewood and charcoal; informal temporary jobs (*biscatos*), and small scale trading. Food processing activities are limited and consist primarily in transforming cassava or maize into a powder to make "*kissangua*", a local drink.

- *In the central section*, in the municipality of Icolo e Bengo, there is commercialization of agricultural production surplus (eg. maize, cassava, and sweet potato), complemented by sales of domestic goods; informal temporary jobs, and small scale trading. There is also occasional commercialization of fish and goats.

- *West of Catete commune* (Icolo e Bengo municipality) toward the municipalities of Viana and Belas, job opportunities are very limited. Temporary jobs include work on nearby farms, construction related work, cleaning services.

Lack of employment was one of the main complaints and challenges identified by interviewees, together with access to water, health and education services. This is likely a reflection of the desire for individuals to gain employment beyond subsistence agriculture. There is high expectation from local authorities and community members that projects such as the Lauca-Bita transmission line will create local jobs.

Decades of civil war has had a significant impact in the employment sector. In addition, formal employment demands personal identification documents, known as *Bilhete de Identidade* or BI. Along the surveyed area, the majority of the population does not have a BI and, although it is possible to register, costs are high especially for those living on very low incomes. It was reported that the average cost for a young adult to get a BI is around 27,000 kwanzas, plus transportation costs to larger settlements where this service is available. [1]

Informal Employment

The informal sector is an important source of employment for the population in Angola and most peri-urban employment is in the informal sector. This sector includes domestic work, wholesale and retail commerce, and primary production. Some activities appear to be strongly gendered; typically, female sectors include food manufacturing, services and trade.

Street vending is an important part of informal employment and of urban livelihoods. Street vendors offer a wide range of goods and services, and were mostly found along the Study Area in the municipalities of Viana (Mateia and Hanga Calumbo settlements) and Belas (Bita Ambriz settlement), and in the peri-urban areas of the municipality of Cambambe (Tari, Wala and Morro 50 settlements).

Informal employment is usually referred to *biscatos* (see more in the following section). *Biscatos* include painting, mechanics, smiting, wood and construction work, and agricultural labour. These types of economic activity were not considered 'employment' by the people interviewed during the survey, as for them the word '*employment*' implies a steady source of income.

Working practice and Labour rights

The institution concerned with the management of formal employment in Angola is the Ministry of Public Administration, Employment and Social Security (MAPESS). The legal framework governing labour and employment in Angola is the general labour law (Law n. º 7/15), which establishes procedures and guidelines for employment. Angola also has an Occupational Health and Safety System (Decree n. º 31/94) establishing the principles that promote safety, hygiene and health at work.

[1] Equivalent of approximately US$97, as of August 2018: US$1 = 276 kwanzas.

Angola's General Labour Law (7/15) stipulates that workers are allowed to form independent unions, to collectively bargain, and to strike. Anti-union discrimination is banned under this law. Nevertheless, these rights are constrained in practice. In particular, a minimum percentage (30%) of workers from a specific sector at the provincial level must be involved to establish a union, and authorities must grant an authorization for it to be legal. Government restrictions may also affect workers' right to strike. [1]

Surveys are conducted every year by the local government to assess the number of Angolan nationals hired by foreign companies, in particular in the oil sector. A company needs to ask the government's permission to hire expatriates, only in the event that no locals qualify for the position. [2] This practice is intended to promote local hiring and boost local employment and the national economy. However, according to the Labour Law, written employment contracts are only needed for temporary employment agreements or agreement involving foreign employees. [3]

As of 2018, the minimum wage in Angola is set at 16,503 kwanza per month under Presidential Decree No. 91/17 (roughly 47 Euro or 54.75 USD at the time of writing). [4] The minimum wage in agriculture is the same as the general minimum wage.

Child Labour

According to ILO standards on child labour, the general minimum age for admission to employment or work is set at 15 years (13 for light work) and the minimum age for hazardous work at 18 (16 under certain strict conditions).

In Angola, the law prohibits children under 14 from working, and allows work for children between 14 and 16 years of age with parental permission, or without if they are married and the work does not interfere with schooling or harm the physical, mental, and moral development of the minor. In practice, it is reported that 25.7% of children between 5 and 14 are working (22.1% are combining work and school, and 3.6% drop out of school and only work). Specifically, children tend to be employed in agriculture, construction, fishing (including high seas fishing), coal industries, mining and street work. [5]

A study carried out in Luanda found that 6.3% of working children are involved in construction-related services, which represent 10.7% of all construction labourers. Child labour in construction mostly applies to boys, who are employed more than twice as much as girls. [6]

[1] https://www.export.gov/article?id=Angola-Labor-Policies-Practices
[2] https://www.export.gov/article?id=Angola-Labor-Policies-Practices
[3] http://www.ilo.org/dyn/eplex/termdisplay.empContracts?p_lang=en&p_expandcomments=Y&p_checkbox=Y&p_country=103
[4] https://www.minimum-wage.org/international/angola
[5] https://lexuniversal.com/en/news/19383
[6] https://www.dol.gov/ilab/ICLRE/Downloads/Research/Report/Angola_Research_Report.pdf (Table 5.14 p.48, Table 5.12 p. 45)

Despite having ratified all international conventions concerning child labour, the existing gap between the minimum age for work (14) and the compulsory education age (12) leaves children vulnerable to the worst forms of child labour, including commercial sexual exploitation and other forms of forced labour [1]. The most common forms of forced labour in which children are involved include forcing children to act as couriers in illegal cross-border trade between Angola and Namibia, in the sale and transport of illegal drugs, working as thieves and, again, for sexual exploitation. [2]

Forced Labour

According to a 2017 report on Human Rights in Angola, forced labour occurred among men and women in agriculture, construction, domestic service, and artisanal diamond-mining sectors, particularly in Lunda Norte and Lunda Sul Provinces. Migrant workers were subject to seizure of passports, threats, denial of food, and confinement. The Ministry of Culture and the National Institute of Children (INAC) work to reduce the number of children traveling to agricultural areas in the country's southern regions to work on farms, mostly through community outreach about the importance of an education. [3]

7.4.9 Income and Livelihoods

Income

It is estimated that 36.6% of Angolans lived below the poverty line (US$1.9 per day) in 2008 and more than half of the population live on less than US$3.2 per day. [4] This context of low income was observed throughout the settlements visited in the four municipalities (Cambambe, Icolo e Bengo, Viana, and Belas).

In 2018, the Angolan Congress discussed the implementation of a monthly minimum income of 16,503 kwanzas, which still only corresponds to approximately US$59. [5] If implemented, it would apply to formal employment, which is uncommon in the Study Area.

Livelihoods

The majority of the settlements surveyed reported that subsistence agriculture (including animal husbandry) is the primary livelihood activity. In addition to agriculture, other livelihood activities reported are:

- Fishing;

[1] https://www.dol.gov/agencies/ilab/resources/reports/child-labor/angola#_ENREF_1
[2] https://www.dol.gov/ilab/reports/child-labor/findings/tda2009/angola.pdf
[3] https://www.state.gov/documents/organization/277211.pdf
[4] At 2011 international prices. BTI 2018 Country Report: Angola. Access: August 2018. Available at http://www.bti-project.org
[5] O Observador. Access: August 2018. Available at https://observador.pt/2017/06/08/salario-minimo-nacional-unico-em-angola-fixado-nos-88-euros/

- Hunting;
- Forestry (baobab, firewood); and
- Informal trade and *biscatos*.

As described in *Table 7.19,* all of the surveyed settlements in Cambambe and Icolo e Bengo municipalities reported subsistence agriculture as their primary livelihood activity. In the peri-urban areas of Viana and Belas municipalities, all settlements except for Bita-Ambriz similarly reported subsistence agriculture as their primary livelihood. For Bita-Ambriz the primary livelihood was reported to be informal trade and *biscatos*.

Table 7.19 Primary and Secondary Activities in the Settlements of the Study Area

Municipality	Settlement	Primary Livelihood	Secondary Livelihood	Comments
Cuanza Norte Province				
Cambambe	Nhangue ya Pepe	Agriculture	Fishing, forestry	Mainly subsistence focused on self-consumption with any surplus of agricultural produce commercialized.
	Dumbo ya Pepe	Agriculture	Fishing, forestry	
	Quissuba	Agriculture	Hunting, fishing, forestry	
	Aldeia Lucapa	Agriculture	n/a	
	Muchau	Agriculture and hunting	*Biscatos*	
	Quitendele	Agriculture	Hunting, forestry	
	Zenza do Itombe	Local commerce and agriculture	*Biscatos* (construction work)	
Luanda province				
Icolo e Bengo	Sagrada Esperança	Agriculture	Hunting, fishing, forestry,	Subsistence and commercialization of agriculture produce along the main road Some farmers organized in small cooperatives. Most of the produce is commercialized (sold) at the KM 30 market (*)
	Mazozo	Agriculture	Fishing, forestry	
	Morro 50	Agriculture	Informal business, forestry, hunting	
	Tari	Agriculture	Informal trade, forestry, hunting	
	Koba	Agriculture	Informal trade, forestry, hunting	
	Wala	Agriculture	Informal trade, forestry, fishing	
	Ngolome	Agriculture	n/a	
Viana	Hanga Calumbo	Agriculture	Forestry	Subsistence agriculture is the main livelihood.
	Mbanza Calumbo II	Agriculture		Subsistence agriculture is the main livelihood. Farmers organized in small cooperative.
	Mateia	Agriculture	*Biscatos* (farming, blacksmithing), formal jobs in the public sector	Subsistence agriculture is the main livelihood. Formal jobs and informal trading are also important livelihoods.
Belas	Bita Ambriz	Informal trade	*Biscatos* (woodwork, blacksmithing, farming, mechanics)	Small vendors at *Praça Progresso*

Source: ERM Social Field Work (2018)
Notes: (*) KM 30 is the name of the main market in the area.

Figure 7.36 Livelihood Activities in the Settlements in the Study Area



Firewood for sale in Dumbo Ya Pepe (Cambambe municipality)



Firewood (left) and goats in Quissuba (Cambambe municipality)



Vendors along road, near Zenza do Itombe (Cambambe municipality)



Baobab for sale along Dondo-Catete road (Icolo e Bengo municipality)



Fruit trees in Bita Ambriz (Belas municipality)



Street vendors in the municipality of Belas

Source: ERM Social Field Work (2018)

Household food consumption is usually dependent on a combination of agriculture, hunting and fishing; depending on season and availability of resources. Complementary goods such as salt and oil are bought with money from informal trade and *biscatos* (temporary jobs), and sale of forestry products (eg. baobab, wood and charcoal) and production of honey (notably in the settlements of Quitendele (Cambambe municipality) and Koba (Icolo e Bengo municipality).

Agriculture

Agriculture Production and Commercialisation

The surveyed settlements can be divided into three different groups regarding their agricultural activities:

1. Agriculture for self-consumption with occasional commercialization of surplus, most common in the eastern and central portions of the line in the settlements closer to Lauca, in the municipality of Cambambe, and in the eastern part of Icolo e Bengo municipality;

2. Agriculture for subsistence and commercialization, most common in the central section of the transmission line route, in the western part of Cambambe municipality and settlements closer to Catete commune, in the municipality of Icolo e Bengo; and

3. Agriculture as a customary practice where the producer does not rely on the produce for food consumption or income generation.

Subsistence agriculture with occasional commercialization of surplus was identified in three settlements in the municipality of Cambambe (Nhangue Ya Pepe, Dumbo Ya Pepe, and Quissuba). In these settlements, agriculture production is the main source of food for the community, and there is rarely any surplus for commercialization. These settlements are the most vulnerable in terms of food security. In Icolo e Bengo (Tari, Wala and Morro 50) and Viana (Hanga Calumbo) subsistence agriculture was reported as complementary food source as well as complementary source of income.

Subsistence agriculture and commercialization was identified in six settlements in the Study Area, four of which are organized in cooperatives: Muchau (Cambambe municipality), Mazozo and Ngolome (Icolo e Bengo municipality), and Mbanza Calumbo II (Viana municipality). The produce is sold by the side of main roads or in local markets and are transported by private vehicles and / or taxi.

Figure 7.37 Roadside Agricultural Vending



Women selling vegetables and fruits along the road (Cambambe municipality)



Fruits and baobab in Morro 50 settlement (Icolo e Bengo municipality)

In the peri-urban areas of Hanga Calumbo (Viana municipality) and Bita Ambriz (Belas municipality), agriculture often undertaken a customary practice, and is not necessarily an important source of income or food for the family. In Bita Ambriz, for example, the plots are farmed by elder women known as *mamas* (mothers) who live with their families in the city and, since they are used to work the land, they maintain farming plots of their own or work on other people's plots.

Crops

The main crops identified along the surveyed settlements are cassava, beans, sweet potato, peanuts, and maize. There are also fruit trees including mango, lime, papaya, cashew and banana. All crops are for self-consumption and commercialization (in some settlements, see above, they are commercialized only if there are surpluses). In the settlement of Koba (Icolo e Bengo municipality), maize is produced to feed chickens at the nearby chicken farm.

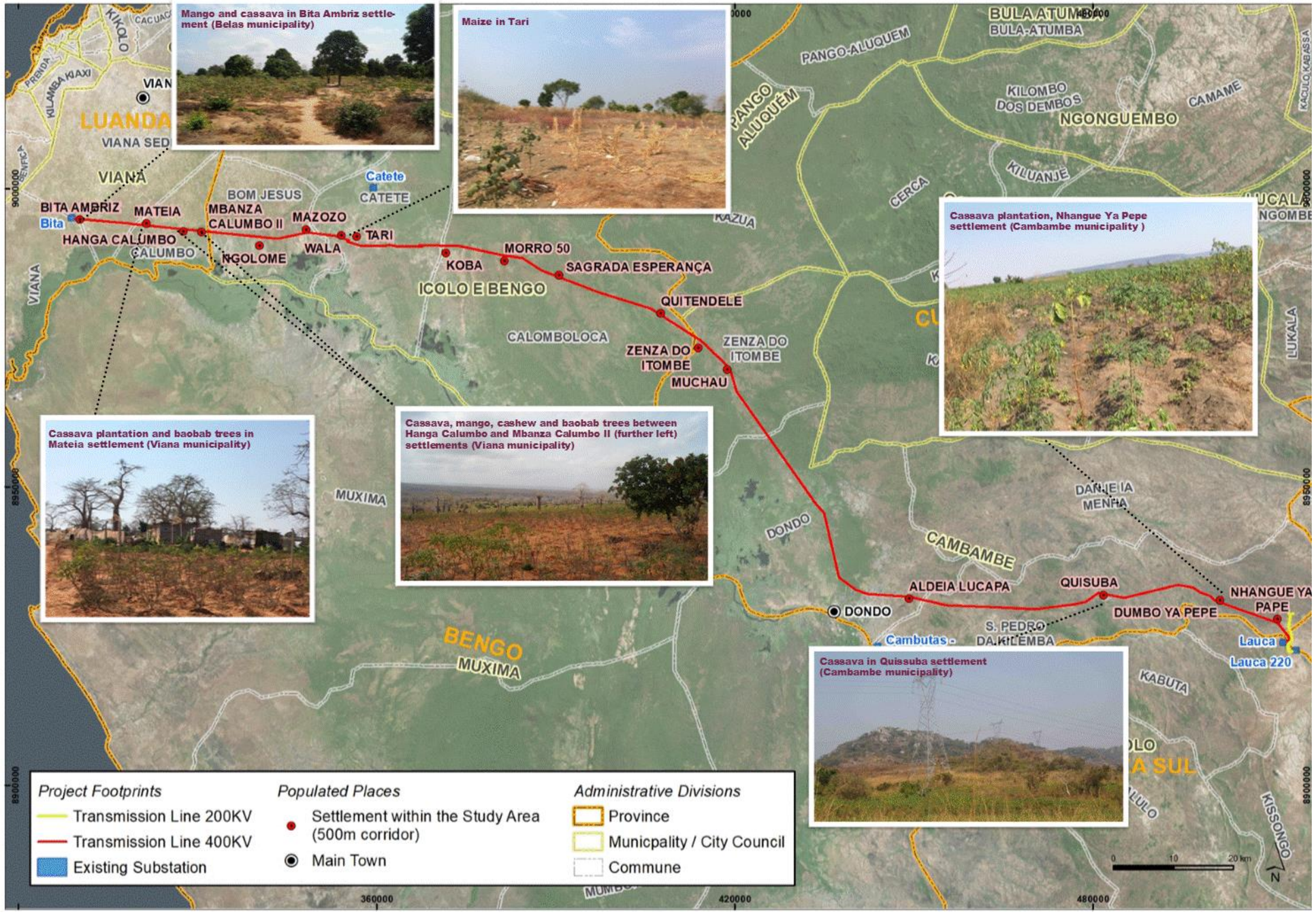
Table 7.20 lists the main crops mentioned in each settlement surveyed and *Figure 7.30* presents photos of some of plots farmed within the Study Area.

Table 7.20 Main Crops in the Settlements of the Study Area

Municipality	Settlement	Crops
Cambambe	Nhangue ya Pepe	Cassava, beans, sweet potato, maize, yam, kale, onion
	Dumbo ya Pepe	Cassava, beans, sweet potato, yam, maize, kale, onion, tomato, fruits (mango, papaya, cashew)
	Quissuba	Cassava, peanuts, maize, beans, sweet potato, kale, tomato, onion, fruits (orange, mango, passionfruit, papaya, cashew)
	Aldeia Lucapa	(not available)
	Muchau	Lime, cassava, banana, sugar cane, sweet potato, carrot, kale, onion, passionfruit
	Quitendele	Cassava, sweet potato, corn, various fruits
	Zenza do itombe	Lime, banana, orange, tangerine, sweet potato
Icolo e Bengo	Sagrada Esperança	Cassava, maize, banana, sweet potato, peanuts, papaya
	Mazozo	Cassava, beans, sweet potato, yam, maize, kale, onion, tomato, fruits (mango, papaya, cashew)
	Koba	Cassava, corn
	Morro 50	Cassava, peanut, maize
	Tari	Maize, sweet potato, tomato, kale, cassava, *quissaca*
	Wala	Sweet potato, beans, pumpkin, tomato, pepper, kale, cassava, maize, *quissaca*
	Ngolome	Banana, tomato, kale, cassava, sugar cane
Viana	Hanga Calumbo	Cassava, maize, sweet potato, fruits (mango, cashew)
	Mbanza Calumbo II	Cassava, maize, sweet potato, beans
	Mateia	Cassava, aubergine, banana, sweet potato, passionfruit, maize
Belas	Bita Ambriz	(not applicable)

Source: ERM Social Field Work (2018)

Figure 7.38 Farming Activities in the Study Area



Access to Land

Most surveyed settlements indicated access to farming land through the *soba* or community coordinator. The average size of a household in the surveyed settlement was found to be six persons (seven in Cuanza Norte and 4.7 in Luanda). In rural areas, all households have access to one plot determined by the *soba* which is transferred through inheritance; in case the land holder wants to transfer the land to a third person (not family) she/he needs to ask permission from the *soba*.

The average parcel size was reported to be less than one hectare, although it can vary according to land availability.[1] Households may share the use of different plots to grow different crops, using plots in different areas that have the characteristics required for each type of crop (e.g.soil type, water availability etc.). This practice is often encouraged by the *soba*. When shared, the parcel continues to be 'owned' only by the household that was previously defined by the *soba* as right holder; shared use does not imply shared ownership.

When a particular plot is no longer productive, the land holder will seek an alternative parcel from the *soba*. Regular land rotation is not a common practice and households usually farm in the same plot for around six years, depending on how fast the soil is depleted.

Roles and Responsibilities

Both men and women work the land with women being predominantly responsible for the activity as men are also involved in hunting, fishing, baobab harvesting, and other informal sources of income when available.

Seasonality

Although farming is practised all year round, the rainy season, from September/October to March, is the peak season for agricultural activity. Land preparation starts in late August/early September in the municipalities of Cuanza Norte province (i.e. Cambambe), and in October in the municipalities of Luanda Province (i.e. Ibolo e Bengo, Viana, and Belas). The choice of crops by the subsistence farmers, is not always related to the best use of the land, but to other aspects such as manpower, seed availability, knowledge, market. Crop harvesting time depends on the crops. Some can be harvested in two to three months while others need 6 months. For example, maize grows quicker than cassava.

[1] Average parcel size estimated based on feedback received from community sobas or coordinators and land users interviewed. This estimate is also consistent with observations from similar projects in West African countries.

Challenges

The main challenges related to agriculture in the surveyed settlements are related to sufficiency for subsistence, (not enough financial resources to invest in tools that could improve productivity), fertility of the soil and diseases (especially in casaba plantations).

In addition, in Sagrada Esperança (Icolo e Bengo municipality), it was reported that elephants destroy great part of the production during the harvesting period of January to April.

Where production is aimed at commercialization, the main challenge is transportation to access markets. Public transportation is non-existent in the surveyed area and transportation costs are high, directly impacting the profitability of agricultural goods.

Animal Husbandry

Animal husbandry along the surveyed settlements consists mainly of chicken, goats, pork and ducks for subsistence. Most families in rural areas have animals that can roam freely around settlements. Goats are also often seen along the main roads.

Figure 7.39 Animal Husbandry in the Study Area



Goats in Morro 50 settlement (Icolo e Bengo municipality



Pork and animal shelter in Quissuba settlement (Cambambe municipality)



Chicken in Muchau settlement (Cambambe municipality)

Source: ERM Social Field Work (2018)

The average number of animals per household varies among and within the settlements surveyed in the area of study. This variation is mainly due to the availability of other food sources (i.e. when there is not enough crop production for consumption, a higher number of animals are slaughtered).

There are few chicken farms along the Project line located nearby Koba [(1)] and Ngolome, both in the municipality of Icolo e Bengo. These farms are not managed by residents of the settlements surveyed.

[1] Although no data was collected in this settlement, informal interviews identified the presence of a chicken farm close to the Project line.

Figure 7.40 Chicken farm near Ngolome Settlement



Chicken farm near Ngolome (Icolo e Bengo)

Source: ERM Social Field Work (2018)

Fishing

Fishing was reported as one of the livelihood activities in six settlements: Nhangue Ya Pape, Dumbo Ya Pepe and Quissuba (Cambambe), and Sagrada Esperança, Mazozo and Wala (Icolo e Bengo). Although, fishing is an important source of food, agriculture remains the primary livelihood in these settlements.

Only the men fish, and the catch is mostly eaten in the home. Although fishing is performed all year round, the main season is from September to December, and the main species are tilapia and catfish.

In Quissuba settlement (Cambambe municipality), men go fishing in the Cuanza river for a 3-4 days at time, during which the women are responsible for all farming and animal husbandry activities.

Forest Products and Hunting

Forest Products

The harvest of baobab fruit, locally called *múcua*, is practised extensively along the transmission line route, as well as across the country. These trees mostly grow in savannah and scrubland vegetation. Despite being a common practice, most settlements do not identify it as a main source of income. This could be because it is considered such an intrinsic part of Angola's rural culture that is seen as an economic activity.

Baobab harvesting is performed by men only, and is conducted all year round.

The fruit is used for self-consumption in many forms such as fruit, juice and milk, and is commercialized in sacks of 20 or 50 kg. The price of baobab varies according to the location and final consumer.

In the settlement of Quissuba, for example, a sack of 20 kg is sold to people from the settlement or people who drive through the settlement at an average of 2,500 kwanzas. Close to peri-urban areas, a sack of 50 kg cost approximately 12,000[1] kwanzas (i.e. Mbanza Calumbo II) and can reach higher process depending on the demand from urban centres where the fruit is used mainly for juice production.

Figure 7.41 Harvested Forest Products



Baobab harvested in Quissuba (Cambambe municipality)

Source: ERM Social Field Work (2018)

Other products obtained from the forests are wood and charcoal, both used as important sources of energy, as further detailed bellow (on Energy and Electricity *Section*).

Hunting

Hunting was mentioned in the settlements of Dumbo Ya Pepe, Quissuba, Aldeia Lucapa, Muchau (Cambambe municipality), Sagrada Esperança, Morro 50 and Tari (Icolo e Bengo municipality), as a complementary source of food, and is mostly used for household consumption.

It is an activity performed by men only. The practice is in decline due to two main factors: (i) illegal hunting has caused a decrease in animal numbers, and (ii) it has historically been performed by the elders and has not been taken on as a traditional activity by the youth.

[1] Approximately US$42.

In Nhangue ya Pepe settlement, it was reported that hunting is no longer performed as the men who historically conducted the hunting have passed away.

The main species mentioned were blue duiker *(seixa*), warthog (*facocero*), bushbuck (*golungo*), cane rat (*paca*), wild cat (*gato do mato*), impala (*gazela*), monkeys, rabbits.

Other Livelihoods

As mentioned at the end of the previous section, the settlements of the Study Area are mostly impoverished, where households live on very low or minimum income sourced from the subsistence activities mentioned above. There are, however, other sources of income that include small vendors and temporary jobs, known as "*biscatos*". Formal employment is uncommon and unemployment was one of the main complaints/challenges cited during the data collection.

Only in Bita Ambriz (Belas municipality) were these other sources identified as primary activities. They were mentioned as secondary activities in the following settlements: Muchau and Zenza do Itombe (Cambambe municipality), Mazozo, Morro 50, Tari, Wala and Ngolome (Icolo e Bengo municipality), Hanga Calumbo and Mateia (Viana municipality).

Small informal trade (or small vendors) of garments, groceries and school supplies were identified in settlements located in peri-urban areas: Wala (Icolo e Bengo municipality), Mateia and Hanga Calumbo (Viana municipality), and Bita Ambriz (Belas municipality). These activities are usually performed by women who buy merchandise in bulk to sell locally or in nearby markets.

Biscatos are temporary jobs, usually performed by men, and consist of painting, mechanics, smithing, wood and construction work, and farm labouring.

Figure 7.42 Small Vendors



Local vendor in Dumbo Ya Pepe (Cambambe)



Progresso Square (Belas)

Source: ERM Social Field Work (2018)

7.4.10 Health

National Overview

According to the World Health Organization (WHO), Angola's total expenditure on health per capita was US$ 239 in 2014, which represented 3.3% total expenditure of GDP for the same year.

Life expectancy at birth was 60 years old for male and 65 years old for female in 2016.[1] Infant mortality rate is 67.6 deaths/1,000 live births.[2] Acute respiratory infections, diarrhoea, and malaria represented 45% of the causes of deaths in children under-5 in 2013. [3] Diarrhoea, lower respiratory infections, malaria, preterm birth complications, and protein-energy malnutrition were responsible for 41.6% of population deaths in 2012. [4]

The key health issues in Angola result from lack of investment in public health and could be avoided and treated with investment in basic sanitation infrastructure, water and waste management systems, and early diagnostics. [5]

The 2012-2025 National Health Development Plan (*Plano Nacional de Desenvolvimento Sanitário*) identifies the following main health needs and problems 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. [6] The estimated number of people newly infected with HIV has dropped from 2010 to 2016. [7]

Community Health

Health issues identified during the field survey reflect the country's profile. The mean issues mentioned in all surveyed settlements are: diarrhoea, malaria and respiratory problems. Other issues include: urinary tract infection, skin problems, typhoid fever, and high blood pressure, as shown by *Table 7.21*.

There is no maternal care, and unassisted home childbirth is a common practice, both in rural and peri-urban surveyed settlements.

[1] World Health Organization – Angola: WHO statistical profile.
[2] The World Factbook, CIA.
[3] World Health Organization – Angola: WHO statistical profile.
[4] World Health Organization – Angola: WHO statistical profile.
[5] BTI 2018 Country Report: Angola. Access: August 2018. Available at http://www.bti-project.org
[6] Angola UNAIDS (2016). Available at: http://www.unaids.org/en/regionscountries/countries/angola
[7] WHO, Angola: HIV Profile, 2016.

Table 7.21 Main health issues in the settlements of the Study Area

Municipality	Settlement	Health issues
Cambambe	Nhangue ya Pepe	Malaria, skin problems, urinary infection
	Dumbo ya Pepe	(not available)
	Quissuba	Malaria, diarrhoea, urinary infection
	Aldeia Lucapa	(not available)
	Muchau	(not available)
	Quitendele	(not available)
	Zenza do itombe	(not available)
Icolo e Bengo	Sagrada Esperança	Malaria, diarrhoea, respiratory problems, blood pressure
	Mazozo	Malaria, urinary infection, respiratory problems, skin problems
	Koba	(not available)
	Morro 50	(not available)
	Tari	Malaria, typhoid fever, diarrhoea, respiratory problems
	Wala	Malaria, typhoid fever, diarrhoea, respiratory problems
	Ngolome	Malaria, diarrhoea
Viana	Hanga Calumbo	Malaria, diarrhoea, respiratory problems
	Mbanza Calumbo II	(not available)
	Mateia	Malaria, diarrhoea, respiratory problems
Belas	Bita Ambriz	Malaria, diarrhoea, respiratory problems

Source: ERM (2018)

7.4.11 Education

Education System

The Angolan education system is divided into:

- Pre-primary school (*Iniciação*) – 1 year
- Primary school (*Ensino Básico*) – 6 grades
- Secondary school (*Ensino Secundário*) including:
    - *Primeiro ciclo* – grades 7 to 9
    - *Segundo ciclo* – grades 10-12

Education up to the 9th grade is mandatory; however, attendance is relatively low particularly beyond 6th grade as access to education facilities is difficult, especially in rural areas.

Education and Skills Attainment

The national literacy rate of people of 15 years old or above is 65.6%; 79.4% and 41.1% in urban and rural areas respectively. (1)

While the primary enrolment and literacy rates have improved over time, the quality of education is low. In the population group between 6-17 years old, 13.4% have never been to school; 25.2% in rural areas and 6.8% in urban areas. From 2016 to 2017, the budget allocation for education dropped from 7.7% to 6.9%. (2)

In Cuanza Norte province, 70% of the population who attended school concluded the 6th grade; in Luanda, only 34% of the population concluded the six grades of primary school. (3) The average percentage among other provinces is 67%. In Cuanza Norte, 21% of the population age 6 or above has never attended school; this reduces to 7% in Luanda province.

Education attainment level in the surveyed settlements varies between 6th to 9th grades, depending on the grade taught in the nearest school facility. Shared classrooms, where different grades attend class in one room at the same time, is common throughout the surveyed settlements.

According to key informants interviewed during the survey in the Study Area, economic factors were reported as an obstacle that limits children's ability to continue schooling beyond 6th grade. Other identified obstacles were: the lack of education facilities close to the settlements; the cost of transportation, housing, and school supplies; and the need for children to bring their own benches or chairs to the classroom every day, or otherwise sit on the floor.

7.4.12 *Infrastructure and Services*

Health Care

Health Care System

There is no public health coverage in Angola and the majority of the population needs to pay for health services.
Public hospitals are underfunded and understaffed as a result of the low public expenditure on health care – among the continent's lowest. (4)
Specifically, according to the BTI 2018 report for Angola, healthcare expenditures for the 2017 budget accounted for 6.15% of social expenditures, which in conjunction with high inflation rates and overall spending cuts, translated into a reduction in real spending of 18% from 2014.

[1] World Factbook, CIA. Access: August 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.
[2] BTI 2018 Country Report: Angola. Access: August 2018. Available at http://www.bti-project.org
[3] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014*; *Resultados Preliminares do Recenseamento Geral da População e da Habitação de Angola 2014.*
[4] BTI 2018 Country Report: Angola. Access: August 2018. Available at http://www.bti-project.org

Access to Health Care

Data from the National Institute of Statistics (INE) show that the perception of the population regarding the distance between the place of residence and the nearest health centre varies according to the area of residence (urban or rural). In urban areas, the general perception (about 63% of the population) is that this distance varies between 0 and 2 km. In rural areas, the perception of this distance is not uniform, ranging from 0 to 2 km (about 24% of the population), 5-10 km (24% of the population) and more than 10 km (22% of population). These results point to a greater concentration of health services in urban areas.

The main health facilities in the affected municipalities are listed in *Table 7.22*.

Table 7.22 Main Health Facilities in the Municipalities along the Study Area

Municipality	Health Facilities
Cuanza Norte Province	
Cambambe	1 hospital 1 health centre 13 medical unities
Luanda Province	
Icolo e Bengo	Catete – 1 hospital e 5 health unities Cabiri – 5 health units Cassoneca – 1 health centre e 2 health unities Bom Jesus – 1 health centre e 3 health unities Kaculo-Kahango – 1 health centre e 1 health unit
Viana	3 health centres with maternity and hospitalization services
Belas	4 hospitals (the largest in Camana) 18 medical centres

Source: ESIA (2014)

Table 7.23 lists access to health facilities across the surveyed settlements. As shown, Zenza do Itombe (Cambambe municipality) and Mazozo (Icolo e Bengo municipality) are the only settlements surveyed that have a health centre in the settlement, but these reported an insufficient number of staff. The settlement of Nhangue Ya Pepe has a private pharmacy, which is shown in *Figure 7.43* below. Tiehe settlements of Sagrada Esperança (Icolo e Bengo municipality) and Dumbo Ya Pepe (Cambambe municipality) have the farthest distance to access health services within the Study Area, 15 km and 14 km respectively.

Table 7.23 Distribution of Health Facilities along the Area of Study

Municipality	Settlement	Health Centre (location and/or distance)	Public Hospital (location and/or distance)
Cuanza Norte Province			
Cambambe	Nhangue Ya Pepe	Ngola Ndala, 1km	Dondo
	Dumbo Ya Pepe	Ngola Ndala, 14km	Dondo
	Quissuba	São Pedro da Quilemba	São Pedro da Quilemba, 7km

Municipality	Settlement	Health Centre (location and/or distance)	Public Hospital (location and/or distance)
	Aldeia Lucapa	Dondo	Dondo
	Muchau	Dondo	Dondo
	Quitendele	Maria Tereza, 6 km	Dondo
	Zenza do Itombe	Lucala Demining Unit	Dondo or Catete
Luanda Province			
Icolo e Bengo	Sagrada Esperança	Calomboloca, 15km	Catete, 30km
	Mazozo	In the settlement	Catete, 7km
	Koba	500m from the settllement	Calomboloca
	Morro 50		Calomboloca
	Tari		Catete, 3km
	Wala		Catete, 2km
	Ngolome	In the settlement	
Viana	Hanga Calumbo	Calumbo, 4km or Zango 5km	
	Mbanza Calumbo II	Calumbo 4km	
	Mateia	Zango, 5km	
Belas	Bita Ambriz	Bita Tanque, 2km or Kilamba, 5km	

Source: ERM Social Field Survey (2018)

Figure 7.43 Pharmacy in Nhangue Ya Pepe Settlement



Private pharmacy in Nhangue Ya Pepe (Cambambe municipality)

Source: ERM Social Field Work (2018)

Education

Most of the surveyed settlements (75%) have local education facilities. In two of them (Muchau, municipality of Cambambe; and Hanga Calumbo, municipality of Viana), only private education is offered. *Table 7.24* presents the number and type of education facilities in the four surveyed municipalities and *Table 7.25* details the location and highest grades offered in each settlement surveyed.

Table 7.24 Number of Education Facilities in the Municipalities along the area of study

Municipality	Education Facilities
Cuanza Norte Province	
Cambambe	1 Secondary school 29 Primary schools
Luanda Province	
Icolo e Bengo	62 school (various grades – primary and secondary)
Viana	Various schools with diverse grades (primary and secondary), including lower and upper secondary vocational tracks, pre-college, colleges/universities (Universidade Piaget, Universidade Técnica de Angola e Instituto Superior), and the *Instituto Médio de Administração e Gestão*, in Zango.
Belas	81 schools (various grades – primary and secondary)

Source: ESIA (2014)

Table 7.25 Education Facilities in the Study Area

Municipality	Settlement	Education facility (location and/or distance)	Highest grade offered
Cuanza Norte Province			
Cambambe	Nhangue Ya Pepe	In the settlement	6th grade
	Dumbo Ya Pepe	Nhangue Ya Pepe, 14km	6th grade
	Quissuba	Muquila, 1.5km or Sao Pedro da Quilemba, 7km	6th grade and 12th grade
	Aldeia Lucapa	In the settlement	n/a
	Muchau	In the settlement *	n/a
	Quitendele	Maria Teresa, 7km	n/a
	Zenza do Itombe	In the settlement	12th grade
Luanda Province			
Icolo e Bengo	Sagrada Esperança	In the settlement, Cassala, Calomboloca or Catete	3rd grade, 6th grade, 12th grade
	Mazozo	In the settlement, Cabiri or Catete	4th grade, 12th grade
	Koba	In the settlement	6th grade
	Morro 50	In the settlement	6th grade
	Tari	In the settlement or Catete	6th grade, 12th grade
	Wala	In the settlement or Catete	6th grade, 12th grade
	Ngolome	In the settlement or Bom Jesus	6th grade, 12th grade
Viana	Hanga Calumbo	In the settlement*, Calumbo or Zango	2nd grade, 12th grade
	Mbanza Calumbo II	Mbanza Calumbo (1.5km)	6th grade
	Mateia	In the settlement or Zango	12th grade
Belas	Bita Ambriz	Bita Tanque, 2km or Kilamba, 5km	6th grade, 12th grade

Source: ERM Social Field Survey (2018)

Notes: (*) only private education available, known as 'Explicação'.

Figure 7.44 Schools in the Study Area



School in Ngolome (Icolo e Bengo municipality)



School in Quissuba (Cambambe municipality)

Source: ERM Social Field Work (2018)

Water, Sanitation and Waste Management

Water

Lack of infrastructure, poor maintenance, and long dry seasons are the main difficulties related to water access. According to the national census (2014), 23% of households in Cuanza Norte province have access to adequate water sources, including drinking water, which is close to the 22.4% national average for rural areas but well below the overall national average of 43%. Luanda province has better access to adequate water sources with a 47% coverage, slightly above the national average of 43%.

Three quarters of the settlements surveyed listed access to clean water as one of three main challenges faced by local households.

Within the municipalities of the Study Area, there is only one water treatment plant in Belas (Luanda province), the *Estação de Tratamento de Águas (ETA) do Kikuxi*, which can be seen from the settlement of Mateia (Viana municipality). The types and distribution of water sources available in the Study Area is summarized in *Table 7.26* below.

Table 7.26 Water Sources in the Study Area

Water source	Municipalities
River, streams and lagoons	Cambambe and parts of Icolo e Bengo.
Water trucks, public pipes and community water points	Viana, Belas and parts of Icolo e Bengo.

Source: ERM field survey 2018.

Specifically, in Morro 50 and Wala (Icolo e Bengo municipality), there are public pipelines that, according to locals have never worked. Wala has a community water point, however water supply is intermittent. In Mateia (Viana municipality), there is a community water point maintained by local residents through a monthly fee to cover costs of the water pump that pumps water from a nearby reservoir.

In Nhangue Ya Pepe (Cambambe municipality), water used to be sourced from nearby streams that have since run dry, and currently the main source of water is the Cuanza River, 2.5 km away from the settlement. Locals wait by the side of the road for water donations from companies and contractors working in the Laúca project.

None of the settlements surveyed have in-house running water.

Figure 7.45 Community Water Points in the Study Area



Water tank in Aldeia Lucapa (Cambambe municipality)



Water containers in Quissuba (Cambambe municipality)



Community water pipe in Morro 50 (Icolo e Bengo municipality)

Source: ERM Social Field Survey (2018)

Sanitation

In Angola, 60% of households are reported to have access to adequate sanitation systems (including toilet infrastructure); 25.9% amongst rural households and 82% amongst urban households.[1]

No sanitation or sewage system were present in any of the settlements surveyed, and most households did not have toilets.

[1] All data regarding national or provincial information is from the 2014 Census.

Few toilets were identified along the Study Area, either in the *soba*'s house, or in public areas, such as the toilet shown in *Figure 7.46*, in the settlement of Quissuba (Cambambe municipality). In peri-urban areas, where some settlements had toilets serviced by sewage, these drain to septic tanks.

Figure 7.46 Community Church Toilet in Quissuba Settlement (Cambambe Municipality)



Source: ERM Social Field Survey (2018)

Waste

In Angola, 70% of households dispose of waste in open areas (87% in urban, and 58% in rural areas); only 8.8% of rural households and 37.5% of urban households have access to appropriate waste disposal.[1]

Most households burn or bury their waste. In the settlements of Tari (Icolo e Bengo municipality) and Mateia (Viana municipality), there are either dump sites or waste containers, but waste is still thrown in open areas and/or burnt. In some cases, waste is also thrown into nearby waterbodies.

Lack of access to clean water, sanitation, and proper waste disposal are a major health concerns as they are directly related to diseases that could be avoided by the implementation of basic management systems.

[1] 2014 Census. *Resultados Definitivos do Recenseamento Geral da População e da Habitação de Angola 2014*; *Resultados Preliminares do Recenseamento Geral da População e da Habitação de Angola 2014*.

Figure 7.47 Examples of Waste Disposal



Waste burnt in Tari (Icolo e Bengo municipality)



Waste disposal in Dumbo Ya Pepe (Cambambe municipality)

Source: ERM Social Field Survey (2018)

Housing

In Angola, most households reside in houses built by themselves (70%). In the provinces of the Study Area (Cuanza Norte and Luanda), most households live in self-built houses, although in Luanda province a higher proportion rent housing due to high rates of migration and population density in the city of Luanda, when compared to the rest of the country. *Table 7.27* presents the percentage of home ownership and rental in urban and rural areas across the country. In the settlements of the Study Area, the majority of households live in houses built by themselves.

Table 7.27 Percentage of households by occupation regime

	Regime	
	Rental	**Built***
Angola	***19%***	***70%***
Urban	29%	55%
Rural	0.3%	91%
Cuanza Norte province	***13%***	***69%***
Luanda province	***34%***	***48%***

Source: 2014 Census

Notes: (*) House built by the own household or inherited from family

The houses in the area of study are divided into two types of use: residential and *casas de lavra*, the latter are small shacks used by farmers as shelters and storage, and are usually located next to farming land.

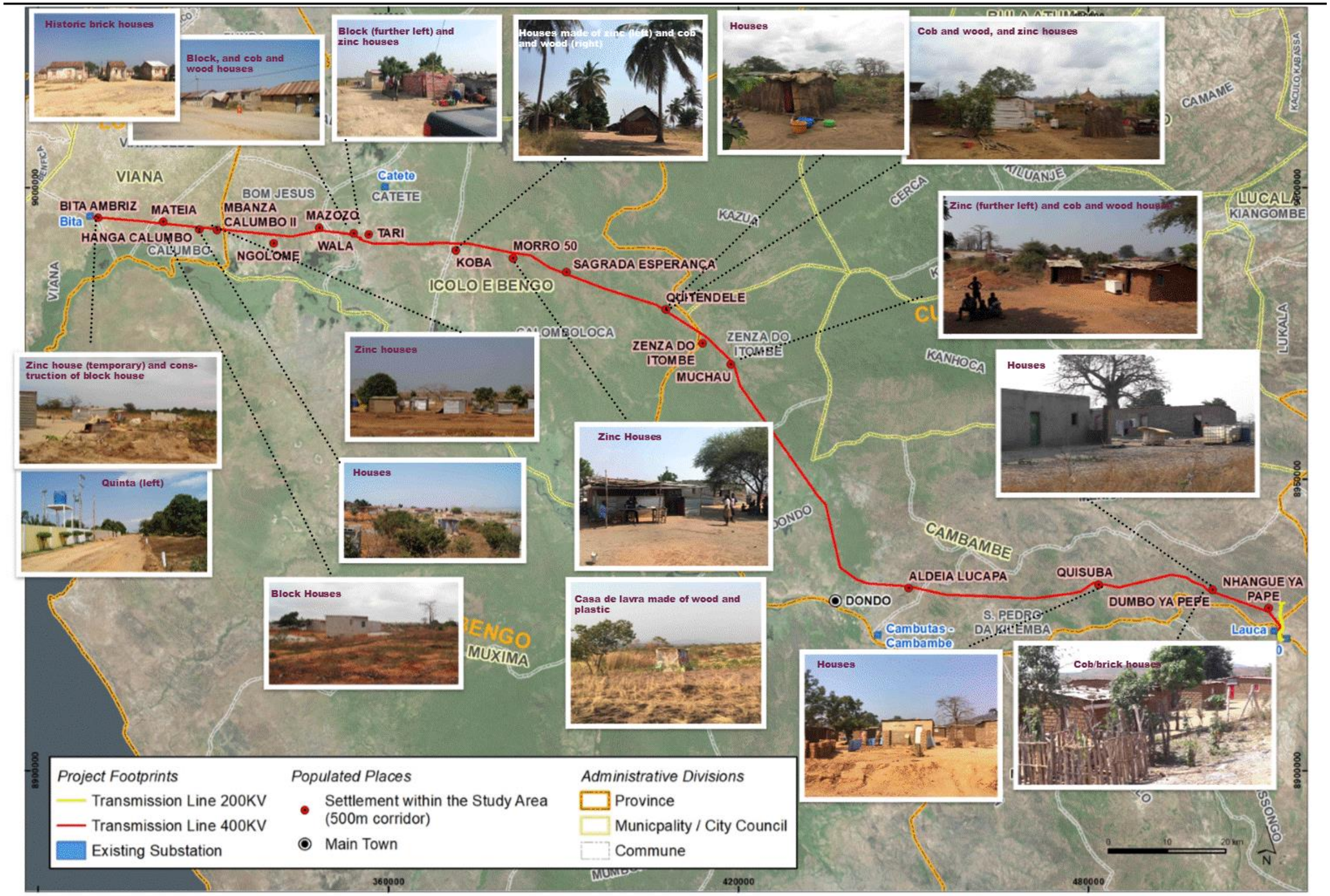
The average size of residential buildings along the surveyed area is 20 $m^{2,}$ divided into one bedroom and one living room. The kitchen is generally located outside the house and most have no toilet facilities (for example in Sagrada Esperança settlement in the municipality of Icolo e Bengo, only five houses were identified with toilets).

Most houses are made of cob and wood (*pau-a-pique*) and zinc sheets, with fewer being built with brick (red) and block (grey). Zinc sheets are the main material used for roofs, and rocks and tyres are placed on top to keep them from being blown off. Older rural settlements, such as Nhangue Ya Pepe and Quissuba (both in Cambambe municipality) tend to have more houses made of cob and wood; however cob and wood houses were found throughout the surveyed settlements. Although brick and block houses were found in most settlements, their use is predominant in established peri-urban settlements such as Hanga Calumbo and Mateia (Viana municipality).

In addition to being used for *casas de lavra*, zinc is the main material for temporary houses. In Bita Ambriz (Belas municipality), families live in zinc houses while saving money to buy construction material to build their permanent houses. Zinc houses are also used to indicate that a particular piece of land is already taken.

The presence of zinc houses may also indicate that the population has been relocated previously. This is the case in Mzanza Calumbo II (Viana municipality) which was previously displaced from the area where the national stadium was built. The families were reportedly given zinc sheets and driven to the area that is now Mbanza Calumbo II settlement.

Figure 7.48 Housing in the Study Area



Energy and Electricity

In Angola, only 2.2% of rural households have access to electricity. In Cuanza Norte Province 38.8% of households have access to electricity, rising to 66.8% of households in Luanda Province.

Among the settlements of the Study Area, more than half of the settlements do not have access to electricity. Those that do are mostly located in the western portion of the transmission line route. Specifically, Mazozo, Tari, Wala and Ngolome (Icolo e Bengo municipality) are connected to the electricity grid, while Mateia (Viana municipality) and Bita Ambriz (Belas municipality) have access to the grid but most households are not yet connected. Zenza do Itombe (Cambambe municipality), located in the centre portion, and is also connected to the grid.

Where there is access to the electricity grid, it is either through pre- or post-paid access; the latter is the most common but also the most difficult to maintain due to costs of connecting to the grid and re-connecting in case of cuts for non-payment.

In the localities without access to electricity, lighting sources include candles, torches, and flashlights. Few generators running on diesel exist, however the cost of fuel limits regular use of these generators.

For cooking, households rely on firewood and/or butane gas. Wood is usually harvested in the settlement's vicinities, and charcoal is produced locally. Butane gas is also used, although not as widespread as wood and charcoal due to costs. In rural Angola, 93.5% of households use solid fuel (wood) for cooking.

Charcoal and wood are the main sources of energy for cooking in Cambambe settlements, while butane is the main source in the municipalities of Icolo e Bengo, Viana, and Belas. The use of butane for cooking is directly related to its price, which is defined according to availability and distance from a large settlement, meaning that it is more expensive in areas located further away from urban centres as transportation costs are added to the final price. The average price of butane varies from 2,500 kwanzas in Cambambe [1], 1,400 to 2,000 kwanzas in Icolo e Bengo, [2] to 1,200 to 1,500 kwanzas in the municipalities of Viana and Belas. .

[1] Approximately US$9.
[2] Approximately US$5-7.

Figure 7.49 Examples of Cooking Fuel Observed in the Study Area



Cooking with coal in Muchau (Cambambe municipality)



Cooking with firewood in Ngolome (Icolo e Bengo municipality)

Source: ERM Social Field Survey (2018)

Roads and Transport

The road network is the primary transport system which is used by private vehicles and served in peri-urban areas by mini bus taxis. The transmission line runs parallel to the main road and the majority of settlements visited are located close to the main road. Some settlements were a couple of kilometres from it and are connected by dirt roads.

Outside of the peri-urban areas there is little public transport, and individuals either walk, hitchhike, or rely on private taxis (vans) to reach larger settlements. Taxis (and buses, where available) are considered expensive and unreliable, and are mostly used only in cases of medical emergencies.

Road infrastructure and safety are precarious along the Project line. The main road was asphalted in 2014, but is currently in a very poor condition. There is road works taking place on large stretches of the main road, resulting in sudden detours, no hard shoulders, and occasional reduction of the width of the road to one-lane.

Road conditions and lack of public transportation system are the main challenges regarding access to services such as health and education, as well as to job opportunities.

Figure 7.50 Examples of Road Infrastructure in the Study Area



Road crossing Quissuba (Cambambe municipality



Access road to Muchau (Cambambe municipality)



Road connecting Dondo to Catete (Cambambe and Icolo e Bengo municipalities)



Road in Dondo (will be crossed by transmission line) (Cambambe municipality)



Road in Bita Ambriz (Belas municipality)

Source: ERM Social Field Survey (2018)

7.4.13 Vulnerable Groups

Vulnerability is related to the ability of individuals and groups to adapt to socio-economic or bio-physical change. Vulnerable individuals and groups are therefore more susceptible to negative impacts and/or have a limited ability to take advantage of positive impacts. Vulnerability is a pre-existing status that is independent of the project and may be reflected by the existing low level of access to key socio-economic or environmental resources or a lack of access to information and decision making.

In the Study Area, vulnerability has been identified and linked to the following factors:

- *Households with particularly low incomes and high land dependency for subsistence and income generation.* Low income households have fewer resources on which to rely and are less likely to have savings and / or access to alternative sources of income. Low income households can be found throughout the Study Area, and are prevalent in the rural settlements where agriculture is the primary livelihood activity and most of the produce is used for subsistence. In these cases, restricted access to the land used for income generation and food production could also impact household income and food security levels of these households.

- *Households with disabled household members.* Those who lack physical mobility or who have mental health issues may be vulnerable to changes and have more difficulties adapting to new contexts. With relation to the transmission line, displacement impacts related to restriction on land access or need to replace housing could be particularly challenging.

- *Elderly.* The elderly have specific vulnerabilities relating to income levels and limited ability to change or increase access to additional income sources. They usually live on minimal income and are more likely to have less physical and mental capacity to cope with changes to their environment. Elderly women, in particular widows, rely heavily on land access for subsistence (self-consumption and commercialization) as well as a form of cultural activity. Across the Study Area, in rural and peri-urban settlements, it is evident that elderly women have a strong connection to farming the land.

- *Female and / or child headed households*. These households are likely to have fewer resources on which to rely and are less likely to have savings and / or access to alternative sources of income. They are also likely to have less access to information and decision making and may not understand or be able to exert their rights.

- *Households or settlements that have already been displaced*. Displacement directly affects the social and economic dynamics of a community. In the Study Area, the settlement of Mbanza Calumbo II, in Viana municipality, was recently formed due to the previous displacement of households. Further threat or actual displacement will be particularly difficult, including psychologically difficult in this area.

Not directly identified in the Study Area during the field survey, the following group should nevertheless be considered as potentially vulnerable, principally in relation to land access for subsistence activities:

- *Migrants*. As land is mostly inherited through customary practices, migrants who are new to the settlements might face difficulties in finding replacement land, especially in areas with lower land availability, such as those located in peri-urban areas (eg. Tari and Wala, in Cambambe municipality, western portion of the line route).

In the Study Area, the level of vulnerability is high, and it can be estimated that approximately 70% of the households across the affected settlements are vulnerable to project impacts, as most are heavily dependent on land for subsistence and income generation. This percentage is mainly associated with households heavily dependent on land for income generation and subsistence, and households with low incomes and high land dependency.

7.4.14 Cultural Heritage

Introduction

Cultural heritage and archaeological sites in Angola are legally protected. This protection extends not only to material and asset cultural heritage such as monuments and archaeological sites, but also intangible heritage, for example traditional knowledge.

This section aims to identify archaeological and historic sites which are either unknown, known to archaeologists, catalogued or listed (or in the process of being listed), and are located in the Laúca – Bita transmission line 1000 m corridor. The primary focus of this assessment is to safeguard this heritage from potential impacts caused by the implementation of the project, through the application of mitigation measures. By understanding the heritage of the region, it is possible to prevent possibly detrimental interventions that may cause social disturbances to the inhabitants of the areas under consideration.

Material available at the Angolan National Archive, National Cultural Heritage Institute and other relevant bibliography such as Ervedosa's archaeological chart (Ervedosa, 1980) were examined, and interviews with local administration and representatives at preselected sites were held in order to further understand the heritage of the study area.

The project area is not well explored archaeologically. Consequently, limited information is available. Most existing information has been compiled from old bibliographies (e. Ervedosa, 1980). Despite the fact that the existing studies are described as preliminary, the Ministry of Culture believes that there is some archaeological potential, particularly with respect to the history of the Cuanza Corridor. However, the focus of this project will be along the Cuanza River in the areas of Laúca and Calumbo-Bom Jesus.

Regional Level

Colonial Heritage

Since 1576 the Cuanza River is a well-known historical trading route, created by the Portuguese when they first established a settlement in Luanda.

From this early days, the Portuguese used the Cuanza River to access and establish trading routes into the interior of the country (E'Silva, 2011). A number of 16th century forts are still located along the Cuanza River. Muxima Fort and Church of Our Lady of Muxima were built on the left bank of the Cuanza River (in the lower Cuanza) to support the Portuguese activities towards mainland and also served as a slave prison. The church has been a popular pilgrimage site for the Catholic Church since the 17th century, and continues to draw thousands of people to Muxima annually.

In 2018 an estimated 1,050,000 visitors attended the event. The church and fort were considered worthy of a national monument in 1924, and in 1996 was added to the UNESCO World Heritage Tentative List for Cultural sites[1].

Sacred Sites

Little information is available on the distribution and location of sacred sites along the Cuanza River. In the Laúca Dam area, the Laúca Rock outcrop is regarded as a sacred site with a spectacular view of the rivers system and Egyptian vultures. Here, stone graves and old fortified remains exist in a cave at Laúca Rock along with archaeological artefacts (pottery, basketry) and it appears the site is a significant sacred site. Some cemeteries are of particular significance in the Laúca Dam area, particularly one across the river from Kissaquina village where 12 *sobas* (chiefs) are buried. This site is considered of great importance for the Ambundu tribe and rituals are held at the cemetery with access gained by crossing the river. However this site is not within the transmission line corridor.

A battlefield near Laúca Dam should also be pointed out, where people of the north and south fought during the reign of King Ngola Kiluange. This site is also located outside the transmission line corridor.

Notable archaeological and cultural heritage that has been recorded in research documents (e.g. E'Silva 2011) include the following:

- In 1578, Paulo Dias de Novais established his second settlement on the banks of the Cuanza River, which he named Santa Cruz but which today is known as Tombo;

- In 1582, the small Massango Fort and Nossa Senhora da Victoria church near Massango were completed;

[1] http://whc.unesco.org/en/tentativelists/928

- In 1595, Muxima Fort and a church (Nossa Senhora da Muxima church) were built on the left bank of the Cuanza River. The fortress is built from stone, with canon pointed over the Muxima Sanctuary. It was built to protect the Portuguese against the Angolans who tried to resist the slave trade and conquest of their land. The fort also served as a slavery prison. It is a classified National Monument (Decree no. 2 of 12 Jan 1924) and is part of Angola's tentative list to qualify for inclusion in the World Heritage List.

- In 1604, the Cambambe Fort was built and in 1606, the church Nossa Senhora do Rosário church at Cambambe, on the northern bank of the Cuanza River. The Cambambe Fort has been upgraded and the area cleaned up to receive visitors

Regional Summary

Based on the information gathered and more recent reports from the Ministry of Culture, it was possible to identify and characterise cultural heritage and archaeological sites located in the vicinity of the Laúca-Bita transmission line route. In total, in the three provinces investigated, ten cultural heritage sites were identified as follows:

- one cultural landscape site;
- two burial / funerary sites;
- two cultural and archaeological sites; and
- four inventoried cultural sites.

Local

The ten cultural heritage sites mentioned above are located outside of the proposed transmission line route (such as the cultural heritage sites of Muxima Fort and Church) and thus are unlikely to be affected by the proposed project.

Rural communities place considerable importance on ancestral gravesites particularly those where local chiefs (*sobas*) are buried. On the baseline assessment undertaken no burial sites have been either observed or confirmed by the people interviewed to be within the proposed corridor of transmission line.

A variety of potentially valuable tangible cultural heritage structures were identified during field work activities. However these are not located within the proposed transmission line route. These are described below according to their location at provincial level (*Table 7.28*).

Table 7.28 Documented Cultural Heritage Sites in the vicinity of the transmission line

#	Site Name	Province / Location	Status	Importance	Coordinates
1	Paisagem Cultural de Pungo Andongo	Malanje / Pungo Andongo	Classified by Executive Decree n.º 01/17 of April 10	Cultural	9°39'55.47"S 15°35'27.58"E
2	Túmulos de Capanda (Tombs of Capanda)	Malanje / Cacuso	Report for classifying as a cultural site being developed	Cultural (burial site)	9°46'35.81"S 5°27'10.55"E
3	Pedra Laúca	Malanje / São Pedro da Quilemba	Classified by Executive Decree n.º 543/15 of September 28	Cultural	9°43'31.43"S 15° 6'17.99"E
4	Zona Histórica da Cidade do Dondo	Cuanza-Norte (Dondo)	Classified by Executive Decree n.º 314/13 of September 27	Cultural and Archaeological	9°41'22.00"S 14°25'25.06"E
5	Ruínas da Igreja de Nossa Senhora do Rosário de Kambambe do Século XVII	Cuanza-Norte (Cambambe)	Classified by Order n.º 65 of May 30, 1925	Cultural and Archaeological	9°44'32.95"S 14°29'13.80"E
6	Túmulos de Laúca (Tombs of Laúca)	Cuanza-Norte (nas margens da barragem de Laúca)	Report for classifying as a cultural site being developed	Cultural (burial site)	Located near Laúca Dam
7	Edifício de residência e de comércio dos Pedronhos	Luanda / Bom Jesus	Inventoried (site currently being assessed by the provincial authorities).	Cultural and Archaeological	Located in the town of Bom Jesus
8	Residência do antigo proprietário da Açucareira – José Masangu	Luanda / Bom Jesus	Inventoried (site currently being assessed by the provincial authorities).	Cultural and Historical	Located in the town of Bom Jesus
9	Hospital Chiberal	Luanda / Bom Jesus	Inventoried (site currently being assessed by the provincial authorities).	Cultural and Historical	Located in the town of Bom Jesus
10	Capela de Bom Jesus (Chapel of Bom Jesus)	Luanda / Bom Jesus	Inventoried (site currently being assessed by the provincial authorities).	Cultural and Religious	Located in the town of Bom Jesus

Note: The exact location of sites 5 and 7, 8, 9 and 10 have not yet been provided by the Ministry of Culture.

7.5 LANDSCAPE AND VISUAL

7.5.1 Landscape

Introduction

The landscape is characterized by different components: topography, land use and potentially sensitive areas with regards to landscape (e.g. cultural 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
- Evidence on human modifications.

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 2 km corridor along the transmission line (1 km each side) where it is assumed that most of the potential impacts will occur.

Topography

Angola's physical terrain is composed primarily of broad tablelands above 1,000 m in altitude; a high plateau in the central and southern regions ranges up to 2,400 m. The mostly flat coastal plain stretches inland for 50 km to 150 km into a belt of rolling hills and a series of scattered mountains.

Angola's elevated high plateau rises 1,200 m to 1,800 m, and lies to the east of the hills and mountains and dominates Angola's terrain. The highest point of the country is Morro de Moco peaks at 2,620 m, located in the Ahaggar Mountains.

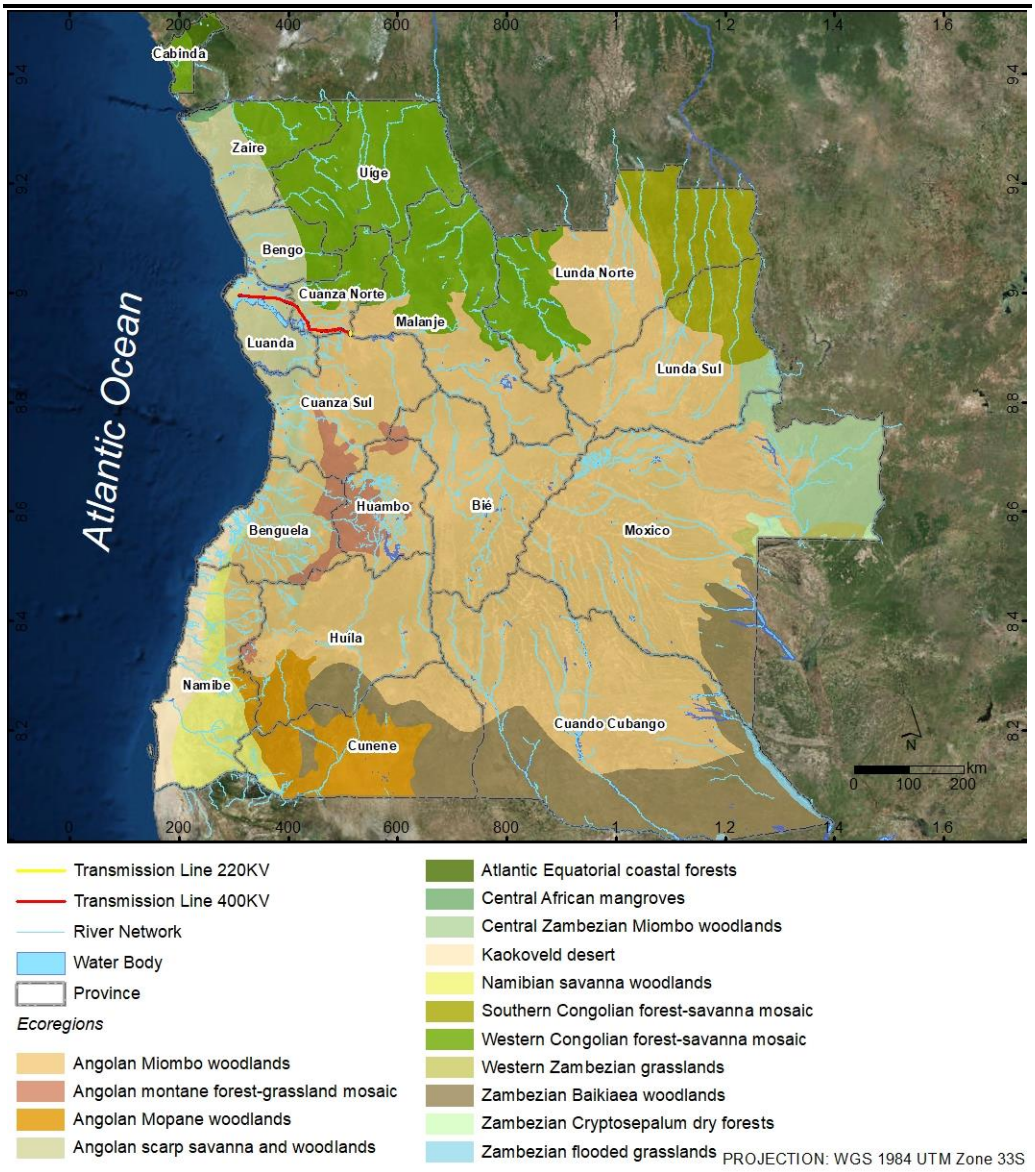
The terrain along the transmission line ranges from approximately 0 to 860 m above mean sea level.

Landscape Characteristic Unit (LCU)

Based on WWF, Angola can be divided into "*key ecoregions*" (*Figure 7.51*). Ecoregions are defined as large units of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions[1]. Each ecoregion is characterised by distinct landscape characteristics.

[1] https://www.worldwildlife.org/biomes (accessed 30 August 2018)

Figure 7.51 Angola Ecoregions



Source: WWF Ecoregions of the world, https://www.worldwildlife.org/pages/conservation-science-data-and-tools (adapted)

The Project is located within the following two ecoregions.

- *Angolan Scarp savannah and woodlands*: is an ecoregion located on the coast of Angola. This ecoregion consists of the strip of land that runs along the coast of Angola and the steep west-facing ridge that rises from the Atlantic coast to Angola's large central plateau, to a height of about 1000 m. The area contains a mixture of habitat types including; rain forests, cloud forests, grasslands, mangroves, and swamps. This coast has a tropical climate with summer rains and high humidity all year round.

- *Angolan Miombo woodlands*: cover most of central Angola. This area of savannah and woodland covers an area of plateau and gentle hills in central Angola, in the Cubango-Zambezi Basin which drains into the Zambezi River to the east.

- The area lies east of the range of hills run parallel the Atlantic coast, and north of the Kalahari Desert reaching up as far as the rainforests of the Congo.

The transmission line has a general development from southeast to northwest, starting in the area of the Laúca Hydroelectric Plant and extending to the new important node of the National Transport Network designed for Kilamba.

A detailed Land Cover map was extracted for a 2 km corridor along the Transmission Line route based on satellite imagery analysis, and further confirmed during the environmental survey in July 2018 (see *Annex A – Map 04*).

In general, the Savannah vegetation consists of grassland, bushland and open woodland. At some river crossings there is mature riparian forest and some remote areas are forested. In several places, the environment bears marks of having been cultivated in the form of large plantations and grazing areas as well as small-scale slash and burn cultivation, forming the item "savannah with agricultural patches".

Coupling the information retrieved from:

- The regional map of Ecoregions; and
- The detailed Land Cover map.

The transmission line corridor was then divided into three main areas with distinct Landscape Character Units (LCUs) as described in *Table 7.29* and in *Figure 7.52.*

LCUs are areas that show homogeneous characteristics in terms of topography, land cover / land use, ecosystems and other physical aspects that play an important role in the characterisation of the Landscape.

Table 7.29 Landscape Character Units (LCUs)

Landscape Characteristic Unit	Kp	Predominant Land cover
LCU 1 – Miombo woodlands	From kp 0 to kp 73	Savannah and savannah with agricultural patches
LCU 2 – Forest and savannah	From kp 73 to kp 193	Forest and savannah
LCU 3 – Mosaic	From kp 193 to kp 237	Mosaic of agriculture and vegetation with savannah

Figure 7.52 LCUs Map



For the characterisation of each LCU, within the landscape Study Area, a set of view Points (VPs) was selected to understand the sensitivity of the landscape character, as well as the sensitivity to change that are important when analysing the overall landscape impact of the Project.

Factors affecting the sensitivity of change for evaluation of landscape are:

- Importance and rarity of special landscape elements;
- Ability of the landscape to accommodate change;
- Significance of the change in the local and regional context; and
- Maturity of the landscape.

Photographs of the site surrounding were taken from the viewpoints presented in:

- *Figure 7.53* for LCU 1
- *Figure 7.70* for LCU 2
- *Figure 7.82* for LCU 3.

LCU 1 – Miombo Woodlands

Corridor length: 74km - from kp 0 to kp 74

Topography: 870 – 170m asl

Municipality crossing: Cacuzo – Cambambe

Villages near the project: Nhangue ya Pape, Dumbo Ya Pepe, Quisuba,, Quilemba, Kamongua, Bungo, Aldeia Lucapa, Alto Dondo

The length of the route within the LCU 1 Miombo woodlands is 74 km, from kp 0 to kp 74.

It is characterized mainly by savannah and savannah with agricultural patches, with some spare areas of forest, as shown in *Table 7.30* and in Figure 7.53 *and Figure 7.54.*

Table 7.30 Landcover LCU 1

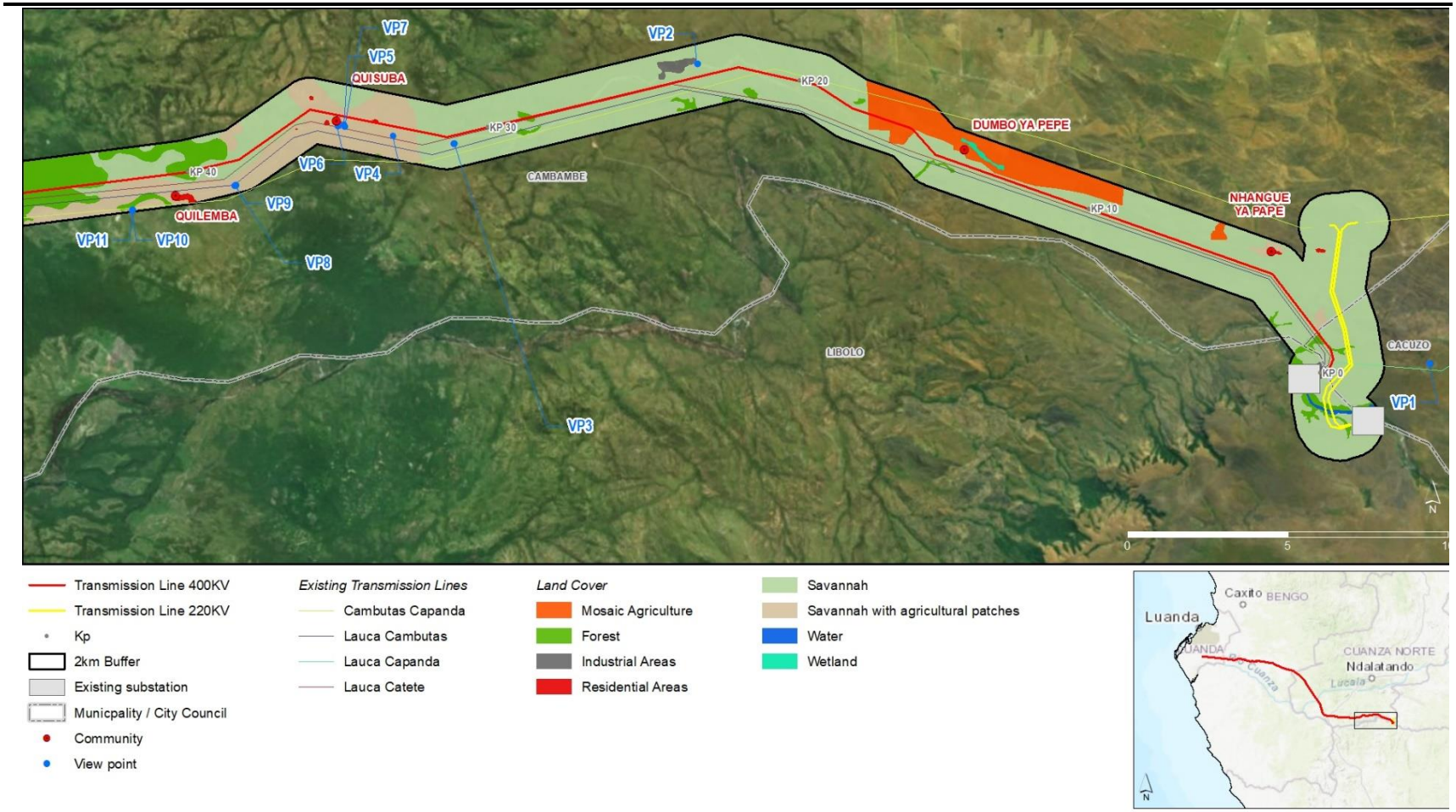
	Landcover type	Percentage distribution (%)
	Savannah	49
	Savannah with agricultural patches	33
	Forest	13
	Other	6

The beginning of the corridor is in the area of the Laúca Hydroelectric Power Plant (*Figure 7.55 VP1*), on the right bank of the Kwanza river, developing north-northwest through an almost unoccupied zone of bushy, bare and stony soils.

Along the road to Cacuso, near the corridor, there is a small cluster of buildings in Nhangue Ya Pape.

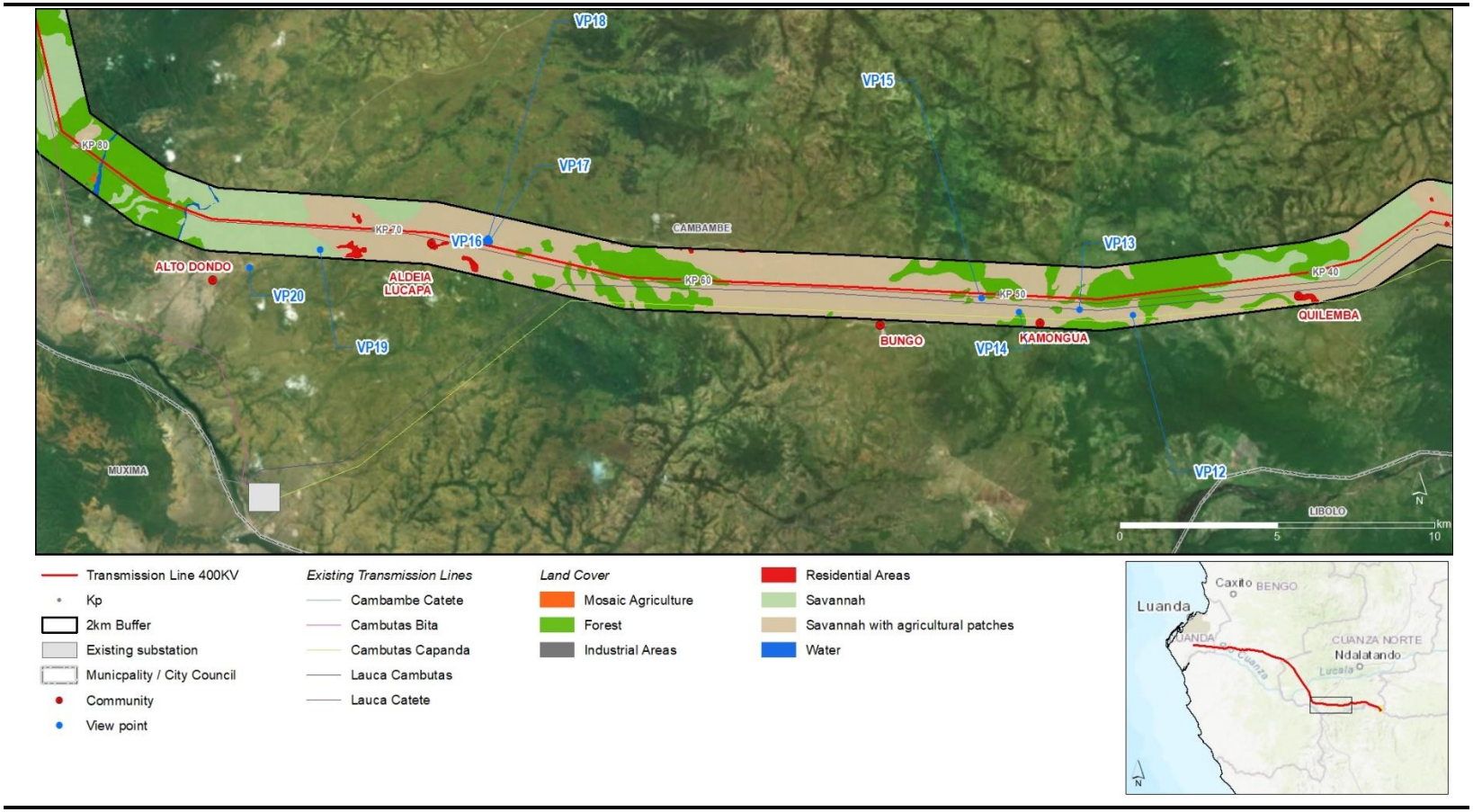
From the kp 10 to kp 18, near Dumbo, one passes through an area with cultivated plots. Near kp 24 there is an industrial area (*Figure 7.55* VP2) and near kp 35, in Quisuba; there are some buildings located along the road (*Figure 7.57* VP6).

Figure 7.53 LCU 1 Land Cover and View Point (1 of 2)



Source: ERM (2018)

Figure 7.54 LCU 1 Land Cover and View Point (2 of 2)



Source: ERM (2018)

Figure 7.55 VP1 and VP2 Profile



VP1	LCU 1 - Miombo woodlands
Lat -9.7302 Long 15.1446 Direction 238 degree Nearest kp: kp 0 Distance from corridor: 3000m	Area of the Laúca Hydroelectric Power Plant Existing transmission line: visible



VP2	LCU 1 - Miombo woodlands
Lat -9.6453 Long 14.9365 Direction 122 degree Nearest kp: kp 24 Distance from corridor: 400m	Industrial area Existing transmission line: visible

Source: ERM (2018)

Figure 7.56 VP3 and VP4 Profile



VP3	LCU 1 - Miombo woodlands
Lat -9.6678 Long 14.8673 Direction 77 degree Nearest kp: kp 31 Distance from corridor: 242m	Unpaved road network within the TL route corridor Existing transmission line: visible



VP4	LCU 1 - Miombo woodlands
Lat -9.6659 Long 14.85 Direction 234 degree Nearest kp: kp 33 Distance from corridor: 309m	Shrubs and low vegetation Existing transmission line: visible

Source: ERM (2018)

Figure 7.57 VP5 and VP6 Profile



VP5	LCU 1 - Miombo woodlands
Lat -9.6625 Long 14.8361 Direction 17 degree Nearest kp: kp 34 Distance from corridor: 245m	Unpaved road network within the TL route corridor with tall trees and scrublands Existing transmission line: not visible



VP6	LCU 1 - Miombo woodlands
Lat -9.6631 Long 14.8342 Direction 60 degree Nearest kp: kp 34 Distance from corridor: 350m	Sparse buildings Existing transmission line: not visible

Source: ERM (2018)

Figure 7.58 VP7 and VP8 Profile



VP7	LCU 1 - Miombo woodlands
Lat -9.6631 Long 14.8363 Direction 149 degree Nearest kp: kp 34 Distance from corridor: 305m	Transmission line alignment Bita - Cambambe Existing transmission line: visible



VP8	LCU 1 - Miombo woodlands
Lat -9.6798 Long 14.8053 Direction 195 degree Nearest kp: kp 38 Distance from corridor: 782m	Example of predominant cultivation (cassava) along route Cambambe - Lauca Existing transmission line: not visible

Source: ERM (2018)

Figure 7.59 VP8 and VP8 Profile



Source: ERM (2018)

Figure 7.60 VP9 and VP10 Profile



VP9	LCU 1 - Miombo woodlands
Lat -9.6795 Long 14.8051 Direction 117 degree Nearest kp: kp 38 Distance from corridor: 737m	Small bush with clear evidence of clearing Existing transmission line: not visible



VP10	LCU 1 - Miombo woodlands
Lat -9.6867 Long 14.776 Direction 345 degree Nearest kp: kp 41 Distance from corridor: 1018m	Dense vegetation including palm trees and ficus trees Private cultivation activities, with palm trees Existing transmission line: not visible

Source: ERM (2018)

Figure 7.61 VP11 and VP12 Profile



VP11	LCU 1 - Miombo woodlands
Lat -9.6866 Long 14.776 Direction 3 degree Nearest kp: kp 41 Distance from corridor: 1017m	Dense vegetation including palm trees and ficus trees Private cultivation activities, with palm trees Existing transmission line: not visible



VP12	LCU 1 - Miombo woodlands
Lat -9.6882 Long 14.7401 Direction 61 degree Nearest kp: kp 46 Distance from corridor: 641m	Private cultivation activities, with palm trees No signs of use of groundwater, cultivation is said to be highly resistant to drought. Existing transmission line: visible

Source: ERM (2018)

Figure 7.62 VP13 and VP14 Profile



VP13	LCU 1 - Miombo woodlands
Lat -9.6866 Long 14.7248 Direction 20 degree Nearest kp: kp 47 Distance from corridor: 372m	Evidence of burnt areas potentially associated to agri-cultural activities Existing transmission line: visible



VP14	LCU 1 - Miombo woodlands
Lat -9.6872 Long 14.7075 Direction 42 degree Nearest kp: kp 49 Distance from corridor: 537m	Dense bush as well as small trees Rock hill close to the transmission line path Existing transmission line: visible

Source: ERM (2018)

Figure 7.63 VP15 and VP15 Profile



VP15	LCU 1 - Miombo woodlands
Lat -9.6831 Long 14.6962 Direction 248 degree Nearest kp: kp 50 Distance from corridor: 144m	View of typical miombo woodland in the project area Existing transmission line: visible



VP15	LCU 1 - Miombo woodlands
Lat -9.6831 Long 14.6962 Direction 248 degree Nearest kp: kp 50 Distance from corridor: 144m	View of typical miombo woodland in the project area Existing transmission line: visible

Source: ERM (2018)

Figure 7.64 VP16 and VP16 Profile



VP16	LCU 1 - Miombo woodlands
Lat -9.6668 Long 14.5527 Direction 189 degree Nearest kp: kp 66 Distance from corridor: 110m	Villages Existing transmission line: visible

VP16	LCU 1 - Miombo woodlands
Lat -9.6668 Long 14.5527 Direction 189 degree Nearest kp: kp 66 Distance from corridor: 110m	Villages Existing transmission line: visible

Source: ERM (2018)

Figure 7.65 VP16 and VP17 Profile



VP16	LCU 1 - Miombo woodlands
Lat -9.6668 Long 14.5527 Direction 189 degree Nearest kp: kp 66 Distance from corridor: 110m	Villages Existing transmission line: visible



VP17	LCU 1 - Miombo woodlands
Lat -9.6667 Long 14.554 Direction 168 degree Nearest kp: kp 66 Distance from corridor: 153m	Villages Existing transmission line: not visible

Source: ERM (2018)

Figure 7.66 VP18 and VP19 Profile



VP18	LCU 1 - Miombo woodlands
Lat -9.6667 Long 14.554 Direction 152 degree Nearest kp: kp 66 Distance from corridor: 247m	Grassland, bushland and burned cultivation. Existing transmission line: visible



VP19	LCU 1 - Miombo woodlands
Lat -9.6692 Long 14.5048 Direction 7 degree Nearest kp: kp 72 Distance from corridor: 769m	Palm trees, dense vegetation Existing transmission line: not visible

Source: ERM (2018)

Figure 7.67 VP19 and VP19 Profile



VP19	LCU 1 - Miombo woodlands
Lat -9.6692 Long 14.5048 Direction 7 degree Nearest kp: kp 72 Distance from corridor: 769m	Palm trees, dense vegetation Existing transmission line: not visible



VP19	LCU 1 - Miombo woodlands
Lat -9.6692 Long 14.5048 Direction 7 degree Nearest kp: kp 72 Distance from corridor: 769m	Palm trees, dense vegetation Existing transmission line: not visible

Source: ERM (2018)

Figure 7.68 VP19 and VP20 Profile



VP19	LCU 1 - Miombo woodlands
Lat -9.6692 Long 14.5048 Direction 7 degree Nearest kp: kp 72 Distance from corridor: 769m	Palm trees, dense vegetation Existing transmission line: not visible



VP20	LCU 1 - Miombo woodlands
Lat -9.674 Long 14.4843 Direction 23 degree Nearest kp: kp 74 Distance from corridor: 1140m	Alto Dondo industrial area, storage Existing transmission line: not visible

Source: ERM (2018)

Figure 7.69 VP20 and VP20 Profile



VP20	LCU 1 - Miombo woodlands
Lat -9.674 Long 14.4843 Direction 23 degree Nearest kp: kp 74 Distance from corridor: 1140m	Alto Dondo industrial area, storage Existing transmission line: not visible



VP20	LCU 1 - Miombo woodlands
Lat -9.674 Long 14.4843 Direction 23 degree Nearest kp: kp 74 Distance from corridor: 1140m	Alto Dondo industrial area, storage Existing transmission line: not visible

Source: ERM (2018)

LCU 2 – Savannah and forest

Corridor length: 120km - from kp 74 to kp 194

Topography: 170 – 20m asl

Municipality crossing: Cambambe - Icolo e Bengo

Villages near the project:
Nova Cassoalala, Cassoalala, Henriques Cruz, Cassoco, Muchau, Zenza do Itombe, Quitendele, Maria Teresa, Anduri, Sagrada Esperanca, Barraca, Morro 50, Cabembela, Koba, Botomona, Calomboloca, Tari, Catete, Wala.

The length of the route within the LCU 2 Savannah and Forest is approximately 120 km, from kp 74 to kp 194. It is characterized mainly by forest and savannah as shown in *Table 7.31* and in *Figure 7.70,* Figure 7.71 *and* Figure 7.72.

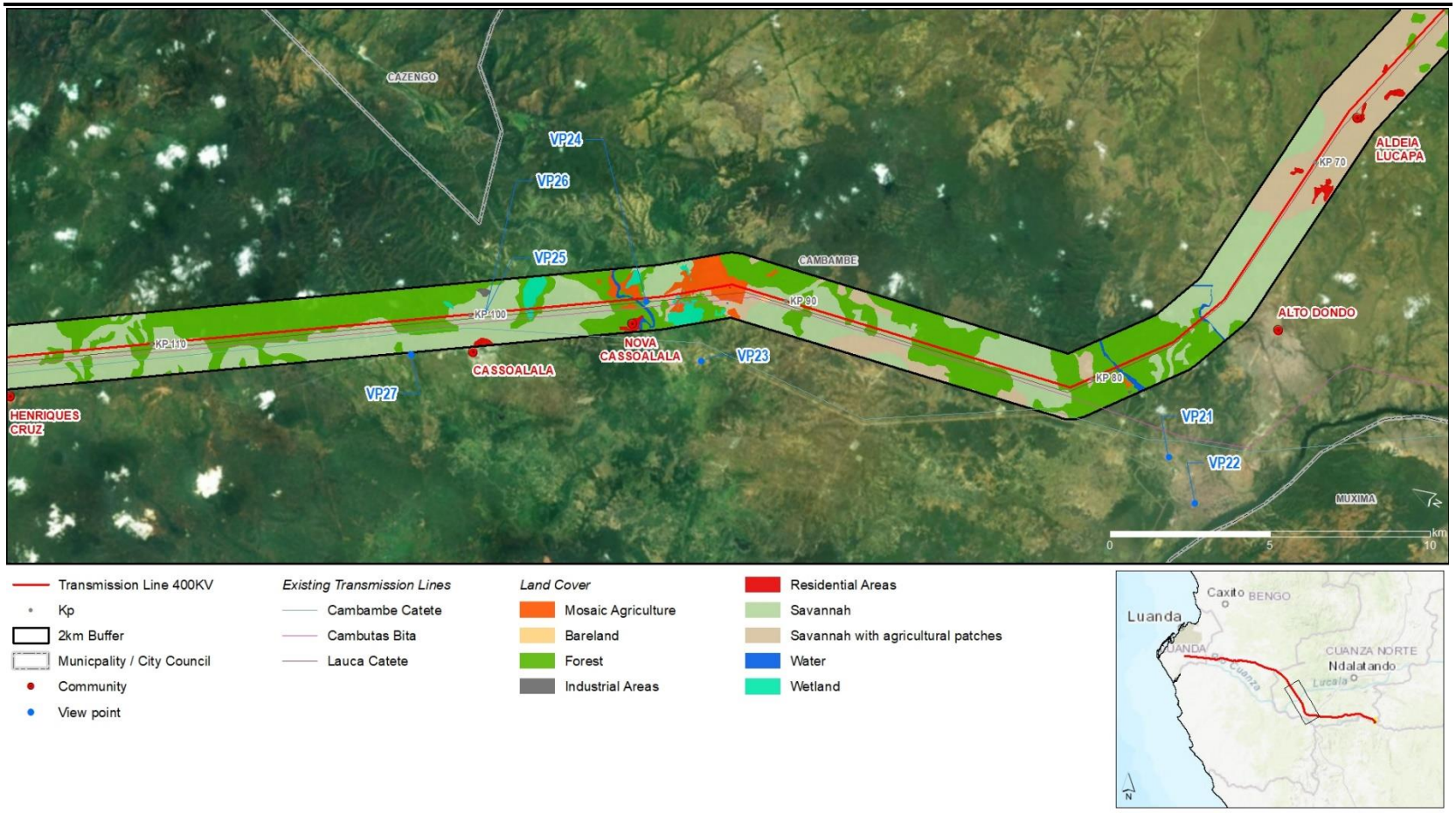
Table 7.31 Landcover LCU 2

	Landcover type	**Percentage distribution (%)**
	Forest	36
	Savannah	32
	Savannah with agricultural patches	27
	Other	5

Near kp 95 the route crosses the Lucala River (*Figure 7.74* VP24). In this area, especially near the community of Cassoalala at kp 100, a great presence of buildings was observed and mapped, consisting mainly of simple houses and shacks, and extending along the banks of the river and in the neighbourhood of Cassoalala.
In between kp 92 and kp 99 there are small patches characterised by features typical of wetland areas.
Another relevant group of sparse houses is present around kp 121 (*Figure 7.77* VP30).

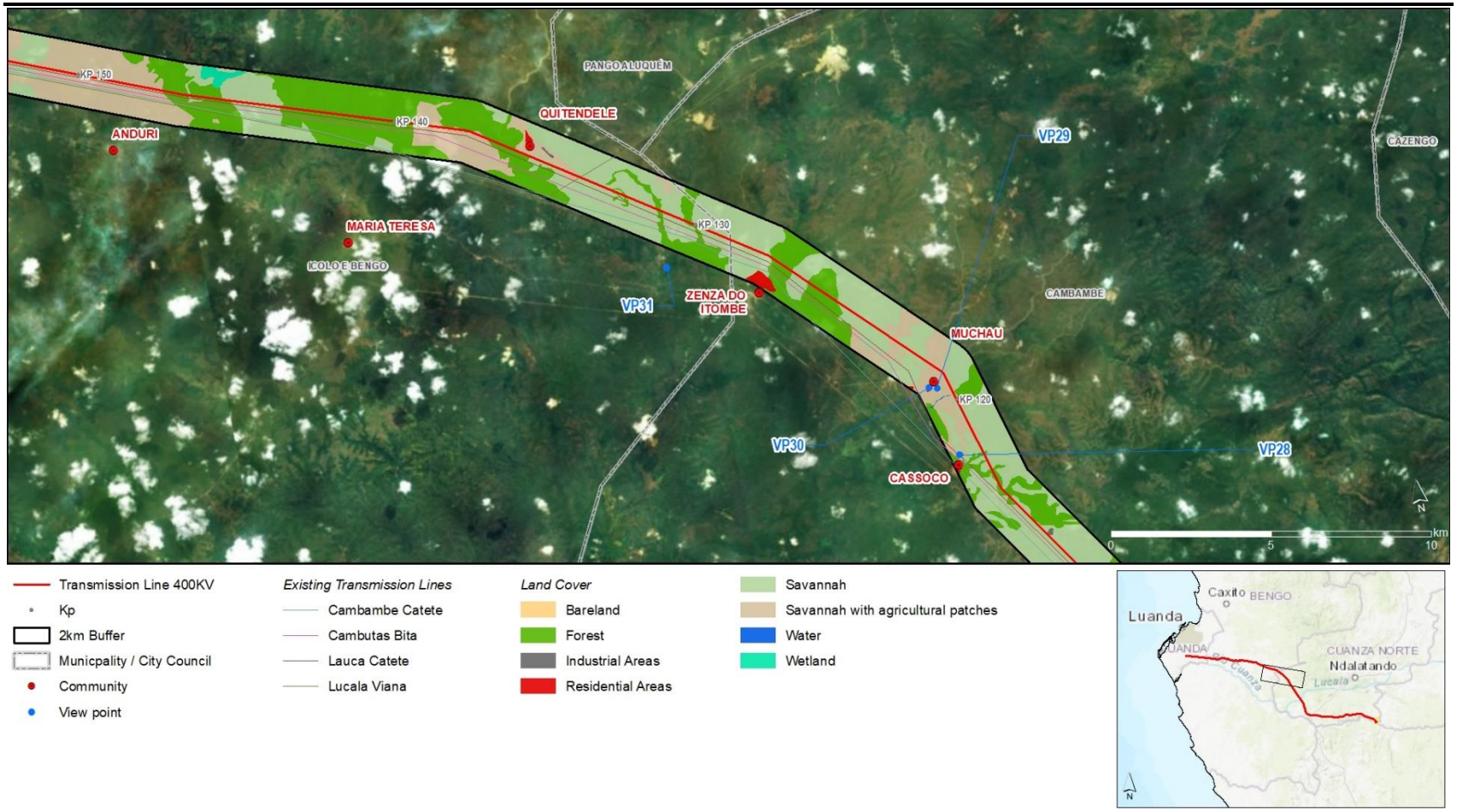
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Figure 7.70 LCU 2 Landcover and View Point 1 (1 of 3)



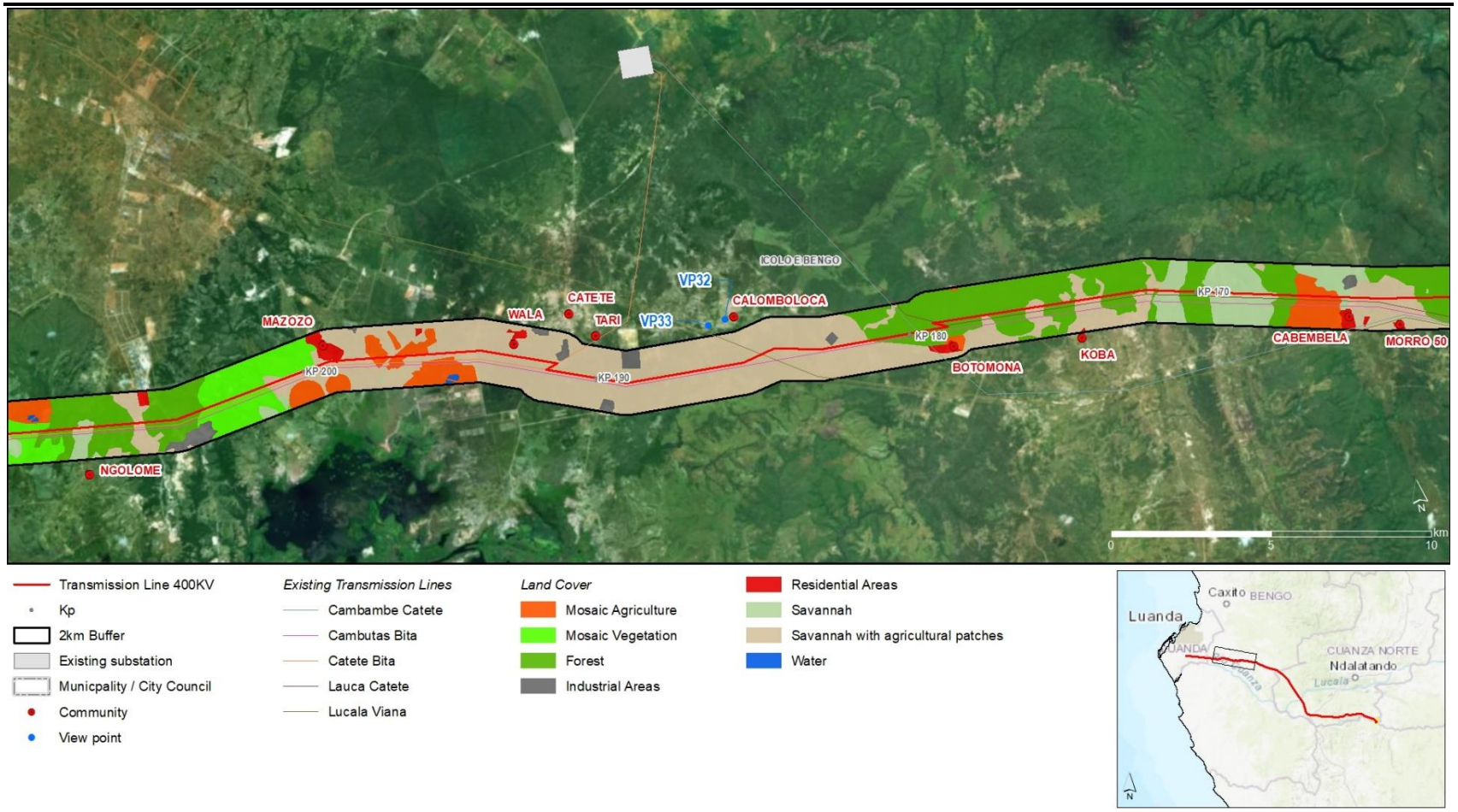
Source: ERM (2018)

Figure 7.71 LCU 2 Landcover and View Point (2 of 3)



Source: ERM (2018)

Figure 7.72 LCU 2 Landcover and View Point (3 of 3)



Source: ERM (2018)

Figure 7.73 VP21 and VP22 Profile



VP21	LCU 2 - Forest and savannah
Lat -9.6686 Long 14.4271 Direction 88 degree Nearest kp: kp 78 Distance from corridor: 3234m	Dondo, residential area Existing transmission line: visible



VP22	LCU 2 - Forest and savannah
Lat -9.6817 Long 14.4194 Direction 76 degree Nearest kp: kp 79 Distance from corridor: 4860m	Dondo, residential area Existing transmission line: visible

Source: ERM (2018)

Figure 7.74 VP23 and VP24 Profile



VP23	LCU 2 - Forest and savannah	VP24	LCU 2 - Forest and savannah
Lat -9.5407 Long 14.3841 Direction 121 degree Nearest kp: kp 92 Distance from corridor: 2134m	Agricultural activities, cultivation of casava leaves Existing transmission line: not visible	Lat -9.519 Long 14.3912 Direction 350 degree Nearest kp: kp 94 Distance from corridor: 87m	Lucala river Existing transmission line: visible

Source: ERM (2018)

Figure 7.75 VP25 and VP26 Profile



VP25	LCU 2 - Forest and savannah	VP26	LCU 2 - Forest and savannah
Lat -9.4813 Long 14.3657 Direction 221 degree Nearest kp: kp 99 Distance from corridor: 20m	Scrublands with trees Existing transmission line: visible	Lat -9.4812 Long 14.3659 Direction 97 degree Nearest kp: kp 99 Distance from corridor: 42m	Scrublands with trees Existing transmission line: not visible

Source: ERM (2018)

Figure 7.76 VP27 and VP28 Profile



VP27	LCU 2 - Forest and savannah
Lat -9.4691 Long 14.3448 Direction 72 degree Nearest kp: kp 102 Distance from corridor: 1074m	Scrublands with trees Existing transmission line: visible



VP28	LCU 2 - Forest and savannah
Lat -9.3415 Long 14.2643 Direction 115 degree Nearest kp: kp 118 Distance from corridor: 718m	Electrical substation, near cassoco village Existing transmission line: visible

Source: ERM (2018)

Figure 7.77 VP29 and VP30 Profile



VP29	LCU 2 - Forest and savannah
Lat -9.3219 Long 14.2614 Direction 262 degree Nearest kp: kp 121 Distance from corridor: 411m	Sparse buildings Existing transmission line: not visible



VP30	LCU 2 - Forest and savannah
Lat -9.3214 Long 14.2593 Direction 284 degree Nearest kp: kp 121 Distance from corridor: 664m	Sparse buildings Existing transmission line: visible

Source: ERM (2018)

Figure 7.78 VP30 and VP30 Profile



Source: ERM (2018)

Figure 7.79 VP31 and VP31 Profile



VP31	LCU 2 - Forest and savannah
Lat -9.2749 Long 14.1919 Direction 7 degree Nearest kp: kp 130 Distance from corridor: 1553m	Dense baobab forest Existing transmission line: not visible



VP31	LCU 2 - Forest and savannah
Lat -9.2749 Long 14.1919 Direction 7 degree Nearest kp: kp 130 Distance from corridor: 1553m	Dense baobab forest Existing transmission line: not visible

Source: ERM (2018)

Figure 7.80 VP31 and VP31 Profile



VP31	LCU 2 - Forest and savannah
Lat -9.2749 Long 14.1919 Direction 7 degree Nearest kp: kp 130 Distance from corridor: 1553m	Dense baobab forest Existing transmission line: not visible

VP31	LCU 2 - Forest and savannah
Lat -9.2749 Long 14.1919 Direction 7 degree Nearest kp: kp 130 Distance from corridor: 1553m	Dense baobab forest Existing transmission line: not visible

Source: ERM (2018)

Figure 7.81 VP32 and VP33 Profile



VP32	LCU 2 - Forest and savannah
Lat -9.1187 Long 13.7331 Direction 102 degree Nearest kp: kp 186 Distance from corridor: 1422m	Scrublands and Calomboloca village Existing transmission line: visible



VP33	LCU 2 - Forest and savannah
Lat -9.1196 Long 13.728 Direction 261 degree Nearest kp: kp 186 Distance from corridor: 1329m	Scrublands and sparse buildings Existing transmission line: not visible

Source: ERM (2018)

LCU 3 – Mosaic

Corridor length: 44 km - from kp 194 to kp 238

Topography: 20 – 110 m asl

Municipality crossing: Icolo e Bengo

Villages near the project: Mazozo, Bom Jesus, Calumbo, Zango IV, Bita Tanque

The length of the route within the LCU 3 Mosaic is 44 km, from kp 194 to kp 238. It is mainly characterized by Savannah with patches of agriculture. In detail, the specific land cover classes comprising the LCU 3 are shown in *Table 7.32* and *Figure 7.82* and Figure 7.83.

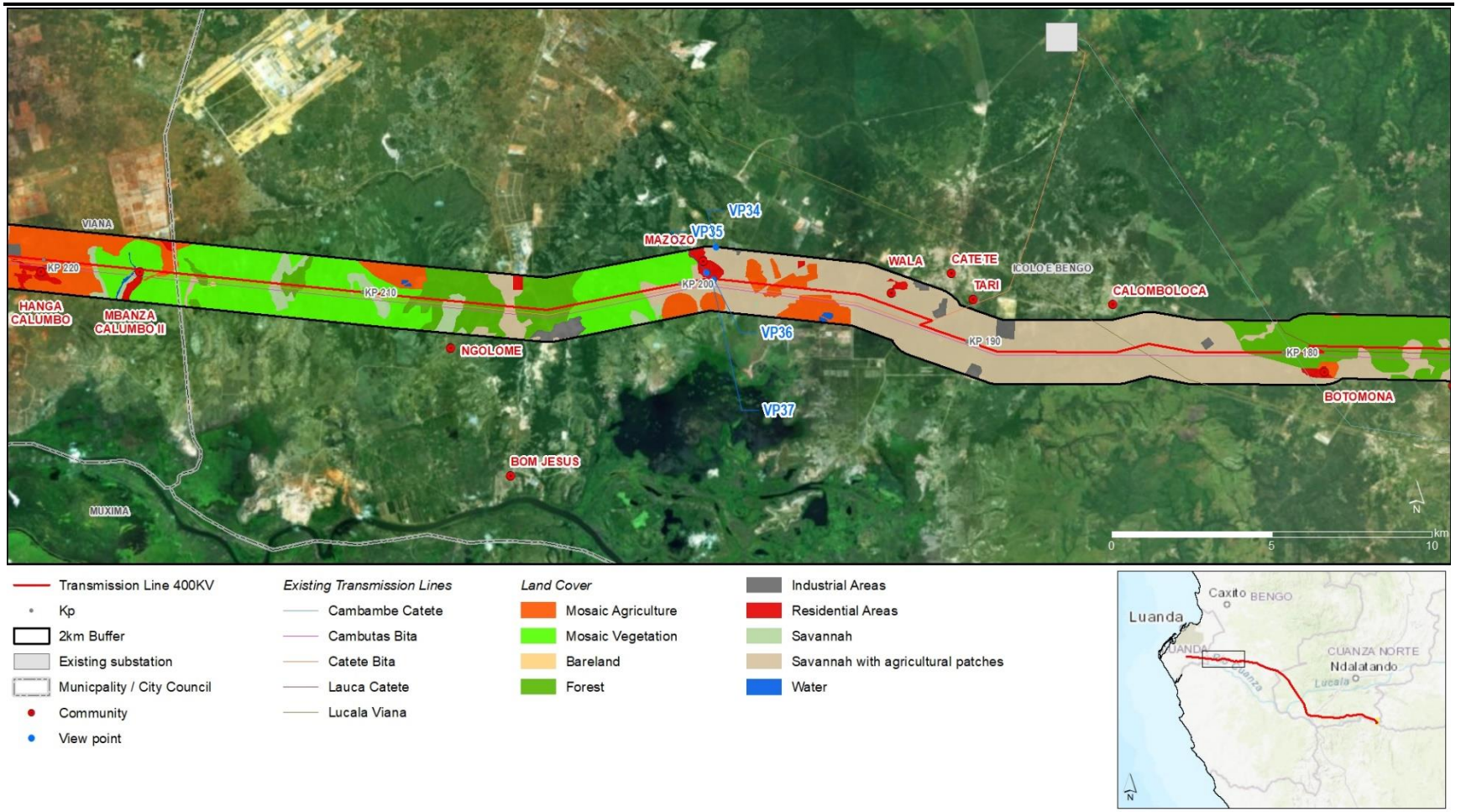
Table 7.32 Landcover LCU 3

	Landcover type	**Percentage distribution (%)**
	Savannah with agricultural patches	27
	Mosaic agriculture	23
	Mosaic vegetation	23
	Savannah	13
	Other	14

Between the Bom Jesus road and the Calumbo road, the corridor crosses the Calumbo / Bom Jesus Mining Reserve. However, it does not intercept any exploration in activity.

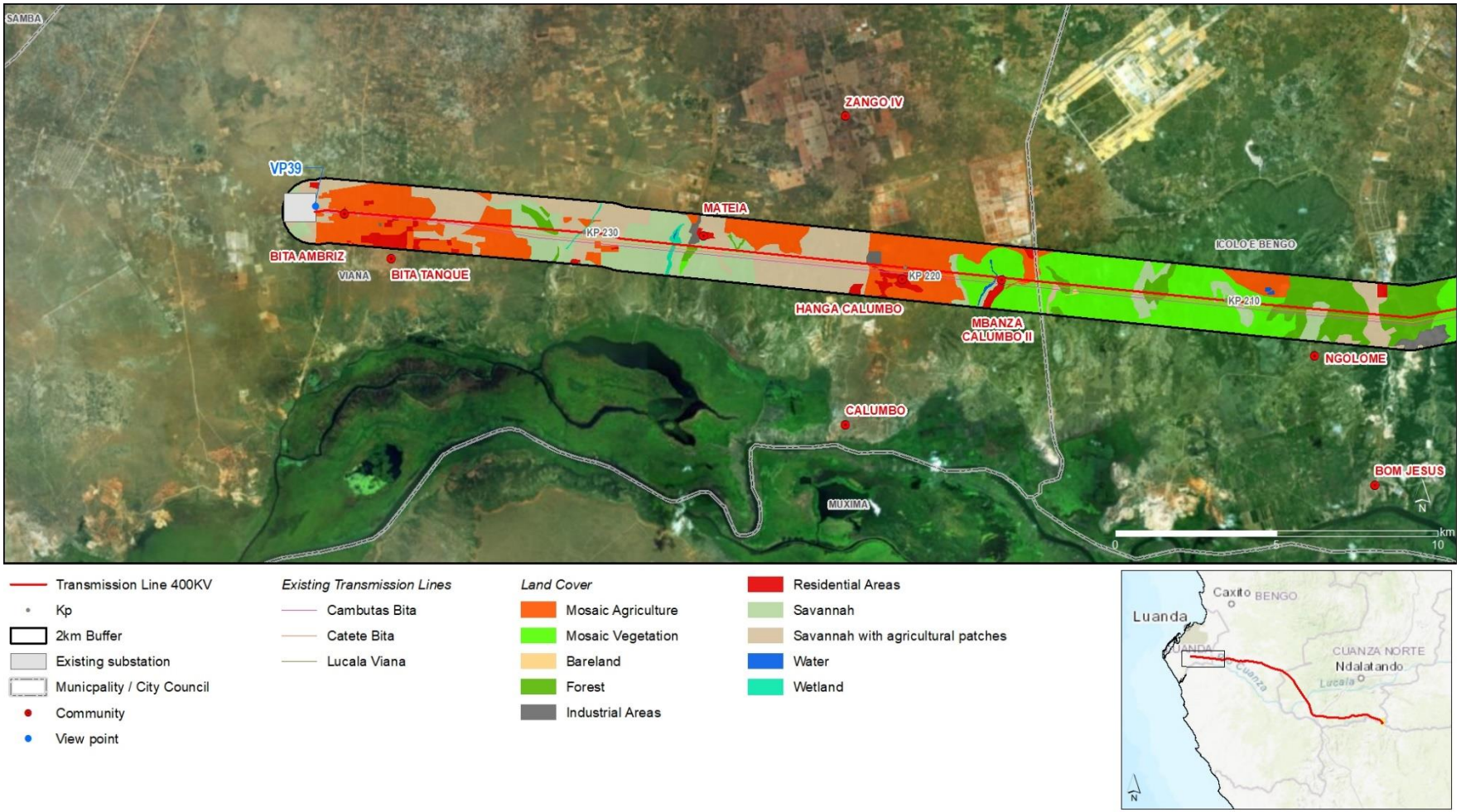
It should be noted that within the Mineira Reserve, there is also the Bad-Bom Jesus Agricultural Reserve, roughly between the Lower Ngolome and Cana Cassansa The reserve is crossed by the corridor, but does not cover agricultural areas in exploration. Neither the satellite imagery analysis nor the field visits revealed ongoing exploration/mining activities

Figure 7.82 LCU 3 Landcover and View Point (1 of 2)



Source: ERM (2018)

Figure 7.83 LCU 3 Landcover and View Point (2 of 2)



Source: ERM (2018)

Figure 7.84 VP34 and VP34 Profile



VP34	LCU 3 - Mosaic
Lat -9.1018 Long 13.6227 Direction 138 degree Nearest kp: kp 199 Distance from corridor: 985m	Uncultivated and bush soils. Existing transmission line: not visible

VP34	LCU 3 - Mosaic
Lat -9.1018 Long 13.6227 Direction 138 degree Nearest kp: kp 199 Distance from corridor: 985m	Uncultivated and bush soils. Existing transmission line: not visible

Source: ERM (2018)

Figure 7.85 VP34 and VP35



VP34	LCU 3 - Mosaic
Lat -9.1018 Long 13.6227 Direction 138 degree Nearest kp: kp 199 Distance from corridor: 985m	Uncultivated and bush soils. Existing transmission line: not visible



VP35	LCU 3 - Mosaic
Lat -9.1087 Long 13.6203 Direction 41 degree Nearest kp: kp 199 Distance from corridor: 16m	Villages Existing transmission line: not visible

Source: ERM (2018)

Figure 7.86 VP35 and VP35 Profile



Source: ERM (2018)

Figure 7.87 VP35 and VP36 Profile



VP35	LCU 3 - Mosaic
Lat -9.1087 Long 13.6203 Direction 41 degree Nearest kp: kp 199 Distance from corridor: 16m	Villages Existing transmission line: not visible



VP36	LCU 3 - Mosaic
Lat -9.1108 Long 13.6222 Direction 127 degree Nearest kp: kp 199 Distance from corridor: 16m	Villages Existing transmission line: visible

Source: ERM (2018)

Figure 7.88 VP37 and VP38 Profile



VP37	LCU 3 - Mosaic	VP38	LCU 3 - Mosaic
Lat -9.1112 Long 13.6216 Direction 251 degree Nearest kp: kp 199 Distance from corridor: 76m	Villages Existing transmission line: not visible	Lat -9.1111 Long 13.6217 Direction 86 degree Nearest kp: kp 199 Distance from corridor: 53m	Villages Existing transmission line: visible

Source: ERM (2018)

Figure 7.89 VP39 Profile



VP39	LCU 3 - Mosaic
Lat -9.0865 Long 13.2657 Direction 26 degree Nearest kp: kp 238 Distance from corridor: 182m	Predominant land use around Bita substation future location Existing transmission line: visible

Source: ERM (2018)

Protected Landscapes

During the desktop baseline review, 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 July 2018, the route corridor does not intersect any relevant protected area in terms of landscape (refer to *Section 7.5.1* and *7.4.14* for more details).

7.5.2 Visual

Visual interferences may occur when new elements are introduced into a landscape or existing elements are altered or removed leading to a change in the way that stakeholders access, perceive or experience landscape resources.

The proposed visual baseline has been developed according to the following tasks:

- Study Area definition;
- Viewshed analysis; and
- Viewpoints and sensitive receptors identification.

Study Area Definition and Viewshed

The visual Study Area is defined as the area within which the Project could be discernible by the human eye and could interfere with the main sensitivities identified in the local context.

To identify the landscape Study Area, the Zone of Theoretical Visibility (ZTV) has been determined through computer analysis of topographical mapping to establish the theoretical distance from which the project (mainly pylons)could be visible in each direction.

The ZTV was determined through a viewshed analysis using a Geographic Information System (GIS) modelling tool available within the ESRI ArcGIS 10.4 package. The viewshed analysis is based only on topography (i.e. digital elevation model), and represents the areas where the project could be potentially visible.

For this specific assessment, the SRTM 90 m Digital Elevation Data Version 4 (Shuttle Radar Topographic Mission, NASA/USGS) was used.

Defining an appropriate viewshed helps understanding the visual impacts of the Project. The area of the viewshed will vary depending on the nature and scale of the proposed facility. Larger facilities produce larger viewsheds, as it will be more visible from a greater distance. The viewshed is therefore the area that is most likely to be visually impacted.

An analysis can be undertaken based upon the vertical field of view for human vision, showing the relationship between impact and the proportion that the development occupies within the vertical line of sight.

Box 7.3 and *Table 7.33* explain how a viewshed is defined and identified depending on the vertical field of views.

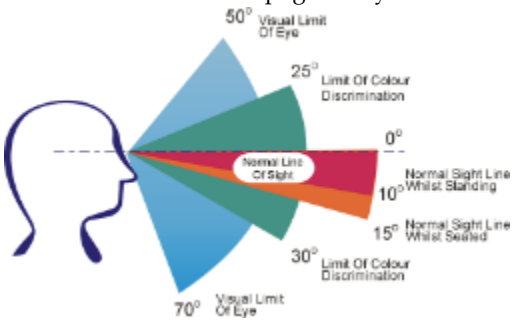
Based on the Project characteristics, the main interferences could occur from:

- Temporary construction compound;
- Erection of pylons;
- Clearing of vegetation; and
- Movement of large construction vehicles.

The pylons are the major visual element of the proposed development and may visually impact on the surrounding. As the viewer moves further away from these structures the visual impact decreases until it is no longer visible. However, before the point of non-visibility is reached, the transmission line have reduced in scale such that they no longer have a significant visual impact.

Box 7.3 ***Vertical Field of View***

The vertical central field of vision has a similar set of parameters. The vertical binocular field is normally 25° above the vertical and 30° below the vertical. When project components exceed the 50° upper visual limit of the eye, they are considered to dominate the vertical central field of vision. When project components occupy 0.5° they are not considered dominant, nor are they usually perceived as a significant change to the existing baseline condition when they are located within an anthropogenically modified landscape.



Source: Human Dimension & Interior Space – A Source Book of Design Reference Standards, Julius Panero and Martin Zelnik, The Architectural Press Ltd. London, 1979

Table 7.33 Vertical Field of View

Vertical Line of Sight	Impact	Distance from an Observer to a 50m Tall Pylons
< 0.5° of vertical angle	Insignificant, a thin line in the landscape	>6 km
0.5° – 2.5° of vertical angle	The Project will be a discernible element in the landscape but will not dominate the landscape from this distance.	6km – 1.200m
2.5° – 5° of vertical angle	At this distance range, the Project will be noticeable.	1.200m – 600m
> 5° of vertical angle	Visible, however the degree of visual intrusion will depend of the width of the object and its placement within the landscape	< 600m

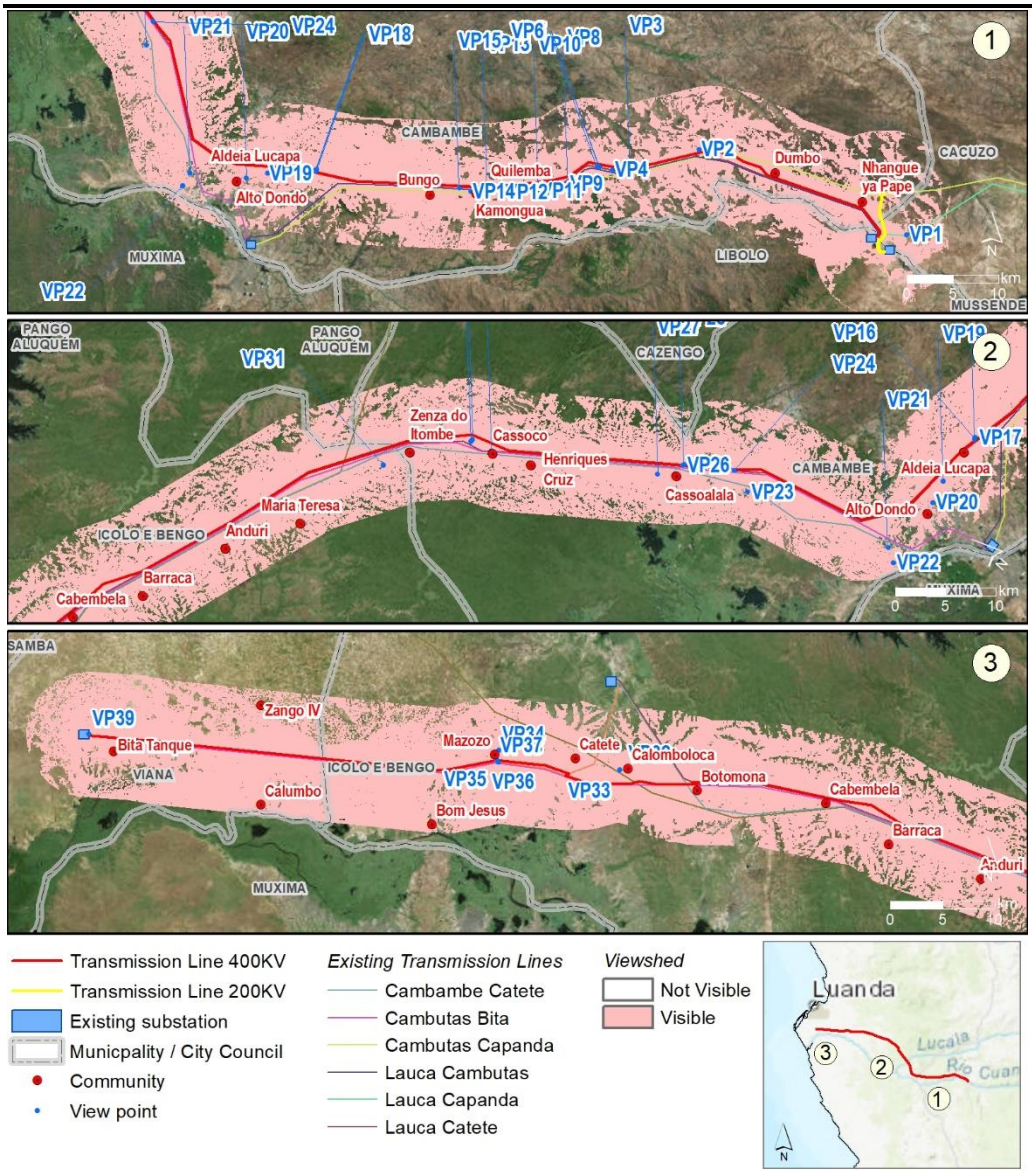
Based on the calculations in *Table 7.33,* it is reasonable to assume that distances at which the magnitude of visual impact of the transmission line will be reduced can be greater than 6 km, where a fully visible pylons would be an insignificant element within the landscape.

GIS software was used to determine the ZTV for transmission line. The current visibility within the ZTV will vary depending on the presence of intervening local topography, and features such as vegetation and buildings. This GIS viewshed analysis has been based solely on topography and did not take into account the potential screening granted by the local vegetation patches, which would further reduce the actual viewshed.

Figure 7.90 shows the ZTV mapping. Moreover, it should be highlighted that a typical viewshed assessment does not take typical meteorological conditions into account that can result in changes to real visibility. For example, rainfall and other atmospheric conditions will alter the visibility of the pylons. The diminution of visual clarity brought about by atmospheric conditions also increases with distance, and cloudy days can result in a natural attenuation of the visibility of the Project.

Similar to cloud coverage, rainy days are able to reduce the visibility as water droplets obscure vision. This varies greatly depending on the heaviness of the precipitation, but even light rain obscures distant objects greatly.

Figure 7.90 Viewshed (6km Corridor)



Source: ERM (2018)

It should be emphasised that localised vegetation cover is not considered in this mapping. This is likely to significantly reduce the visibility of the Project, in whole or in part, and therefore reduce the impact identified.

Viewpoints Identification

In order to assess the visual baseline, all the viewpoints (VP) described above have been selected as representative locations. These viewpoints are referred to as Visual Sensitive Receptors (VSRs); they represent points within the viewshed from where people will be able to see the Project, and where the quality of the landscape and the visual resources of people could be affected by the presence of the Project. VSRs were then ground truthed during the landscape field campaign in July 2018.

Figure 7.90 shows the locations of the VSRs representative of the general landscape character of the area, as viewed from; representative locations of residential areas, nearby locations of the road network, in diverse distance ranges and within various landscape units. *Table 7.34* provides the geographic coordinates of these locations as well as their distances for the proposed route.

Table 7.34 VSR

VRS	Lat	Long	kp	Distance from route
VP1	-9.7302	15.1446	kp 0	3000m
VP2	-9.6453	14.9365	kp 24	400m
VP3	-9.6678	14.8673	kp 31	242m
VP4	-9.6659	14.85	kp 33	309m
VP5	-9.6625	14.8361	kp 34	245m
VP6	-9.6631	14.8342	kp 34	350m
VP7	-9.6631	14.8363	kp 34	305m
VP8	-9.6798	14.8053	kp 38	782m
VP9	-9.6795	14.8051	kp 38	737m
VP10	-9.6867	14.776	kp 41	1018m
VP11	-9.6866	14.776	kp 41	1017m
VP12	-9.6882	14.7401	kp 46	641m
VP13	-9.6866	14.7248	kp 47	372m
VP14	-9.6872	14.7075	kp 49	537m
VP15	-9.6831	14.6962	kp 50	144m
VP16	-9.6668	14.5527	kp 66	110m
VP17	-9.6667	14.554	kp 66	153m
VP18	-9.6667	14.554	kp 66	247m
VP19	-9.6692	14.5048	kp 72	769m
VP20	-9.674	14.4843	kp 74	1140m
VP21	-9.6686	14.4271	kp 78	3234m
VP22	-9.6817	14.4194	kp 79	4860m
VP23	-9.5407	14.3841	kp 92	2134m
VP24	-9.519	14.3912	kp 94	87m
VP25	-9.4813	14.3657	kp 99	20m
VP26	-9.4812	14.3659	kp 99	42m
VP27	-9.4691	14.3448	kp 102	1074m
VP28	-9.3415	14.2643	kp 118	718m
VP29	-9.3219	14.2614	kp 121	411m
VP30	-9.3214	14.2593	kp 121	664m
VP31	-9.2749	14.1919	kp 130	1553m
VP32	-9.1187	13.7331	kp 186	1422m
VP33	-9.1196	13.728	kp 186	1329m
VP34	-9.1018	13.6227	kp 199	985m
VP35	-9.1087	13.6203	kp 199	195m
VP36	-9.1108	13.6222	kp 199	16m
VP37	-9.1112	13.6216	kp 199	76m
VP38	-9.1111	13.6217	kp 199	53m
VP39	-9.0865	13.2657	kp 238	182m

8 STAKEHOLDER ENGAGEMENT

8.1 INTRODUCTION

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 through the different parties involved, i.e. NHID, GAMEK and RNT. This programme is designed to cover all phases of the Project. The Community grievance mechanism's purpose and procedure is also summarised. This section is complemented by the Project's Stakeholder Engagement Plan (ERM, 2018) presented in *Annex F.*

8.2 STAKEHOLDER ENGAGEMENT PRINCIPLES

Stakeholder engagement is a requirement of international lenders within the IFC Performance Standards (namely Performance Standard 1) as it is recognised that failure to engage stakeholders can create significant risks to development of a project.

NHID understands that effective stakeholder engagement and public consultation is a cornerstone of successful Project development, and is committed to free, prior, and informed engagement with stakeholders throughout the Project lifecycle.

The key principles guiding NHID's approach to stakeholder engagement on this Project are:

- To be open and transparent with stakeholders.
- To be accountable and willing to accept responsibility as a corporate citizen and to account for impacts associated with the Project activities.
- To have a relationship with stakeholders that is based on trust and a mutual commitment to acting in good faith.
- To respect stakeholders' interests, opinions and aspirations.
- To work collaboratively and cooperatively with stakeholders to find solutions that meet common interests.
- To be responsive and to coherently respond in good time to stakeholders.
- To be pro-active and to act in anticipation of the need for information or potential issues.

- To engage with stakeholders such that they feel they are treated fairly and their issues and concerns are afforded fair consideration.

- To be inclusive and accessible to stakeholders so that they feel able to participate; to receive and understand information; and to be heard.

8.3 *STAKEHOLDER IDENTIFICATION*

Stakeholders include individuals or groups that may influence or be impacted by the Project, as described in *Box 8.1*.

Box 8.1 Definition of a Stakeholder (1)

> *"Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses."*

The level of interest and impact of any given group of stakeholders is dependent on a number of factors including level of authority, socio-economic context, influence, education and cultural factors.

Stakeholder identification began at Project inception and planning, and has continued through the various stages of the Project development.

Stakeholders identified to date represent the organisations and individuals who may be directly or indirectly (positively or negatively) affected by the Project or who may have an effect on how the Project is implemented.

Stakeholders identified for inclusion in engagement activities meet one of the following criteria:

- Have an interest in the Project;
- would potentially be impacted by or have an influence on the Project (negatively or positively); and/or,
- could provide commentary on issues and concerns related to the Project.

(1) IFC (2007) Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets Available at: https://www.scribd.com/document/16903354/Stakeholder-Engagement-A-Good-Practice-Handbook-for-Companies-Doing-Business-in-Emerging-Markets-May-2007#fullscreen (Accessed 09/10/2018)

Table 8.1 presents an overview of the main stakeholder groups of relevance to the Project. A more complete list of stakeholders in included in the Project's Stakeholder Engagement Plan (ERM, 2018).

Table 8.1 Overview of stakeholder groups

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
National Government	• Key Ministries • National Regulatory bodies • Government Agencies and Institutes	National government are 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 Regulatory Bodies* • Ministry of Environment "*Ministério do Ambiente*" (MinAmb) • Ministry of Energy and Water "*Ministério da Energia e Águas*" (MinEA) Key *Ministries and Ministry Departments* • Ministry of Agriculture and Forestry "*Ministério da Agricultura e Florestas*" • Agriculture Land Management Office "*Gabinete de Gestão de Terras*" (Ministry of Agriculture and Forestry) • National Agriculture Directorate "*Direcção Nacional da Agricultura*"(Ministry of Agriculture and Forestry) • Agriculture Development Institute "*Instituto de Desenvolvimento Agrário*" (Ministry of Agriculture and Forestry) *National Implementing Body* • GAMEK – *Gabinete de Aproveitamento do Médio Kwanza* • RNT EP – *Rede Nacional de Transporte de Electricidade, Empresa Pública* (Ministry of Energy and Water)
Regional and Local Government	• Provincial authorities • Municipal authorities • Commune authorities	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. In addition, the municipalities along the transmission line will be impacted by the	*Provincial governments* • Governor of the Luanda Province • Governor of Cuanza-Norte Province *Municipal administration* • Municipal administrator of Belas • Municipal administrator of Viana • Municipal administrator of Icolo e Bengo • Municipal administrator of Cambambe *Commune administration* • Commune administrator of Quenguela

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
		Project and will need to be kept informed of progress and plans in their area, to consider the Project activities in their policy-making, regulatory and other duties and activities	• Commune administrator of Calumbo • Distrito Urbano do Zango (Urban District) • Distrito Urbano do Kikuxi (Urban District) • Commune administrator of Bom Jesus • Commune administrator of Catete • Commune administrator of Calomboloca • Commune administrator of Zenza do Itombe • Commune administrator of Dondo • Commune administrator of São Pedro da Quilemba • Commune administrator of Cassoneca
Parastatals	• Government funded private enterprises in charge of managing specific activities.	Parastatals may have land or other assets which could be affected by the Project. RNT is the owner of the transmission line and electricity network that the Project will connect to. RNT is responsible for all the Very High Voltage Transmission assets.	• GAMEK (Gabinete de Aproveitamento do Médio Kwanza (Ministry of Energy and Water) • RNT (*Rede Nacional de Transporte de Electricidade*) National Network of Energy Transmission
Traditional and Community Level Authorities	• Community level local administration representatives. • Traditional authorities at community level	Local community leaders acting as representatives of their local community. These are the key leadership figures at local level. They are locally appointed amongst the most respected community members. Sobas are traditional village leaders. Their role is to support local communities and liaise with government authorities. Meetings with traditional authorities will follow local practices and should be held prior to any wider communication in local communities in order to respect the political and social structures. Communication will also include specific efforts to ensure participation of and disclosure to illiterate individuals, individuals with hearing or vision disabilities, individuals	Traditional and community level authorities of the settlements and neighbourhoods ("*bairros*") included in the AoI (500 buffer) or that have land within the AoI (see below): • Community coordinator (and secretary coordinator) in peri-urban areas • Sobas (village chiefs) and secretary soba • Village elders and councillors of affected settlements.

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
		with limited mobility and the elderly who may not be able to get to venues of meetings.	
Communities or Settlements	• Project affected communities along the 500 m buffer including: • Landowners and users; • Community members who use access roads to access nearby natural resources • Social / public infrastructure and services.	Households and communities that may be directly or indirectly affected by the proposed Project and its activities. This includes people living on land affected by the Project, through direct land take or by social and environmental impacts, and other people who visit or use land or resources that may be affected. Primary stakeholders include landowners and land users. These communities need to be engaged around Project impacts (construction and operations). Land affected households will need to be informed about land acquisition and restrictions to land, to participate in the finalization of agreements around compensation and livelihood restoration and take active ownership of the resulting implementation of these measures.	*Villages (included in the AoI (500 m buffer) or that have land in the buffer)*: Directly and indirectly affected community members from: • Bita Ambriz • 4 de Fevereiro • Mbanza Calumbo II (Settlement 17) • Hanga (settlement 16) • Mateia (settlement 11) • Ngolome (settlement 20) • Mazozo • Tare (settlement 29) • Uala (settlement 26) • Koba (settlement 37) • Botomona • Morro 50 (settlement 40) • Sagrada Esperança (settlement 43) • Quitendele (settlement 47) • Zenza do Itombe • Muchau (settlement 49) • Cassoalala • Nova Cassoalala • Aldeia Lucapa • Quissuba (settlement 71) • Dumbo Ya Pepe • Nhangue Ya Pepe *Affected Community Members and Infrastructures* • Households losing access to land • Households losing access to livelihood resources • Households with houses at risk of displacement
Vulnerable Persons/Groups	Vulnerable groups within the study area:	Vulnerable groups may be affected by the Project by virtue of their physical disability, social or economic standing, limited	Vulnerable people within the communities of the Study Area (listed above), sspecifically: • very poor households that rely mostly on farming for food;

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
		education, lack of employment or access to land. Appropriate engagement practices and tools will be adopted to ensure adequate access to information and participation.	• women and female-headed households including single mothers and widows – these households typically rely on farming since other activities such as harvesting of múcua, hunting/fishing, and informal jobs (*"biscatos")* are usually performed by men; • unemployed youth – high unemployment rate in the study area; • elderly and orphans; • disabled persons; • in-migrants (these include migrants from other communities and ethnic groups in search of employment opportunities, farmland, education and intermarriage). It can be more difficult for migrants to find land available.
Civil Society	• Community-Based Organisations (CBOs) • Community or Other Associations • Research and Academic Institutions	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. Such organisations may also have useful data and insight and may potentially become partners to the Project in areas of common interest such as the implementation of community investment as applicable.	• Rede Terra (non-governmental organization working towards supporting communities to have access to land and has conducted studies that include land tenure information). • Rede Ambiental Maiombe (is a forum for consultation of environmental NGOs, proclaimed on 31 January 2001, which is presented as a continuation of the quality of life, as well as a recovery and recovery of ecosystems). • Fundação Kissama is a non-governmental organization founded in 1996 with the aim of promoting the protection of Angolan flora and fauna. • ADRA – Acção para o Desenvolvimento Rural e Ambiente *(ADRA is an Angolan Non-Governmental Organization committed to building a democratic and sustainable development, socially, economically and environmentally just, and with the process of national reconciliation and peace for Angola.)*. • Juventude Ecológica Angolana (JEA) – JEA is a non-governmental organization dedicated to environmental awareness and education. • Other organisations
Non-Governmental Organizations (NGOs)	• International • National • Local	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	• Local NGOs and NGOs located in the Study Area: o Red Cross operating in Cambambe municipality • International NGOs and Pressure Groups: Human Rights Watch, World Vision, IUCN, OXFAM, CARE, WWF, GTZ,

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
		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 bilateral organisations.	Eldoret - SOS Children's Villages International are all present in Angola. • Development Workshop (DW) Is ONGs that has been working in Angola since 1981 at the national government's request to assist in developing policies and programs for human settlements and self-help housing. • ADPP (Ajuda de Desenvolvimento de Povo para Povo) - ADPP is an Angolan Non-Governmental Organization that started its activities in 1986 and has invested in the construction of schools in rural areas as well as supporting agricultural projects implemented by women.
Other interest groups:	• Media • Law enforcement	Local and Municipal level media will typically have a higher level of influence over the Project and may be leveraged to influence local stakeholders' perceptions of the Project.	• Local radio stations part of *Rádio Nacional de Angola* • Provincial media (radio stations). • Angolan local police
*Potential **business** partners*	• Contractors • Suppliers and service providers. • Other businesses operating within the community • Local and international banks • Other	Organisations, businesses and individuals with direct interest in the Project e.g. running businesses or providing services and supplies to the Project.	• Municipal / provincial businesses

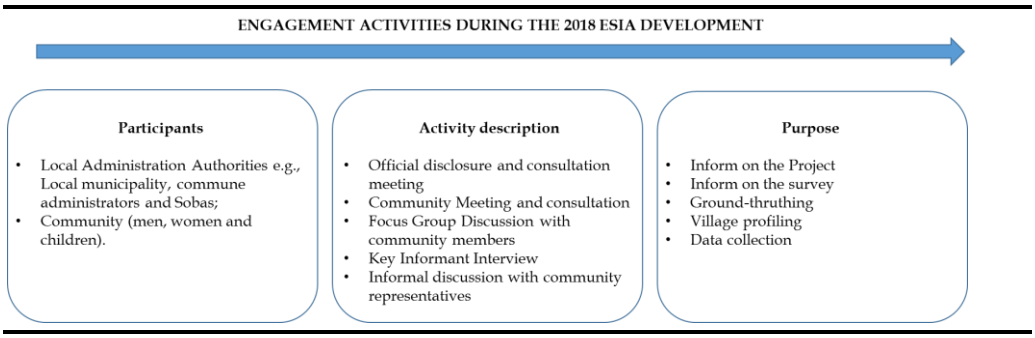
8.4 ESIA CONSULTATION ACTIVITIES

During the development of the 2014 and 2016 EIAs, engagement activities have been very limited, consisting only in the public consultation organised by MINAMB following the EIAs. The results of this consultation is not available.

As part of the Project disclosure and social baseline data collection for the 2018 ESIA, extensive stakeholder engagement was undertaken. Engagement activities included Project disclosure engagement meetings with municipality and commune officials, and potentially affected community members undertaken between the 10th of July 2018 and the 3rd of August 2018 as well as social baseline data collection engagement activities.

A summary of the stakeholder engagement activities undertaken during the 2018 ESIA preparation (participants, activities undertaken and purpose of these activities) is showed in *Figure 8.1.* Details on the engagement activities are provided in Project's Stakeholder Engagement Plan (ERM, 2018).

Figure 8.1 Engagement Activities Undertaken in 2018



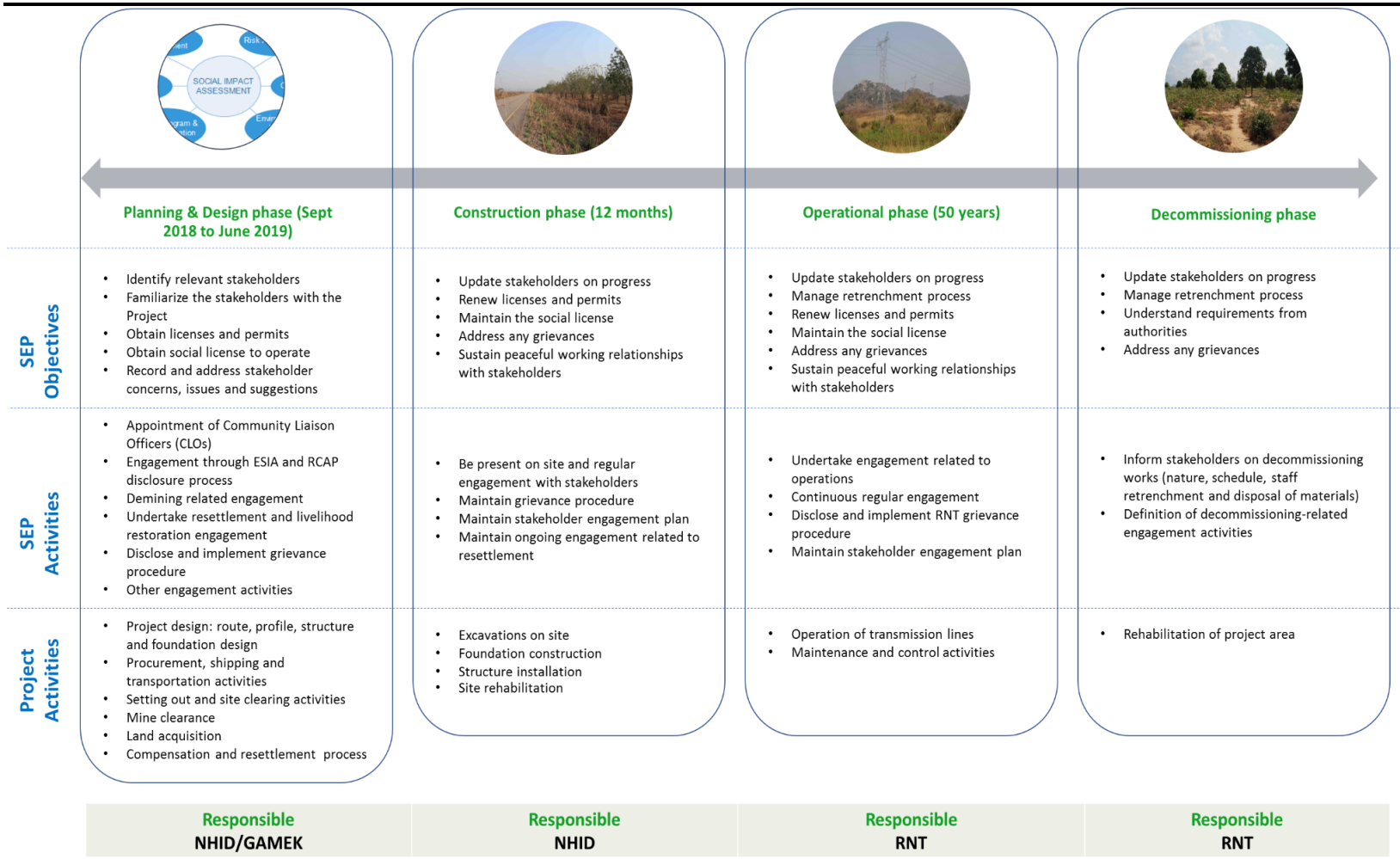
Source: ERM, 2018

8.5 CONSIDERATIONS FOR FUTURE STAKEHOLDER ENGAGEMENT

The stakeholder engagement programme is designed to cover all phases of the Project. However, NHID will hand over the Project to *Rede Nacional de Transporte de Electricidade* (RNT) once the construction of the transmission lines is completed. NHID will have no responsibilities during the operation phase. Once the project is commissioned, MINEA-GAMEK will transfer the assets as well as the responsibility for RNT to fulfil IFC standards. [1] In this regard, all engagement activities during the operation will be managed and promoted by RNT. The general objectives of stakeholder engagement are outlined in *Figure 8.2* as well as the Project activities.

[1] At that stage, RNT will ask MINAMB for the Environmental Operation License (EOL). This EOL will includes the requirements from the MINAMB with regards to fulfilment of IFC standards.

Figure 8.2 Stakeholder Engagement Objectives and Activities for each Project Phase



Source: ERM, 2018

Specific planning and engagement activities will be necessary at each Project phase. These are presented in Project's Stakeholder Engagement Plan (ERM, 2018).

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 (see *Section 8.7*).
- Regular Project Monitoring reports (in particular during Construction and Operations).

8.6 GRIEVANCE MECHANISM

The Community Grievance Mechanism enables any stakeholder to make a complaint or a suggestion about the way the Project is being implemented. Grievances may take the form of specific complaints for damages/injury, concerns about routine Project activities, or perceived incidents or impacts.

The purpose of the Community Grievance Mechanism Procedure is to implement a formalised process (identification, tracking and redress) to manage complaints/grievances from communities and other local stakeholders in a systematic and transparent manner that could potentially arise from the Project.

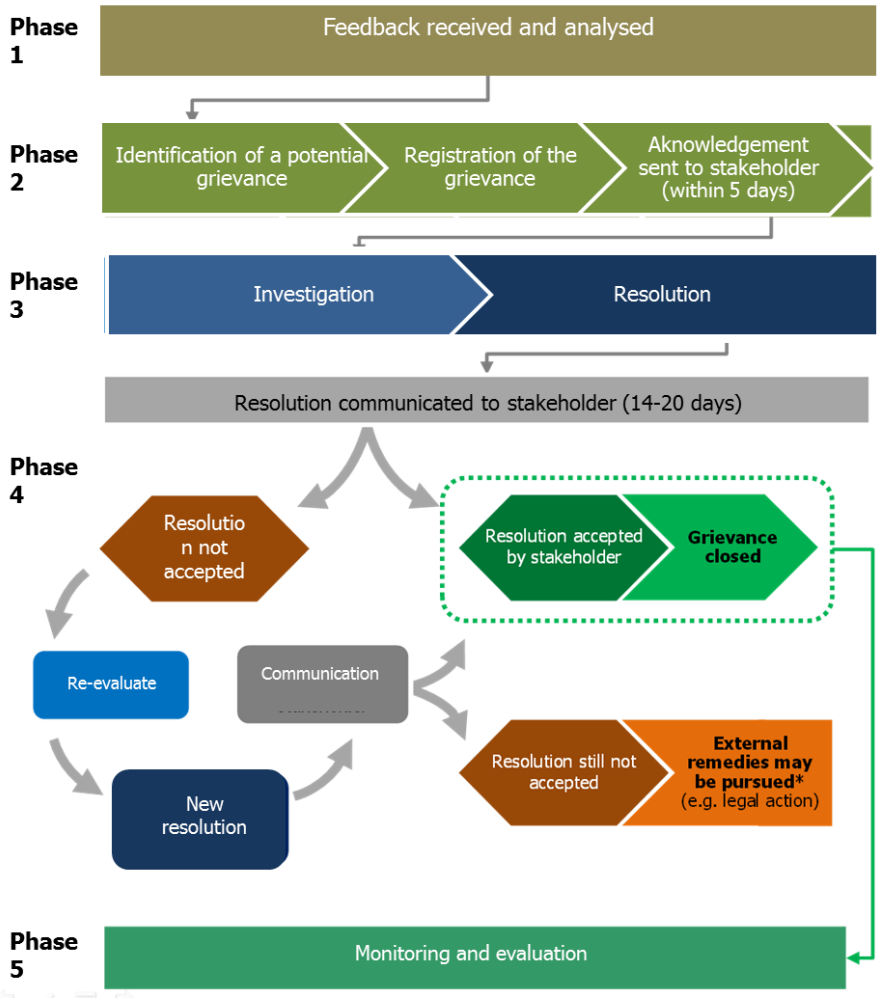
8.6.1 Grievance Procedure

This grievance procedure will be implemented by NHID and only covers the pre-construction and construction phase. Following the OHTL commissioning, RNT will have the responsibility to implement a grievance mechanism during the operational phase.

The grievance procedure in *Figure 8.3* is proposed to ensure an effective and timely response to community complaints and maintain good community and stakeholder relations. The five phases that constitute the grievance procedure are represented in *Figure 8.3.* These consist of:

- Phase 1: Grievance receipt and registration
- Phase 2: Screening and Prioritisation
- Phase 3: Grievance Investigation
- Phase 4: Resolution and Feedback to Complainant(s)
- Phase 5: Grievance Close-out and Register Update

Figure 8.3 ***Grievance mechanism during the pre-construction and construction phase***



Source: ERM, 2018

8.7 *MONITORING AND REPORTING STAKEHOLDER ENGAGEMENT ACTIVITIES*

It will be important to monitor and report on the on-going stakeholder engagement activities to ensure that the desired outcomes are being achieved, and to maintain a comprehensive record of engagement activities and the issues raised.

8.7.1 Data Management

In order to record activities, assess the effectiveness of the Stakeholder Engagement Plan and associated community dialogue activities, NHID will implement a data management and monitoring process. Stakeholder engagement activities will be documented and filed in order to track and refer to records when required and ensure delivery of commitments made to stakeholders.

The following stakeholder community dialogue records and documentation will be used and maintained by NHID during pre-construction and construction phase:

- Stakeholder list
- Stakeholder engagement log
- Commitments register
- Meeting minute template
- Grievance log
- Media monitoring of press and radio stories relevant to the project and unconventional related issues and activities.

8.7.2 Internal and external reporting

The following internal reports will be developed by NHID E&S Manager:

- *Red Flag Reports*: consisting of weekly or daily reports for urgent items (e.g.high potential grievances) or incidents of significant nature.

- *Internal quarterly progress reports:* these reports will summarise engagement activities undertaken in the reporting period, grievance mechanism, social license risk to the Project, limitations and priorities for the following quarter.

These reports will be discussed at quarterly meetings and will be circulated internally as required.

In addition, as an integral step in building relationships with stakeholders and promoting understanding between NHID and its publics, it is recommended to keep track of commitments made (commitments tracker) with stakeholders and to communicate progress made against these commitments on a regular basis (for instance during regular meetings with the community representatives). This external reporting will also be developed by NHID E&S Manager, but bi-annualy.

9 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

9.1 INTRODUCTION

This *Chapter* presents the assessment of potential environmental (physical, biological), community health and safety and social impacts associated with the construction and operation of the Project. Unplanned events and cumulative impacts are also covered. The Chapter is organised by resources and receptors, then by potential impact, and then by design stage (construction or operations). The scope of the assessment has been defined through the scoping process (as summarised in *Chapter 6*).

Based on the impact assessment, mitigation for both construction and operation phases are specified with the goal to either avoid the impact, abate the impact at the source, minimize the impact at receptor and, if necessary to offset the impact through compensatation or other means.

For the purposes of this assessment, ERM has adopted the *Mitigation Hierarchy* described in *Chapter 5* i.e. avoid at source / reduce at source, abate on site, abate at receptor, repair or remedy, or compensate in kind, compensate through other means.

Regarding the physical resources or receptors, the impacts are assessed in four areas: soils, water resources, air quality, and noise and vibration. For biological resources and receptors, impacts are assessed for: flora, fauna, and visual amenity.

The social impacts are assessed for four areas: land and livelihoods, community health and safety, worker health and safety and worker management, public access to infrastructure and services; and cultural resources. In terms of community health and safety, the impact assessment was focused on community safety and environmental health (which indirectly affects community health).

Impacts resulting from unplanned or non-routine events and those which are a result of accidents is also assessed. These are different to impacts that would reasonably be predicted to occur to some degree in the normal course of activities (including the application of in-built control measures) during construction and operations.

And finally, a cumulative impact assessment (i.e. Project impacts that act with impacts from other projects) is presented in order to determine whether Project activities in combination with activities associated with other projects is likely to significantly affect the viability or sustainability of the existing environmental and social receptors and resources (using the concepts of Valued Environmental and Social Components or VECs).

9.2 PHYSICAL RESOURCES AND RECEPTORS

9.2.1 Soils

Potential Impacts

Project activities will have direct physical impacts to soil. Possible direct physical impacts to soil include erosion resulting from activities such as excavation of foundations for electricity pylons, clearing of vegetation for infrastructure such as roads, laydown areas, construction zones and camps. No indirect impacts to soil and erosion are anticipated.

The excavation of soil for the construction of pylon foundations will disrupt the soil cohesion and also may result in surplus soil due to the use of concrete for the foundation. If not properly restored or managed, this soil may erode and wash into nearby surface water bodies adversely impacting these (see *Section 7.2.6*). Any temporary soil stockpiles established during construction of infrastructure will be at risk of erosion from wind and rainfall.

Impacts to soil from unplanned events, such as accidental release of hazardous materials is discussed elsewhere.

Baseline Conditions

The potential for soil erosion to occur during the construction phase is based on a number of factors including the type and physical properties of soil, the topographic slope, the vegetation cover, and the nature and duration of construction activities which disrupt the soil.

The proposed transmission line traverses the western region of Angola, which is characterized by three main soil types: ferric luvisols, eutric cambisols and haplic xerosols (*Section 7.2.4*). The majority of the AoI is underlain by ferric luvisols which are generally red and/or yellow soils whose colours are derived from the accumulation of metal oxides including iron and aluminium and which are generally low in organic matter and nutrients.

The sensitivity to erosion of soils along the proposed transmission line depends on the type and properties of the soils as detailed in *Table 7.3 - Section 7.2.4* (ESDAC, 2018).

Impact Assessment

Construction Phase

The excavation of foundations and the construction of temporary roads and equipment laydown areas will have a direct negative effect on soil cohesion, thereby increasing the risk of erosion along the entire footprint of the project. The impact is likely to occur but the extent of the impact is likely to be limited

to the footprint of the activities, particularly the construction and use of access roads, laydown areas (i.e. local extent).

The impacts of construction activities on soil erosion are anticipated to last for the duration of the construction phase only (i.e. short term). Given the subtropical location of the Project and the nature of vegetation present, it is anticipated that cleared areas will revegetate naturally and relatively quickly (assuming rainfall patterns similar to the current averages persist), minimising the risk of erosion.

Table 9.1 Pre-Mitigation Impact Assessment

Impact	**Soil Erosion during Construction**				
Impact Nature	Negative	Positive	Neutral		
	Loss of soil cohesion contributing to erosion.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities and soil along the footprint of the project.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is expected to be short term, however in the case of serious erosion the impacts may be experienced long term.				
Impact Extent	Local	Regional	International		
	The impact will be limited to the footprint of the project and immediate surrounds.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the soil along the proposed transmission line to erosion is considered to be medium to low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is medium to low, the overall significance is considered to be minor.				

Operational Phase

The RoW will be reinstated following construction with soil spread and graded and the area revegetated. Following reinstatement, no significant soil erosion is anticipated.

Mitigation

The following mitigation measures will be implemented to minimise the potential for soil erosion:

- Vegetation clearing and topsoil disturbance will be minimised.
- Contour temporary and permanent access roads / laydown areas so as to minimise surface water runoff and erosion;

- Sheet erosion of soil shall be prevented where necessary through the use of sand bags, diversion berms, culverts, or other physical means.

- Topsoil shall be stockpiled separate from subsoil. Stockpiles shall not exceed 2 m height, shall be located away from drainage lines, shall be protected from rain and wind erosion, and shall not be contaminated. Wherever possible construction work will take place during the dry season.

- Topsoil shall be evenly spread across the cleared areas when reinstated.

- Accelerated erosion from storm events during construction shall be minimised through managing storm water runoff (e.g. velocity control measures).

- Soil backfilled into excavations shall be replaced in the order of removal in order to preserve the soil profile.

- Spread mulch generated from indigenous cleared vegetation across exposed soils after construction.

Residual Impact

The implementation of the proposed mitigation measures reduces the significance of the residual impact to ***negligible*** to ***minor*** along the entire route of the transmission line.

Table 9.2 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Loss of soil resources due to erosion	Construction	Minor	Negligible to Minor

9.2.2 Water Resources

Potential Impacts

Project activities will interact with water resources in the following ways:

- There will be direct interaction during clearing and construction near to or in surface water bodies. There will be indirect interaction in the case of erosion of soils into water bodies.
- There will be direct interaction from the abstraction of water from surface water bodies for construction (e.g. for dust control).
- There will be direct interaction from the discharge of treated domestic wastewater to surface water bodies.

The transmission line will cross two major rivers (Cuanza – close to Laúca substation; and Lucala – near Km 95) and small surface water bodies (e.g. creeks) of varying size (*Table 7.5 – Section 7.2.6*). Project activities that will have a direct effect on the surface water where clearing of vegetation and excavation of foundations occurs near surface water bodies. In addition, if vegetation and soil 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.

Water required for construction activities and general camp domestic purposes will be sourced from surface water bodies and not groundwater. Abstraction will be done at rates which do not adversely affect ecological functions and do not impede access to water of existing users.

Wastewater discharged from construction camps will be sampled by NHID (or its subcontractors) to ensure that it complies with local effluent discharge limits which are protective of human and ecological health.

Baseline Conditions

The proposed transmission line is located within the catchment basin of the Cuanza River, which is 960 km long and has a basin that covers roughly 51,000 km^2.

During much of its upper and middle course, the Cuanza River is broken at intervals by rapids and flows in a well-defined valley, however the lower reaches of the river is navigable by small vessels to the sea over a distance of approximately 255 km.

No information is available on the quality of the water in the Cuanza River, including turbidity and concentration of suspended solids.

Impact Assessment

Construction Phase

The addition of silt to the Cuanza River and its tributaries resulting from erosion of land cleared during the construction of the transmission line and associated service infrastructure will have a direct negative effect on surface water quality by increasing the turbidity and concentration of total dissolved / suspended solids, with potentially adverse effects on river biota. No information is available about the turbidity and concentration of suspended solids in rivers in the project area, however given the extent of human settlement and agricultural activities it is probable that these are elevated already and therefore that these rivers have a low to medium sensitivity to change.

The volume of soil like to be disturbed by proposed project activities is likely to be ***minor*** and therefore the extent of the impacts from sediment addition to the river is considered to be local. Owing to the subtropical location of the project and the high probability that cleared areas will revegetate naturally thereby limiting erosion, the duration of this impact is anticipated to be short term.

The nature of the construction activities for the transmission line render the erosion of soil and subsequent siltation of rivers along the route possible. The ***small*** magnitude of this impact on surface water quality and the *low* sensitivity of the these rivers to increased turbidity means the significance of this impact is assessed as ***minor***.

Table 9.3 Pre-Mitigation Impact Assessment

Impact	**Siltation of surface water**				
Impact Nature	Negative	Positive	Neutral		
	Eroded soil entering surface water bodies.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities and the environment along the footprint of the project.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is expected to be short term, however in the case of serious erosion the impacts of siltation of surface water may be experienced long term (into the operational phase).				
Impact Extent	Local	Regional	International		
	The impact will be limited to the footprint of the project and immediate surrounds. The dilution of sediments in the river will render this impact negligible at the regional scale.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the rivers along the proposed transmission line to siltation is considered to be medium to low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is medium to low, the overall significance is considered to be minor.				

Operation Phase

Once the RoW is reinstated, no direct disturbance of surface water bodies is anticipated.

Mitigation

The mitigation measures listed for soil management above are also applicable to surface water quality. In addition, the following mitigation measures will be implemented to minimise the potential for siltation of surface water:

- Activities shall be conducted > 100 m away from water bodies, except where crossings are required.

- All waste water which may be contaminated with oily substances must be managed in accordance with an appropriate waste management plan and no hydrocarbon-contaminated water may be discharged to the environment; and

- Domestic wastewater shall be treated and disposed of in accordance with an approved waste management plan.

Residual Impact

The implementation of the proposed mitigation measures reduces the significance of the residual impact to ***negligible*** to ***minor*** along the entire route of the transmission line.

Table 9.4 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Availability and Quality of Water Resources	Construction	Minor	Negligible to Minor

9.2.3 Air Quality

Potential Impacts

Project activities that have potential to impact air quality would be associated with construction from emissions of air pollutants from temporary power generators, construction equipment, and vehicles. Construction activities will also create dust.

The following would be expected during construction:

- Emissions of oxides of nitrogen (NO_2 in particular) 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_{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 impact assessment focusses on the impacts during the construction phase. Of these, dust and PM_{10}[1] emissions from construction activities are of interest, in particular where vehicles are using unpaved roads close to properties and agricultural areas.

Baseline Conditions

Pollutant Levels

Based upon the potential impacts, the pollutants of interest are oxides of nitrogen dust, and particulate matter.

Baseline dust and PM_{10} is influenced by a wide range of emissions, including man-made and natural sources. Along the route it is anticipated that there will be several locations where the dust and PM_{10} baseline is elevated and close to and frequently above air quality standards due to existing levels of human activities including vehicle traffic. This includes in the urban areas around Luanda at the western end of the route, and in settlements where there are unpaved roads, at individual properties close to unpaved roads and properties close to agricultural activities. On this basis, the baseline dust and PM_{10} airshed is considered to be degraded but only on a localised basis.

NO_2 is emitted from combustion sources and these are almost exclusively man-made. In the absence of significant local sources, including at the western end of the route, NO_2 concentrations are not expected to approach or exceed air quality standards. On this basis, existing levels of NO_2 will be below air quality standards throughout the route and the airshed is considered to be undegraded.

Receptor Sensitivity

The sensitivity of receptors in the Area of Influence are defined as follows:

For sensitive human receptors[2]:

- High – locations where there are particularly vulnerable receptors, including hospitals with high dependency and intensive care wards;
- Medium – locations where people are generally present permanently, including dwellings, schools and settlements; and
- Low – where people are only present for short periods, such as agricultural areas and fishing areas.

[1] Dust and particulate matter are different and in broad terms, particulate matter refers to the small diameter partical of 10 microns and less that can harm human health through inhalation. Dust includes larger sized particles that are not a health hazard but that can obscure visibility in the air and settle on surface and cause visual impact. Note that while all particulate matter is dust, not all dust contains particulate matter as defined.

[2] Air quality standards for the protection of human health are set to protect the most vulnerable people in society, including the old, inform and very young. As a result, there are few locations where there are particularly vulnerable people and most location where people are present are defined in the 'Medium' sensitivity category.

For sensitive ecological and agricultural receptors:

- High – habitat sites with international designations, such as Ramsar sites;
- Medium – habitat sites with statutory national protection, and sites where agricultural activities are producing particularly sensitive crops, such as fruit or green vegetables; and
- Low – local or national habitats sites with no statutory protection, and other agricultural areas.

Based on a review of the proposed route and the access roads the following specific sensitivities have been identified:

- Sensitive human receptors are defined as Medium where there are permanent settlements of dwellings, and low elsewhere; and
- Sensitive ecological and agricultural receptors are defined as Low in all locations, as there are no protected habitats.

Impact Assessment

Exhaust Emissions

The method for assessing whether road traffic exhaust emissions may be potentially significant are set out in *Figure 9.1*. No detailed traffic data is available at this stage. However, the numbers of Heavy Duty Vehicles (HDV) and Light Duty Vehicles (LDVs) are expected to be well below the thresholds for potentially significant impacts. On this basis, the magnitude of impacts associated road traffic exhaust emissions are predicted to be Negligible.

Combined with the Medium and Low receptor sensitivities identified, the overall significance of impacts is **Negligible** at all locations.

Dust and PM_{10}

The method for assessing whether dust and PM_{10} emissions may be potentially significant are set out in Figure 9.1. There are the potential for impacts to arise from:

- Traffic on unpaved roads;
- Earthworks;
- Construction activities; and
- Trackout[1].

The Project will generate traffic on unpaved roads close to dwellings and within settlements. As this is expected to be more than five HDVs/day, and at some locations for more than four weeks, the magnitude is large.

[1] Trackout refers to dirt and dust created from vehicles moving from unpaved roads to paved roads and is evidenced by dirt track marks on the paved areas where the paths intersect.

The Project will require earthworks along the length of the route. These works will include stripping vegetation from the route, construction of access roads and the route haul track, excavations for the concrete bases for the pylons, and the construction of construction compounds. Due to the scale of these activities, the Magnitude is Large.

The Project will require the construction of substation structures. However, these are small with a total volume of less than 10,000 m^3. Due to this, the Magnitude is Negligible.

The exact number of HDVs that will be generated is unknown. However, this is expected to range from 10 to 50 HDVs per day category using unpaved site roads. On this basis, the magnitude of trackout is medium.

Combined with the Medium and Low receptor sensitivities identified, the significance of unmitigated impacts are:

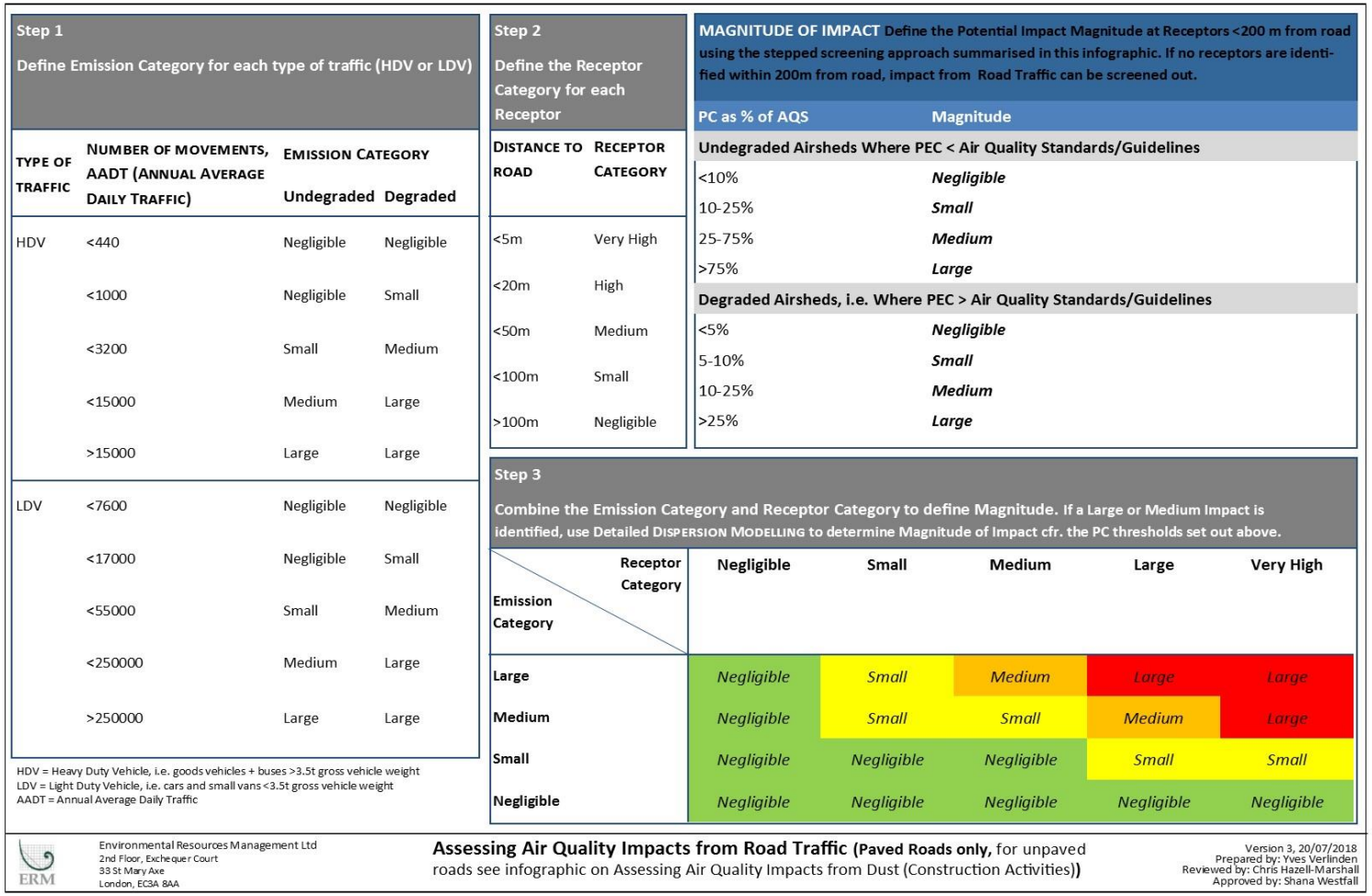
- Traffic on unpaved roads are **Major** where there are receptors within 50m of unpaved roads used by construction traffic, or the haul route;

- Earthworks are **Major** where there are receptors within 350 m of locations where earthworks are being undertaken, including route stripping, construction compounds and excavations;
- Construction activities are **Negligible** at all receptors; and

- Trackout are **Major** at receptors within 50 m of routes used to access the construction route where these are within 500 m of the access point to the route or construction compounds.

On this basis there is a need for mitigation to be implemented to reduce dust emissions/ impacts.

Figure 9.1 Road traffic Exhaust Emissions Impact Assessment Matrix



Step 1

Define Emission Category for each type of traffic (HDV or LDV)

Type of Traffic	Number of Movements, AADT (Annual Average Daily Traffic)	Emission Category	
		Undegraded	Degraded
HDV	<440	Negligible	Negligible
	<1000	Negligible	Small
	<3200	Small	Medium
	<15000	Medium	Large
	>15000	Large	Large
LDV	<7600	Negligible	Negligible
	<17000	Negligible	Small
	<55000	Small	Medium
	<250000	Medium	Large
	>250000	Large	Large

HDV = Heavy Duty Vehicle, i.e. goods vehicles + buses >3.5t gross vehicle weight
LDV = Light Duty Vehicle, i.e. cars and small vans <3.5t gross vehicle weight
AADT = Annual Average Daily Traffic

Step 2

Define the Receptor Category for each Receptor

Distance to Road	Receptor Category
<5m	Very High
<20m	High
<50m	Medium
<100m	Small
>100m	Negligible

MAGNITUDE OF IMPACT Define the Potential Impact Magnitude at Receptors <200 m from road using the stepped screening approach summarised in this infographic. If no receptors are identified within 200m from road, impact from Road Traffic can be screened out.

PC as % of AQS	Magnitude
Undegraded Airsheds Where PEC < Air Quality Standards/Guidelines	
<10%	***Negligible***
10-25%	***Small***
25-75%	***Medium***
>75%	***Large***
Degraded Airsheds, i.e. Where PEC > Air Quality Standards/Guidelines	
<5%	***Negligible***
5-10%	***Small***
10-25%	***Medium***
>25%	***Large***

Step 3

Combine the Emission Category and Receptor Category to define Magnitude. If a Large or Medium Impact is identified, use Detailed Dispersion Modelling to determine Magnitude of Impact cfr. the PC thresholds set out above.

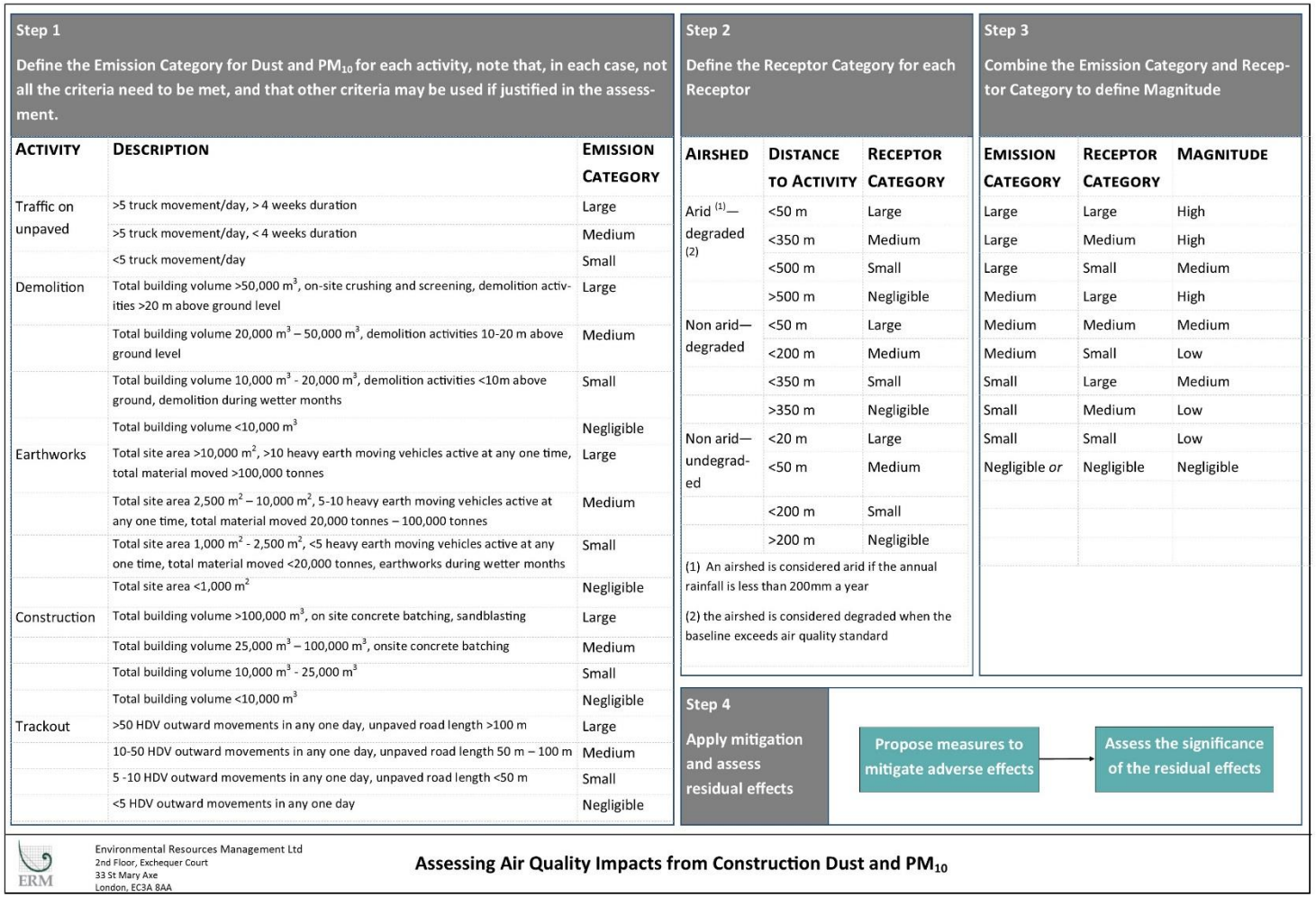
Emission Category \ Receptor Category	Negligible	Small	Medium	Large	Very High
Large	*Negligible*	*Small*	*Medium*	*Large*	*Large*
Medium	*Negligible*	*Small*	*Small*	*Medium*	*Large*
Small	*Negligible*	*Negligible*	*Negligible*	*Small*	*Small*
Negligible	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*

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Assessing Air Quality Impacts from Road Traffic (Paved Roads only, for unpaved roads see infographic on Assessing Air Quality Impacts from Dust (Construction Activities)**)**

Version 3, 20/07/2018
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Reviewed by: Chris Hazell-Marshall
Approved by: Shana Westfall

Figure 9.2 Dust and PM_{10} Impact Assessment Matrix



Step 1

Define the Emission Category for Dust and PM_{10} for each activity, note that, in each case, not all the criteria need to be met, and that other criteria may be used if justified in the assessment.

Activity	Description	Emission Category
Traffic on unpaved	>5 truck movement/day, > 4 weeks duration	Large
	>5 truck movement/day, < 4 weeks duration	Medium
	<5 truck movement/day	Small
Demolition	Total building volume >50,000 m^3, on-site crushing and screening, demolition activities >20 m above ground level	Large
	Total building volume 20,000 m^3 – 50,000 m^3, demolition activities 10-20 m above ground level	Medium
	Total building volume 10,000 m^3 - 20,000 m^3, demolition activities <10m above ground, demolition during wetter months	Small
	Total building volume <10,000 m^3	Negligible
Earthworks	Total site area >10,000 m^2, >10 heavy earth moving vehicles active at any one time, total material moved >100,000 tonnes	Large
	Total site area 2,500 m^2 – 10,000 m^2, 5-10 heavy earth moving vehicles active at any one time, total material moved 20,000 tonnes – 100,000 tonnes	Medium
	Total site area 1,000 m^2 - 2,500 m^2, <5 heavy earth moving vehicles active at any one time, total material moved <20,000 tonnes, earthworks during wetter months	Small
	Total site area <1,000 m^2	Negligible
Construction	Total building volume >100,000 m^3, on site concrete batching, sandblasting	Large
	Total building volume 25,000 m^3 – 100,000 m^3, onsite concrete batching	Medium
	Total building volume 10,000 m^3 - 25,000 m^3	Small
	Total building volume <10,000 m^3	Negligible
Trackout	>50 HDV outward movements in any one day, unpaved road length >100 m	Large
	10-50 HDV outward movements in any one day, unpaved road length 50 m – 100 m	Medium
	5 -10 HDV outward movements in any one day, unpaved road length <50 m	Small
	<5 HDV outward movements in any one day	Negligible

Step 2

Define the Receptor Category for each Receptor

Airshed	Distance to Activity	Receptor Category
Arid (1)—degraded (2)	<50 m	Large
	<350 m	Medium
	<500 m	Small
	>500 m	Negligible
Non arid—degraded	<50 m	Large
	<200 m	Medium
	<350 m	Small
	>350 m	Negligible
Non arid—undegraded	<20 m	Large
	<50 m	Medium
	<200 m	Small
	>200 m	Negligible

(1) An airshed is considered arid if the annual rainfall is less than 200mm a year

(2) the airshed is considered degraded when the baseline exceeds air quality standard

Step 3

Combine the Emission Category and Receptor Category to define Magnitude

Emission Category	Receptor Category	Magnitude
Large	Large	High
Large	Medium	High
Large	Small	Medium
Medium	Large	High
Medium	Medium	Medium
Medium	Small	Low
Small	Large	Medium
Small	Medium	Low
Small	Small	Low
Negligible *or*	Negligible	Negligible

Step 4

Apply mitigation and assess residual effects

Propose measures to mitigate adverse effects → Assess the significance of the residual effects

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Assessing Air Quality Impacts from Construction Dust and PM_{10}

Table 9.5 Pre-Mitigation Impact Assessment

Impact	Degradation of the Airshed during Construction				
Impact Nature	Negative	Positive	Neutral		
	Increase in airborne pollution.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities and the environment along the footprint of the project.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is expected to be temporary as emissions arise throughout the construction phase.				
Impact Extent	Local	Regional	International		
	The impact will arise locally in the footprint of the project and immediate surrounds. Impacts will also arise further afield close to unpaved public roads used to access the work sites during construction.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Intermittent – impacts will typically only arise during working hours				
Likelihood	Inevitable				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of human receptors is Medium in dwellings and settlements, Low elsewhere. The receptors of agricultural activities is Low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Dust emissions have the potentially to have Major significant impacts at nearby sensitive human receptors.				

Mitigation

Exhaust Emissions

No mitigation is required. We assume that the project will use only vehicles that are operated and maintained according to manufacturer specifications.

Dust and PM_{10}

The impact assessment identified Major impacts associated with traffic on unpaved roads and earthworks, and due to trackout. The following mitigation is therefore recommended to manage these impacts. Mitigation measures should be implemented in locations where there are receptors within the relevant distance, as set out in *Section 7.2.7.*

This mitigation is derived from the "Institute of Air Quality Management, Guidance on the assessment of dust from demolition and construction[1]." The mitigation set out within this are generally applicable to construction projects, and is applicable to Angola. Mitigation measures are split into general considerations for all construction activities, and specific mitigation measures for traffic on unpaved roads, earthworks and trackout.

[1] Available at: http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf

As general measures for all locations:

- Develop a Dust Management Plan;
- Record all dust and air quality complaints, identify cause(s), take appropriate measures;
- Liaise with local communities to forewarn of potentially dusty activities;
- Undertake monitoring close to dusty activities, noting that this may be daily visual inspections, or passive/active monitoring as required by Lender agreement;
- Undertake inspections to ensure compliance with the Dust Management Plan;
- Plan potentially dusty activities so that these are located as far from receptors as feasible;
- Erect solid screens if feasible around stockpiles and concrete batching;
- Avoid run off of mud and water and maintain drains in a clean state;
- Remove dusty materials form site as soon as possible if not being re-used. If being re-used, cover or vegetate if possible;
- Impose speed limits on haul routes and in construction compounds to reduce dust generation;
- Minimise drop heights when loading stockpiles or transferring materials; and
- Avoid waste or vegetation burning.

For traffic on unpaved roads:

- Undertake watering to attenuate dust near sensitive receptors. The duration and frequency of this should be set out in the Dust Management Plan and will consider water availability and any stakeholder grievances; and
- On unpaved roads in use for more than 1 month, consider use of surface and sealants to reduce the use of water and water trucks. Use of lignin-based sealants recommended due to low environmental toxicity.

For earthworks:

- Revegetate exposed areas as soon as feasible;
- Revegetate or cover stockpiles if feasible;
- Expose the minimum area required for the works, and undertake; and exposure on a staged basis to minimise dust blow.

For trackout:

- Where trackout is onto paved roads, use wet road cleaning methods to remove dirt and mud build up;
- Avoid dry sweeping or large areas; and

- Where feasible, undertake wheel washing and vehicle clean down prior to accessing public roads.

Residual Impact

The residual impacts associated with road traffic exhaust emissions are **Negligible**.

With the implementation of suitable mitigation and with adequate monitoring, residual impacts associated with dust and PM_{10} from construction activities are **Negligible**.

Table 9.6 ***Residual Impact Significance***

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Road Traffic Exhaust Emissions	Construction	Negligible	Negligible
Dust and PM_{10} from construction activities	Construction	Major	Negligible

9.2.4 Noise and Vibration

Potential Impacts

Potential noise impacts may arise as a result of the construction activities associated with the transmission line steel lattice towers.

Construction activities and equipment are not expected to result in significant levels of vibration. Equipment that might high levels of vibration (such as impact piling or vibratory compaction) will not be used. Therefore vibration effects have been scoped out of further assessment.

It is expected that existing access roads can be utilized. Before construction begins, it may be necessary to carry out maintenance work on these roads. Typically this would involve minor re-grading using a grader. This is not expected to give rise to significant noise impacts and has therefore been scoped out of further assessment.

Few if any new access roads will be required. Where required, basic access tracks will be established to each structure position by moving obstacles such as rocks, levelling high points and filling in holes. This is not expected to give rise to significant noise impacts and has therefore also been scoped out of further assessment.

During the operational phase, high voltage overhead power transmission lines can generate noise by a phenomenon known as 'corona discharge'. 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 expected to mask effects from corona discharge noise and this impact has been scoped out of further assessment.

Baseline Conditions

The ambient noise environment at settlements along the transmission line corridor is influenced by activities within settlements including people activities, animals (such as birds), occasional cars, vegetation blowing in the wind, and weather (wind, rain).

The noise baseline survey conducted for the ESIA determined that daytime noise levels, L_{Aeq}, were generally low and in the range 35 to 41 dB. Close to the proposed Bita substation and representative of the noise environment at the more isolated properties found in that area, measured L_{Aeq} noise levels included little human activity. Consequently they were somewhat lower, ranging between 28 and 30 dB.

Noise monitoring was not carried out during the night as significant night-time noise effects from the construction and operation of the Project are not expected.

Methodology

Noise from construction has been predicted using the methodology set out in BS 5228 (1). This standard provides a database of equipment noise source levels which has been used.

Construction noise predictions have been carried out for the noisiest period of the main construction phase. The predictions include factors to account for the number and type of construction plant items that are likely to operate at the site during a particular construction phase. Noise from construction activities has been predicted assuming 50 percent of the intervening ground is acoustically soft (e.g. open, vegetated fields). The effect of screening from existing intervening structures or ground topography has not been considered, which is conservative. The predictions assume works take place at the closest part of the site to noise sensitive receptors (NSRs), which results in predictions representing the highest expected noise levels at NSRs. In practice, noise levels will be lower for periods as works take place further away.

The transmission lines extend approximately 253 km in total. Concrete foundations will be used to support the steel lattice tower structures, which

(1) BS 5228-1:2009+A1:2014 Code of Practise for Noise and Vibration Control on Construction and Open Sites,- Part 1: Noise, BSi 2014

will be installed using a mobile crane. A sound power level of 105 dB L_{WA} has been assumed for the noisiest phase of construction, which is expected to be foundation works. This includes a concrete mixer truck, a tracked mobile crane, a compressor and a poker vibrator working simultaneously.

When assessing effects from noise, impact significance is not determined in the same way that it is for most other technical disciplines i.e. using a matrix of impact magnitude and receptor sensitivity. Consideration of receptor sensitivity is made at the start of the assessment, and impacts are only assessed where sensitive receptors are identified. Receptor sensitivity is represented by impact criteria determined by reference to appropriate standards or guidelines. The significance of an impact is derived from the impact magnitude, but takes account of other factors such as the duration of the impact and the design of the receptor. This is shown in *Table 9.7*.

Table 9.7 Noise Impact Significance

Impact Magnitude Classification (positive or negative)	Influencing Factors	Impact Significance Rating
Negligible	Consider other factors that have the ability to affect the significance of the impact such as duration, receptor detail / design or the receiver perception of noise	Negligible
Small		Minor
Medium		Moderate
Large		Major

Construction noise impact magnitude is usually judged by exceedance of absolute noise thresholds, because noise levels are usually well above baseline noise levels. The guidance applied here is based on a review of international guidance, and is summarised in *Table 9.8*.

Table 9.8 Noise Impact Magnitude

Operating Period	Daytime Noise Level, L_{Aeq}, day dB				Night-time Noise Level, L_{Aeq}, night dB			
Impact Rating	**Negligible**	**Small**	**Medium**	**Large**	**Negligible**	**Small**	**Medium**	**Large**
Short term exposure < 1 month	**<70**	**70-75**	**>75-80**	**>80**	**<55**	**55-60**	**>60-65**	**>65**
Medium term exposure 1 to 6 months	<65	65-70	>70-75	>75	<45	45-55	>55-60	>60
Long term exposure > 6 month	<55	55-60	>60-65	>65	<45	45-50	>50-55	>55

Impact Assessment

Although the overall construction programme may last for up to 12 months, construction works to install each tower will affect individual NSRs for approximately one month. Therefore, the first row of *Table 9.8* has been adopted to assess the potential magnitude of noise effects.

Installation work will be carried out during the day only. Noise levels exceeding the daytime criterion for a medium magnitude impact are predicted at distances of 19 m or less. However, the predictions conservatively assume all equipment will always be located at the closest part of the site to the receptor which is unlikely to be the case in practice. In addition, contractors are required to safeguard the work site to protect the safety of people and animals which may include erecting a temporary fence around the site. It is therefore considered unlikely that the criterion for a medium magnitude impact will be exceeded at any NSR in practice. Small impacts are predicted at NSRs beyond 19 m whilst beyond 32 m, impacts are predicted to be negligible. Most towers will be located well away from NSRs such that impacts would be negligible. Small magnitude impacts of ***minor*** significance may affect a small number of the closest receptors during the daytime only.

Table 9.9 Pre-Mitigation Impact Assessment

Impact	**Noise during Construction**				
Impact Nature	Negative	Positive	Neutral		
	Elevated noise levels from operation of construction equipment.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result of noise generated by construction activities.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Impacts are expected to be short term (up to one month) at any individual NSR in the vicinity of a proposed steel lattice tower worksite				
Impact Extent	Local	Regional	International		
	The impact will be limited to the NSRs within the immediate surrounds of each tower worksite.				
Impact Scale	Local				
Frequency	Impacts may occur during daytime periods over a short term duration at each tower worksite.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered negligible to small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Dwellings are considered to have a high sensitivity to noise.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small to negligible and the sensitivity is high, the overall significance is considered to be negligible to minor.				

Mitigation

Mitigation measures are set out below, which have been assumed for the base case assessment. They are assumed to result in a 5 dB (A) reduction in the overall noise from construction plant teams.

The following standard mitigation measures will be employed:

- Siting noisy plant and equipment as far away as possible from NSRs, and use of barriers (e.g. site huts, acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever practicable;

- Where practicable noisy equipment will be orientated to face away from the nearest NSRs;

- Working hours for significant noise generating construction work (including works required to upgrade existing access roads or create new ones), will be daytime only;

- Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where practicable;

- Where practicable, stationary equipment will be located in an acoustically treated enclosure;

- 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;

- Throttle settings will be reduced and equipment and plant turned off, when not being used;

- Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked; and

- Fitting of mufflers or silencers of the type recommended by manufacturers.

Residual Impact

Standard mitigation measures listed above have been assumed for the base case noise assessment. No impacts above small are predicted and therefore no further mitigation is required. Consequently, the residual impacts are the same as those presented above.

Table 9.10 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Noise from construction activities affecting nearby dwellings	Construction	Negligible - Minor	Negligible

9.3 BIOLOGICAL RESOURCES AND RECEPTORS

9.3.1 Flora and Vegetation

Potential Impacts

According to data from the survey carried out for the ESIA, some of the ecosystems to be crossed by the transmission line are of a considerable biodiversity, particularly within areas of dense forest mosaic, which is considered a fragile ecosystem, sensitive to changes to its components. To clear a ROW for the project infrastructure, it will be necessary to remove some native vegetation particularly when outside the existing transmission lines corridor. This will cause impacts, such as loss of biodiversity, fragmentation of habitat, changes in light conditions and possible invasion by invasive alien species (e.g. *Chromolaena odorata*), whose competitiveness and growth rate are considered high.

Table 9.11 Summary of Potential Impacts to Flora and Vegetation

Construction Phase	Operation Phase
• Loss and fragmentation of areas of native forest due to project infrastructure and ROW • Change in the structure of the vegetation communities	• Fragmentation of habitat • Spread of invasive alien species

Baseline Conditions

The baseline conditions along the proposed transmission line reflects the vegetation of the Middle Kwanza in general and varies from plant distribution dominated by grasses and shrubs, to dense forest, and to modified habitat due to urban expansion and agriculture and logging activities. As indicated in *Section 7.3.3* in the proposed area there are no Protected Areas (e.g. national parks or forest reserves) within approximately 10- 20 km distance from the transmission line routes.

The vegetation cover closer to Luanda and around most of the urban and some rural areas has been largely modified to give room for anthropogenic activities. The open space, plantation areas, cultivation and vegetable farms that have been observed within the transmission line routes are modified areas and are unlikely to have any natural vegetation with any conservation

significance. Moreover, flora and vegetation in cultivated areas are unlikely to have any conservational significance, except for some forest patches along the drainage lines (including the Lucala River) where small gallery-type forests occur and wetland areas.

Impact Assessment

Construction Phase

During construction, improved access to some presently remote areas also increase human pressure on the vegetation resources for example where trees are cut for fuel wood and land is converted for agriculture use. Disturbance will also occur due to construction activities which will generate noise, vibration and human and vehicle presence. However, these impacts are likely to be temporary and short lived impacts as the construction work will be progressive (overall programme of 12 months) and most of these will take place along areas already disturbed by the existing transmission line infrastructure. The removal and vegetation associated with vehicle movement can also lead to the establishment of favourable conditions for the massive and rapid dissemination of invasive alien plants. Based on the available data it is not expected that the above-mentioned aspects will result in negative impacts on any sensitive species.

This direct impact is permanent, since the tree and shrub vegetation will be removed to clear the RoW, install the infrastructure and carry out regular maintenance, and along that strip no tree regeneration whose height may compromise the safety of the transmission lines is allowed. The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity in most of the areas. The impact is direct and negative; resulting from the vegetation removal and disturbance during the construction phase. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be medium.

Based on the analysis provided above, the impact of vegetation removal, habitat fragmentation and degradation will be a ***moderate*** negative impact pre-mitigation (*Table 9.16).*

Table 9.12 Pre-Mitigation Impact Assessment

Impact	**Flora and Vegetation during Construction**			
Impact Nature	Negative	Positive	Neutral	
	Disturbance to vegetation and habitat loss and fragmentation as a result of the ROW or degradation to environment and habitat during construction			
Impact Type	Direct	Indirect	Induced	
	Impact is as a result of a direct interaction between the project (i.e. construction activities) and the existing vegetation along the transmission line			
Impact Duration	Temporary	Short Term	Long Term	Permanent

Impact	Flora and Vegetation during Construction				
	The effect is considered permanent as the areas where vegetation will be removed for the construction of the line will have to be permanently kept with vegetation for maintenance purposes during the operational phase				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered medium scale. Although the impact will occur across the whole length of the proposed transmission line RoW's and access roads, large sections of the lines are in built up areas with modified habitat (i.e. urban areas, agricultural land and along the existing corridor) and thus there is a decreased risk of impacts to vegetation in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	Although the transmission line will cross some disturbed and modified habitats that occur along the transmission line RoW it will also cross some sensitive forest patches and wetlands. The sensitivity is considered medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is large and the sensitivity is medium, the overall significance is considered to be of moderate significance.				

Operation Phase

During the operational phase there is the potential for impacts on vegetation and flora as a result of the existence of the transmission line, particularly due to the maintenance including periodic clearing of the ROW which perpetuate habitat fragmentation. Due to the location of the transmission lines within the exiting corridor where three other lines are present it is not expected that there will be larger impacts on the existing flora and vegetation during the operation phase. However, there is the potential for spread of invasive alien species due to the maintenance works.

Due to the inexistence of surrounding protected areas nor sensitive habitats the impact of the operation of the transmission line is expected to have a low sensitivity. The impact is directly negative, will be permanent as the lines will be in place for 50 years and during the period, maintenance will be conducted periodically. The extent of the impact is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be small.

Based on the analysis provided above, the impact of direct loss of vegetation and flora and degradation and fragmentation of habitat will be of ***minor*** significance pre-mitigation (*Table 9.16).*

Table 9.13 Pre-Mitigation Impact Assessment

Impact	Flora and Vegetation during Operations		
Impact Nature	Negative	Positive	Neutral
	Disturbance to vegetation and potential grow of invasive species as result of the maintenance works during operation		

Impact	Flora and Vegetation during Operations				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the transmission line infrastructure in the RoW				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered permanent as the RoW will be kept free of vegetation during operation				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered low scale as most of the impacts related to vegetation removal occurred during the construction phase. However there will be a degree of habitat fragmentation.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Valu e/ Importance*	Low	Medium	High		
	The sensitivity is considered low as most of the major impacts on the vegetation and flora will occur during the construction phase.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is low, the overall significance is considered to be of minor significance.				

Mitigation

The following standard mitigation measures will be employed:

- Avoidance of impacts should be prioritised. This is especially true for the natural or near-natural forest patches found in the crossings with Lucala River and near wetlands and river gallery forest. In order to protect these habitats, it is strongly recommended to closely follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary. Servitude to be cleared in line with Angolan standards for minimum vegetation clearance distance;

- Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;

- The use of pesticides and herbicides shall be in compliance with national laws and international conventions and under the supervision of the HSE Manager;

- Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;

- There should be no deviation from the access road position without prior discussions with the authorities;

- Firewood collection by the project's employees should be strictly forbidden.

- Rehabilitation of temporary construction sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;

- Materials (e.g. pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and

- Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible.

Residual Impact

The impact significance is **Moderate** after mitigation measures during construction and **Minor** post mitigation for operations (*Table 9.18*). There will be some habitat loss and fragmentation as well as potential increase of invasive species as a result of the construction, however most of the habitat is modified and not expected to have conservational value, except for the wetland areas and river gallery forests. With the proposed mitigation measures, the residual negative impacts on flora are assessed to be of a low magnitude.

Table 9.14 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Disturbance to vegetation and habitat loss and fragmentation as a result of the ROW or degradation to environment and habitat	Construction	Moderate	Minor
Disturbance to vegetation and potential grow of invasive species as result of the maintenance works	Operation	Moderate	Negligible

9.3.2 Fauna

Potential Impacts

In terms of fauna, project potential impacts will be focused on the avian populations within the development area and near surrounds, by habitat loss associated with the construction activities, such as displacement from breeding and foraging habitat 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).

Table 9.15 Potential Impacts to Avian Fauna

Construction Phase	Operation Phase
• Disturbance due to noise, vibration and human and vehicle presence • Loss of habitat as a result of RoW or other project infrastructure	• Bird strikes along transmission lines

Baseline Conditions

There are no protected areas within approximately 10- 20 km distance from the transmission line routes. The natural environment has been largely transformed along the route of the overhead transmission lines.

The open space, plantation areas, cultivation and vegetable farms that have been observed within the transmission line routes are modified areas and are unlikely to have any natural vegetation with any importance. Moreover, fauna in cultivated areas are unlikely to have any conservational significance.

Impact Assessment

Construction Phase

During construction, birds within the near surrounds of the development area will be disturbed due to noise, vibration and human and vehicle presence.

Disturbance impacts during construction are likely to be temporary and short lived. Impacts as the construction work will be progressive (overall programme of 18 – 24 months). Although disturbance and displacement impacts are likely to be temporary and limited in their magnitude, if combined with the impacts of direct habitat loss, it could lead to disturbance and displacement of breeding and foraging bird habitat and birds. Based on the survey carried out for the ESIA, it is not expected that there will be any sensitive species in the Project area of international or local importance.

The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity. The impact is direct and negative; resulting from the land take and disturbance during construction. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be medium.

Based on the analysis provided above, the impact of direct loss and degradation of habitat will be a **Minor** negative impact pre-mitigation (*Table 9.16).*

Table 9.16 Pre-Mitigation Impact Assessment

Impact	Avifauna during Construction				
Impact Nature	Negative	Positive	Neutral		
	Disturbance to avifauna species and loss of habitat as a result of the ROW or degradation to environment during construction				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e. construction activities) and the bird population along the transmission lines				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary as it will only occur during the construction period				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of the transmission line RoW's and access roads, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to Avifauna in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity is considered low due to the disturbed and modified habitats that occur along the transmission line RoW.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is low, the overall significance is considered to be of minor significance.				

Operation Phase

During the operational phase there is the potential for impacts on avian populations as a result of direct strike with the transmission line and pylons (bird collision) and by electrocution. The species of bird which are most likely to be impacted by collision with transmission lines are large species (such as raptors and waterfowl), birds that regularly migrate across the path of the transmission line (either daily or seasonal migration) and species whose flight patterns result in an increased time spent at transmission line height in the area of the development (predominantly display flight activities such as looping or circling repeatedly in the area).

Due to the location of the transmission lines within the Luanda metropolitan area it is not expected that there will be large numbers of birds present that are susceptible collisions with transmission lines.

Due to the inexistence of surrounding protected areas the impact of bird strikes is expected to have a low sensitivity. The impact is directly negative, will be permanent as the lines will be in place for 50 years. The extent of the impact is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be low.

Based on the analysis provided above, the impact of direct loss and degradation of habitat will be of **Minor** significance pre-mitigation *(Table 9.17*).

Table 9.17 Pre-Mitigation Impact Assessment

Impact	**Avifauna during Operations**				
Impact Nature	Negative	Positive	Neutral		
	Increase in bid mortality due to bird strikes during operation				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the erection of the transmission lines and the bird species along the RoW				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is considered permanent as the life cycle of the project is 50 years				
Impact Extent	Local	Regional	International		
	Impact is limited to the Project AoI				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of each of the transmission line RoW's, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to Avifauna in these areas.				
Frequency	The frequency is expected to be occasional				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude is expected to be small due to bird mortality				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity is considered low, birds of conservational significance are not expected along the transmission line RoW.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude of the impact is small and the sensitivity is low the overall significance is considered to be of minor significance				

Mitigation

In addition to the embedded controls mentioned above, as well as those specified for mitigating impacts to flora and vegetation the following mitigation measures are recommended during *construction*:

- Maximum use of both existing servitudes and existing roads shall be made;
- All private roads used for access to the servitude shall be maintained and upon completion of the works, be left in at least the original condition. As far as possible, access roads shall follow the contours in hilly areas, as opposed to winding down steep slopes;
- Access is to be established by vehicles passing over the same track on natural ground, multiple tracks are not permitted;
- Only indigenous species will be used for replanting;

- Where impacted through construction activity, all sloped areas must be stabilized to ensure proper rehabilitation is effected and erosion is controlled;

- Sloped areas are stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments;

- The Project will ensure that best practice measures are adopted to avoid incursion into areas adjacent to the work sites or any secondary effects from pollution, altered drainage regimes, dust, and sedimentation; and

- Guidance shall be given to all staff that they are not allowed to harm any animals.

The following mitigation measures are recommended during *operations*:

- All areas disturbed by construction activities shall be landscaped and rehabilitated;

- The use of pesticides and herbicides shall be in compliance with fit to purpose NHID standards and under the supervision of the HSE Manager;

- Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazards, should not be trimmed or cut unless it is growing in the road access area;

- Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise road kill;

- In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed 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;

- Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energised wires;

- Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;

- No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct).

- All animal dens in close proximity to the work areas must be marked as no go areas.

- The breeding sites of wild bird species must be taken into consideration during the planning of the construction and breeding sites shall be kept intact with disturbance to breeding birds avoided. Special care shall be taken where nestlings or fledglings are present; and

- Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.

Residual Impact

The impact significance is **Negligible** after mitigation measures during construction and **Minor** post mitigation for operations (*Table 9.18*). There will be some habitat loss as a result of the construction, however the habitat is modified and not expected to have conservational value.

Table 9.18 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Disturbance to avifauna species and degradation to environment during construction	Construction	Minor	Negligible
Increase in bird mortality due to bird strikes during operation	Operation	Minor	Minor

9.3.3 Visual Amenity

Potential Impacts

Visual Impacts refers mainly to the changes to the visual character of landscape views resulting from: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the views of the visual receptors and intrusion of foreign elements into the viewshed of landscape features.

The construction activities for the transmission lines will have an impact on the visual character of the landscape due to:

- Clearance of vegetation along the transmission line corridor, construction yards and access roads;
- Presence of large construction vehicles and equipment;
- Worker presence and activity; and

- Dust emissions resulting from construction activities and traffic.

During operation, the impacts are mainly related to the following aspects:

- The need to guarantee a permanent clearance of the vegetation nearby the project features; and
- The presence of the towers that cannot be reduced or avoided.

Table 9.19 presents the potentially significant visual impacts that may occur during the construction and operation phases.

Table 9.19 Potential Impacts to Landscape and Visual Amenity

Construction Phase	Operation Phase
• Presence of construction vehicles and workforce	• Presence of transmission lines and towers/monopoles • Permanent clearance of vegetation

Baseline Conditions

The local settings of the landscape are mainly characterised by the presence of open space plantations and cultivation areas. The uniqueness of the views is not high because similar conditions are very common in the entire area and the local environment is already characterised within the same corridor by the presence of existing transmission line towers. These conditions coupled with the lack of relevant scenic views are leading to consider the local viewshed conditions already altered and not typical of a natural environment.

Impact Assessment

Construction Phase

In order to evaluate impacts during construction, it should be highlighted that the proposed project will be close to other existing transmissions lines. Such condition could allow use of existing access roads and thus reduce the impact of the linear development by not crossing natural landscape, but mainly modified.

As per the current settings of the project area, the proposed power line will cause minimal change to people's existing views since those views are already complex containing highly contrasting elements and patterns.

Despite the direct and negative impact of additional construction vehicles on site, it will be temporary and local.

The small magnitude on visual amenity and the low sensitivity of the receptors means the significance of this impact is assessed as **Negligible**

Table 9.20 Pre-Mitigation Impact Assessment

Impact	**Visual Amenity during Construction**				
Impact Nature	Negative	Positive	Neutral		
	Change in visual amenity				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities and local views				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration will be temporary				
Impact Extent	Local	Regional	International		
	The impact will be limited to the immediate surroundings of the construction yards and access roads.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The area has mainly modified environment with no relevant scenic views locations				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is low, the overall significance is considered to be Negligible.				

Operation Phase

Along the proposed alignment, only the few communities in close proximity to the corridor will be able to perceive the presence of the project features, being more sensitive to the visual intrusion. However, the proposed project will run within an existing corridor characterised by the presence of other transmission lines, without altering the viewshed experience of the local sensitive receptors.

Due to the local settings, the prevalence of a modified environment and the lack of unique landscape features, the viewshed is of low sensitivity. Moreover, the expected pylons type (not solid but lattice) are limiting their evidence in the landscape as the viewer moves further away from them. The visual absorption capacity of the landscape is enhanced by the existing infrastructure as well as by the local vegetation patches and local gentle topography.

Based on the analysis provided above, the visual impact and change of landscape will be of ***minor*** significance.

Table 9.21 Pre-Mitigation Impact Assessment

Impact	**Visual Amenity during Operations**		
Impact Nature	Negative	Positive	Neutral
	Change in visual character		
Impact Type	Direct	Indirect	Induced

Impact	Visual Amenity during Operations				
	Impact is as a result of a direct interaction between the project and surrounding residents and land users				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration will be permanent as the life cycle for the project is 50 years				
Impact Extent	Local	Regional	International		
	The viewshed experience is limited to few kilometres				
Impact Scale	The impact is considered as local scale. Visual impacts will not only impact people who live near the transmission line route, but also people who are travelling daily.				
Frequency	Likely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is expected to be medium				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The area has mainly modified environment with no relevant scenic views locations				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is medium and the sensitivity is low the overall significance is considered to be minor				

Mitigation

The nature of the development (i.e. tall structures and a linear formation) does not allow many opportunities for complete screening. The objective of mitigation is to minimise visual scarring of the landscape and to enhance absorption of the development permanent equipment and structure into the surrounding environment.

Specific recommended measures during operation as best practices include:

- Any excavated or cut and fill areas will be landscaped and revegetated;
- No debris or waste materials will be left at the work sites, good housekeeping on site to avoid litter and minimise waste;
- Towers and structures should have a non-reflective finish;
- Night lighting of sites should be minimised within requirements of safety and efficiency;
- Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the corridor or substation site; and
- It is suggested to evaluate locations in proximity of very close sensitive receptors to determine whether installation of screening items such as vegetated areas with indigenous species will reduce visual impacts and install if warranted.

Residual Impact

Considering the nature of the construction activities, the foreseen mitigation measures are able to furtherly reduce the impacts avoiding an alteration of the viewshed experience.

For the operational phase, the nature of the project features is limiting the possibility to greatly reduce the potential impacts. There are, however, a number of sensitive visual receptors in proximity to the power line and the power line will intrude on their existing views. These visual receptors are mainly limited to residents with houses within 1 km of the route. Mitigation measures are unlikely to reduce the visual impact of the power lines on these visual receptors but for they will grant the local scale of the residual impacts.

Table 9.22 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Visual impact	Construction	Minor	Negligible
	Operation	Minor	Minor

9.4 SOCIAL RESOURCES AND RECEPTORS

9.4.1 Economy and Employment

Potential Impacts

At the macro level, the Project is intended to result in increased electrical capacity in Luanda, which is expected to contribute to the national economy. Beyond these macro level impacts, the Project is expected to generate positive impacts on the local economy and employment conditions throughout its life cycle. The primary impacts are expected during the construction phase through the creation of temporary local/regional employment opportunities 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 and waste management facilities. To a lesser extent, the operation phase will generate some limited longer-term local employment opportunities mainly for maintenance and monitoring activities.

Impacts related to labour rights including employment contracts, working hours, child labour and forced labour are discussed separately in *Section* 9.7.

Table 9.23 summarises the potentially significant impacts on economy and employment during the construction and operation phases of the Project.

Table 9.23 Potential Impacts on Economy and Employment

Construction Phase	Operation Phase
• Creation of temporary employment opportunities (primarily low skilled and semi-skilled workforce). • Long-term benefits from capacity enhancement of local labour through on-the-job and formal training opportunities. • Creation of local economic development and diversification opportunities as a result of the use of local facilities and goods and services by the Project (e.g. transportation, water supply provider, waste management facilities, etc.) as well as worker spending in the local economy.	• Creation of long-term employment opportunities for maintenance and monitoring. • Provision of electrical capacity and related benefits on the national economy.

Baseline Conditions

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

- The main economic activities in the Study Area are commercialization of agricultural production surplus, firewood, charcoal and domestic goods, and informal jobs.

- Informal jobs, mostly in per-urban areas, include street vending, painting, mechanics, smiting, woodwork, as well as construction.

- Lack of employment was one of the main complaints and challenges identified in the settlements in the Study Area together with access to water, health and education services.

- The construction sector employs 4% of the labour force in Angola in the formal employment sector. Based on field survey findings, the informal employment sector also accounts for an important portion of construction-related employment and income generating activities in urban and peri-urban areas.

Project Design Elements

Relevant Project design elements that may potentially influence impacts are summarized as follows:

- Construction is expected to last 12 months using three EPC Contractors. During the peak of construction there is likely to be up to 600 workers, of which approximately 50 will be specialist positions filled by mostly expatriates. The intention is to fill the majority of positions with Angolan

nationals (i.e. from urban centres such as Luanda for skilled and semi-skilled job) as well as from peri-urban areas close to the transmission line routes for construction workers, and from local communities in the Study Area for low skilled positions such as vegetation clearance, security guards, cooks, cleaning/house-keeping. It is estimated that of the national workforce 85% will be recruited locally.

- As part of site preparation (pre-construction), mine clearance activities will be undertaken throughout the 60 m OHTL RoW and will be undertaken by an accredited demining operator (either a privately owned company or the specialized demining unit of the Angolan Army) authorized by the Commission for Humanitarian Demining and Assistance (CNIDAH). The number of required experts for this activity will be determined in the Demining Method Statement, which will be prepared at a later stage by the demining operator.

- Whilst construction equipment and materials will be imported from abroad, contracting and indirect employment opportunities will result from:
  - Transportation of construction materials, and workers from camps to tower sites working areas;
  - Contracts for provision of potable water via water trucks for workers and water for the construction of the foundations;
  - Disposal of waste from the construction phase to appropriately licensed landfill sites in Luanda; and
  - Collection and transport of sewage to sewage treatment facilities.

- Employment during operations will be significantly reduced from that during construction and will be limited to maintenance activities.

Impact Assessment

Construction

Economic impacts during the construction of the transmission lines will stem from procurement of goods and services by the Project, local employment, and induced economic effects of spending by construction workers.

During the 12 month construction phase, activities will be performed by a workforce of 370 employees from two different EPC contractors which will be composed at 85% of locally sourced workers. The Project is therefore expected to create local employment opportunities for approximately 600 local workers, mainly semi-skilled and low skilled over a period of almost two years. The positive impact will be temporary during the construction phase, which will be followed by workforce reduction during the transmission to operations. Most workers are expected to be from urban areas such as Luanda and peri-urban areas close to Luanda located mostly in the eastern portion of the transmission line, including potentially in the municipalities of Viana, Belas,

and Icolo e Benga, where there are more construction companies and expertise. The remaining portions of the line in the municipality of Cambambe are mostly rural with less activity and expertise in the construction sector. In addition to the Project construction workforce, mine clearance activities may also generate some limited and temporary employment if the authorized demining operator is a private company. The demining experts are specifically trained for this task and are expected to be contracted from large urban centres where demining companies may base such as Luanda. This will be confirmed at a later stage along with the number of demining experts required.

The Project will also create long-term benefits for local contractor and supplier companies and their employees from capacity enhancement and the acquisition of specific skillsets through on-the-job and formal trainings. Considering the importance of urban development and related construction, transport, and storage sectors in Angola in general, these skill sets may transferred to other construction-related projects in the area after the completion of construction.

The economic impact of project workforce spending in the local economy is expected to be small, since the construction camps will provide food and other services for the workers.

Project construction workers will be present at construction camps for a relatively short period of up to 12 months. As the camps are expected to be open allowing relatively free movement of workers, visits to local settlements in the Study Area and near-by urban centres during the workers' free time is quite likely. These visits can 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 construction workers as well as water for construction activities. It is expected that the Project will contract a private water supplier. Similarly, solid waste will also be generated during construction and from the accommodation camps. Waste generated in the camps will be disposed of at appropriately licensed landfill sites in Luanda. The Project may also contract the services of a local catering company to provide food to the construction workers. 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.

The anticipated impacts are ***positive*** but limited to the 12 months construction period and to urban centres such as Luanda where skilled and semi-skilled construction workforce is expected to be sourced. To a lesser extent, semi-skilled construction labour may also be sourced from peri-urban areas along the transmission line route (i.e. municipalities of Viana, Belas, and Icolo e

Bengo), and low skilled positions such as vegetation clearance, cleaning and house-keeping at accommodation camps, security guards, etc. may be sourced in the settlements of the Study Area along the line route. Employment related to demining has not been confirmed at this stage and will depend on whether the authorized demining operator selected is a private company or the Angolan army.

Table 9.24 Pre-Mitigation Impact Assessment

Impact	**Local Employment Opportunities, Capacity Building and Economic Development**			
Impact Nature	Negative	Positive	Neutral	
	Creation of local employment opportunities, enhancement of local workforce capacity and contribution to economic development and diversification at the local level through procurement and worker spending			
Impact Type	Direct	Indirect	Induced	
	Impact resulting from a direct interaction between the Project (i.e. employment creation, procurement, on-the-job and formal training, and worker spending) and the local workforce and local economy.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	Local employment opportunities as well as contribution to the national and local economy will be short-term during the construction phase of 12 months. However, the benefits of capacity enhancement of the local workforce may extend to the longer term as they provide the workforce with tools to acquire new jobs in the future.			
Impact Extent	Local	Regional	International	
	Employment and procurement related impact primarily in urban centres and peri-urban areas, potentially including in the municipalities of Viana, Belas and Icolo e Bengo, where construction skills are more readily available. Worker spending is also expected mostly in nearby urban centres or peri-urban areas and to a lesser extent in the local settlements of the Study Area.			
Impact Scale	Small scale. Approximately 600 local workers will be recruited. Other workers may benefit indirectly.			
Frequency	Continuous during 12 months.			

Operations

The primary impact associated with the Project during the operation phase is expected to be the long-term employment of local workforce for maintenance of the infrastructure and the OHTL footprint corridor (20m wide) and monitoring activities for the transmission lines. Once construction is over, operation of the transmission line will handed over to National Electricity Transmission Network Company (*Empresa Rede Nacional de Transporte de Electricidade* (RNT-EP) 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 20 m OHTL footprint corridor will require low skilled workforce.

In addition to employment generation, another important positive impact during Project operation will be the increased electrical capacity in Luanda, which will receive the generated electricity through the national grid. This increase in electrical capacity is expected to contribute to the improvement of the national economy and livelihoods of the population through a more stable and safe supply of electricity to the households and businesses in Luanda. Specifically, the improved and more stable supply may result in an increase in productivity and growth of service industries and in the development and increased competitiveness of small enterprises over the long term, which would also benefit women entrepreneurs in Luanda. Improved access to electricity is also expected to reduce the need for backup generators which will lead to cost savings for electricity users as well as improvements in community health from the reduction in noise and air emissions from generators.

It should be noted that no connections along the transmission line will be made to supply electricity to the rural communities along the line, which may result in some resentment from local communities.

Considering the above, the impact is expected to be positive, however of a relatively negligible significance for employment. On a broader scale, the Project may also contribute indirectly to increases in productivity and growth of national industries in the long-term. This impact is considered indirect and long term.

Table 9.25 Pre-Mitigation Impact Assessment

Impact	**Local Employment Opportunities**			
Impact Nature	Negative	Positive	Neutral	
	Creation of local employment opportunities.			
Impact Type	Direct	Indirect	Induced	
	Impact resulting from a direct interaction between the Project (i.e. employment creation for specific activities) and the local / regional workforce.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	Local employment opportunities will be long-term throughout the operation phase			
Impact Extent	Local	Regional	International	
	Skilled and semi-skilled employment opportunities in the Study Area are expected to be limited, with most jobs potentially sourced at the Provincial level. Low skilled or unskilled employment opportunities (i.e. vegetation clearance) might benefit all communities along the transmission line.			
Impact Scale	Although exact staff number is not defined at this stage, the scale is considered to be small.			
Frequency	One-off or remote as recruitment is expected to occur once before the start of operations.			

Mitigation Measures (Enhancements)

NHID will develop a *Local Content and Procurement Plan* for the construction phase to enhance positive impacts on the economy and employment. Since RNT will be responsible for the operation of the transmission line enhancement measures during this phase have not been defined.

Specific enhancement measures included in the *Local Content and Procurement Plan* include the following:

- An Employment Strategy and hiring procedure which will include a hiring procedure to ensure that local people from the Study Area are employed wherever possible and that this is done in a fair, consistent, and transparent manner by the Project and its contractors. Workers from the settlements along the transmission line will be given priority for low skilled jobs such as vegetation clearance, security guards, cleaning, etc. Low-skilled construction jobs can also be sourced from peri-urban areas along the transmission line route (ie. Viana, Belas, and Icolo e Bengo municipalities).

- The Employment Strategy will outline and require a fair and transparent recruitment process for all openings. NHID and contractors will work with local authorities to advertise all openings in ways that are accessible to local communities.
- NHID (and its subcontractors) will provide clear information on the number and limited timescales of employment opportunities.

- Contractors will be required to show best efforts in filing all low skilled service jobs with local (commune level) residents.

- In order to maximise local procurement, NHID will require contractors, as part of the tendering process, to develop a purchasing strategy stipulating how local purchase of goods and services will be optimised in particular with respect to transportation, waste management and disposal, water supply, and catering.

- NHID will optimise employment opportunities by requesting contractors to breaking tendering opportunities into smaller components to increase the likelihood of granting individual pieces of work to Angolan companies.

- As part of the tendering process, NHID will require contractors to develop a purchasing strategy that stipulates how national and local purchase of goods and services will be optimised. Agreed targets will be monitored.

- To maximise capacity enhancement and transfer of knowledge to local contractors and their employees, NHID will develop formal training programs and formalise on-the-job trainings to the extent possible, including learning targets and performance monitoring.

- NHID will coordinate with local authorities in order to avoid opportunistic, informal markets developing at the perimeters of the construction camps in order to ensure that local settlements in the Study Area and nearby urban centres benefit from workers spending.

Residual Impact

The impacts identified on the local economy and on employment are positive. Longer term benefits from employment creation during the operation phase are also expected although to a lesser extent given the reduced size of the workforce needed.

Table 9.26 Residual Impact Significance

Impact	Project Phase	Significance (Pre-enhancement)	Residual Impact Significance (Post-enhancement)
Local employment opportunities, capacity building and economic development	Construction	Positive	Positive
Long term local employment opportunities	Operation	Positive	Positive

9.4.2 Land and Livelihoods

Potential Impacts

This section presents the impacts on existing land based livelihoods as a result of the construction and operation of the Project.

Table 9.27 presents the potentially significant impacts as result of the land take required for the Project.

Table 9.27 Potential Impacts on Land and Livelihoods

Construction Phase	Operation Phase
• Temporary loss of livelihoods and household income as a result of temporary land take. • Displacement of physical structures and physical resettlement. • Impact on collection of forest products from the site clearing and opening of potential access roads.	• Permanent loss of livelihoods and household income due to permanent land take of towers and 4 m maintenance road, and maintenance activities along the 20 m OHTL Project Footprint corridor and 4 m maintenance road. • Changes in land values post construction in peri-urban areas due to building restrictions.

Baseline Conditions

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

- The transmission lines crosses primarily rural areas and peri-urban areas (i.e. municipalities of Viana and Belas and outskirts of Catete commune in Icolo e Bengo municipality) where subsistence agriculture and animal husbandry are predominant, along with related activities including hunting, fishing, and forestry. Other economic activities such as small-scale trading / street vending, informal temporary jobs (including farm labour, construction-related work, cleaning services, etc.), informal businesses, and employment in the public sector, are also observed in the peri-urban areas.

- Small-scale agriculture of seasonal crops and some permanent crops as well as animal husbandry activities are mainly practiced for self- consumption and small-scale commerce of surplus agricultural production.

- Most families in rural areas have animals that are free to roam around settlements, mainly chicken, goats, pork, and ducks for subsistence. Goats are also often seen along the main roads.

- Harvesting of baobab fruit is practised extensively along the transmission line route and is used for both self-consumption and commercialisation.
- Charcoal and wood are the main sources of energy for cooking in Cambambe settlements, while butane is the main source in the municipalities of Icolo e Bengo, Viana, and Belas.

- Vulnerable groups include households with particularly low incomes and high land dependency for subsistence and income generation. These households can be found throughout the Study Area and are prevalent in the rural settlements where agriculture is the primary livelihood activity. Households with disabled and elderly household members as well as female or child-headed household are also particularly vulnerable to potential loss of livelihoods related to land access restrictions.

- In rural areas, all households have access to one plot determined by the soba, which is transferred through inheritance. The average parcel size was reported to be less than one hectare. Households may share the use of different plots to grow different crops; when shared, the parcel continues to be 'owned' by the household that was previously defined by the soba as right holder.

- In urban/peri-urban areas, land access is less dependent on inheritance and allocation by the soba and is generally transferred through sale.

- Physical structures found along the Study Area mainly includes residential houses and *casas de lavra* (small shacks used by farmers as shelters and

storage) which are usually located within farm land. Most houses are made of cob and wood (pau-a-pique) and zinc sheets, with fewer being built with brick (red) and block (grey). Brick and blockhouses are mostly found in established peri-urban settlements.

- A number of weekend houses have been identified in the peri-urban areas of Viana, Belas and Icolo e Bengo municipalities. Typically, owners of these houses live in urban areas and spend the weekend there, with the older women often working the land.

Project Design Elements

Relevant Project design elements that may potentially influence impacts are summarized as follows:

- Up to four existing construction camps will be required for the three different subcontractors; in Laúca dam, Dondo, Maria Teresa and Catete, all sized for about 150 workers each. Construction of new camps is unlikely to happen.

- Although it is expected that existing tracks can be utilized with few if any new access roads needed, vegetation clearance will still be required to provide access. The amount of land clearance for access roads is not known at this stage.

- During pre-construction, mine clearance activities will be undertaken throughout the 60 m OHTL RoW.

- During the construction phase (12 months), the anticipated maximum temporary land take for the Project is approximately 230 ha (i.e. 568 acres). This corresponds to approximately 126.2 ha of land required for temporary tower site working areas (average 40mx50m per site), and the 101 ha for the 4 m maintenance road.
- During the operational phase (up to 50 years) the anticipated maximum land take for the Project is 102 ha (ie. 253 acres) including 6.3 ha for the permanent tower footprint areas (10x10m each), and 101 ha for the 4 m maintenance road.

- There will be additional land use restrictions within the OHTL Right of Way (RoW) of 60 m (30m either side) based on safety requirements during construction and operation.

The land requirements during the construction and operation phases are summarised in *Table 9.28* below. *Table 9.29* explains land use restrictions in the OHTL RoW.

Table 9.28 Construction and Operations Land Take Requirements

Component	Unit Size	Land Required
Construction		
OHTL Right of Way (60 m wide)	237+15 km line length	1,512 ha
OHTL Footprint corridor (20 m wide)	237+15 km line length	504 ha
Temporary tower site working areas	631 (593+48) tower´s sites Average 40mx50m per site	126.2 ha
Operations		
Permanent tower sites laydown area	631 (593+48) tower´s sites Average 10mx10m per site	6.3 ha
Maintenance road (4 m wide)	237+15 km line length	101 ha

Source: Prepared by ERM based on NHID input (2018).

Table 9.29 Land Use/Access Restrictions during Construction and Operation

Component	Construction restrictions	Operations restrictions
Transmission Line Corridors		
Maintenance road 4 m wide (2 m on each side)	• Land clearance and removal of all trees and crops. • Removal of all houses and structures	• No new trees or crops allowed. • No new houses/structures allowed
OHTL footprint corridor 20 m wide (10 m on each side) (1)	• Restricted access for cultivation during the demining activities. • Removal of all trees. • Crops of up to 6-7m high are allowed. • Removal of all houses and structures. (2)	• No construction of new houses or structures allowed. • No planting of new trees allowed, only vegetation/crops of up to 6-7 meters high.
Remaining OHTL RoW area (up to 40 m wide, ie. 20m either side)	• Restricted access for cultivation during the demining activities. • Crops and trees allowed. • Minimum overhead clearance to the overhead conductors is 5m and 8m radius for 220 kV and 400 kV respectively. • Houses and structures allowed as long as safety distances of 6m and 8m radius from the overhead conductors are respected for 220 kV and 400 kV respectively. (3)	• Crops and trees allowed, but with the following clearances to the overhead conductors: 8m clearance for 400 kV; 5m to 220 kV. • Houses and structures allowed but with the following clearances to overhead conductors: 8m for 400 kV; 6m to 220 kV. • No construction of new houses or structures.
Tower sites		

[1] The width of the OHTL footprint corridor is not fixed as it varies based on the type of tower (suspension, multiple angle, etc.). Most common towers are suspension towers with a corridor of 19.6 m (i.e. Approximately 20 m).
[2] Removal of uninhabited structures will be conducted on a case by case basis and after careful assessment including on-site verification.
[3] Safety distance for buildings: 6m radius for the 220kv line, and 8m for the 400kv line.

Component	Construction restrictions	Operations restrictions
Temporary tower site working areas (average 40x50m per site)	• Removal of houses and other structures. • Removal of trees and crops. (1) • No access of unauthorized personnel.	• No additional restrictions above those for the corridor.
Permanent tower footprint (average 10x10m per site)	• Within the working areas	• No structures allowed. • No trees or crops allowed.

Source: Prepared by ERM based on NHID input (2018).

Impact Assessment

Construction

Loss of Livelihoods as a result of Loss of Agricultural Resources.

The loss of agricultural land and agricultural crops will be as follows:

- *Temporary tower site working areas inside of the 60 m OHTL RoW:*
    - Temporary loss of access to approximately 129 ha of land for the establishment of the 631 (583+48) temporary tower sites working areas (average 40x50 m).These construction sites will be located entirely inside the 60 m OHTL RoW.
    - Assuming that the distribution of agricultural land inside the temporary tower sites working areas follows the distribution inside the OHTL RoW, it can be estimated that approximately 11 ha out of the 126 are agricultural which represents approximately 1.2% of the agricultural land available in the Study Area. The exact proportion of agricultural land affected will be confirmed during the RAP socioeconomic field surveys.

- *OHTL Footprint Corridor (20 m wide):*
    - Trees and vegetation more than 6-7 m high inside the OHTL footprint corridor of 20 m will be removed.
    - Access for the cultivation of the remaining crops (less than 6-7 m high) will be restricted during a short period of time during the demining activities (ie. 8 hours/days per demining expert for each meter of land).
    - Access and cultivation of the remaining crops inside the 20 m OHTL footprint corridor will be allowed except at the 631 tower sites (i.e. 126 ha of land).
    - Agricultural land inside the 20 m OHTL footprint corridor where restrictions to crops and trees will apply represents approximately 4.8% of agricultural land inside the Study Area.

[1] May be able to maintain trees in this area, outside of tower footprint and 20 m OHTL footprint corridor. This will be decided on a case-by-case basis.

- *Maintenance road (4 m wide):*

    - Permanent loss of access to land in the 4 m wide maintenance road.
    - Removal of all trees and crops.
    - Approximately 8.5% of the land inside the 4 m maintenance road is used for agriculture (mix of mosaic agriculture and agricultural patches), therefore an estimated 8.6 ha of agricultural land will be permanently lost. This represents less than 1% of the agricultural land available in the Study Area.

The loss of access to land associated with the 20 m OHTL footprint corridor, temporary tower sites working areas, and maintenance corridor will result in the loss of land used for seasonal crops, removal of fruit trees, and restrictions to animal grazing.

The loss of seasonal agricultural production for the establishment of the temporary tower sites working areas within the 60 m OHTL RoW will be temporary over a period of more than two years, while the loss will be permanent for seasonal crops located inside the footprint of the 4 m maintenance road. This corresponds to a temporary loss of access to 230 ha of land for seasonal crops during construction (i.e. a loss of 19.5 ha of cultivated land) and a permanent loss of access to 107.4 ha during operations (ie. a loss of 9 ha of cultivated land). Cultivation of seasonal crops will be otherwise allowed in the 20 m footprint corridor (but not in the 4 m maintenance road), outside the tower sites working areas, and after mine clearance. It is recognised 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.

All trees will be removed during construction inside the 20 m OHTL footprint corridor. This will include fruit trees, which tend to be clustered close to some settlements including Mateia and Hanga Calumbo (Viana municipality), Ngolome, Mazozo and Sagrada Esperança (Icolo e Bengo municipality), Cassoalala and new Cassoalala (outside the 500 m corridor in Cambambe municipality), and Zenza do Itombe, Muchau, Quissuba, and Dumbo Ya Pepe (Cambambe municipality). Since agricultural land (both trees and crops) inside the OHTL footprint corridor represents approximately 4.8% (42.8 ha) of the agricultural land inside the Study Area, the area with crop trees will be significantly smaller. This is in line with Google Earth satellite imagery, which show that the proportion of crop trees along the OHTL RoW seems to be negligible and sparsely spread out.

With respect to animal grazing activities, potential impacts during the construction phase stem from 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 with restricted access should be able to find alternative land in most instances.

To summarize, the main impacts on land-related livelihoods and household incomes during construction are as follows:

- Permanent loss of seasonal crops and fruit trees inside the 4 m maintenance road;
- Permanent loss of fruit trees inside the 20 m OHTL Footprint Corridor; and
- Loss of seasonal crops (short-term) and fruit trees (permanent) inside the temporary tower site working areas.

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. 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 Rural Development.

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 land owners, 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 transmission line route was undertaken, with alternative routes identified to minimise environmental and social impacts. This included minimizing potential physical and economic displacement, by following established transmission line routes. NHID has also committed to minimising land clearance for the 4 m maintenance road if other access roads are available, and to reducing tree cut-off in the temporary tower site working areas. However, the scale and impact of such these measures are still unclear.

In addition, site rehabilitation post construction is already embedded in Project design and will include replacing top soil and planting indigenous grass where necessary.

Construction activities will lead to temporary loss of access to land during the construction phase and may result in potential loss of livelihoods and household income, which will have a negative impact on households and land users in the Study Area. The magnitude is considered small since less than 5% of agricultural land inside the 60 m OHTL RoW will be affected and considering the embedded measures in place to minimize land clearance. The receptors sensitivity is considered high given the high dependency on agriculture for livelihoods and subsistence in the area. Impact significance is therefore considered ***moderate.***

It should be noted however that 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 camp. This will be taken into account in the Resettlement Action Plans once the location of the different Project components is finalised.

Table 9.30 Pre-Mitigation Impact Assessment

Impact	**Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land during construction**				
Impact Nature	Negative	Positive	Neutral		
	The temporary land take during construction activities may lead to a temporary loss of livelihoods and household income.				
Impact Type	Direct	Indirect	Induced		
	Potential loss of livelihoods and household income due to a direct interaction between the Project (i.e. land taken) and land users/owners.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The majority of the construction land take will be reinstated after construction (12 months). Permanent impacts are expected on livelihoods related to fruit trees removal in the 20 m OHTL footprint corridor and to removal of all crops and trees in the 4 m maintenance road.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area				
Impact Scale	Total land required for the project in the construction phase (230 ha) represents 15% of the 60 m OHTL RoW and less than 5% of the agricultural land available in the Study Area.				
Frequency	The impact is expected to be continuous over the 12 months of construction. Some permanent impacts such as the restriction related to the 4 m maintenance road will also extend to the operation phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above and the embedded measures in place to minimize land take and land clearance the magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors is considered high considering the dependence on agriculture as a main source of livelihood in the area.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is small and sensitivity is high, the impact on livelihoods and household income during construction activities is considered of Moderate significance.				

Displacement of Physical Structures and Potential Resettlement during Construction

The proposed transmission line route has been designed by NHID to avoid the displacement of physical structures to the extent possible. The proposed route has reduced the number of sensitive receptors at risk of removal inside the 20 m OHTL footprint corridor from the previous 2017 transmission line route from approximately 67 to 31 physical structures. The type of structures identified inside the 20 m OHTL RoW cannot be specified using Google Earth images, however it can be assumed that these structures may include a mix of residential and non-residential structures, farms, animal shelters, factories, agricultural facilities and commercial buildings / markets. Residential structures may also include weekend houses or *quintas*, which are secondary residences of individuals residing in urban areas and who use these houses on weekends to work the land.

Despite the updated line route for the proposed line, construction activities may still result in some limited displacement of structures. The final number of structures inside the 20 m OHTL footprint corridor that will need to be removed is 30, including an undetermined number of inhabited houses. All these structures are located along the eastern portion of the line in the municipalities of Viana and Icolo e Bengo, and will all be displaced before the start of construction.

The displacement will consist in the removal of individual structures rather than clusters. As such, the Project can seek to replace the lost residential land plots within the same settlements (in-fill resettlement), as *sobas* and community representatives report that alternative land is available in the affected settlements.
For industrial facilities such as factories, if applicable, the owners and employees may experience a temporary loss of income and employment due to removal and relocation of these structures. Should the not be relocated close by, then workers may lose their employment. Lack of employment opportunities is an issue throughout the socioeconomic Study Area, so workers may struggle to find alternative employment in the local area.

Similarly, in the case of commercial facilities such as local markets, if applicable, the loss of a local market will affect those that use it as a location of trading, and also as a space for social interaction.

Considering the measures in place to minimize the number of structures at risk of being physically resettled, the magnitude of the impact is considered ***medium***. The receptors sensitivity is considered ***high*** given the low incomes and presence of households with disabled and elderly household members as well as female or child-headed households. Impact significance is therefore considered ***Major***.

Table 9.31 Pre-Mitigation Impact Assessment

Impact	**Displacement of physical structures and potential resettlement during construction**				
Impact Nature	Negative	Positive	Neutral		
	The temporary land taken during construction activities may lead to the permanent relocation of residential and non-residential structures.				
Impact Type	Direct	Indirect	Induced		
	Potential relocation of physical structures and potential loss of employment and livelihoods related to economic structures due to a direct interaction between the Project (i.e. land taken) and land users/owners.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Although land take for construction is temporary, the displacement of physical structures is considered permanent.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area.				
Impact Scale	Out of approximately 67 sensitive structures initially identified along the 2017 transmission line route, the updated proposed line route will reduce the number of structures to be resettled to 31.				
Frequency	The impact is expected to be a one-time impact occurring before the start of construction activities.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the measures in place to reduce the number of physical structures at risk of displacement, the magnitude is considered to be medium.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors is considered high given the low incomes and presence of households with disabled and elderly household members as well as female or child-headed households				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the medium impact magnitude and medium sensitivity of receptors, the impact related to the displacement of physical structures is considered to be of major significance.				

Impact on collection of forest products from site clearing during construction

The restrictions requirements applicable to savannah and forest vegetation during the construction phase inside the 60 m OHTL RoW will be as follows:

- Full clearance of all trees and vegetation inside the 4 m maintenance road (permanent);
- removal of all trees inside the temporary tower sites working areas (40x50 m) (temporary);
- removal of all trees inside the 20 m OHTL footprint corridor (permanent); and
- trimming or pruning of trees inside the remaining OHTL RoW area (up to 20 m) to maintain the overhead cabling clearance.

The level of forest and savannah clearance required inside the 20 m footprint corridor will vary between municipalities. In total approximately 132 ha of forest (ie. 26% of the 20 m footprint corridor) and 194 ha of savannah (ie. 38%) may need to be cleared, resulting in the loss of access to 326 ha of communal resources. This loss represents approximately 4.1% of the forest and savannah land cover in the Study Area. In addition, all trees inside the 40x50m temporary tower sites working areas during construction will need to be cleared, which corresponds to approximately 126 ha (some of which overlaps with the 20 m OHTL footprint corridor). The largest area of forest and savannah clearance will be in the municipality of Cambambe as shown in the land use map (Map 04 - *Annex A*).

Wood is the main source of fuel for heating and cooking throughout the Study Area, especially in rural areas, and an additional source of income for some households. Although alternative energy sources exist, such as butane gas, they are more costly. The harvest of baobab fruit is also a common practice along the transmission line route, for both self-consumption and commercialization. Some hunting is also undertaken as a complementary source of food for household consumption, but is in decline.

Overall, the level of impact is therefore dependent on level of clearance in a single area and access to alternative areas as well as on reliance on wood versus butane. In the case of fuel wood specifically, in the municipality of Cambambe where wood and charcoal are the main sources of energy for cooking, receptor sensitivity would be higher than in the municipalities of Icolo e Bengo, Viana, and Belas (eastern portion of the line) where butane is the main source. Similarly, rural settlements in the municipality of Cambambe exposed to larger areas of forest and savannah clearance may be more heavily impacted by the reduced access to other forest resources such as baobab trees and bush meat hunting.

As described previously, an optimization of the original transmission line route was undertaken, with alternative routes identified to minimise environmental and social impacts. NHID has also committed to reducing the clearance inside the 4 m maintenance road if other access roads are available, and to reducing tree cut-off in the temporary tower sites working areas. However, the scale and impact of such these measures are still unclear.

The significance of the impact related to the collection of forest products based on the above considerations is summarized in *Table 9.32* below.

Table 9.32 Pre-Mitigation Impact Assessment

Impact	**Temporary Impact Related Collection of Forest Products and Related Livelihoods and Subsistence Activities during Construction**		
Impact Nature	Negative	Positive	Neutral
	The temporary land taken during construction activities may lead in a temporary loss of forest-related livelihoods and subsistence activities.		
Impact Type	Direct	Indirect	Induced

	Potential reduction in forest-related subsistence and livelihood activities due to a direct interaction between the Project (i.e. land taken) and forest and savannah land users.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Forest and savannah clearance will be have long-term impacts throughout construction and into the operation phase as trees will not be allowed to be reinstated inside the 20 m footprint corridor.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area				
Impact Scale	The amount of forest and savannah area to be cleared represents 65% of the 20 m OHTL footprint corridor and approximately 4.1% of the forest and savannah vegetation in the Study Area.				
Frequency	The impact is expected to be continuous over the 12 months of construction.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Considering the embedded measures in place to optimise the transmission line route and minimise the amount of vegetation clearance, the magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors is considered medium primarily for the settlements in the municipality of Cambambe where reliance on forest products is more important, while settlements in the eastern portion of the line (Icolo e Bengo, Viana, and Belas) are considered of low sensitivity due to the availability of alternative sources of fuel.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is small and sensitivity is medium, the impact related to the collection of forest products during construction activities is considered to be of minor significance.				

Operations

Permanent Loss of Livelihoods and Household Income Due to Permanent Land Restrictions

The following restrictions will apply during operations to ensure access for the maintenance of the transmission lines and towers:

- Crop trees: planting of trees is not allowed inside the 20 m footprint corridor (including the 4 m maintenance road) nor inside the 10x10 m permanent tower footprint areas. In total, the area restricted for trees is of approximately 505 ha [(1)], which represents approximately 56.6% of the agricultural land used for agriculture in the Study Area. However, it should be noted that more land is available nearby.

- Seasonal crops: crop cultivation is not allowed inside the permanent tower site laydown areas and along the 4 m maintenance road. This amounts to 102 ha of land restricted for trees, which represents approximately 11.4% of the cultivated land in the Study Area. [(2)]

[1] This amounts to 1.3 ha for the permanent tower sites laydown areas and 504 ha for the 20 m footprint corridor (which also include the 4 m maintenance road).
[2] This amounts to 6.3 ha for the permanent tower sites and 101 ha for the 4 m maintenance road

These restrictions will result in reduced areas available for cultivation and other livelihoods.

The permanent land take and restrictions to trees is a direct negative impact which is permanent in nature. The amount of land where restrictions will apply are relatively small in the overall context of the land around the settlements. Given the verbal confirmation of local leaders that adequate replacement land is available the magnitude of the impact is considered ***low***. Receptor sensitivity is considered ***high*** considering the level of dependence on agriculture as the primary source of subsistence and livelihoods. The potential impact is therefore considered ***moderate***.

Table 9.33 Pre-Mitigation Impact Assessment

Impact	**Permanent Loss of Livelihoods and Household Income during Operations**				
Impact Nature	Negative	Positive	Neutral		
	The permanent land restrictions will lead to a permanent loss of livelihoods and household income. Permanent restrictions to the planting and cultivation of crop trees in the 20 m footprint corridor may also result in livelihood losses considering the amount of time and money required for new crop trees to bear fruit and reach maturity.				
Impact Type	Direct	Indirect	Induced		
	Potential loss of livelihoods and household income due to a direct interaction between the Project (i.e. land taken and restrictions) and land users/owners.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The loss of livelihoods and income associated to the restrictions for operation activities is considered to be permanent during the 50 years operation activities.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area				
Impact Scale	The scale of the impact is considered low as the amount of land where restrictions will apply are relatively small in the overall context of the land around the settlements. .				
Frequency	The impact will be felt continuously throughout the 50 years of operation as the restrictions will apply throughout.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above and the relatively small amount of land permanently required for the project, the magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors is considered high given the levels of dependence over agriculture for subsistence and livelihoods and their vulnerability to potential losses of livelihoods.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude and sensitivity are small and high, the impact on livelihoods and household income during operation activities is considered to be of moderate significance.				

Changes in Land Values Post-construction in Peri-urban Areas

Land in rural areas is mainly communal and falls under customary rights. This land is considered part of the "Public" domain in which land ownership

rights are not transferrable ("*non-conferrable*") and therefore communal land cannot be sold. As such, impacts from changes to land values post construction will not apply to rural areas along the transmission line route.

In contrast, changing land values in relation to peri-urban or urban land is more likely an issue as land in these areas may be rented or acquired through purchase. Potential impacts on the land values in peri-urban areas will be linked to the health and safety requirements restricting construction of new houses or buildings within the 60 m OHTL RoW.

Peri-urban areas in the Study Area are mostly located in the eastern portion of the line in the municipalities of Viana, Belas, and Icolo e Bengo where residential housing has been identified including a few weekend houses belonging to individuals residing in urban centres and using these houses on the weekends to cultivate the land. As stated above, access to land in these areas is mostly dependent on the land market. Building and development in these area will be restricted which may affect long-term urban development planning at the municipality level. In the immediate future, building restrictions will affect local landowners in these municipalities as the value of their land might decrease. Residential areas inside the 60 m RoW amount to 4.6 ha of land, which represent approximately 0.3% of the total area inside the RoW. Residential land in peri-urban areas represents an even smaller area.

Based on the above the magnitude of the impact is considered small since the area of land at risk of devaluation is limited. Receptor sensitivity is considered medium as this would mainly impact urban development plans at local government levels. Although it is recognised that some land-owning households may also be impacted, some of these have been identified as being secondary residence owners and are therefore considered less vulnerable. The overall significance is therefore considered ***minor.***

Table 9.34 Pre-Mitigation Impact Assessment

Impact	**Permanent loss of livelihoods and household income during Operations**			
Impact Nature	Negative	Positive	Neutral	
	Restrictions to the construction of physical structures and to height requirements may affect long-term urban development plans of local governments as well as the landowners who would see the value of their land decreasing.			
Impact Type	Direct	Indirect	Induced	
	Potential loss of land value and restrictions to urban developed due to restrictions by the Proejct.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The land value depreciation and impediment to local urban development associated to Project restrictions is considered permanent.			
Impact Extent	Local	Regional	International	
	Impact limited to the Study Area			
Impact Scale	The impact is considered as small scale considering that potentially affected land only represents about 4.6 ha.			
Frequency	The impact will occur once during the Project life at the time of the establishment of the RoW and construction of the lines.			

Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above and the small amount of land affeted, the magnitude is considered to be small.				
Resource/ Receptor Sensitivity	Low		Medium	High	
	Much of the land is likely to be municipal land that has no private ownership and some land is owned by wealthier households who own second houses. Nevertheless the majority of land owners may be low income households. The sensitivity is therefore considered medium.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the magnitude is small and sensitivity is medium, the impact on land value depreciation is considered minor.				

Mitigation Measures

Construction

As introduced previously, the main embedded measures for land and livelihood related impacts will be delivered through avoidance through detailed routing and design. NHID is currently developing the Executive Project, that include detiled design , and has specifically committed to the following in order to minimise transmission line routing and related clearance:

- NHID will avoid or minimize the number of towers sites working areas in agricultural areas or areas of community resources.

- NHID will minimise clearance of the 4 m maintenance road as in some cases clearance may not be necessary since other access roads are available.

- NHID will minimise as far as possible tree cut-off and tree trimming in the temporary tower sites working areas.

In addition, NHID has committed to developing a Resettlement and Compensation Action Plan (RCAP) and specific stand-alone Resettlement Action Plan (RAPs) and Livelihood Restoration Plans (LRPs) as RCAP annexes for discrete sections of the line to ensure that both customary landowners and land users receive adequate compensation for the loss of crops and related loss of income and, when required, are provided with access to alternative land of equal productivity. Compensation will also take into account 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. The objectives of the RCAP are as follows:

- To provide compensation for loss of assets at replacement cost and for the loss of income opportunities from seasonal and permanent crops. This also includes community-level compensation for the loss of community resources such as firewood and charcoal collection and harvesting of baobab trees inside the 20 m footprint corridor and related livelihood and

subsistence losses. If such losses to affected communities are idenitifed during the RCAP socioeconomic surveys, the Project will commit to replacing the lost trees and providing support for them to mature. The best approach for doing so will be discussed internally by NHID based on community feedback.

- Ensure that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.

- Improve or, at a minimum, restore the livelihoods and standards of living of displaced persons to pre-project levels, so as to facilitate sustainable improvements to socio-economic status (including the provision of alternative land for cultivation with equal or better soil productivity, and the provision of improved replacement housing). The provision of improved assets and alternative land constitutes a positive outcome that contributes to off-setting the inconvenience and disturbance and potential risk to livelihoods of the economic and physical displacement.

- In the case of changes in land values post-construction, affected land owners and/or right holders are entitled to cash compensation at replacement values for the reduced opportunities to use the land most productively.

- Pay particular attention to the needs of vulnerable groups, including households in Mbanza Calumbo II C that have already been displaced previously, identifying additional compensation and livelihood restoration measures as necessary.

The RCAP is the first step in the development of more detailed stand-alone RCAP annexes or Resettlement Action Plans (RAPs) and Livelihood Restoration Plans (LRPs) for specific sections of the transmission line route following the finalization of Project design.

Therefore, as next steps to the RCAP, NHID will conduct the following:

- Develop one or more RAPs/LRPs for different sections of the TL including:
    - conducting an asset inventory and census of all affected households; and
    - disclosure of the LRPs and agreement at the community level.
- Implement the RAPs/LRPs prior to land take in order to ensure that replacement homes and lands are ready, required infrastructure in place, and replacement livelihood resources can be accessed productively. Specifically NHID will:

- agree household level entitlements and provide compensation;
- ensure replacement assets are available or provide transition arrangements (e.g. provision of assisted self-build programmes for replacement housing); and
- provide continued support to households to restore livelihoods and monitor to demonstrate achievements of IFC principles (e.g. relocation assistance in nature and/or in kind, provision of land preparation allowance, etc.).

Operations

Impacts during the operations phase will be managed by RNT as operator of the line. Mitigation measures will include the following:

- Responsibilities will include monitoring and providing the necessary follow-up to support households to restore their livelihoods throughout the operations phase.

- The grievance mechanism established during the construction phase will be maintained during operations to ensure that local communities and stakeholders have an adequate channel to voice concerns.

Residual Impact

Provided the above mitigation measures are implemented, the residual impact related to temporary land taken during construction and permanent restrictions and land take during operations is reduced to ***minor*** levels.

Table 9.35 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land	Construction	Moderate	Minor
Physical displacement of Project-Affected People during construction	Construction	Major	Minor
Temporary loss of access to forest products from site clearing during construction	Construction	Minor	Negligible
Permanent loss of livelihoods and household income due to permanent land take and restrictions.	Operation	Moderate	Minor
Changes in land and property value	Operation	Minor	Negligible

9.4.3 Community Health, Safety and Security

Potential Impacts

The presence of the Project could affect the health, safety and wellbeing of the communities along the transmission line route. Increased Project-related traffic, demining, civil works for site preparation including site clearance 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 transmission lines once they are operational including exposure to electric and magnetic fields (EMF), also have the potential to affect communities.

Table 9.36 presents the potentially significant community health, safety and security [1] impacts that may occur during the construction and operation phases.

Table 9.36 Potential Impacts on Community Health and Safety

Construction Phase	Operation Phase
• Potential impacts on community safety, in particular road accidents, trespass on the sites, and demining activities potentially resulting in accidents leading to injuries or fatalities. • Environmental health: changes to the environment due to increased noise and vibrations, decreased air quality and, inadequate management of waste. • Impact from workers presence and potential interaction with local populations.	• Community health over exposure to EMF. • Increased community safety after demining.

Non-routine events such as risk of electrocution and potential fire of flammable material or forest resources are assessed under unplanned events in *Section 9.10.*

Baseline Conditions

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

[1] Although security has not been identified as an issue in communities in the study area, it is recommended that that any use of security / policy presence involves the development of a security plan taking into account requirements of IFC PS and Voluntary Principles on Security and Human Rights.

- Access to health and education services are limited throughout the transmission line route. There is no public health coverage in Angola and the majority of the population needs to pay for health services.

- Zenza do Itombe (Cambambe municipality) and Mazozo (Icolo e Bengo municipality) are the only settlements surveyed that have a health centre in the settlement, but these reported an insufficient number of staff.

- The main health issues in the settlements of the Study Area are malaria, diarrhoea, respiratory problems and urinary infections. HIV/AIDS prevalence in Angola as of 2016 is approximately 2.2% among among adults aged 15–49 years old, which is equivalent to the average in West and Central Africa. [1]

- Road infrastructure and road safety are precarious along the Project transmission line route.

- The transmission line runs parallel to the main road connecting Luanda to Laúca and the majority of settlements visited are located close to the main road.

- There are settlements in Zango Commune where residents have been previously displaced due to construction of transmission lines. It was reported that any further resettlement might not be well received.

- Outside of the peri-urban areas there is little public transport and individuals either walk or rely on private taxis (vans). Commercial activity such as the sale of agricultural products, wood and other small trades is often conducted on the side of the roads which increases the risk of accidents. The populations in the settlements along the Transmission Line route therefore live next to the road or use the road for commercial activities and will have construction going on very close to their homes (presence of children) and commercial centres.

Project Design Elements

Relevant project design elements that may potentially influence impacts are summarized as follows:

- The Project will establish a total of 650 temporary tower site working areas (40x50m each on average) inside the OHTL footprint corridor (598 in the 400 kV line and 42 in the 220 kV line).

- Construction activities at the tower sites working areas will be sequential; however access to these sites will be prohibited throughout the 12 months

[1] https://www.avert.org/hiv-and-aids-west-and-central-africa-overview

of construction, as machinery and equipment will be left at the sites in between team shifts from site to site until completion of the works.

- During the peak of construction there is likely to be up to 600 workers. Although local employment of labour from local settlements will be maximized, the majority of jobs is expected to be sourced at the national level from urban centres such as Luanda. The presence of workers from outside the Study Area increases the risk to community health and safety from interactions with workers.
- Up to four existing worker camps will be rented out by NHID contractors to house the Project workforce. These camps are located at the Laúca dam, near Dondo, Catete and near Maria Teresa, with capacity for 150 workers each.

- Worker camps will be open allowing free movement of workers.

- At each of the 650 tower sites working areas there will be vehicles including trucks, excavators and light duty vehicles (LDV).

- The construction equipment and materials that will be sourced from Angola, a mix of air freight, terrestrial and sea shipping will be used to convey the equipment to the temporary storage areas adjacent to the Laúca and Dondo camps and later to the 650 tower sites along the transmission line route.

- Water will be transported by truck to provide potable water for workers and water for the construction of tower foundations.

- Prior to the start of construction activities, demining will take place inside the 60 m OHTL RoW along the transmission line. It is not clear at this stage whether the Angolan army or a private company will conduct these activities. It is most likely that a manual method of demining will be undertaken with no or limited use of heavy machinery.

Impact Assessment

Construction

Impact on Community 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 60 m OHTL Right of Way 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. This being said, demining, once completed will increase the safety of people moving about and therefore translate into a positive impact.

During construction there will be an increase in traffic movements of heavy machinery and light vehicles in the road along the Transmission Line route and in access roads leading to the 650 temporary tower site working areas during a period of 12 months. This will include 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 site working areas and along transportation routes and access roads.

It is assumed that the 650 tower site working areas (40x50m 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 (e.g. open excavations for the erection of towers). Young people, elders and children are most at risk of being injured.

NHID will select the demining contractor company to ensure that ISO9001:2008 standards are followed and that operations are conform to international regulatory requirements such as International Mine Action Standards (IMAS) and the Angolan National Technical Standards and Guidelines (NTSGs).

It is not clear at this stage whether the Angolan army or a private demining company will be contracted to conduct the demining activities. However in both cases, these demining specialists are accredited in Angola by CNIDAH and are required to conform to IMAS Standards and the Angolan National Technical Standards and Guidelines (NTSGs).

In addition, the selected EPC contractors will be required to operate according to best international practice with respect to community and occupational health and safety.

The impact is a direct result of interaction with the increased traffic associated with construction activities, and the potential risk to community safety related to demining and construction activities. The impact is temporary in nature and limited to the settlements in the Study Area and the surrounding road

network. Contractors will also be required to operate according to best international practice. However, considering the potential risk posed to communities, the magnitude is considered medium. Receptor sensitivity is also rated as medium, resulting in ***moderate*** impact significance**.**

Table 9.37 Pre-Mitigation Impact Assessment

Impact	**Community Safety**				
Impact Nature	Negative	Positive	Neutral		
	Increased traffic during the construction period may result in increased risk to road traffic accidents and the presence of unfenced tower site working areas near settlements may result in trespassing and potential injuries. Demining activities also present a risk to communities if communities are not properly notified and if safety measures are not in place.				
Impact Type	Direct	Indirect	Induced		
	Impact that result from a direct interaction between the Project (i.e. increased traffic, unfenced tower work sites, risk posed by demining activities) and the local population along the transmission lines and road users.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The increased traffic effect and risks to injuries is temporary, as construction activities will take place in a sequential manner during the length of the construction period. However, although construction activities at the tower sites working areas will be sequential, access to these sites will be prohibited throughout the 12 months of construction, as machinery and equipment will be left at the sites in between team shifts from site to site until completion of the works.				
Impact Extent	Local	Regional	International		
	Impact limited to the settlements in the Study Area				
Impact Scale	The impact is considered as medium scale since 650 temporary tower sites will be under construction along the transmission line.				
Frequency	The frequency is considered to be occasional or one time at each temporary tower site over the duration of the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be medium considering the potential consequence of accidents.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors (local population along the transmission lines and road users including vehicle users, pedestrians and cyclists) is considered medium, as EPC contractors will be ensure that construction activities are undertaken in compliance with international standards. In addition, the transmission lines will be built in mostly rural areas and peri-urban areas where previous transmission lines have been built in recent years, and dense traffic in these areas may not be unusual for the populations, which may also contribute to improving the overall sensitivity.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude and sensitivity are medium, the impact on the community safety during construction activities is considered to be of moderate significance.				

Impact on Environmental Health for Communities

During the construction phase (approximately 12 months), activities will result in changes to the physical environment, with the potential to affect the health and welfare of communities. There will be temporary increases in dust during the duration of the construction phase, which will be mostly localised to the 650 temporary tower site working areas and access roads. These are likely to result in increased disturbance and decreased wellbeing especially for residents closest to construction site and along unpaved access roads. There are no impacts on local air quality over the long term and therefore unlikely to result in a recordable increase in respiratory diseases in the population.

Similarly, the construction of the transmission lines is likely to result in temporary increased noise levels for residents close to the temporary tower site working areas. The increase in noise is likely to result in disturbance and decreased wellbeing for those closest to the construction activities. However, this will be limited to construction hours and sleep disturbance is unlikely assuming construction work will be undertaken during daytime hours.

Project construction will also entail some temporary, localized, ground works that will generate vibrations. Depending on the soil characteristics and on the distance to the nearest building, these activities could produce vibrations for houses in the vicinity. Impacts could range from the level of temporary nuisance and disturbance, up to actual damage to buildings. It should be noted that the minimum allowed distance from a physical structure to the tower position is 10 m.

Waste production as a result of the construction activities is unlikely to impact on the health of communities along the route since most of the waste will be placed in the appropriate covered waste containers, and transported periodically to licensed landfills, and therefore opportunities for communities to come into contact with waste will be minimal.

In terms of design and operational controls in place, rerouting of the proposed transmission line route are planned near the settlements of Kisuba and Mucchau to avoid displacement of large numbers of households.

Produced solid waste will be stored in fenced areas and periodically transported to licensed landfills. NHID will reinstate and rehabilitate construction areas including repairing any damage caused as part of the construction activities.

The impacts on environmental health during construction are temporary in nature for the duration of the construction phase. Construction activities and associated vehicular traffic will take place in 650 temporary tower working areas and dirt access roads along the transmission line and close to local settlements. Considering the temporary nature of the works and the sequential approach, the magnitude is considered medium. Receptor sensitivity is also considered medium as receptors will include children, older

people and others that may be susceptible to changes to environmental quality. However it is noted that the transmission line crosses areas where previous transmission lines have been built in recent years, and related environmental changes might not be unusual for the populations, which may reduce the overall sensitivity of the populations. The impact significance is therefore considered ***moderate***.

*Table 9.38 **Pre-Mitigation Impact Assessment***

Impact	**Environmental Health**				
Impact Nature	Negative	Positive	Neutral		
	Construction activities have the potential to impact on environmental health which may translate into decreased localised air quality and increase in noise emission and associated disturbance.				
Impact Type	Direct	Indirect	Induced		
	Impacts that result from a direct interaction between the Project (i.e. air and noise emissions, vibrations, changes into visual environment and generation of waste) and the population along the transmission lines.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary since it is expected to be limited to the duration of construction activities at each of the 650 temporary tower sites. Note however that the time between each stop may vary, and that machinery and equipment will be left at the sites in between team shifts. Access to these sites will therefore be prohibited during the 12 months of construction.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area and surrounding access roads connecting to settlements located further away (500 m area from the line)				
Impact Scale	The impact is considered medium. Although construction will take place in a phased manner at the different sites, there is the potential for air and noise emissions to extend beyond the immediate 650 tower sites working areas and associated access roads.				
Frequency	The frequency is considered to be occasional or one time at each tower site and associated access roads throughout the 12 months construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be medium.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity is considered medium as receptors may experience disturbance and decreased well-being. Also, although structures inside the 20 m footprint corridor will be displaced to maintain security distances to the line, houses located further away mays still experience some impacts related to noise and air quality. However, since the transmission line crosses areas where previous transmission lines have been built in recent years, related environmental changes might not be unusual for the populations, which may contribute to reducing the sensitivity of the local people.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering both the magnitude and receptor sensitivity are medium, the impact on the community health due to environmental changes during construction activities is considered of moderate significance.				

Potential Interactions with Project Workforce and Resulting Increase in Disease Transmission

The Project workforce will be housed in open accommodation camps allowing free movements of workers. Interaction with nearby communities is therefore very likely and could potentially lead to an increased transmission of communicable diseases and sexually transmitted diseases within these communities. This is a particular risk in relation to communities located close to worker camps where the potential for interaction is highest. The exact locations of the workers camps are not confirmed at this stage, but are expected to be located in Lauca dam camp and near the towns of Catete, Dondo and Maria Teresa.

The profile of these diseases will be influenced by the existing diseases profile of communities along the route and the diseases profile of the countries workers are sourced from. In addition, if opportunistic workers arrive in the area hoping to benefit from employment spin offs this could also impact on the transmission of communicable diseases. Considering that 85% of the workers will be sourced from urban centres such as Luanda and to a lesser extent from peri-urban municipalities near the transmission line route, communicable diseases of concern are likely to include diarrhoea, respiratory infections, and typhoid fever. Children will be at particular risk of diarrhoeal diseases due to their sanitary behaviours, while the elderly will be at risk of more severe health outcomes as a result of their frailty.

In addition, considering that HIV/AIDS prevalence in Angola as of 2016 is approximately 2.2% among adults aged 15–49 years old, transmission of HIV may also occur. Since workers will live in open camps, prostitution may also be an issue considering the low levels of employment opportunities, and it is possible that some women in settlements close to the construction camps may resort to prostitution for short term economic gain. There is also a risk of increased pregnancies of young girls that could result in increased school drop outs in the settlements of the Study Area.

Based on the above, interaction between Project workforce and local communities in the Study Area is considered very likely during the construction phase. However considering that the Project workforce of 600 workers represent less 2.5% of the estimated population of the settlements in the Study Area, distributed into three camps, the impact magnitude is considered small. Receptor sensitivity is considered high as the low levels of employment opportunities might encourage prostitution and transmission of STDs and communicable diseases. This results in a ***moderate*** impact significance.

Table 9.39 Pre-Mitigation Impact Assessment

Impact	**Interaction with Project Workforce**		
Impact Nature	Negative	Positive	Neutral

Impact	Interaction with Project Workforce				
	The presence of Project Workforce will lead to interaction with the local communities which will potentially result in increased transmission of communicable diseases and sexually transmitted diseases.				
Impact Type	Direct	Indirect	Induced		
	Impacts that result from a direct interaction between the Project workforce and and the population along the transmission lines.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered short term as it is expected to last throughout the 12 months construction period in sequential manner along the transmission line and in the areas surrounding the four worker camps.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area and nearby urban centres.				
Impact Scale	Camps are open, workers will be free to access surrounding villages and settlements, interaction is therefore very likely. The Project workforce of 600 workers represent less 2.5% of the estimated population of the settlements in the Study Area, and will be distributed into four camps.				
Frequency	The frequency is considered to be continuous throughout the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered small since Project workforce represent less 2.5% of the estimated population of the settlements in the Study Area, and will be distributed into four camps.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity is considered high. The low levels of employment opportunities might encourage prostitution and transmission of STDs, and children and the elderly are considered particularly vulnerable to the transmission of communicable diseases.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Since impact magnitude is considered small and receptor sensitivity is high, the impact on community health due to interactions with the Project Workforce during construction activities is considered of moderate significance.				

Operations

Potential Health Impact from Exposure to Electromagnetic Fields

Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device such as power lines and electrical equipment. Electric fields are created by differences in voltage; the higher the voltage, the stronger the resulting electric field. Concerns over EMF health and safety risks are related to chronic (long term) health effects and acute (short term) effects. The potential impacts on community health and safety resulting from potential chronic and acute health effects caused by the Lauca-Bita transmission lines' EMF are assessed below.

Chronic effects relate to long term exposure to low magnetic fields and the potential impacts on health. Specifically, epidemiological studies indicated that long term exposure to 50 – 60 Hz magnetic fields might be associated with an increased risk of childhood leukaemia. There are also some concerns about possible increased risk of cancer from exposure to electromagnetic radiation

from overhead transmission line. However, according the IFC EHS guidelines for electric power distribution, there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. Nevertheless, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern (1).

Similarly, with respect to acute health effects from EMF, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines notes that there are a number of well-established acute effects of exposure to low frequency EMFs on the nervous systems; these being a result of direct stimulation of nerve and muscle tissue and the induction of retinal phosphenes. These health effects are not believed to result in long term or pathological health effects.

In terms of design or operational controls, as noted in *Section 2.5.2* of the Project Description, the development of the Project (TDS-V3) has been designed to comply with the *IFC EHS Guidelines for Electric Power Transmission and Distribution (April 30, 2007)* and the *ICNIRP Guidelines (2010)*. As such, rerouting of the transmission line has aimed to minimize exposure to the public in accordance with ICNIRP guidelines on public and occupational exposure. The rerouting of the line is still ongoing and not final at this stage, however the number of structures inside the 60 m RoW has been identified to ensure that population exposure levels are compliant with ICNIPR guidelines (*Section 2.5.2* of the Project Description).

Additionally, the EPC Contractor has increased the height of the transmission line towers as recommended by the *IFC EHS Guidelines on Electric Power Transmission and Distribution (see Section 1.1).*

Based on the analysis provided above, the potential impact from EMF from chronic and acute exposure is of ***minor*** significance.

Table 9.40 Pre-Mitigation Impact Assessment

Impact	**EMF Chronic and Acute Health Effects**			
Impact Nature	Negative	Positive	Neutral	
	Negative chronic and acute health effects as a result of EMF exposure.			
Impact Type	Direct	Indirect	Induced	
	The impact is a direct interaction between the transmission lines and surrounding residents and land users.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The duration is permanent as the project life cycle is expected to be a minimum of 50 years.			
Impact Extent	Local	Regional	International	
	The impact is of local extent as it will be limited to the vicinity of the transmission line.			

(1) It is the view of ICNIRP that the currently existing scientific evidence that prolonged exposure to low frequency magnetic fields is causally related with an increased risk of childhood leukaemia is too weak to form the basis for exposure guidelines.

Impact	EMF Chronic and Acute Health Effects				
Impact Scale	The impact scale is small considering the embedded measures in place to minimize exposure to the public in accordance with *ICNIRP guidelines on public and occupational exposure* and *IFC EHS Guidelines on Electric Power Transmission and Distribution.*				
Frequency	The occurrence of EMF is constant during the operation of the transmission lines; however, the risk of the chronic and acute health effects occurring is low.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude is considered small considering the embedded measures in place.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity is considered medium due to range of individuals in nearby settlements.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The overall potential chronic and acute effects are considered minor.				

Impact on Community Safety after Demining Activities during the Operations Phase

Once the construction phase is completed, mine clearance will have been undertaken in all areas inside the 60 m OHTL RoW that had not been previously cleared and that did not have an associated demining certificate. This clearance will result in increased safety for households and land users moving about in the area and will also release additional areas of land for cultivation. The impact is therefore positive.

Table 9.41 Pre-Mitigation Impact Assessment

Impact	Local Employment Opportunities			
Impact Nature	Negative	Positive	Neutral	
	Increased community safety.			
Impact Type	Direct	Indirect	Induced	
	Impact resulting from a direct interaction between the Project (i.e. demining of the OHTL RoW) and the local community.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The safety benefits of demined areas will be permanent throughout operations and onwards.			
Impact Extent	Local	Regional	International	
	The area to be demined is limited to the 60 m OHTL RoW that had not been previously demined and will benefit local communities nearby.			
Impact Scale	Although the exact number of individuals living along the Transmission Line is not determined at this stage, the scale is considered medium to large considering the length of the transmission line route.			
Frequency	One-off as demining is expected to occur once before the start of operations.			

Mitigation Measures

The following mitigation measures will be implemented during the construction phase to reduce any impacts on community health and safety.

- NHID will develop and monitor the implementation of a Community Health and Safety Management Plan which will include the following measures:

    - Ensure that all workers are housed in accommodation camps rather than in the local settlements in order to minimize interaction with local communities and related health and safety impacts.
    - Ensure all workers including contractors and subcontractors undergo pre-employment screening and regular health screening including voluntary screening for STDs.
    - Ensure any trucking companies employed to work on the Project will have policies around health screening of their workers in line with Project requirements.
    - Ensure all workers including contractors and subcontractors receive education around transmission routes and symptoms of communicable diseases of concern and STDs.
    - Provide access to health care for those injured by its activities.
    - Ensure that work sites are fenced and that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. When work fronts are less than 100 metres from a community or house, employ security guards from the local community to prevent trespass.
    - Undertake a programme 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.

- NHID will develop *Emergency Response Plans* (ERPs) in cooperation with local emergency authorities and hospitals.

- NHID will extend the *Worker Code of Conduct* to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors and truck drivers as part of the induction process.

- NHID will provide primary health care and first aid at construction camp sites to avoid pressure on local healthcare infrastructures.

- NHID will implement a *Community Grievance Mechanism*.

- NHID will develop and implement a *Traffic Management Plan* covering aspects such as vehicle safety, driver and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations.

With respect to demining, NHID will require the demining operator establish the following mitigation measures to ensure community safety:

- Establish appropriate safety distances and perimeters for communities.
- 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.

During the operations phase the following measures will apply and will be the responsibility of RNT to implement:

- As part of the Project's *Stakeholder Engagement Plan*, the start date for electricity transmission and safety implication will be announced locally using public announcement systems.

- Permanent warning plates (danger sign boards) and anti-climbing devices on all faces of the lattice towers.

- RNT will ensure that an *Emergency Preparedness and Response Plan (EPRP)* is developed.

- The Community Grievance Mechanism established during the construction phase will be maintained during the operation phase so stakeholders can report specific concerns.

- As part of the *Community Health and Safety Management Plan*, RNT will undertake a community education programme on transmission lines safety.

- Residents and land right holder will be trained on safety issues and actions to be taken; for example, where a pole is located close to residential areas or schools and recreational areas.

- Mitigations measures specified for physical and biological aspects will be implemented to reduce impacts to the environment and reduce risk of indirect impacts to human receptors and community health.

- NHID will 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.

- NHID will implement a grievance mechanism to address stakeholder concerns related to the Project in a timely manner.

For potential impacts associated with electromagnetic fields, as part of Project Design NHID will implement the following mitigation measures to ensure compliance with *ICNIRP guidelines on public and occupational exposure* and *IFC EHS Guidelines on Electric Power Transmission and Distribution* during the operation of the line:

- Installation of transmission line above or adjacent to residential properties or other locations intended for highly frequent human occupancy (eg. schools or offices) will be avoided.

- If EMF levels are confirmed to be above the recommended exposure limits, application of engineering techniques will be considered to reduce the EMF produced by the lines. Examples of such techniques include shielding with specific metal alloys, increasing height of transmission towers, modification to size spacing and configuration of conductors.

During operations, specific measures will also be applied to minimize the risk of negative health effects from exposure to electromagnetic fields:

- Once the line is operational, NHID will undertake initial measurements of the 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 EMF is and that people should not build new houses within the RoW; and

- RNT will undertake annual monitoring of the corridor to ensure that people are not building new houses within the corridor.

Residual Impacts

The significance of the residual impacts on community health and safety after the implementation of mitigation measures is presented in *Table 9.42* below.

Table 9.42 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Community Safety (Road Accidents, Site Trespass, Demining)	Construction	Moderate	Minor
Environmental Health (Noise and Air)	Construction	Moderate	Minor
Interaction with Project Workforce	Construction	Moderate	Minor
EMF Health effects	Operation	Minor	Minor
Safety benefits post demining	Operation	Positive	Positive

9.4.4 *Worker Health and Safety and Workers Management*

Potential Impacts

Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labour abuses and to ensure fair treatment, remuneration and working conditions. These issues should be considered not only for those who are directly employed by NHID but also its contractors (including sub-contractors) and within the supply chain.

The Project could potentially lead to workforce-related social and health issues throughout the life cycle of the Project if worker management and rights do not meet Angolan law or international best practice.

Table 9.43 presents the potentially significant impacts associated with occupational health and safety and worker management during the construction and operation phases. The potential for occupational health and safety incidents throughout the life cycle of the project is higher during construction phase.

Table 9.43 Potential Impacts on Occupational Health and Safety and Worker Management

Construction Phase	Operation Phase
• Impacts on workers' health and safety, in particular from road accidents, slip, and trip and falls hazards during tower erection and stringing activities, exposure to chemicals and inconsistent use of PPEs, and exposure to land mines during demining activities, resulting in accidents and potential injuries or fatalities. • Impacts on workers' rights from violations of labour laws in particular with respect to enforcement of health and safety measures by the employer such as the use of appropriate PPEs during construction of the transmission lines.	• Impacts on workers' health and safety in particular during maintenance of the transmission lines and from occupational hazards such as electrocution and EMF during line maintenance and the exposure to chemicals. • Impacts on worker's rights from lack of enforcement of health and safety measures by the employer such as the use of appropriate PPEs during maintenance of the transmission lines.

Non-routine events such as risk of transmission line collapse and risks during stringing activities are assessed in *Section 9.5* on Unplanned Events.

Baseline Conditions

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

- There is no public health coverage in Angola and the majority of the population needs to pay for health services.

- Zenza do Itombe (Cambambe municipality) and Mazozo (Icolo e Bengo municipality) are the only settlements surveyed that have a health centre in the settlement, but these reported an insufficient number of staff.

- Settlement level key informants reported that the distance to health centres from these settlements varies between 0 and 2 km.

- Road infrastructure and road safety are precarious along the Project transmission line route.

- Enforcement of health and safety laws and standards in Angola is expected to be limited, which contributes to high incidence of accidents on construction sites.

Project Design Elements

Relevant Project design elements that may potentially influence impacts are summarized as follows:

- The Project will establish a total of 650 temporary tower site working areas (40x50m each) inside the OHTL footprint corridor. Construction activities at the tower sites will be sequential, however access to these sites will be prohibited throughout the 12 months of construction, as machinery and equipment will be left at the sites in between team shifts from site to site until completion of the works.

- During the peak of construction there is likely to be up to 600 workers, of which approximately 50 will be specialist positions filled by mostly expatriates. The intention is to fill the majority of positions from urban centres such as Luanda, and to a lesser extent from peri-urban areas and rural areas along the transmission line route for low skilled positions. A 15%/85% split in favour of local employment is assumed.

- Up to four existing construction camps will be required for the three different subcontractors; in Laúca dam, Dondo, Maria Teresa and Catete, all sized for about 150 workers each.

- Prior to the start of construction activities, demining will take inside the 60 m RoW along the transmission line. It is not clear at this stage whether the Angolan army or a private company will conduct these activities. The most likely method is manual with no or limited use of heavy machinery.

Construction

Worker's Health and Safety and Labour Rights

Typical activities for the construction of the transmission lines include clearance of the RoW in vegetated areas, excavation work, erecting the towers, working at height and stringing the transmission lines. Workers conducting the demining activities are also exposed to land mine hazards during the preliminary land preparation phase. Considering that construction was identified as one of the sectors of employment (formal and informal) in Angola (including in the peri-urban areas along the transmission line route), the locally hired workforce may have some experience in traditional / 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 the construction of transmission lines may also pose a hazard to the health of the workforce if not handled properly.
Equipment and worker transport along the access roads to the pole 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 of accidents.

In addition, as described in the construction impact section, mine clearance of the 60 m corridor will take place in areas that had not been cleared previously and that do not have an associated demining certificate. Although activities will be conducted in line with international standards, exposure to potential mine explosions remains a risk to workers' safety which may result in serious injuries or death.

During construction, local employment will be subject to local labour laws and applicable international standards to which Angola is party (ILO conventions) in particular with respect to safeguarding the health and safety of workers. In addition contractors will need to comply with NHID's EHSS Policy standards 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.

All the employees and contractors are required to acknowledge and adopt NHID's environmental and social work practices and comply with all EHSS policies and procedures as well as the Code of Conduct, reporting safety hazards, unsafe work practices, unacceptable conditions, environmental and social issues. Only approved herbicides will be used for vegetation clearance as approved by the Health, Safety and Environment Manager (HSE Manager).

With regard to demining, NHID will select the demining contractor company to ensure that ISO9001:2008 standards are followed and that operations are conform to international regulatory requirements such as International Mine Action Standards (IMAS) and the Angolan National Technical Standards and Guidelines (NTSGs). It is not clear at this stage whether the Angolan army or a private demining company will be contracted to conduct the demining activities. However in both cases, these demining specialists are accredited in Angola by CENIDAH and are required to conform to IMAS Standards and the Angolan National Technical Standards and Guidelines (NTSGs). It should also be noted that Angola is signatory of the 1997 Ottawa convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction.

All contractor contracts will include explicit reference to the need to abide by Angolan law and NHID standards and policies in relation to health and safety.

During construction, the direct interaction between the Project and the workforce if not managed properly, will result in negative impacts on the workers' working conditions and potentially permanent impacts on their health and safety. The impact is considered short-term and continuous over the 12 months construction phase across 650 construction sites resulting in a medium impact magnitude. Since EPCs are expected to operate according to international standards and considering the level of prior training of the workforce, receptor sensitivity is considered medium. Therefore the impact is of ***moderate*** significance.

Table 9.44 Pre-Mitigation Impact Assessment

Impact	**Workers Health and Safety and Rights during Construction**			
Impact Nature	Negative	Positive	Neutral	
	Poor planning, non-compliance with health and safety best practice and labour rights can result in injuries or fatalities.			
Impact Type	Direct	Indirect	Induced	
	Resulting from a direct interaction between the Project (i.e. increased project traffic, working at height, stringing the transmission lines across the towers, open excavations, and demining) and the workforce.			
Impact Duration	Temporary	Short Term	Long Term	Permanent

Impact	Workers Health and Safety and Rights during Construction				
	Injuries and fatalities could have permanent impacts on workers and their families.				
Impact Extent	Local		Regional		International
	The workforce will be primarily contracted from urban centres such as Luanda, and potentially from peri-urban areas along the Transmission line.				
Impact Scale	As mentioned above the workers will be working on different sections of the line at different times. The impact scale is therefore medium.				
Frequency	The frequency is considered to be infrequent as the workforce and drivers are expected to be trained and the employer is expected to enforce the use of PPEs and health and safety measures.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, and considering the embedded measures in place the magnitude is considered to be medium.				
Resource/ Receptor Sensitivity	Low		Medium		High
	The sensitivity of the receptors (workforce working along the transmission lines) is considered medium as some workers may not be aware of their rights.				
Impact Significance	Negligible		Minor	Moderate	Major
	Since the magnitude is considered medium and sensitivity is medium, the impact on workers' health and safety during construction activities is considered to be of moderate significance.				

Operations

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.

With respect to exposure to EMF, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) considers that there are occupational circumstances where, with appropriate advice and training, it is reasonable for workers voluntarily and knowingly to experience transient effects such as retinal phosphenes and possible minor changes in some brain functions. These symptoms are not believed to result in long term or pathological health effects.

As stated previously, the Project during its lifetime will be subject to local labour laws and international standards with respect to the responsibility of the employer to safeguard the health and safety of its employees. The Project is therefore expected to abide by these regulations and develop and implement appropriate health and safety measures covering the operations phase including the use of PPE by the workforce. As stated for the construction phase, compliance with NHID's EHSS policy aimed at safeguarding the health and safety of its employees and subcontractors will additionally help prevent potential labour abuses and reduce the risk of health and safety incidents.

Finally, all contractor contracts include explicit reference to the need to abide by Angolan law and NHID's standards and policies in relation to health and safety.

Any health and safety and labour rights related impact during the operations phase will be limited to a small number of workers and will be temporary over the 50 years operation phase. The magnitude is therefore considered small. Receptor sensitivity is considered low as most workers will be permanent skilled workers. Therefore the impact is of ***minor*** significance.

Table 9.45 Pre-Mitigation Impact Assessment

Impact	**Workers Health and Safety and Rights during Operations**				
Impact Nature	Negative		Positive		Neutral
	Poor planning, non-compliance with health and safety best practice and labour rights can result in injuries or fatalities.				
Impact Type	Direct		Indirect		Induced
	Resulting from a direct interaction between the Project (i.e. increased project traffic, working at height, stringing the transmission lines across the towers, open excavations, and demining) and the workforce.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Injuries and fatalities could have permanent impacts on workers and their families.				
Impact Extent	Local		Regional		International
	The workforce will be primarily contracted from urban centres such as Luanda, and from other countries for some higher skilled jobs.				
Impact Scale	The impact scale is considered small during operations as the workforce size will be reduced and maintenance activities will be periodic.				
Frequency	The impact is considered to be infrequent since the operation activities will be limited to maintenance works. The workforce is expected to be trained and the employer is expected to enforce the use of PPEs and health and safety measures. Lessons learned from the construction phase are expected to enhance the safety conditions and thus reducing the frequency of safety incidents during the operation and maintenance phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, and the embedded measures in place, the magnitude is considered small.				
Resource/ Receptor Sensitivity/Value/ Importance*	Low		Medium		High
	The sensitivity of the receptors is considered low as workers will be mostly skilled permanent employees.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the magnitude is medium and sensitivity is low, the impact on workers' health and safety during operations activities is considered to be of Moderate significance.				

Mitigation Measures

The following mitigation measures will be implemented during the construction phase to reduce any impacts on workers' health and safety and labour rights.

- NHID will develop and implement a *Workers's Health and Safety Management System* covering all contractors and subcontractors including the following measures:

  - NHID will develop a Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable ILO standards, compensation including consideration of overtime, holidays etc. NHID will require its contractors and subcontractors to put in place policies in line with national legislation and applicable international legislation and NHID Code of Conduct and Policies.
  - NHID 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 NHID with the right of audit.
  - NHID will prohibit the use of alcohol or 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 or the environment.

  - NHID and self-employed contractors will assess the H&S risks related with the tasks to be performed during the construction phase.
  - Pre-employment medical assessments will be put in place as a workforce risk management tool to screen individuals for risk factors that may limit their ability to perform a job safely and effectively. Expected bents of conducting a pre-employment medical assessments include a safer working environment, reduction in workplace injuries, minimised downtime, matching the capacity of the employee with the role, and overall recruitment cost and risk reduction.
  - NHID will ensure that training on health and safety measures is provided to all construction workers prior to starting to work on the Project and that supervisors have adequate experience to deliver on their responsibilities.
  - NHID will 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.
  - NHID will develop and implement a *Workers Grievance Mechanism* for the Project workforce including contractors and subcontractors.
  - NHID will 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.

- NHID will ensure that facilities and work sites are designed and maintained such that robust barriers are in place to prevent accidents.

- NHID will 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.

- NHID will ensures that IFC/ EBRD guidelines regarding the construction and management of worker accommodation and the provisions of medical facilities at worker accommodation are followed.

- NHID will ensure that adequate clean water, adequate food and access to medical care is provided to all workers on the worksite and at accommodation.

- NHID will develop and implement a *Traffic Management Plan* covering aspects such as vehicle safety, driver and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations.

- NHID will develop a *Waste Management Plan* for the construction phase with clear guidelines for the safe storage and disposal of hazardous waste and handling of hazardous materials.

- Recruitment will be undertaken in collaboration with local authorities and local agencies. NHID will put in place measures to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation.

During the operation phase, RNT will implement the following measures:

- The *Workers's Health and Safety Management System* will be extended to the operation phase and adapted to address relevant aspects, including the following measures:

    - Development of a Human Resources Policy which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable ILO standards, compensation including consideration of overtime, holidays etc.
    - Identification and provision of appropriate PPE, training and monitoring, as well as ongoing safety checks and safety audits.

- Prohibiting the use of alcohol or 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 or the environment.
- Ensuring that training on health and safety measures is provided to all construction and operation workers prior to starting to work on the Project.
- RNT will undertake compliance monitoring of labour rights. KPIs will be developed around worker rights, discrimination and management, workforce grievance mechanism and monitoring of outcomes.
- Implementing a *Workers Grievance Mechanism* for the Project workforce.
- Establishing a procedure for the recording and analysis of lessons learned and implementation of additional actions to avoid or minimize occupational health and safety risks.

- RNT will 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.

- RNT will put in place measures to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation.

Residual Impacts

The implementation of mitigation measures will contribute to reducing 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. This risk will be short-term during the construction phase (12 months) and long term during operations. Confirmation of roles and responsibilities for implementation, including any supporting resources for RNT and GAMEK required, will ensure that the significance of the residual impacts is minimised.

With the implementation of mitigation measures the remaining impact significance is considered ***minor*** significance during construction and negligible during operation. In fact, during operations, knowledge and lessons learned in terms of health and safety and labour rights during the construction phase may extend to the operation phase and contribute to strengthening local knowledge and practices in Angola. Skill improvement and capacity building is assessed in more detail in *Chapter 10*.

Table 9.46 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Worker health and safety and labour rights	Construction	Moderate	Minor
Worker health and safety and labour rights	Operation	Moderate	Minor

9.4.5 Access to Infrastructure and Services

Potential Impacts

The Project will use the existing infrastructure for activities such as transportation and waste disposal. The transportation of construction material and equipment will take place by trucks and through the existing road network during construction. Stringing activities will also require short-term road closures and will disrupt transit routes. Although road improvement and construction of access roads may lead to disruption of traffic during the construction phase, these improvements are expected to benefit the local communities in the long-run during the operation phase. The potential increase in the risk of road accidents is addressed under Community and Occupational Health and Safety Impacts in *Section 9.4.3* and *Section 9.4.4* above.

During construction, the Project is not considered to give rise to any significant impact associated the increased pressure on healthcare infrastructure in the Study Areas as workers will be housed in worker camps where healthcare services will be provided. Impact on health infrastructures has therefore been scoped out. Similarly, the potential pressure on local sources of water has also been scoped out since the Project will bring in potable water and water for construction by trucks. No pressure on existing waste management infrastructure and services in the Study Area is expected either as the Project will contract a waste management company to dispose of the waste generated by the Project and worker camps at licensed landfill sites in Luanda.

Table 9.47 summarises the potentially significant impacts on local infrastructure and services during the construction and operation phases of the Project.

Table 9.47 Potential Impacts on Infrastructure and Services

Construction Phase	Operation Phase
• Disruption to traffic and transportation mainly during the upgrade of existing access roads, access to tower position, transport of equipment and material supply and stringing activities.	• Benefits to local settlements from road infrastructure improvements.

Baseline Conditions

Relevant baseline conditions that may influence the significance of potential impacts on infrastructures and services are summarized as follows:

- Road infrastructure and road safety are precarious along the Project line.

- Road conditions and lack of public transportation system are the main challenges regarding access to services such as health and education, as well as to job opportunities.
- Lack of infrastructure, poor maintenance, and long dry seasons are the main difficulties related to water access. None of the settlements in the Study Area have in-house running water.

- Households in the settlements of the Study Area do not have access to sanitation or sewage system, and most households do not have toilets.

- In Angola most households burn or bury their waste. Only 8.8% of rural households and 37.5% of urban households have access to appropriate waste disposal.

- Zenza do Itombe (Cambambe municipality) and Mazozo (Icolo e Bengo municipality) are the only settlements surveyed that have a health centre in the settlement, meaning that the remaining settlements need to travel longer distances to access health centres.

Project Design Elements

Relevant Project design element to consider include the following:

- It is expected that existing access roads can be utilized. Few if any new access roads will be required. The existing road network will be upgraded.

- Once the 4 m maintenance road is established, existing access roads will be re-established or new ones will be built.

Impact Assessment

Construction

Disruption to road traffic and transportation during the upgrade of existing access roads, access to tower sites, transport of equipment and material supply and stringing activities could result in impacts to quality of life, and if unmanaged, in health impacts for local populations (eg. worsening of the sanitary situation, inability to reach healthcare infrastructure during an emergency due to road upgrading or traffic, etc.). Therefore, if unmanaged, disruption to services might also result in community distrust and resentment towards the Project.

This being said, the associated increased pressure and disruption of the existing road network and related traffic issues will be temporary and limited to the construction phase. Considering that the local population in the Study Area needs to travel on average 2 km to access healthcare services, and even longer distances in cases of emergency, access to appropriate road networks is very important, which leads to a high receptor sensitivity.

NHID commits to performing site reinstatement and rehabilitation including repairing any damage caused as part of the construction activities and reinstating existing access roads if needed.

As described above, the impact magnitude is considered small and receptor sensitivity is high resulting in an impact of ***moderate*** significance.

Table 9.48 Pre-Mitigation Impact Assessment

Impact	**Damage / Access to Local Infrastructure and Services during Construction**				
Impact Nature	Negative		Positive		Neutral
	Damage road infrastructure can lead to disruptions and reduced quality of life of communities in the Study Area.				
Impact Type	Direct		Indirect		Induced
	Increased pressure on road infrastructure is expected to occur as a result of direct utilisation by the Project (road usage, transport of equipment, material, workers, water, waste, etc.).				
Impact Duration	Temporary		Short Term	Long Term	Permanent
	The impact is considered to be of temporary duration as it is not expected that transportation and road upgrades will not be continuous throughout the construction phase.				
Impact Extent	Local		Regional		International
	Impact limited to the Study Area				
Impact Scale	The impact is considered as small scale since could result in temporary reductions in community well-being from loss of access to basic services before reinstatement.				
Frequency	The frequency is considered to be occasional considering that the traffic generated by the Project is expected to be low and localised and the building of new roads will be limited.				
	Positive	Negligible	Small	Medium	Large

Impact	Damage / Access to Local Infrastructure and Services during Construction			
Impact Magnitude	Based on the parameters above, and considering the embedded measures in place to reinstate road networks, the magnitude is considered to be small.			
Resource/ Receptor Sensitivity	Low	Medium	High	
	The sensitivity of the local communities is considered to be high as they depend on the road network to access healthcare services.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the magnitude is small and sensitivity is high, the impact on community access to infrastructure during construction is considered to be of moderate significance.			

Operations

Improvements to roads have the potential to positively impact on community access to education, employment, services and road safety. Communities in rural and remote areas, in particular in the municipality of Cambambe, that are currently lacking in quality roads and infrastructure have the potential to be most positively impacted by infrastructure improvement. Communities benefiting from the upgrade and construction of new roads may also experience positive impacts such as enhanced access to markets for their local agricultural produce, and access to transportation and services (education, health, transport, etc.).

As the Project is expected to use mainly existing roads, these will require upgrading during the construction phase and maintenance during operations which result in a long-term positive impact for local communities.

Table 9.49 Pe-Mitigation Impact Assessment

Impact	Damage / access to local infrastructure and services during operations			
Impact Nature	Negative	Positive	Neutral	
	Improvement of the local road network leading to improved access education, employment, healthcare and improved road safety for local communities in the Study Area.			
Impact Type	Direct	Indirect	Induced	
	The improvement in access to service and in livelihoods and employment is a direct result of Project road improvement, reinstatement and maintenance activities.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The impact is considered to be of long-term duration throughout the 50-year operation phase.			
Impact Extent	Local	Regional	International	
	Impact limited to the Study Area.			
Impact Scale	The impact is considered as medium scale considering the length of the Transmission Line route.			
Frequency	The frequency of the impact is continuous throughout the operation phase.			

Mitigation Measures

The following mitigation measures should be employed to reduce any impacts on local infrastructure access and/or damage:

- Methods will be implemented to maintain open, clear and transparent communication with the local communities regarding the use of local infrastructures by the Project throughout the different phases.
- Engagement with the relevant authorities is recommended in order to avoid damage to common property and minimize access disruption to education and healthcare facilities.
- A *Community Grievance Mechanism* will be implemented.
- A *Traffic Management Plan* shall be issued before earth movements and construction start in order to minimize traffic disruptions.
- Where temporary closure of road is required, alternative access to property will be ensured and local solutions including diversions will be implemented to ensure uninterrupted mobility.

Residual Impacts

Considering the mitigation measures in place, the significance of traffic and road network disruption may be reduced to ***minor***, while the impact from road network improvements in the operation phase is ***positive.***

Table 9.50 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Disruption to traffic and transportation	Construction	Moderate	Minor
Improvement of the local road networks	Operation	Positive	Positive

9.4.6 Cultural heritage

Potential Impacts

Baseline assessments have not identified cultural heritage sites in the proposed transmission line corridor and thus no valuable tangible cultural heritage structures and resources are likely to be impacted by the project. However due to the remoteness of the area and the time spam between the baseline surveys and the actual project implementation grave sites can be found at a later stage. Potential impact are more likely to be related to grave or burial sites to be established in the near future. The potentially impacted

resources and receptors are the communities located within the proposed transmission line.

Table 9.51 Potential Impacts to Cultural Heritage

Construction Phase	Operation Phase
• Damage of grave sites considered important by the local communities • Loss of access to tangible cultural heritage sites	• Not applicable

Baseline Conditions

A number of cultural heritage and archaeological sites have been identified in the three provinces crossed by the project and these include ten cultural heritage sites, namely:

- one cultural landscape site;
- two burial / funerary sites;
- two cultural and archaeological sites; and
- four inventoried cultural sites.

The structures mentioned above (detailed in *Section 7.4.15*) are located further away from the proposed transmission line route (such as the cultural heritage sites of Muxima Fort and Church) and thus are unlikely to be affected by the proposed project.

Impact Assessment

Construction Phase

During the construction activities there will be the need to improve access to some of the presently remote areas for vehicles and establishment of pioneer camps as well as in some inhabited areas. The removal of vegetation and opening of road accesses might uncover illegal grave sites which can only be removed by the appropriate governmental structures and consultation with the traditional authorities. The potential impacts are likely to be temporary and short term and most of these can be avoided during the vegetation removal process.

Based on the baseline data it is not expected that the planned activities will result in negative impacts over the existent cultural and archaeological sites.

In terms of embedded controls, during the construction phase of the proposed transmission line project the EPC contractor will apply the chance finding procedures as recommended by IFC guidelines (PS8).

This direct impact is temporary, since the impacts will be evident during the vegetation removal and installation of the infrastructure. As there are no grave sites identified within the transmission line RoW the likelihood of these impacts is low. The potential impact, in case illegal grave sites are identified during the vegetation removal process, is direct and negative. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be negligible.

Based on the analysis provided above, the impact of the project on cultural sites, will be a ***moderate*** negative impact pre-mitigation (*Table 9.52).*

Table 9.52 Pre-Mitigation Impact Assessment

Impact	**Cultural Heritage during Construction**				
Impact Nature	Negative	Positive	Neutral		
	Disturbance to grave sites during vegetation removal and construction activities				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e. construction activities) and potential cultural sites (e.g. garve sites) along the transmission line				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary as grave sites would be identified during the vegetation removal activities				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered to be of negligible scale.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Valu e/ Importance*	Low	Medium	High		
	The receptors can be identified in the early stages of the process (e.g. vegetation removal and opening accesses). The sensitivity is considered low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is negligible and the sensitivity is low, the overall significance is considered to be of negligible significance.				

Operations

During the operational phase there are not expected potential impacts on the cultural heritage as a result of the existence of the transmission line.

Table 9.53 reflects the non-applicability of the significance of impacts on cultural heritage during the operation of the transmission line.

Table 9.53 Pre-Mitigation Impact Assessment

Impact	**Cultural Heritage during Operations**		
Impact Nature	Negative	Positive	Neutral

	There are no expected impacts during operation				
Impact Type	Direct	Indirect	Induced		
	N/A				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	N/A				
Impact Extent	Local	Regional	International		
	N/A				
Impact Scale	The impact is considered to be of negligible scale.				
Frequency	N/A				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	N/A				
Impact Significance	Negligible	Minor	Moderate	Major	
	N/A				

Mitigation

The following standard mitigation measures will be employed:

- Consult community sobas when any community issue arises in order to engage traditional forms of community leadership.

- Work with local community representatives to develop cultural awareness materials (published in Portuguese) that will cover key issues including the location and importance of all local cultural sites and other cultural sensitivities (graves).

- Should construction activity be required in proximity to existing graves, develop and implement working protocols in consultation with local traditional leaders (sobas).

- 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.

- Establish a grievance procedure to ensure community concerns are addressed.

- Develop a chance find procedure which will detail the appropriate course of action that must be followed for any relevant cultural heritage discoveries.

Residual Impact

The impact significance is ***negligible*** after mitigation measures during construction and no impacts are expected during operations (*Table 9.54).* 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.

Table 9.54 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Damage of grave sites considered important by the local communities	Construction	Negligible	Negligible

9.5 UNPLANNED EVENTS

The following *Chapter* 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 takes into account 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 *Chapter.*

9.5.1 Potential Impacts to Soil and Surface Water from Spill Events

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 transmission line RoW and substation footprints.

During operation of the transmission line RoW, spills could occur during maintenance activities such as spillage of pesticides.

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. *Table 9.54* summarises the potential impacts from unplanned events.

Table 9.55 Potential Impacts from Spillages

Construction Phase	Operation Phase
• Soil and surface water degradation due to fuel spills during construction activities (refuelling, maintenance machinery)	• Soil and surface water degradation as a result fuel spills due to maintenance activities of the transmission lines and substations.

Impact Assessment

If hazardous materials such as fuel were to be released to the soil and surface water resources, this would be limited to the local extent, depending on the volume spilt and rate of spillage. Within the Project AoI there are surface water resources such as streams which could be impacted if the spill were to occur within proximity of the resource.

Likelihood

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.

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 transmission RoW which are used for cultivation and therefore the sensitivity is considered of medium sensitivity. This results in a potential negative impact of **Moderate** significance (*Table 9.55*).

For surface water, the impact of the spill would be short to medium term as the release of fuel or oil is likely to be a discrete (i.e.: non-continuous) event and the effects on water quality naturally mitigated through dilution and natural attenuation. Despite the unavailability of information on surface water quality, the sensitivity is considered medium as the communities along the river make use of the water resource for various domestic and agricultural needs. The magnitude of the impact is considered medium and the potential impact is therefore of **Moderate** significance (*Table 9.56*).

Table 9.56 Pre-Mitigation Impact Assessment

Impact	Accidental Fuel Spills on Soils		
Impact Nature	Negative	Positive	Neutral

	Reduction in local soil quality as a result of spillage during maintenance of machinery, improper storage of hazardous materials, spillage during transfers of fuel and general construction activities.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities soil resources along the RoW areas				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is long term due to time for remediation or natural attenuation expected for contaminated soils				
Impact Extent	Local	Regional	International		
	The impact will be limited to the AoI				
Impact Scale	The impact is considered as medium scale. If a spill occurs it will be locally – usually at a construction site – and not along the whole of the transmission line.				
Frequency	Not Applicable				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered medium				
Resource/ Receptor Sensitivity	Low	Medium	High		
	While some areas along the RoW are in urban areas (Luanda metropolitan area) other sections include cultivated areas and therefore the significance is medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is medium the overall significance is considered to be moderate.				

Table 9.57 Pre-Mitigation Impact Assessment

Impact	**Accidental Fuel Spills on Surface Water**				
Impact Nature	Negative	Positive	Neutral		
	Reduction in local soil quality as a result of maintenance of machinery, storage of hazardous materials, transfers of fuel from fuel storage and general construction activities.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities surface water resources along the RoW and construction areas.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is considered to be short term as the spillage event is likely to be a discrete (i.e.: non-continuous) event and the effects on water quality naturally mitigated through dilution and natural attenuation.				
Impact Extent	Local	Regional	International		
	The impact will be limited to surface water streams and temporary water bodies along the AoI				
Impact Scale	The impact is considered as medium scale. If a spill occurs it is more likely to be a construction location and not along the whole of the transmission line.				
Frequency	Not Applicable				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the impact magnitude is considered medium				
Resource/ Receptor Sensitivity	Low	Medium	High		

	The sensitivity of the surface water resources along the project footprint is considered Medium as these resources are extensively used for domestic and agricultural purposes.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the impact magnitude is medium and the sensitivity is medium the overall significance is considered to be moderate			

Mitigations

The following management measures will be implemented in the Project's ESMP:

- The Project will develop a detailed Oil Spill Response Plan (OSRP) which includes community notifications of any significant spills that have the potential to affect communities. 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).

- Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, treated by incineration or removed by an authorised local contractor. Drip trays must be used when refuelling and servicing vehicles or equipment, where it is not on a hardstanding surface.

- 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.

- Hydrocarbon spill cleanup 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.

Residual Impact

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 unutilised areas. Based on the surface water context, impacts on surface water will be of **Minor** significance post mitigation.

Table 9.58 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Reduction in local soil quality	Construction and operation	Moderate	Minor
Reduction in surface water	Construction and operation	Moderate	Minor

9.5.2 Potential Impacts to Community Health and Safety

During the transmission line construction and operation phases, unplanned events with the potential to negatively affect human population could occur. *Table 9.58* presents the potentially significant unplanned events that may occur during the construction and operation phases.

Table 9.59 Potential Impacts on Community Health and Safety

Construction Phase	Operation Phase
• Risks during stringing activities. • Exposure to land mines during construction, resulting in accidents and potential injuries or fatalities.	• Dielectric oil release that have the potential to ignite, create fire or explosion and could lead to fatalities. • Potential disaster resulting in a transmission line snapping, transmission tower/pylon collapse.

Impact Assessment

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 using personal protective equipment (PPE) should be taken in consideration, i.e. their attitude to avoid PPE may result in accident/hazard.

As part of the project will be developed outside the existing corridor, de-mining hasn't happened yet for the full route. Construction activities will increase the potential interaction between communities and existing land mines. If not mitigated, both the demining activites and the land mines not deactivated but lifted to the surface during earthworks, can negatively impact the populations.

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 transmission line can result in electrocution.

Embedded Controls

The following embedded controls are considered as part of the assessment:

- EPC Contractor team will follow the method statement for overhead stringing; the activities will be managed by experienced Supervisors.

- Implementation of design standards (built in safety), the line hardware used on the overhead transmission lines is rated or designed higher than the conductor ultimate tensile strength and the conductor is only pulled to 20% of its ultimate tensile strength.

The potential impacts are all considered unlikely in that they are not likely to occur during the lifetime of the Project.

The significance of the impact associated with stringing activities is summarised *Table 9.59.* This is considered a negative event that could lead to permanent impacts if there are injuries and fatalities. The overall impact is considered of **Moderate** significance.

Table 9.60 Pre-Mitigation Impact Assessment

Impact	**Risks during Stringing Activities**				
Impact Nature	Negative	Positive	Neutral		
	Inadequate planning of stringing activities has the potential to impact occupational and community health.				
Impact Type	Direct	Indirect	Induced		
	The community health and welfare of workers and population around the stringing activities could be directly impacted.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Potential impacts are considered to be permanent as they could lead in injuries and fatalities.				
Impact Extent	Local	Regional	International		
	The impact will have a localised extent limited to the transmission lines footprint.				
Impact Scale	The impact is considered as medium scale covering the length of the transmission lines.				
Likelihood	Unlikely because it is not likely to occur during the lifetime of the project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above, the event is considered to have a Medium magnitude.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Sensitivity of receptor considered as Medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is medium as well as the sensitivity, the impact on the community health and welfare is considered to be of moderate significance.				

In terms of the impact related to UXO exposure to the communities, it is considered a negative event that could lead to permanent impacts if there are injuries and fatalities. The overall impact is considered of **Major** significance if unmitigated (*Table 9.60*).

Table 9.61 Pre-Mitigation Impact Assessment

Impact	**Risks during Stringing Activities**				
Impact Nature	Negative	Positive	Neutral		
	Injuries or fatalities to community members or workforce.				
Impact Type	Direct	Indirect	Induced		
	The community health and welfare of workers and population around the construction areas could be directly impacted.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Potential impacts are considered to be permanent as they could lead in injuries and fatalities.				
Impact Extent	Local	Regional	International		
	The impact will have a localised extent limited to the transmission lines footprint.				
Impact Scale	The impact is considered as medium scale covering the length of the transmission lines.				
Likelihood	Possible given the high incident of UXOs in the region.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the potential for fatalities, the event is considered to have a Large magnitude.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Sensitivity of receptor considered as Medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the risk of fatalities. the impact on the community health and welfare (and workforce) is considered to be of Major significance if unmitigated.				

Table 9.61 summarises the potential impact associated with transmission line snapping or pylon collapse. The negative impact is a direct impact, which while regional in its extent, could lead to permanent impacts and therefore has a large magnitude. 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 transmission line RoWs in the areas close to Luanda metropolitan area. This is therefore considered as a ***Major*** significant impact, which is unlikely to occur during the lifetime of the Project.

In the rural areas, due to the fact that the transmission line routing was mostly designed far from the existing communities the receptor sensitivity is considered low but with medium significance.

Table 9.62 Pre-Mitigation Impact Assessment

Impact	**Potential Disaster Resulting in Transmission Line Snapping and/or Transmission Tower/Pylon Collapse**		
Impact Nature	Negative	Positive	Neutral
	An unplanned event leading to the snapping of the transmission lines or collapse of transmission towers or parts of it has the potential to impact on community health and welfare.		

Impact Type	Direct		Indirect		Induced
	The community health and welfare of population around the transmission lines could be directly impacted.				
Impact Duration	Temporary		Short Term	Long Term	Permanent
	Impacts on community health and wellbeing are considered to be permanent as they could lead in injuries and fatalities.				
Impact Extent	Local		Regional		International
	The impact will have a localised extent limited to the areas surrounding the transmission lines – more acute close to Luanda metropolitan area				
Impact Scale	The impact is considered as medium scale.				
Likelihood	Unlikely because the event is not likely to occur during the lifetime of the project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above, the event is considered to have a Large magnitude.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Sensitivity of receptor considered as High, considering that significant portions of the transmission lines routes cross dense residential areas.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is large and the sensitivity high, the impact on the community health and welfare in case of transmission line snapping or transmission tower/pylon collapse is considered to be of major significance in the areas closer to Luanda and moderate significance in the rural areas. It should be noted that although this event is unlikely to occur it has a great consequence since the majority of the transmission line crosses urban areas.				

Mitigations

The following mitigation measures will be employed to reduce any impacts resulting from a 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.

- Implementation of a demining campaign (refer to *Section 2.12*) as per the Angolan legal framework, aligning with the demining contractor a set of control measures (e.g. safety perimeter, safety distances to maintain, equipment, tools, etc.) following the ISO9001:2008 standard.

- Making sure that operations will be performed by the demining accredited operator in accordance with international regulatory requirements such as International Mine Action Standards (IMAS) and the Angolan National Technical Standards and Guidelines (NTSGs).

- Making sure that temporary soil stock piles are safelly stored, with controlled access.

- An Emergency Prevention and Response Plan (EPRP) will be developed according to Angolan requirements 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.

- Based on consultations with relevant stakeholders, NHID will investigate the capacity of statutory local emergency response providers to participate in emergency response activities.

- Personnel will be trained on how to respond to unplanned events.

- Periodic audits will be performed in order to ensure the safeguards are in place.

- 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 publicised locally in advance.

- In addition, the risk of the transmission line spanning or pylon collapse can be mitigated through complying with design specifications, installing anti-theft devices, conducting material quality inspection and compliance and following NHID's installation procedures.

- NHID will development and implementof a Demining Plan. This Plan will be communicated to the communities in the direct AoI of the project. Demining will occur along a 60m cooridor arong the transmission line route (as well as for any additional footprint of access roads and construction camps.

Residual Impact

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 risk due to transmission line snapping/collapse). Demining the transmission line corridor and project footprint will result in a positive residual impact as well (as this removes this associated risk for any future developments on the land).

Table 9.63 Residual Impact Significance

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Risk during stringing activities	Construction	Moderate	Minor
Unplanned spillages	Construction and Operation	Moderate	Minor
Exposure to UXOs	Construction	Major	Positive
Fire and/or explosion due to dielectric oil release	Operation	Moderate	Minor
Risk due to transmission line snapping and transmission tower/pylon collapse	Operation	Major	Minor

9.6 CUMULATIVE IMPACTS

9.6.1 Introduction

Purpose

The aim of the Cumulative Impact Assessment (CIA) is to determine whether activities are likely to significantly affect the viability or sustainability of the existing environmental and social receptors and resources. These are referred as Valued Environmental and Social Components (VECs).

Definition

Cumulative impacts are defined as impacts that (1):

> *"result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted."*

Cumulative impacts are generally considered to be Project impacts that act with impacts from other projects such that:

- Sum of the impacts is greater than the parts; or
- Sum of the impacts reaches a threshold level such that the impact becomes significant.

The types of cumulative impacts that may be relevance include:

- **Accumulative**: the overall effect of different types of impacts at the same location. An example would be fugitive dust emissions, construction noise

(1) IFC Performance Standard 1

and construction traffic all impacting the three local communities as a nuisance/ disturbance.

- **Interactive**: where two different types of impacts react with each other to create a new impact (e.g. water abstraction from a watercourse might exacerbate the impacts caused by increased sediment loading).

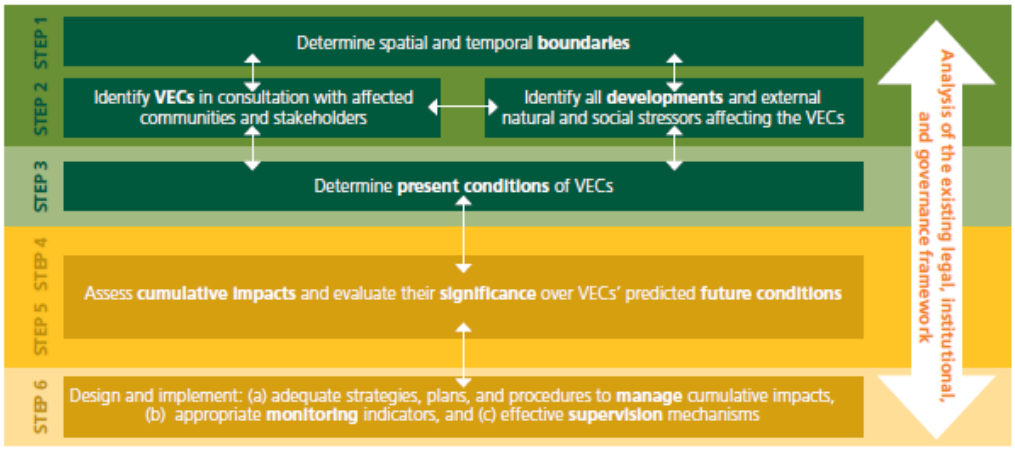
- **Additive or In-combination**: where impacts from the primary activity (i.e. the construction and operation of the Project) are added to impacts from third party activities e.g. other major projects in the vicinity of the Project which are already occurring, planned or may happen in the foreseeable future.

9.6.2 Approach

This assessment follows the approach outlined by the IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets. The overall approach is summarized in *Figure 9.3.*

This assessment has focussed on potential cumulative effects on VECs adversely impacted by significant Project impacts only (i.e. Minor, Moderate or Major) as part of the preceding assessment. Other VECs have been scoped out from this assessment on the grounds that the Project will not significantly contribute to any cumulative effects.

Figure 9.3 Approach to Cumulative Impact Assessment



Source: IFC document Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, 2013

Because all of Project predicted residual adverse impacts are of **Minor** or **Negligible** significance, only a high-level CIA has been carried out, on the basis that the potential significant cumulative effects is low.

9.6.3 Application of CIA Methodology

Step 1: Determine Spatial and Temporal Boundaries

The spatial extent of any cumulative impacts will be confined to within the AoI of the Project, direct and indirect (See *Chapter 2.6*).

As the temporal scope of any cumulative impacts will be the same temporal scope as the Project. As the most significant impacts from the Project will occur during the construction phase, this will also be the period when the potential for significant cumulative impacts is highest.

Step 2a: Identify VECs in Consultation with Affected Communities and Stakeholders

Per the IFC's Good Practice Handbook on Cumulative Impact Assessment and Management, the focus of the CIA should be on VECs and not traditional receptors. The Handbook states, "*Because it is unrealistic to think that every environmental and social aspect that can be subject to cumulative impacts can be appropriately factored into a CIA, it is good practice to focus the assessment and management strategies on Valued Environmental and Social Components (VECs)*'. VECs are defined as follows per the Handbook.

'*VECs are environmental and social attributes that are considered to be important in assessing risks; they may be:*

- *physical features, habitats, wildlife populations (e.g., biodiversity),*
- *ecosystem services,*
- *natural processes (e.g., water and nutrient cycles, microclimate),*
- *social conditions (e.g., health, economics), or*
- *cultural aspects (e.g., traditional spiritual ceremonies). '*

Using this definition, the receptors and resources affected by significant adverse impacts from the Project were assessed to determine if they are considered to be a VEC. *Table 9.64* sets out this evaluation.

Table 9.64 Potential VECs

Environmental / Social Variable	Project Activities/Impacts	Project Residual Impact	Receptor/ Resource	VEC?
Construction				
Soils	Loss of soil resources due to erosion	Negligible to Minor	Soil in the immediate RoW	No Per *Chapter 9.2.1*, the soils in the region are not particularly sensitive, and given the localised potential area of cumulative effects, this is not consider an important attribute in assessing risk.
Water Resources	Availability and Quality of Water Resources	Negligible to Minor	Surface water bodies crossed (See *Figure 7.13*)	**Yes – Fresh water resources are considered to be a provisioning ecosystem service**
Flora and Vegetation	Disturbance to vegetation and habitat loss and fragmentation as a result of the ROW or degradation to environment and habitat	Minor	Flora/ habitat in RoW	**Yes – Habitat only**
Land and Livelihoods	Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land	Minor	Identified affected households	**Yes – social conditions (economic)**
	Physical displacement of Project-Affected People during construction	Minor	Identified affected households	**Yes – social conditions (economic)**
Community Health and Safety	Community Safety (Road Accidents, Site Trespass, Demining)	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
	Environmental Health (Noise and Air)	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
	Interaction with Project Workforce	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
Access to Infrastructure and Services	Disruption to traffic and transportation	Minor	Residents in the immediate vicinity of the RoW	No. This does not meet the definition of any of the four categories of a VEC

Environmental / Social Variable	Project Activities/Impacts	Project Residual Impact	Receptor/ Resource	VEC?
Unplanned Events - Unplanned Spillages	Reduction in local soil quality	Minor	Soil in the immediate RoW	No Per *Chapter 9.2.1*, the soils in the region are not particularly sensitive, and given the localised potential area of cumulative effects, this is not consider an important attribute in assessing risk.
	Reduction in surface water	Minor	Surface water bodies crossed (See *Figure 7.13*)	**Yes – Fresh water resources are considered to be a provisioning ecosystem service**
Unplanned Events - Community Health and Safety	Risk during stringing activities	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
	Effects from unplanned spillages	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
Operations				
Fauna	Increase in bird mortality due to bird strikes during operation	Minor	Birds in AoI	**Yes – wildlife populations**
Visual Amenity	Deterioration of visual amenity	Minor	Residents in the immediate vicinity of the RoW	No. This does not meet the definition of any of the four categories of a VEC
Land and Livelihoods	Permanent loss of livelihoods and household income due to permanent land take and restrictions.	Minor	Identified affected households	**Yes – social conditions (economic)**
Community Health and Safety	EMF Health effects	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
Worker's Health and Safety and Workers' Rights	Effects on worker health and safety and labour rights	Minor	Maintenance workers	Yes* – social conditions (health) *No potential for cumulative effects as workforce will only be used for Project

Environmental / Social Variable	Project Activities/Impacts	Project Residual Impact	Receptor/ Resource	VEC?
Unplanned Events - Unplanned Spillages	Reduction in local soil quality	Minor	Soil in the immediate RoW	No Per *Chapter 9.2.1*, the soils in the region are not particularly sensitive, and given the localised potential area of cumulative effects, this is not consider an important attribute in assessing risk.
	Reduction in surface water	Minor	Surface water bodies crossed (See *Figure 7.13*)	**Yes – Fresh water resources are considered to be a provisioning ecosystem service**
Unplanned Events - Community Health and Safety	Effects from unplanned spillages	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
	Effects from fire and/or explosion due to dielectric oil release	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**
	Effects from transmission line snapping and transmission tower/pylon collapse	Minor	Residents in the immediate vicinity of the RoW	**Yes – social conditions (health)**

Following this review, the CIA will focus of the following VECs:

- Habitat in the RoW;
- Bird populations;
- Freshwater resources crossed by the transmission line (construction and operations);
- Social conditions (economic) for the identified households (construction and operations); and
- Social conditions (health) for residents in the immediate vicinity of the RoW (construction and operations).

Step 2b: Identify all Developments and External Natural and Social Stressors Affecting the VECs

Habitats within the RoW

The Project's significant habitat impacts are confined to the transmission line RoW, and there are no other developments that can be constructed within this area.

Existing stressors to the habitats crossed have been captured as part of the flora and vegetation baseline conditions (*Chapter 9.3.1*) and therefore have inherently been assessed as part of the Project impact assessment.

Bird Populations

Bird populations are not confined to fixed geographic extents, so identifying specific planned developments that may affect these populations is not feasible. Focusing on the specific issue of bird strike; however, the other existing and planned transmission lines within the AoI can be identified (See *Table 9.65*).

Table 9.65 Transmission Line Developments within the Project AoI

Route	kV	Length (Km)	Status	Operator / Contractor
01 Laúca - Capanda	400	39.86	Under construction – expected conclusion: 2018	RNT
02 Laúca - Cambutas	400	75.220	Under construction – expected conclusion: 2018	RNT
03 Laúca - Catete	400	190.41	Under construction – expected conclusion: 2019	RNT/Odebrecht
04 Cambutas - Bita	400	169.42	*	RNT
05 Catete - Bita	400	57.83	Expected conclusion: 2020	RNT/Odebrecht
06 Capanda – Malange	220	125	*	RNT
07 Bita – Zango	220	27	*	RNT
08 Cacuso – Calandula	110	50	*	RNT
09 Bita - Camama	220	21	*	RNT
10 Lauca - Bita	400	238	Expected conclusion: 2020	RNT /NHID
11 Lauca / split Cambutas- Capanda	220	7,5	Expected conclusion: 2020	RNT /NHID
12 Lucala - Viana	400	222.62	Operational*	RNT
13 Cambutas - Catete	400	123.93	Operational since 2017	RNT/Elecnor

Route	kV	Length (Km)	Status	Operator / Contractor
14 Cambutas - Capanda	220	71.29	Operational since 2005	RNT

Note: * Insufficient data.

Existing stressors to the bird populations have been captured as part of the baseline conditions (*Chapter 9.3.2*) and therefore have inherently been assessed as part of the Project impact assessment.

Freshwater Resources

As presented in *Table 7.5*, existing sources of potential surface water contamination were identified from a combination of field observations and the interpretation of publicly available high resolution satellite imagery for the AoI. Those water bodies crossed by the transmission line route that had visible sources that could contribute to reduced water quality are summarized in *Table 9.66*.

Table 9.66 Surface Water Bodies along the Transmission Line Route with Identified Potential Cumulative Sources for Contamination

ID	Region	Water body type (interpreted)	Potential Pollution
WB033 –Drainage line	Flood Plain	Drainage line	Open pit mine
WB042 - Drainage line	Flood Plain	Drainage line	Up-gradient mining areas
WB043 - Drainage line	Flood Plain	Drainage line	Up-gradient mining areas
WB044 - Drainage line	Flood Plain	Drainage line	Small up-gradient town
WB052 – River	Flood Plain	Minor river	Surrounding development
WB053 – River	Flood Plain	Minor river	Upgradient development
WB056 - Drainage line	Flat/Coastal	Drainage line	Upgradient development
WB057 - Drainage line	Flat/Coastal	Drainage line	Upgradient Township
WB058 - Drainage line	Flat/Coastal	Drainage line	Upgradient development
WB059 - Drainage line	Flat/Coastal	Drainage line	Upgradient Township
WB060 - Drainage line	Flat/Coastal	Drainage line	Upgradient Township
WB061- Drainage line	Flat/Coastal	Drainage line	Upgradient development
WB062 - River	Flat/Coastal	Drainage line	Upgradient Township
WB063 - River	Flat/Coastal	Drainage line	Upgradient Township

Social Conditions (Economic) for the Identified Households

No other planned projects have been identified that would have the potential to affect the livelihoods of the households identified for physical resettlement and/or economic resettlement. Existing stressors have been captured as part of the social baseline conditions and therefore have inherently been assessed as part of the Project impact assessment.

Social Conditions (Health) for Residents in the Immediate Vicinity of the RoW

No other planned projects have been identified that would have the potential to affect the livelihoods of the households identified for physical resettlement and/or economic resettlement. Existing stressors have been captured as part of the social baseline conditions and therefore have inherently been assessed as part of the Project impact assessment.

Step 3: Determine Present Conditions of the VECs

As part of the ESIA the baseline conditions of resources and receptors that have the potential to be affected by cumulative impacts was established. This included the collection of primary and secondary data to determine the existing conditions and the vulnerability/ sensitivity of the receptor.

Steps 4-6: Assess and Manage Predicted Cumulative Impacts

The aim of these steps in the assessment process is to describe the impact on resources and receptors and determine the potential significance of a cumulative impact taking into account the magnitude of the potential change and the sensitivity/ vulnerability of the receptor to such changes in the context of past, present, and future actions, identify trade-offs.

There are a number of limitations in the assessment of cumulative impacts including:

- uncertainty associated with other anticipated developments; and
- absence of strategic regional, sectoral, or integrated resource planning schemes.

Then, for any identified significant cumulative impacts, additional mitigation is set out.

Habitats within the RoW

Based on the fact that the most part of the project will be developed within an existing transmission line corridor, the construction of the Project in combination with other construction activities will not contribute to a substantial change in land use currently in place. The areas along the transmission line RoW do not hold any significant conservational value, the potential cumulative effects could result in a loss of biodiversity (e.g. ecological corridors) or green space within Luanda metropolitan area. Therefore removal of the modified habitat (and disperse fragments of natural habitat) along the RoW will result in a transformation of the existing land use.

As such, no additional measures are proposed.

Bird Populations

There is a potential for cumulative effects on bird populations from bird strike and other factors that may reduce bird populations in the area. However, the Project is already planning to implement rigorous measures to reduce the risk of bird strike, including on-going monitoring. These measures include:

- Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energised parts of transmission infrastructure;

- Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energised wires;

- In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision; and

- Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary.

As such, the Project's contributions to any such cumulative effects are already being minimised as much as feasible.

On this basis, no additional measures are proposed.

Freshwater Resources

The primary mechanism for the Project to contribute to any contamination of freshwater resources will be through unplanned spills. To mitigate this risk, the following measures will be implemented:

- The Project will develop a detailed Oil Spill Response Plan (OSRP) which includes community notifications of any significant spills that have the potential to affect communities. 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).

- Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, treated by incineration or

removed by an authorised local contractor. Drip trays must be used when refuelling and servicing vehicles or equipment, where it is not on a hardstanding surface.

- 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.

- Hydrocarbon spill cleanup 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.

As the above measures already include provision for water monitoring and remediation of any spills, any cumulative effects from other developments would be inherently managed through the Project's commitment to remediate to acceptable water quality levels (i.e. compliance with national and World Bank EHS Guidelines).

On this basis, no additional measures are proposed.

Social Conditions (Health) for Residents in the Immediate Vicinity of the RoW

As presented earlier, no other developments have been identified that will contribute to cumulative effects on the health of the residents in the immediate vicinity of the RoW.

As such, no additional measures are proposed to manage cumulative effects.

Social Conditions (Health) for Residents in the Immediate Vicinity of the RoW

As presented earlier, no other developments have been identified that will contribute to cumulative effects on the livelihoods of the households that will be physical and/or economical resettled as a result of the Project. However, as the formal resettlement process includes rigorous on-going monitoring of these affected individuals/households, any significant cumulative effects on livelihood would be captured and managed through the established procedures included in the Resettlement and Compensation Action Plan (RCAP), Resettlement Action Plans (RAPs) and Livelihood Restoration Plans (LRPs).

As such, no additional measures are proposed to manage cumulative effects.

10 MANAGEMENT AND MONITORING

10.1 INTRODUCTION

This *Chapter* presents the Environmental and Social Management Plan (ESMP) for the construction and operation of the Project, with the purpose to specify the framework, standards, and controls required to manage and monitor the environmental and social impacts. To achieve this the ESMP compiles the potential adverse impacts from the planned activities as identified in the ESIA and outlines mitigation measures required to reduce the likely negative impacts on the biophysical and social environment.

10.1.1 Overview and Scope

The ESMP is intended to cover the Project activities described in *Chapter 2* of this ESIA report. It covers project activities during construction and operation, and will be subject to thorough reviews prior to the commencement of activities to ensure completeness.

The ESMP details roles and responsibilities that will be assumed by each Agent as leader and/or supporter. NHID has already acknowledged its commitments in this regards and ERM understands that initial discussions with between NHID and GAMEK/RNT have indicated that they also understand their responsibilities in this regard given their prior involvement with international funded projects, although further meeting will be held over the coming weeks to finalise this on the basis of the final ESMP (refer to *Annex I* for a detailed roles and responsabilities flowchart).

NHID will have responsibility for the implementation of some of the measures outlined in the ESMP during construction, but may delegate responsibility to its contractors, where appropriate. In cases where other individuals or organisations have responsibility for mitigation measures, this is clearly indicated within the ESMP table (*Section 10.3*).

Capacity building and training requirements are also described within this *Chapter*, where these relate to specific skills required to deliver the ESMP action in question. General training, which will be provided to staff (and contractors' staff as appropriate), is not specifically indicated in the plan.

10.1.2 Objectives

The ESMP is essential for successfully implementing the Project's environmental and social performance throughout the life of the Project. Having this framework in place ensures a systematic approach to bringing environmental and social considerations into decision-making and day-to-day

operations. It establishes a framework for tracking, evaluating and communicating environmental and social performance and helps ensure that environmental risks and liabilities are identified, minimised and managed.

It is, however, important to approach the ESMP as a living document, which will continue to develop during the construction phase to enable continuous improvement of the Project's social and environmental performance.

The core objectives of this ESMP are as follows:

- Ensuring compliance with regulatory authority stipulations and guidelines, which include local, national and international;
- Ensuring that there is sufficient allocation of resources on the Project budget so that the scale of the ESMP related activities is consistent with the significance of Project impacts;
- Verifying environmental and social performance through information on impacts as they occur;
- Periodically updating the ESMP as the Project activities progress;
- Responding to unforeseen events; and
- Providing feedback for continual improvement in environmental performance.

10.1.3 Principles

The ESMP was developed attending three major groups of general principles: Principles of Sustainable Development, Principles of Ethics and Quality and Principles of Best Practice.

Principles of Sustainable Development

- Protection of public health, welfare and safety – activities on site should be contained and will not impact on human health and well-being. The benefits of the port activities should be realised by the communities during all phases.
- Maintenance of ecological processes – natural resources should be conserved or improved and not decreased in value. The resources are managed in such a way that will provide for present and future needs.
- Avoidance, mitigation and management of pollution - existing or possible future contamination of surface, ground water and soil and air pollution is avoided where possible and mitigated and managed within the standards

set. Waste generated will be eliminated, reduced or minimised, reused or recycled and the residual finally disposed of, if no other option is available.
- Precautionary Principle – in the absence of scientific data confirming a complete evaluation if the risk a cautious approach will be adopted to protect human, animal or plant health, or to protect the environment.

Principles of Ethics and Quality

- Consistency with legal and planning context – through all phases of the development of the Project, activities will comply with local, national and international legal and regulatory requirements.

- ESMP implementation and proactive management – the ESMP is implemented at the start of the activities and aims at continual improvement during all phases of the development.

- Clear and easily understood reporting – the ESMP should be easily understood, clearly laid out, an accepted documentation style should be used and all tables, figures and illustrations should be appropriate and necessary.

- Cost effectiveness – ensure that there is a balance between the financial constraints of achieving a maximum return on investment and the reduction of present and future risks and liabilities.

Principles of Best Practice

- Continuous improvement – the Project Proponent should be committed to review and continually improve environmental management, with the objective of improving overall environmental and social performance.

- Broad level of commitment – commitment is sought from all levels of management as well as the workforce in order for the development and implementation of the ESMP to be successful and effective.

- Participative process – consultation will and has been undertaken with all Project Affected Persons (PAPs) to seek their input into the environmental and social management of the Project.

10.1.4 General Requirements

This ESMP has been developed in line with applicable legal and policy requirements. These included the Angolan requirements in terms of the Environmental Assessment Regulations and the requirements of the IFC Performance Standards. The ESMP aligns to:

- Decree N. º 59/07 (13/07/2007) – Environmental Licensing;
- IFC Performance Standard 01; and

- World Bank Group General EHS Guidelines (2007).

Where specific additional standards and guidelines are used, these are noted in the ESMP table contained within *Section 10.3.*

10.1.5 Structure of the ESMP

The structure of this ESMP is set out according to the Plan, Do, Check, Act (PDCA) ESMP process. The PDCA is a well-known management tool which allows for a methodical and ongoing approach to managing environmental and social risks. Each of the primary sections in this *Chapter* relate to key components of the process.

Plan, Do, Check, Act is part of international frameworks for quality and environmental management systems including ISO 14 001. This process is described in *Box 10.1.*

Box 10.1 ESMP Process

Plan
- Define policies and objectives for environmental and social performance;
- Identify environmental and social impacts and risks of the operations;
- Develop mitigations and operational controls to address impacts and risks; and
- Develop a management plan to achieve these objectives.

Do
- Implement management plan; and
- Implement mitigations and operational controls.

Check
- Monitor performance against policies and objectives; and
- Check that mitigations and operational controls are effective.

Act
- Make corrections to plans, mitigations, or controls in response to performance monitoring or out of control events.

It is important to mention that Dominion (part of the NHID Consortium) manages its environmental, social, health and safety aspects in accordance with its ISO 14001:2015 certified Environmental Management Systems (EMS) and its BS OHSAS 18001: 2007 certified Occupational Health and Safety Management System (OHSM)[1].

NHID will incorporate these certifications and are already incorporating same of the elements. The values of the management systems are enshrined in NHID's SHEQ Policy, Corporate Social Responsibility Policy and Code of Conduct included in *Annex E.*

[1] Available online: http://www.dominion-global.com/es/web/guest/calidad-y-medio-ambiente

10.2 PLANNING

10.2.1 Impact Assessment

The Project has utilised the impact assessment through the ESIA process as a tool within the planning process to identify key impacts of the Project and associated mitigation and management measures (refer to *Chapters 5* and *9*) for the construction and operation phases.

The Project will continue to use the impact assessment process as a planning tool for any future development activities. The mitigation hierarchy applied in this ESIA will also be applied.

10.2.2 Environmental and Social Commitments

Through the Project development and ESIA process, mitigation measures have been identified to address environmental and social impacts associated with Project activities. The Project has made a commitment to implement these to ensure or improve environmental and social performance.

The commitments take a number of forms as summarised in *Box 10.2*, with the specific actions intended to address a particular environmental or social issue. The commitments are detailed in tabular form in *Section 10.3* of this *Chapter*.

Box 10.2 Type of Commitments

Avoidance
During the planning phases, potential impacts to sensitive resources are identified. Where feasible, locations or processes can be changed during the planning or design phases to avoid impact to these areas.

Minimisation
Minimisation involves measures to reduce proposed impacts to a resource.

Management
Management commitments include development of plans and procedures for ensuring that measures to protect the environment actually take place and are of the desired standard of practice. Training is another commitment in this category.

Monitoring
Commitments to monitoring are primarily to ensure the above measures are working properly and delivering the desired (and anticipated) results.

Additionally
Additionally involves actions and contributions which are designed to provide a positive benefit. Examples include assisting with additional domestic water supply to surrounding towns.

10.2.3 Management Plans

The ESMP has identified some additional plans that will be prepared by NHID HSE Manager prior to construction commencing on all transmission lines:

- Traffic & Transportation Management Plan;
- Spill Contingency Plan;
- Construction Management Plan;
- Waste Management Plan;
- Chemicals Management Plan;
- Emergency Preparedness and Response Plan;
- Chance Find Procedure;
- Stakeholder Engagement Plan (SEP);
- Employment and Workforce Management Plan;
- Community Health and Safety and Security Plan;
- Occupational Health and Safety Plan;
- Resettlement and Livelihood Restoration Plans (LRPs); and
- Local Content and Procurement Plan.

The specific management plans are listed in *Table 10.1* along with links to how these relate to the activities and impacts described within the ESIA as well as the identified responsible party for each.

Table 10.1 Management Plans

Plan Name	Includes	Plan Owner
Specific Management Plans		
Traffic & Transportation Management Plan	Controls over prescribed routes, driver training, vehicle maintenance, speed restrictions, appropriate road safety signage, and vehicle loading and maintenance measures and vetting procedures. Will also include specification for community awareness and safety programmes.	Project Manager
Spill Contingency Plan	Spill preventative measures and spill response procedures.	Project Manager
Construction Management Plan	Plan for the management of the establishment process, including logistics and site management	Project Manager
Waste Management Plan	Project-related waste handling procedures for hazardous and non-hazardous wastes.	HSE Manager
Chemicals Management Plan	Plan for the management of the chemical substances used during Project lifetime.	HSE Manager

Plan Name	Includes	Plan Owner
Emergency Preparedness and Response Plan	Administration (policy, purpose, distribution, definitions, etc.), organisation of emergency areas (command centres, medical stations, etc.), roles and responsibilities, communication systems, emergency response procedures, emergency resources, training and updating, checklists (role and action list and equipment checklist) and business continuity and contingency. The Plan will also include specifications for emergency communications as well as on-going public and community communication and disclosure.	Project Manager
Change Find Procedure	Procedural guideline to be followed in the event that previously unknown heritage resources or and burial grounds and graves are exposed or found during the life of the project.	HSE Manager
Stakeholder Engagement Plan (SEP)	SEP will build on engagement undertaken to date and specify interactions with community and other stakeholders, as well as finalising the grievance procedure to be used throughout the Project. Community and Employee awareness training and code of conduct procedures.	HSE Manager
Employment and Workforce Management Plan	Plan for local training and procurement for operations. Also specifies requirements for contractors during construction. The Plan will include policies and procedures for hiring of local labour, unskilled, semi-skilled and skilled labour.	Human Resources (HR) Manager
Community Health and Safety and Security Plan	The purpose of the CHSSP is to provide a clear set of actions and responsibilities for the control of impacts affecting the health and safety of the communities within the Project's area of influence. The plan includes measures to respond to exposure to diseases due to worker interaction, environmental change and safety (traffic, unplanned events, etc.)	HSE Manager
Occupational Health and Safety Plan	Procedures on chemical hazards, fire and explosions, confined spaces and on site-traffic hazards. Communication and training programmes. Safety analysis and industrial hygiene surveys procedures. Monitoring, record-keeping and audit procedures.	Project Manager
Resettlement and Livelihood Restoration Plans (LRPs)	This plan defines the procedures and the actions that will be taken to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by the Project.	HSE Manager
Local Content and Procurement Plan	Plan that defines the procedures to be established by the Project to create jobs, promote enterprise development and accelerate the transfer of skills and technologies.	HSE Manager

Together with this ESMP, these specific plans will form the overall Environmental and Social Management System (ESMS) for the Project.

10.2.4 Contractor Environmental and Social Management Plan(s)

As stated in *Section* 2, NHID will delegate some responsibility to construction contractors. During this phase NHID will manage its contractors to ensure that this ESMP is implemented and monitored effectively through contractual mechanisms regular direct oversight.

As a contractual requirement, the contractors will be required to demonstrate compliance of their activities against the ESMP. This includes providing resources to ensure compliance of next tier contractors and a process for emergency stop-work orders in response to monitoring triggers. Contractors will be responsible for performing all work:

- In compliance with relevant national and international EHS legislation and regulations, and with other requirements to which the Project subscribes;
- In conformance with the Project ESMP, and related management plans for specific aspects; and
- In accordance with contractual technical and quality specifications.

The Project's ESMP and related documentation will be the main contractual documentation to which the contractor(s) will be bound. Contractors will be required to develop their own management plans which show how they will comply with these environmental and social requirements.

In this way, the ESMP will be implemented and controlled using both NHID and the contractor management systems. The contractor management systems will therefore:

- Provide the framework that regulates their activities;
- Define responsibilities and reporting relationships for expediting, mitigation and monitoring actions detailed in the ESMP; and
- Specify the mechanisms for inspecting and auditing to ensure that the agreed actions are implemented.

Contractors will be required to self-monitor against their plan and compliance with the plan will be routinely monitored by NHID directly or by third-parties. Contractors will be required to submit regular reports of monitoring activities and the Project will review these on a regular basis.

Contractors will be reviewed and approved by NHID. An external audit and assurance process will be conducted of the contractors' and tenants' EHS documentation on an annual basis, the results of which will be disclosed at completion of the process.

10.3 IMPLEMENTATION

GAMEK (during construction) and RNT (for operation) are ultimately responsibles for the management and supervision of all Project activities and will have principal responsibility for implementing this ESMP and the mitigation measures.

NHID is committed to providing resources and establishing the systems and components essential to the implementation and control of the ESMP. These include appropriate human resources and specialised skills, training programmes, communication procedures, documentation control and a procedure for the management of change.

NHID will support the process and have an HSE department with competent staff on the basis of appropriate education, training and experience.

10.3.1 Roles and Responsibilities

The effective implementation of the ESMP (in alignment with the Stakeholder Engagement Plan and Resettlement and Compensation Action Plan implementation) is dependent on established and clear roles, responsibilities and reporting lines within GAMEK/RNT and NHID institutional framework. The organisational structure for environmental and social management for the Project is defined below and systematized in *Annex J.* The structure will be maintained throughout the construction and operation phases, whilst being reviewed on a regular basis to adapt the structure as necessary.

As per the discussions held so far with GAMEK, the following roles and responsibilities were already commonly agreed:

- Rafael Neto: GAMEK Social and Environmental Manager;
- Sonia Petrova: GAMEK Land Acquisition and Compensation Manager;
- NHID will contract:
    - Environmental and Social Manager
    - Environmental and Social/Project Community Liasion Managers (3)
    - Other personnel as necessary (e.g. Data Manager).

Specific roles and responsibilities regarding the RCAP implementation were also agreed (refer to the RCAP for detailed information).

Discussions between NHID with RNT are also ongoing and a detailed alignment will be formally shared prior to construction comencement.

The key roles and responsibilities are outlined below.

NHID Project Manager (PM)

The Project Manager is the senior representative for the Site and, as such, is the ultimate authority on all matters including environmental and social management. The objective is to actively work towards the elimination of Company and Sub-contractor environmental damage. The PM is responsible for providing the human and financial resources necessary for ensuring compliance to the ESMP and requirements from the Environmental Construction License.

The PM must be fully conversant with the conditions of the environmental license and ensure that all stipulations within the ESMP are communicated and adhered to by the construction team (and any subcontractors).

NHID Site Manager (SM)

The Site Manager shall be responsible for the day-to-day operations of the Contract and may deputise for the Project Manager if required.

The SM's responsibilities include:

- To ensure that all Supervisors and employees are familiar with the contents of the ESMP.
- Advise or instruct any person on site in matters related to Environmental Management.
- To attend Environmental Committee Meetings when required.
- To ensure that all Statutory Acts, Regulations and Codes of Practice are adhered to.
- To ensure that all aspects of the ESMP are carried out to the standards and performance expectation the Client and Company requires.
- Report to the Client and Project Manager on all accidents and incidents and corrective and preventative measures.
- Report to the Project Manager and Client any public grievances (the responsibility for the grievance mechanism will be outlined in detail in the RPF) or concerns raised by the local communities with respect to the project.

The SM reports directly to the NHID PM, oversees site work and liaises with the construction team.

NHID Health, Safety and Environment (HSE) Manager

The HSE Manager is appointed by NHID and will be responsible for day to day environmental and social management.

The HSE Manager is responsible for implementing the monitoring programmes and maintaining the monitoring databases as well as the reporting of the results. The HSE Manager as a minimum will have a degree or diploma in environmental management, nature conservation or related discipline; have knowledge of the relevant legislation and at least two years previous experience in environmental control, environmental management or environmental monitoring and previous experience in land acquisition, compensation and resettlement processes. Key responsibilities include:

- Maintenance of the ESMS, and ESMS training.
- Reporting on environmental statistics (including to international standards as needed).
- Undertake internal environmental compliance audits.
- Coordinate external compliance audits.
- Draft and implement action plans following audits.
- Draft the regular environmental and social progress report required by the Ministry of Environment.
- Obtains all company EHS permits and approvals.
- Ensures that all documentation and records required comply with procedures that are current, available and auditable, and are properly executed in accordance with project quality assurance requirements.
- Reviews and recommends approval status of subcontractors EHS documents that are intended to be incorporated on the project.
- Keeps abreast of applicable national and international requirements as per the projects tracking process.
- Develop environmental training and awareness programmes.
- Work with managers to ensure appropriate actions/management programs are built into the annual action/business plans to achieve community related objectives and targets, and review (and as necessary revise) these actions/management programs annually to ensure progress toward meeting the objectives and targets.

- Determine whether new or modification of current internal documents based on significant aspects and impacts, job experiences, corrective action reports, audit findings, legal requirements, new or modified operations, and/or any other activities is required, and assign personnel to do this where necessary.

- Prepare a document that provides a list of which roles hold responsibility for controlling different types of records related to community issues.

- Maintain an ESMP Document Register and a Record Register.

- Review community-related documents and records annually to determine whether they can be destroyed or whether they should be retained.

- Oversees the land acquisition, compensation and resettlement process, providing advice and resolving high level issues or concerns.

- Handover the environmental and social management to RNT.

Community Liaison Team (CLT) Manager

The Community Liaison Team Manager reports to the NHID Site Manager and his responsibilities include:

- Plan the stakeholder engagement activities and ensure they are appropriately implemented by the the three Environmental and Social/ Project Community Liaison Managers deployed along the TL route.

- Manage the grievance mechanism and grievance resolution process.

- Report to HSES manager and NHID management on the stakeholder engagement activities.

Environmental and Social/ Project Community Liasion Managers

The Environmental and Social/ Project Community Liasion Managers will report to the HSES Manager [1] and their responsibilities include:

- Lead SEP activities and coordinate the results and actions to be taken with the HSES team in each of the areas along the TL route.

[1] The Environmental and Social/ Project Community Liasion Managers will have responsibility for management of environment and social management, managemen of community liaison activities and support the resettlement and compensation process. In this regard in addition to reporting to the HSES Manager thet will also report to the Community Liaision Team Manager and the Land Acquisition and Compensation Manager.

- Lead day-to-day implementation of the SEP and Community Grievance Mechanism, including proactively maintaining regular contact with affected communities through regular community visits to monitor opinions and provide updates on Project activities, and ensuring communication with vulnerable groups (including specific efforts to ensure participation of illiterate individuals, indviduals with hearing or vision disabilities, individuals with limited mobilitiy and the elderly).

- Produce stakeholder engagement monitoring reports and submit to Community Liaison Team Manager.

- Supervise/monitor and coordinate activities with subcontractors to ensure they comply with the SEP.

Land Acquisition and Compensation (LAC) Manager

The LAC Manager will be directly responsible for developing the land acquisition and compensation process and for ensuring all elements of are implemented in accordance with Angolan requirements and international best practice. The LAC Manager will work between field based oversight activities and activities in Luanda. The LAC Manager will:

- supervise the Implementation Team, including consultant and contract personnel;
- supervise and work closely with the field teams and LAC Field Teams Coordinators;
- oversee all land acquisition and compensation activities, including scheduling, resourcing and budget;
- actively review grievances;
- ensure robust monitoring reporting and identify corrective action; and
- promote the participation of all stakeholders and information sharing; and
- ensure the maintenance of robust monitoring information and timely development of fit for purpose reports to ensure timely information sharing between the RCGs and RRC.

Employees

- Read and understands the requirements contained in this ESMP as well as the SEP, providing assistance if needed to ensure compliance with both plans.

- Attend EHS training as required.

- Responsible for observing measures for their own safety and for others who may be affected by their acts or omissions.

- Co-operate with NHID management on health and safety related measures.

- Adhere to safety rules at all times and applicable legislation.

- Specific responsibilities as defined by the ESMP.
- Seek out hazards and reports them for correction.
- Intervene when they come across unsafe work / conditions and shall use right/obligation to stop work, unless act/condition is safe.
- Adhere to EHS rules at all times.
- Perform assigned tasks towards meeting ESMP and SEP objectives, communicating concerns, questions or views to their supervisor or the Environmental and Social/ Project Community Liasion Managers compliance or implementation of the SEP.
- Provide data related to SEP performance/monitoring as required.

10.3.2 Training and Awareness

NHID will identify, plan, monitor, and record training needs for personnel whose work may have a significant adverse impact upon the environment or social conditions. NHID recognises that it is important that employees at each relevant function and level are aware of the Project's environmental and social policy; potential impacts of their activities; and roles and responsibilities in achieving conformance with the policy and procedures. Training and awareness-raising therefore forms a key element of both EHS and the expediting of this ESMP.

Key staff will, therefore, be appropriately trained in key areas of EHS management and operational control with core skills and competencies being validated on an on-going basis. The identification of training and awareness requirements and expediting of the identified training/awareness events will be the responsibility of the HSE Manager.

Training and awareness are not a requisite soley of NHID personnel (and subcontractors). It would be important to include an assessment of the need for training and capacity building of GAMEK staff (before and during the construction phase) and RNT staff at the conclusion of the construction phase and handover of the ESMP, SEP and grievance mechanism from NHID/GAMEK and RNT.

This will be achieved through a formal training process. Employee training will include awareness and competency with respect to:

- environmental and social impacts that could potentially arise from their activities (including, biodiversity and noise);
- legal requirements in relation to environmental and social performance;

- necessity of conforming to the requirements of the ESIA and ESMP, in order to avoid or reduce those impacts;

- activity-specific training on waste management practices, documentation systems and community interactions; and

- roles and responsibilities to achieve that conformity, including those in respect of change management and emergency response.

The HSE Manager is responsible for coordinating training, maintaining employee-training records, ensuring that these are monitored and reviewed on a regular basis, as well as handovering of the ESMS action plans, SEP and Grievance Mechanism to RNT at the end of construction, and capacity building in their use. The HSE Manager will also periodically verify that staff are performing competently through discussion and observation.

Employees responsible for performing site inspections will receive training by drawing on external resources as necessary. Training will be coordinated by the HSE Manager prior to commissioning of the facilities. Upon completion of training and once deemed competent by management, staff will be ready to train other people.

Similarly, the Project will require that each of the contractors institute training programmes for its personnel. Each contractor is responsible for site EHS awareness training for personnel working on the job sites. The contractors are also responsible for identification of any additional training requirements to maintain required competency levels.

The contractor training program will be subject to approval by NHID and it will be audited to ensure that:

- training programs are adequate;
- all personnel requiring training have been trained; and
- competency is being verified.

10.3.3 Communication

NHID will maintain a formal procedure for communications with the regulatory authorities and communities. The HSE Manager is responsible for communication of EHS issues to and from regulatory authorities whenever required. The NHID HSE Manager is kept informed of such communications and pertinent information arising from such interactions will be communicated to contractors through the HSE Manager.

Meetings will be held, as required, between NHID 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.
The grievance mechanisms currently in use and example log sheets are provided as an Annex to the Stakeholder Engagement Plan (SEP) in *Annex F* of the present ESIA.

10.3.4 Documentation

NHID will control EHS documentation, including management plans; associated procedures; and checklists, forms and reports, through a formal procedure. All records will be kept on site and will be backed up at several offsite locations (including secure cloud storage facilities). Records will be kept in both hard copy and soft copy formats. And all records will be archived for the life of the project.

Furthermore, the document control procedure will describe the processes that the Project will employ for official communication of both hardcopy and electronic (through the internet) document deliverables. In addition, it will describe the requirement for electronic filing and posting and for assignment of document tracking and control numbers (including revision codes).

The EHS Manager is responsible for maintaining a master list of applicable EHS documents and making sure that this list is communicated to the appropriate parties. The EHS Manager is responsible for providing notice to the affected parties of changes or revisions to documents, for issuing revised copies and for checking that the information is communicated within that party's organisation appropriately.

The contractors will be required to develop a system for maintaining and controlling its own EHS documentation and describe these systems in their respective EHS plans.

10.3.5 Operational Control Procedures

Each activity for which a potentially significant environmental or socioeconomic risk or impact is expected will have an operational control associated with it that specifies appropriate procedures, work instructions, best management practices, roles, responsibilities, authorities, monitoring, measurement and record keeping for avoiding or reducing impacts. Operational controls are monitored for compliance and effectiveness on a regular basis through a monitoring and auditing procedure described in the ESMP.

Operational control procedures will be reviewed and, where appropriate, amended to include instructions for planning and minimising impacts, or to at least reference relevant documents that address impact avoidance and mitigation.

10.3.6 Emergency Preparedness and Response

NHID will prepare plans and procedures to identify the potential for, and response to, environmental accidents and health and safety emergency situations and for preventing and mitigating potentially adverse environmental and social impacts that may be associated with them.

Emergency preparedness and response will be reviewed by NHID on at least an annual basis and after the occurrence of any accidents or emergency situations to ensure that lessons learnt inform continuous improvement. Emergency exercises will be undertaken on a regular basis to confirm adequacy of response strategies. Investigations of accidents or incidents will follow formal documented procedures.

Emergency planning will include planning for onsite activities as well as notifications and planning support for local community members who would be affected by a site emergency.

10.3.7 Managing Changes to Project Activities

Changes in the Project may occur due to unanticipated situations. Adaptive changes may also occur during the course of the project life cycle. The Project will implement a formal procedure to manage changes in the Project that will apply to all project activities.

The objective of the procedure is to ensure that the impact of changes on the health and safety of personnel, the environment, plant and equipment are identified and assessed prior to changes being implemented.

The management of change procedure will ensure that:

- Proposed changes have a sound technical, safety, environmental, and commercial justification;

- Changes are reviewed by competent personnel and the impact of changes is reflected in documentation, including operating procedures and drawings;

- Hazards resulting from changes that alter the conditions assessed in the ESIA have been identified and assessed and the impact(s) of changes do not adversely affect the management of health, safety or the environment;

- Changes are communicated to personnel who are provided with the necessary skills, via training, to effectively implement changes; and

- The appropriate NHID person accepts the responsibility for the change.

As information regarding the uncertainties becomes available, the Project ESMP will be updated to include that information in subsequent revisions. Environmental and social, as well as engineering feasibility and cost, considerations will be taken into account when choosing between possible alternatives.

10.3.8 Stakeholder Engagement and Grievance Management

In addressing the different needs of stakeholders, the Project have a Stakeholder Engagement Plan (SEP) – *Annex F*, which will be modified and updated as required. Implementation will rest with the 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 *Sobas*.

- *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 (e.g. HIV/AIDS prevention programmes).

Project information will be available from the Project site, 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 through specific Workers Grievance Mechanism for the project workforce including contractors and subcontractor workers. NHID will manage grievances of its employees in accordance with Angolan regulatory requirements. As above, contractors will be expected to comply with Angolan labour regulations.

10.4 CHECKING AND CORRECTIVE ACTION

10.4.1 Introduction

Checking includes inspections and monitoring as well as audit activities to confirm proper implementation of checking systems as well as effectiveness of mitigations. Corrective actions include response to out-of-control situations, non-compliances, and non-conformances. Actions also include those intended to improve performance.

10.4.2 Inspection

EHS inspections will be conducted weekly on an *ad hoc* basis and formally at least once every six months. The results of the inspection activities will be reported to NHID management to be addressed.

10.4.3 Monitoring

Monitoring will be conducted to ensure compliance with regulatory requirements as well as to evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. Monitoring parameters are included in the ESMP.

In addition, lender requirements may include other forms of external monitoring as specified by the lending institution.

Monitoring methodologies or processes must be put in place in order to ensure the efficacy of the mitigation measures identified in the ESIA. Monitoring methodologies should be established to address the following:

- alteration to the biological, chemical, physical, social and health characteristics of the recipient environment;

- alterations in the interactions between project activities and environmental sensitivities, and interactions among the various sensitivities;

- to monitor the effectiveness of the mitigation measures;
- determination of long term and residual effects; and
- identification of Project specific cumulative environmental effects.

The Angolan guidelines require an environmental monitoring plan as part of an ESIA. The aim of the monitoring programme is to ensure that the negative environmental impacts identified in this ESIA are effectively mitigated in the establishment, installation, operations and decommissioning stages of the proposed Project.

10.4.4 Auditing

Beyond the routine inspection and monitoring activities conducted, audits will be carried out internally by NHID to ensure compliance with regulatory requirements. Audits to be conducted will also cover the contractor self-reported monitoring and inspection activities. The audit shall be performed by qualified staff and the results shall be reported to NHID management to be addressed.

The audit will include a review of compliance with the requirements of the ESIA and ESMP and include, at a minimum, the following:

- completeness of EHS documentation, including planning documents and inspection records;
- conformance with monitoring requirements;
- efficacy of activities to address any non-conformance with monitoring requirements; and
- training activities and record keeping.

There will also be a cycle of audits into specific areas or activities of the Project. The frequency of audits will be risk based and will vary with the stage of the Project and will depend on the results of previous audits.

10.4.5 Corrective Action

Impacts will be identified and associated risks addressed before an incident occurs. Investigating a 'near miss' or actual incident after it occurs can be used to obtain valuable lessons and information that can be used to prevent similar or more serious occurrences in the future.

NHID will implement a formal non-compliance and corrective action tracking procedure for investigating the causes of, and identifying corrective actions to,

accidents or environmental or social non-compliances. This will ensure coordinated action between NHID and its contractors. The HSE Manager will be responsible for keeping records of corrective actions and for overseeing the modification of environmental or social protection procedures and/or training programs to avoid repetition of non-conformances and non-compliances.

10.4.6 Reporting

Throughout the construction period, NHID will keep the regulatory authorities informed of the Project performance with respect to EHS matters by way of written status reports and face-to-face meetings. NHID will prepare a report on environmental and social performance and submit it to MinAmb. The frequency of this reporting will be agreed upon between NHID and MinAmb.

If required, NHID will provide appropriate documentation of EHS related activities, including internal inspection records, training records, and reports to the relevant authorities. Contractors are also required to provide EHS performance reporting to NHID on a regular basis through weekly and monthly reports. These will be used as inputs to the above.

10.5 ENVIRONMENTAL AND SOCIAL MITIGATION ACTION COMMITMENTS

Table 10.2 summarises the ESMP actions that NHID are committed to implement during the construction phase, as well as RNT during the operation phase. Note that the monetary value of the implementation of the ESMP will be presented before the construction period commencement.

Table 10.2 Environmental and Social Management Plan

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
General						

Environmental training of construction staff to minimize the occurrence of environmental impacts to the work area	Construction	• All staff[1] are to receive environmental training.
		• All new staff are to receive environmental training prior to working on site
		• Refresher environmental training is available as and when required.
		• All staff are to be made aware, and understand the requirements of this ESMP.
		• All staff are to be made aware, and understand their individual roles and responsibilities in achieving compliance with the ESMP.
		• All staff are to be made aware of the HSE team hierarchy and related roles and responsibilities.
		• Environmental awareness training should include the following as a minimum:
		  • Description of significant environmental impacts related to their work activities
		  • Mitigation measures to be implemented when carrying out specific activities
		  • Emergency preparedness and response procedures
		  • Procedures to be followed when working near or within sensitive areas (i.e. communities, riverine forests and wetlands)
		  • Waste water management procedures
		  • Solid waste management procedures
		  • Sanitation procedures
		  • Disease prevention
		  • Communication with the resident population
		• Chance Find Procedure for archaeological/ paleontological/ historical / cultural sites unearthed during construction.
			NHID HSE Manager	A record of all environmental and social awareness training undertaken as part of the ESMP as well as an attendance register of all staff that have received the training must be available.
				
				Capacity building tools (e.g. presentations, booklets) to be available to staff.
					Routine as required during construction.
					
					Inception training for new workers.
						Internal reporting.
						
						Regular communication to the NHID Site Manager and Project Manager.

Soil and Ground Water						
To safeguard soil resources in the project area by preventing erosion thereof	Construction	• Vegetation clearing and topsoil disturbance will be minimised; • Topsoil shall be stockpiled separate from subsoil. Stockpiles shall not exceed 2 m height, shall be located away from drainage lines, shall be protected from rain and wind erosion, and shall not be contaminated. Wherever possible construction work will take place during the dry season; • Topsoil shall be evenly spread across the cleared areas when reinstated; • Sheet erosion of soil shall be prevented where possible through the use of sand bags, diversion berms, culverts etc.; • Accelerated erosion from storm events during construction shall be minimised through managing storm water runoff (e.g. velocity control measures); • Soil backfilled into excavations shall be replaced in the order of removal in order to preserve the soil profile;	NHID HSE Manager	Estimates of soil volume or area of cultivable soil lost, completed by visual monitoring.	Continuous during construction and quarterly for a period of one year thereafter.	Internal reporting. Regular communication to the NHID Site Manager.

[1] All staff refers to all workers involved in the construction activities. (i.e. project co-workers). Level (effort) of training and materials to be used to be adapted to roles and responsabilties.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• Contour temporary and permanent access roads / laydown areas so as to minimise surface water runoff and erosion; and • Spread mulch generated from indigenous cleared vegetation across exposed soils after construction.				

Response to emergency events through the development of an Emergency Preparedness & Response Plan (EPRP)	Construction and Operation	• Specific actions include:
		  • Develop a site specific EPRP for soil clean-up and decontamination for the operation phase.
		  • Use of spill or drip trays to contain spills and leaks from mobile equipment;
		  • Use of spill control kits to contain and clean small spills and leaks;
		  • Secondary containment with appropriate drainage connection and /or provision for removal of spilt liquids to be provided for all storage facilities of fuels, chemicals and wastes.
		  • Conducting regular maintenance of all vehicles off site and all vehicle and equipment refueling off site where possible;
		• Implement a training program to familiarise staff with emergency procedures and practices for the construction phase.
			NHID HSE Manager, NHID Site Manager and Project Manager	Production of an EPRP and review of implementation, follow up reports	Follow EPRP in an emergency situation throughout construction and operational activities.	Internal reporting.
						
						IFC General EHS Guidelines for Community Health and Safety outline the requirements for an EPRP.

Water Quality						
Preventing adverse impacts to water quality (organoleptic properties)	Construction	• Activities shall be conducted > 100 m away from water bodies, except where crossings are required; • All waste water which may be contaminated with oily substances must be managed in accordance with an appropriate waste management plan and no hydrocarbon-contaminated water may be voided into the environment; and • Domestic wastewater shall be treated and disposed of in accordance with an approved waste management plan. • Measure turbidity of nearby surface water resources in surface water bodies identified along the route of the proposed transmission line on a monthly basis immediately prior to construction, during construction, and for one month after construction of each section. Measurements can be taken in-field using a water clarity tube.	NHID HSE Manager	Visual verification of location of project activities relative to surface water bodies. Measurement of water turbidity prior to, during and after construction activities.	Continuous during construction and for one month thereafter.	Internal reporting. Regular communication to the NHID Site Manager.
To avoid, manage and mitigate potential impacts to the environment caused by waste water discharge during construction (e.g. water pollution caused by oil, grease or other materials used on site)	Construction	• Ensure adequate construction of pit latrines and portable toilets on site and appropriate on going management of these facilities. • Use appropriate lining of toilet facilities to avoid leakage into soil and groundwater. • Sewage from toilets, kitchen and other similar facilities should be collected by a licensed waste collector. • Ensure that the works cause no visible foam, oil, grease or other material to be present in the different water bodies where construction works are taking place (particular attention to be given to the perennial water courses – Lucala river). • Run off from cement/concrete batching areas shall be strictly controlled and contaminated water shall be collected, stored and either treated or disposed offsite, at an approved location.	NHID Site Manager and HSE Manager	Daily inspection of onsite facilities and one off review of purchased lining facilities specifications.	Continuous throughout the construction phase	IFC EHS Guidelines on waste water and ambient water quality should apply. Regular communication to the NHID Project Manager.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards

		• All spillage of oil onto concreate surfaces shall be controlled by the use of an approved absorbent material.
		• When working in or near any watercourse, the following environmental controls shall be undertaken (particularly on perennial water bodies and wetlands):
		  • River levels during period of construction.
		  • Construction within flowing water is to be minimized.
		  • When working in flowing water, downstream sedimentation shall be controlled by installing and maintain the necessary temporary sedimentation barriers.
		  • Where earthwork is undertaken in close proximity to any watercourse, slopes shall be stabilized using suitable materials (e.g. sandbags or geotextile fabric) to prevent sand and rock from entering the channel;
		• Appropriate rehabilitation and revegetation measures for the river banks shall be implemented – detailed complementary measures included in the biodiversity section.				

Minimize potential impacts on water quality from accidental spills through preparation of an Oil Spill Contingency Plan (OSCP) prior to construction and operation for prevention of water pollution from oil/ fuel/chemical spills	Construction and Operation	• OSCP should contain the following:
		  • Response strategies for coordinated response to an oil spill;
		  • Internal organization and responsibilities;
		  • Reporting requirement
		  • Oil response resources;
		  • Commitment to train personnel to conduct fuel and chemical handling according to formal procedures to reduce risk of accidental releases and fire and explosion hazards; conduct regular drills for practicing oil spill response actions;
		  • Maintenance of storage tanks, treatment plants, pipes and components to be carried out regularly.
		  • Provide firefighting equipment around the fuel tank;
		  • Keep the amount of stored chemicals including chlorine to the minimum;
		  • All spills to be immediately contained and cleared up. Proper wash down of the area and waste water to be conveyed to on site wastewater treatment plan for treatment; and
		  • Contaminated areas will be remediated and post remediation verification will be carried out.
		• In the event of accidental oil spill during the construction phase, the EM with SM will use the appropriate oil spillage control equipment to capture the spilt oil.
		• If an oil leakage occurs the cleanup vessels should trace along the current direction to capture the spill.
			NHID Site Manager and HSE Manager	Production of an OSCP and conduct regular visual inspection for oil containing equipment and machinery and storage tanks.	Preparation of an OSCP prior to construction, and then also developed prior to operational phase.
					
					Daily visual inspection of storage tanks and fueling equipment.
						Preparation of an OSCP and maintenance of visual inspection records.
						
						In case of a major spill, local regulations apply as well as the IFC General EHS Guidelines on Community H&S and Occupational H&S applies.
						
						Regular communication to the Project Manager.

Dust Emissions						
Reduce dust emissions during construction activities	Construction	• Removal of vegetation shall be scheduled in the construction programme only when soil stripping is required and there is time for exposed surfaces to be re vegetated or stabilised as soon as possible. • Excavation, handling and transport of erodible materials shall be avoided under high wind conditions.	NHID Site Manager with HSE Manager	Visual inspection on a daily basis	Continuously throughout construction activities	Internal reporting only. There are no applicable air quality standards for construction activities.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• During high wind conditions, the NHID HSE Manager will evaluate the situation and make recommendations as to whether dust damping measures are adequate or whether activities should stop until the wind speed drops to an acceptable level. • Where possible, soil stock piles should be located in sheltered area where they are not exposed to wind. • Vehicle speeds shall not exceed 40 km/h along dust roads or 20 km/h along unconsolidated and vegetated areas. • Appropriate dust suppression methods should be used when dust generation is unavoidable, e.g. dampening with water (in prolonged periods of dry weather).				
Noise and Vibration						
Reduction of noise nuisance from construction activities on site.	Construction	• Working hours for significant noise generating construction work (including works required to upgrade existing access roads or create new ones), will be daytime only. • Siting noisy plant and equipment as far away as possible from noise sensitive receptors (NSRs), and use of barriers (e.g. site huts, acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever possible. • Where practicable noisy equipment will be orientated to face away from the nearest NSRs. • Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where practicable. • Where practicable, stationary equipment will be located in an acoustically treated enclosure. • 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. • Throttle settings will be reduced and equipment and plant turned off, when not being used. • Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked. 9. Fitting of mufflers or silencers of the type recommended by manufacturers.	NHID Site Manager with HSE Manager	Routine visual site inspections to endure good practice is being adhered to.	Monthly inspection and review of maintenance records	Reporting to Project Manager (PM) on a monthly basis, internal reporting only. There are no noise limits for construction activities on an Angolan or IFC basis. List of construction equipment to be used along with noise control measures to be employed.
Reduction of generation of noise from vehicle movement on site and access to the site	Construction	• Identify transportation routes off site that will avoid existing communities, where possible. • Normal working hours will be maintained and the associated loading/unloading activities will be restricted to day time (06:00 to 18:00 hours). Unloading activity may be done after day time (06:00 -18:00) occasionally when unavoidable situations occur. However, transportation will be undertaken during day time. • Implement Traffic Management Plans to optimize the operation of trucks.	NHID Site Manager with HSE Manager	As part of internal procedures	Continuously throughout construction phase	No reporting required. The IFC and Angolan does not stipulate any limits on construction noise. IFC Occupational H&S and Community H&S General Guidelines provide guidance on traffic safety measures.
Inform the local community of potential noise nuisance	Construction	• Communicate the construction times and plan to the communities within a 10 Km radius.	NHID Site Manager with HSE Manager	Construction plan and times are visually presented at public areas / on newspapers/posters/radio etc.	Prior to construction commencing and as plans changed	No reporting required
Biodiversity						
To ensure the safe construction activities of the Project without causing unnecessary clearance	Construction	• A specific method statement should be developed to regulate vegetation clearing.	NHID Site Manager with HSE Manager	Visual inspection on a daily basis	Continuous through construction activities	Internal reporting.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
of vegetation and edaphic degradation on riparian/wetland areas		• Servitude to be cleared in line with Angolan regulations for minimum vegetation clearance distance. • Debris through vegetation clearance shall not be burned under any circumstances. Unless the local community wishes to use the cut wood for firewood, the debris shall be disposed of at an approved or designated waste disposal facility. Debris can also be used for rehabilitation processes (when appropriate). • Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and debris. • A specific method statement to manage the use of pesticides and herbicides should be developed under the supervision of the Site Manager and HSE Manager. • Alien invasive vegetation should be rremoved immediately and disposed of at a licensed waste disposal facility. The area should be quarantined and monitoring efforts should be increased. • Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazards, should not be trimmed or cut unless it is growing in the road access area. • Access to the servitude and tower positions to be agreed prior to commencement of construction activities. • Access roads to tower positions shall be signposted before commencement of construction activities. • There should be no deviation from the access road position without prior discussions with GAMEK. • Maximum use of both existing servitudes and existing roads shall be made. • All private roads used for access to the servitude shall be maintained and upon completion of the works, be left in at least the original condition. As far as possible, access roads shall follow the contours in hilly areas, as opposed to winding down steep slopes. Erosion phenomena should be regularly checked. • Access is to be established by vehicles passing over the same track on natural ground, multiple tracks are not permitted.				IFC PS 6 stipulates the requirements for protecting and conserving biodiversity and managing living natural resources.
Areas disturbed during construction are returned to the states that is equivalent to the state they were prior to construction, including superficial drainage patterns.	Construction	• All areas disturbed by construction activities shall be landscaped and rehabilitated. • Superficial drainage should be maintained during the construction phase. • Indigenous species will be used for replanting. • Stockpiled topsoil shall be used for rehabilitation. • Before placing topsoil, all visible weeds from the placement area and from the topsoil shall be removed. • Subsoil shall be ripped before topsoil is placed. • Where impacted through construction activity, all sloped areas must be stabilized to ensure proper rehabilitation is effected and erosion is controlled.	NHID Site Manager with HSE Manager	Visual inspection on a daily basis	Continuously throughout construction.	Internal reporting. IFC PS 6 stipulates the requirements for protecting and conserving biodiversity and managing living natural resources.
To ensure the protection of fauna during construction and potential future impact during operation.	Construction	• The Project will ensure that best practice measures are adopted to avoid incursion into areas adjacent to the work sites or any secondary effects from pollution, altered drainage regimes, dust, sedimentation, etc.	NHID Site Manager with HSE Manager	Visual inspection on a daily basis. Carcass search assessment to be performed on a weekly basis.	Continuously throughout construction.	Internal reporting only. IFC PS 6 stipulates the requirements for protecting and conserving biodiversity

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• The project will undertake ongoing monitoring for bird species with a focus on endangered species and migratory species particularly in the flooded areas near Lucala river and ephemeral lagoons. • In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision. • The HSE Manager will undertake regular (at least bi-annual, dry and wet seasons) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary. • Carcass search should be performed on a weekly basis, which should include dead animals found on the servitude, nests found on servitude, injured animals etc. • Any wildlife activities should be noted and reported to Project Manager. A wildlife interaction record should be set up. • No interference with livestock shall occur without the owner's permission. • No poaching will be tolerated under any circumstances. All animal dens in close proximity to the work areas must be marked as no go areas. • The breeding sites of wild bird species must be taken into consideration during the planning of the construction and breeding sites shall be kept intact with disturbance to breeding birds avoided. Special care shall be taken where nestlings or fledglings are present. • Littering by the employees of The Company's staff shall not be allowed.		Wildlife interaction record to be updated permanently.		and managing living natural resources.
Landscape and Visual						
To minimise visual scarring of the landscape and to enhance absorption of the development into the surrounding environment		• Vegetation clearing will be kept to the absolute minimum and should not extend beyond the corridor or substation site; • Any excavated or cut and fill areas will be landscaped and allowed to revegetate; • Temporary construction fencing will be removed; • No debris or waste materials will be left at the work sites; • Appropriate directional and intensity settings will be utilised on all lighting; and • The only mitigation that can be applied during operations is the ongoing rehabilitation of cleared areas to minimise visual scarring.	NHID HSE Manager	Visual inspection on a daily basis	Continuous throughout the construction phase	Internal Reporting only
Waste						

To avoid, manage and mitigate potential impacts to the environment caused by the incorrect storage, handling and disposal of general and hazardous solid waste.	Construction	• Development of a Construction Waste Management Plan (CWMP):
		  • Establish waste management priorities and hierarchy;
		  • Periodically review applicable regulations regularly to ensure compliance and maintain inventory of applicable laws and regulations;
			NHID Site Manager with HSE Manager	CWMP in place prior to construction commencing.
				Preparation of an inventory of applicable laws and regulations and inventory of quantity and type of waste stored and recycled, both hazardous and nonhazardous.
				Clear labeling of storage areas following international standards.
					Routine weekly checks of waste management arrangements should be undertaken.
					Particular attention should be given to the provision of sufficient spaces, adequacy of resources and facilities for on-site sorting and temporary storage of construction waste.
						Internal reporting.
						
						NHID should ensure that the inventories are updated at least once a month.
						
						National legislations applies.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• Design processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated; • Identify potential opportunities to recycle material into the design; • Provide appropriate storage; and • Implement a construction materials inventory management system across the construction project (inclusive of sub-contractors) to minimise over-supply of the construction materials. • For minimization of potential impacts from sewage generated on site during the construction phase, the CWMP will also include recommendations to locate toilet facilities away from any water courses and areas of high water table, disinfect the area around the toilets regularly and identify appropriate sewage and wastewater treatment facilities for disposal of sewage sludge. • Provide separate labelled and appropriate containers/ bins/ stockpiles/areas for hazardous, nonhazardous and recyclable materials. Maintain inventory of nonhazardous waste generated and transferred off site. • For hazardous waste, store them in closed containers away from direct sunlight, wind and rain. Maintain inventory of hazardous waste generated and transferred off site. • Cover general refuse/putrescible materials to minimise the occurrence of windblown litter, odour nuisance, leakage of waste, avoid attracting pests and vermin; • Provide sufficient containers to ensure waste does not overflow; • Provide a contained refuse collection area and collect contaminated surface run-off to mitigate potential impacts to water. • For hazardous waste, ensure storage area has an impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container; and • Ensure storage area has adequate ventilation • Under no circumstances shall any waste be disposed of, burned or buried at site.		Training to contractors and engineers on the proper handling and storage of hazardous waste. Production of hazardous and nonhazardous waste inventory. Records in the form of chain of custody documents should be kept of transfers of hazardous waste to ensure wastes are transported by suitable carriers to a permitted disposal facility.	Conduct waste audit annually. Review inventory of applicable laws and regulations on a monthly basis. Routine weekly checks throughout construction and operation. Ad hoc inspection of waste inventories.	IFC General EHS Guidelines: Waste Management (*Section 1.6*) sets out requirements for the management of general and hazardous wastes excluding waste management facilities. IFC General EHS Guidelines: Construction & Demolition gives examples of common hazardous and non-hazardous solid waste generated at construction and decommissioning sites.
To inform and capacity build staff of the proper handling of both hazardous and non-hazardous waste to avoid potential spillages and contamination of habitats	Construction and Operation	• Train staff on how to store, handle waste, prevent leakage/waste and deal with leakage when it happens and provide them with personal protective equipment for the handling of hazardous waste; • Train staff for recycle and reuse as far as practicable waste such as broken glass, iron, steel, wood, carton paper, plastic, etc.; • Ensure information on chemical compatibility of hazardous waste is available to staff; and • Prepare spill response and emergency plans that incorporate potential accidental release of hazardous waste.	NHID HSE Manager with Site Manager	Review of attendance records to show that all new employees and contractors have received training on starting new employment. Review evidence of ongoing training.	Quarterly throughout the construction and operation phases	Internal reporting only. IFC General EHS Guidelines: Waste Management (Section 1.6) sets out requirements for the management of general and hazardous wastes excluding waste management facilities. IFC General EHS Guidelines: Construction & Decommissioning gives examples of common hazardous and non-hazardous solid waste

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
						generated at construction and decommissioning sites.
Proper transportation of waste and disposal at designated dumpsites/facilities by qualified licensed collectors to avoid accumulation of waste on site causing nuisances such as odor, pest control problems and general litter.	Construction and Operation	• Enter into a contract with appropriately licensed waste collectors and recyclers for regular collection of waste. Arrangements should be agreed before construction. Waste handling license to be reviewed by NHID and kept with the contract. • Tightly enclose vehicles/container to minimize windblown litter and dust during the transportation of waste. • Ensure facilities for disposal comply with Angolan legislation as well as the requirements of IFC General EHS Guidelines. Select facilities for disposal that are appropriately designed, permitted by local authorities and that have sufficient capacity for wastes, as per the project execution plan.	NHID Site Manager with Project Manager	Review of permits and contracts with local waste collectors. Review of sites where waste will be disposed to ensure adequate facilities. Make sure to include in the CWMP a procedure to control the waste flow from the constructions areas to the adequate destiny.	Review of permits and contracts on appointment of waste collector once permits are updated and approved. One off site visit of waste facilities upon appointment of contract and for every new facility used.	Waste disposal treatment facilities should comply with local legislation.
Preparation of Operational Waste Management Plan (OWMP) to avoid accumulation or mismanagement of waste on site during operation.	Operation	• The OWMP should identify and highlight disposal options for all waste generated during the operation of the transmission lines; waste avoidance measures; material recovery and recycling program; waste handling, storage and disposal methods; environmental, health and safety control measures, and waste management audit arrangements. • OWMP doesn't need to be exclusively focused on this transmission line, i.e. can include all the transmission lines with the existing corridor.	RNT	OWMP in place prior to commissioning/operations. An updated inventory of applicable laws and regulations and inventory of quantity and type of waste stored and recycled, both hazardous and nonhazardous.	Quarterly site inspections of waste management arrangements should be undertaken. Conduct waste audit annually. Review inventory of applicable laws and regulations on a monthly basis.	The OWMP should comply with the same set of regulations as per the CWMP. In particular, national regulations and IFC General EHS Guidelines: Waste Management.
Socio Economic						
Enhancement measures to enhance potential impacts related to employment and development of the economy during construction.	Construction	• NHID will develop a *Local Content and Procurement Plan* for the construction phase to enhance positive impacts on the economy and employment. Specific enhancement measures include: • An Employment Strategy and hiring procedure which will include a hiring procedure to ensure that local people from the Study Area are employed wherever possible and that this is done in a fair, consistent, and transparent manner by the Project and its contractors. Workers from the settlements along the transmission line will be given priority for low skilled jobs such as vegetation clearance, security guards, cleaning, etc. Low-skilled construction jobs can also be sourced from peri-urban areas along the transmission line route (ie. Viana, Belas, and Icolo e Bengo municipalities). • The Employment Strategy will outline and require a fair and transparent recruitment process for all openings. NHID and contractors will work with local authorities to advertise all openings in ways that are accessible to local communities. • The Project will provide clear information on the number and limited timescales of employment opportunities. • Contractors will be required to show best efforts in filing all low skilled service jobs with local (commune level) residents. • In order to maximise local procurement, NHID will require contractors, as part of the tendering process, to develop a purchasing strategy stipulating how local purchase of goods and services will be optimised in particular with respect to transportation, waste management and disposal, water supply, and catering. • NHID will optimise employment opportunities by breaking tendering opportunities into smaller components to increase	NHID HSE Manager with Project Manager or Site Manager, Human Resource Manager and Procurement Manager. EPC Human Resource Manager and Procurement Manager.	Verify Local Content and Procurement Plan in place prior to construction commencing. Verify Employment strategy and hiring procedure of local people of contractors. HR records on the percentage of local versus non-local employment. Monitoring of local recruitment procedure. HR records of employment opportunities information provided (number and timescales). Verify contractors local purchasing strategy in place. Review of training attendance records of capacity enhancement and transfer of knowledge training that local contractors and their employees will have received. Review evidence of ongoing training.	Prior to construction commencing for Local Content and Procurement Plan. Continuous during construction phase for employment and procurement-related measures. Quarterly for training-related measures.	IFC Performance Standard 1 establishes the importance of sharing development benefits and opportunities with local and Project-affected communities.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		the likelihood of granting individual pieces of work to Angolan companies. • As part of the tendering process, NHID will require contractors to develop a purchasing strategy that stipulates how national and local purchase of goods and services will be optimised. Agreed targets will be monitored. • To maximise capacity enhancement and transfer of knowledge to local contractors and their employees, NHID will develop formal training programs and formalise on-the-job trainings to the extent possible, including learning targets and performance monitoring. • NHID will coordinate with local authorities in order to avoid opportunistic, informal markets developing at the perimeters of the construction camps in order to ensure that local settlements in the Study Area and nearby urban centres benefit from workers spending.				
Measures to mitigate potential impacts related to the physical and economic displacement and related impacts on livelihoods during construction.	Construction	• Develop a Resettlement and Compensation Action Plan (RCAP) including the following: • Provide compensation for loss of assets at replacement cost and for the loss of income opportunities from seasonal and permanent crops. This also includes community-level compensation for the loss of community resources such as baobab trees inside the 20m footprint corridor and related livelihood and subsistence losses. • Ensure that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. • Improve or, at a minimum, restoring the livelihoods and standards of living of displaced persons to pre-project levels, so as to facilitate sustainable improvements to socio-economic status (including the provision of alternative land for cultivation with equal or better soil productivity). • In the case of changes in land values post-construction, affected land owners and/or right holders are entitled to cash compensation at replacement values for the reduced opportunities to use the land most productively. • Pay particular attention to the needs of vulnerable groups, identifying additional compensation and livelihood restoration measures as necessary. • Develop Resettlement Actions Plans (RAPs) and Livelihood Restoration Plans (LRPs) for specific sections of the Transmission Line route including the following: • Develop one or more RAP(s)/LRP(s) for different components of the Project (e.g. early works, transmission line, etc.) including: • Conducting an asset inventory and census of all affected households. • Disclosure of the LRPs and agreement at the community level. • Implement the LRPs prior to land take in order to ensure that replacement homes and lands are ready, required infrastructure in place, and replacement livelihood resources can be accessed productively. Specifically:	NHID HSE Manager with Project Manager or Site Manager and EPC HSE Manager.	Verify Resettlement and Compensation Action Plan (RCAP) developed prior to construction commencing. Verify RAPs and LRPs developed prior to land take commencing. Registry of affected stakeholders eligible for compensation/livelihood restoration. Review of transmission line routing and related clearance including relocation of Baobab trees.	Prior to construction commencing for RCAP Prior to land take commencing for RAPs and LRPs Continuous throughout construction phase for registry of affected stakeholders eligible for compensation/livelihood restoration and routing and clearance activities.	The RCAP, RAPs and LRPs will be aligned with Angolan legal requirement and IFC performance standard 5.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• Agree household level entitlements and provide compensation. • Verify payment of all compensation prior to the start of construction on the respective line sections through regular engagement with GAMEK during the resettlement process. • Ensure replacement assets are available or provide transition arrangements. • Provide continued support to households to restore livelihoods and monitor to demonstrate achievements of IFC principles. • Implement additional measures to minimise transmission line routing and related clearance: • Avoid or minimize the number of towers sites working areas in agricultural areas or areas of community resources. • Minimise clearance of the 4 m maintenance road as in some cases clearance may not be necessary since other access roads are available. • Reduce tree cut-off in the temporary tower sites working areas.				
Measures to mitigate potential impacts from land-related restrictions.	Operation	• Monitoring and providing the necessary follow-up to support households to restore their livelihoods throughout the operations phase. • The grievance mechanism established during the construction phase will be maintained during operations to ensure that local communities and stakeholders have an adequate channel to voice concerns.	RNT HSE Manager with Project Manager	Grievance Mechanism document. Records of any grievance and redress actions. Monitoring and follow-up records of support provided to households to restore their livelihoods	Continuous throughout operation phase.	The grievance mechanisms should be easily understood by the informed communities as required under IFC Performance Standard 5.
Measures to mitigate potential impacts on local infrastructures access and / or damage during construction.	Construction	• Stakeholder engagement will be conducted to maintain open, clear and transparent communication with the local communities regarding the use of local infrastructures by the Project throughout the different phases. • Engagement with the relevant authorities is recommended in order to avoid damage to common property and minimize access disruption to education and healthcare facilities. • A *Community Grievance Mechanism* will be implemented. • A *Traffic Management Plan* shall be issued before earth movements and construction start in order to minimize traffic disruptions. • Where temporary closure of road is required, alternative access to property will be ensured and local solutions including diversions will be implemented to ensure uninterrupted mobility.	NHID HSE Manager with Project Manager and EPC HSE Manager.	Verify Community Grievance Mechanism developed prior to construction commencing. Verify Traffic Management Plan developed prior to earth works and construction commencing. Grievance Mechanism document. Records of any grievance and redress actions.	Prior to construction commencing for the Community Grievance Mechanism. Prior to earth works and construction commencing for Traffic Management Plan developed. Continuous throughout construction phase.	The grievance mechanisms should be easily understood by the informed communities as required under IFC PS 1 and PS5. IFC Performance Standard 2 provides requirements on working conditions of workers. In particular, the Project is required to provide accommodation, transportation, and basic services including water, sanitation, and medical care for the workers working on that project.
Community Health and Safety						
Provide a framework for interactions between Project workforce and local communities and ensure that mitigation measures are in place to minimize potential impacts from road traffic, site trespass and demining activities during construction.	Construction	• Develop a *Community Health and Safety Management Plan* including the following measures: • Ensure that all workers are housed in accommodation camps rather than in the local settlements in order to minimize interaction with local communities and related health and safety impacts. • Ensure all workers including contractors and subcontractors undergo pre- employment screening and	NHID Project Manager or Site Manager with HSE Manager and EPC HSE Manager.	Record of house accommodations in camp granted to each worker. Verification record for pre-screening for STDs. Develop a Code of Conduct document. Record of lessons learned to minimize occupational health and safety risks to ALARP levels.	Code of Conduct shall be developed and approved prior to the construction. Record for STD screening should be done one time previously to the operation phase. Monitoring of contractors compliance with health and	Internal reporting for time entrance verification, training records, pre-screening information. IFC Performance Standard 4 requires the Project to avoid or minimize the risks and impacts to community

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards

		regular health screening including voluntary screening for STDs.
		• Ensure any trucking companies employed to work on the Project will have policies around health screening of their workers in line with Project requirements.
		• Ensure all workers including contractors and subcontractors receive education around transmission routes and symptoms of communicable diseases of concern and STDs.
		• Provide access to health care for those injured by its activities.
		• Ensure that work sites are fenced and that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. When work fronts are less than 100 metres from a community or house, employ security guards from the local community to prevent trespass.
		• Undertake a programme 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.
		• Extend the *Worker Code of Conduct* to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors and truck drivers as part of the induction process.
		• Provide primary health care and first aid at construction camp sites to avoid pressure on local healthcare infrastructures.
		• Develop an *Emergency Preparedness and Response Plan* in cooperation with local emergency authorities and hospitals.
		• Develop and implement a *Traffic Management Plan* covering aspects such as vehicle safety, driver and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations.
		• Implement a *Community Grievance Mechanism*.
		• With respect to demining, the demining operator will be required to establish the following mitigation measures:
		  • Establish appropriate safety distances and perimeters for communities.
		  • Liaise with communities and local authorities including conducting preliminary meetings with the local authorities, advising on safety measures to be taken by the local population, 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.
				Monitoring and auditing all contractors and subcontractors to ensure compliance with health and safety standards and Project specific standards.
				Training records on public health and traffic safety and attendance list.
				Records of incidents observed when situation deviates from normal.
				Keep record of number of health care and aid centers in each camp and that it corresponds to the number of workers accommodated in each camp and verify their correct functioning.
				Ensure visual warning signs are erected.
				Records of incidents when they occur.
				Log book to record entrance time.
				Implement short community consultation sessions.
				Verify the existence and keep record of the development of ERPs and Traffic Management Plan.
					safety standards twice during the construction phase then once a year during operations.
					Training should be provided to construction workers before construction and as new workers join as part of induction.
					Workers should have accessed to clinic during construction period in case of emergency/accidents.
					Monitoring and auditing contractors and subcontractors should be done before and during operation phase.
					Consultation with local authorities and communities shall be conducted before implementation of the suggested mitigation measures.
					Community consultation sessions should be available before and during operation phase, twice a month.
						health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.
						IFC EHS General

Measures to mitigate potential impacts on community health and safety during the	Operation	• As part of the Project's *Stakeholder Engagement Plan*, the start date for electricity transmission and safety implication will be announced locally using public announcement systems.	RNT HSE Manager	Verify that Warning/Danger signs are erected and are easily identifiable and understandable.	Continuously throughout operation phase.	IFC Performance Standard 4 requires the Project to avoid or minimize the risks and

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
operation phase in relation to maintenance activities and line operation.		• Permanent warning plates (danger sign boards) and anti-climbing devices on all faces of the lattice towers. • Ensure that an *Emergency Preparedness and Response Plan (EPRP)* is developed. • The *Community Grievance Mechanism* established during the construction phase will be maintained during the operation phase so stakeholders can report specific concerns. • As part of the *Community Health and Safety Management Plan*, undertake a community education programme on transmission lines safety. • Residents and land right holder will be trained on safety issues and actions to be taken; for example, where a pole is located close to residential areas or schools and recreational areas.		Verify the existence of the EPRP. Keep a record on training sessions on transmission line safety, and safety issues.	The EPRP should be verified at the beginning of the operation phase. Training sessions should be given continuously according to the advance in the electric line construction.	impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.
Ensure compliance with ICNIRP guidelines on public and occupational exposure to electromagnetic fields (EMF) and IFC EHS Guidelines on Electric Power Transmission and Distribution during the operation of the line.	Pre-construction, Construction and Operation	• Installation of transmission line above or adjacent to residential properties or other locations intended for highly frequent human occupancy (e.g. schools or offices) will be avoided. • If EMF levels are confirmed to be above the recommended exposure limits, application of engineering techniques will be considered to reduce the EMF produced by the lines.	NHID Project Manager or Site Manager with HSE Manager and EPC HSE Manager.	Test records of EMF levels. Record of transmission line design changes.	Continuous during pre-construction, construction and operation phase.	Internal Reporting and compliance with IFC EHS Guidelines on Electric Power Transmission and Distribution.
Ensure compliance with ICNIRP guidelines on public and occupational exposure to electromagnetic fields (EMF) and IFC EHS Guidelines on Electric Power Transmission and Distribution during the operation of the line.	Operation	• Once the line is operational, undertake initial measurements of the 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 EMF is and that people should not build new houses within the Right of Way; and • RNT will undertake annual monitoring of the corridor to ensure that people are not building new houses within the corridor.	RNT HSE Manager	Test records of EMF levels. Record and attendance of educational campaigns on EMF. Annual monitoring records of corridor.	Continuous operation phase	Internal Reporting and compliance with IFC EHS Guidelines on Electric Power Transmission and Distribution.
Workers Health and Safety						

Mitigation measures to minimize potential impacts to workers health and safety and ensure respect for labour rights during construction	Construction	• Develop and implement a *Worker's Health and Safety Management System* covering all contractors and subcontractors including the following measures:
		  • Develop a Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable ILO standards, compensation including consideration of overtime, holidays etc. NHID will require its contractors and subcontractors to put in place policies in line with national legislation and applicable international legislation and NHID Code of Conduct and Policies.
		  • 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 NHID with the right of audit.
		  • Prohibit the use of alcohol or 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 or the environment.
			NHID Project Manager or Site Manager with HSE Manager and EPC HSE Manager.	Verify Worker Health and Safety Management System developed prior to construction commencing.
				
				Verify Human Resources Policy is developed as part of the Worker Health and Safety Management System.
				
				Verify contractual clauses of EPC and all sub-contractors requiring adherence to Angolan law and international standards.
				
				Records of incidents observed when situation deviates from normal.
				
				Keep a record on training sessions and attendance on health and safety measures
				
				Monitoring and auditing all contractors and subcontractors to ensure compliance with national standards and Project specific standards.
					Worker Health and Safety Management System and Human Resources Policy developed and approved prior to the construction.
					
					Traffic Management Plan developed and approved prior to the construction.
					
					Waste Management Plan developed and approved prior to the construction.
					
					Code of Conduct shall be developed and approved prior to the construction.
					
					Monitoring of contractors compliance with health and safety standards twice during the construction phase.
						IFC Performance Standard 2 provides requirements on working conditions of workers. In particular, the Project is required to provide accommodation, transportation, and basic services including water, sanitation, and medical care for the workers working on that project.

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• Ensure that training on health and safety measures is provided to all construction workers prior to starting to work on the Project and that supervisors have adequate experience to deliver on their responsibilities. This training should be based on a preliminary H&S assessment to be made by NHID and self-employed contractors on H&S risks focused on the tasks to be performed during the construction phase. • 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 facilities and work sites are designed and maintained such that robust barriers are in place to prevent accidents. • Ensure that the *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. • Ensure an adequate clean water and safe food and access to medical care to all workers o the worksite and at accommodation. • Develop and implement a *Traffic Management Plan* covering aspects such as vehicle safety, driver and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations. • Develop a *Waste Management Plan* for the construction phase with clear guidelines for the safe storage and disposal of hazardous waste and handling of hazardous materials. • Ensure that IFC/ EBRD guidelines regarding the construction and management of worker accommodation and the provisions of medical facilities at worker accommodation are followed. • Recruitment will be undertaken in collaboration with local authorities and local agencies. NHID will put in place measures to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation.		Record of lessons learned to minimize occupational health and safety. Code of Conduct document Verify Traffic Management Plan developed prior to earth works and construction commencing. Verify Waste Management Plan developed prior to construction commencing. Auditing construction and management of worker accommodation and the provisions of medical facilities at worker accommodation to ensure IFC/ EBRD guidelines are followed.	Training should be provided to construction workers before construction and as new workers join as part of induction.	
Mitigation measures to minimize potential impacts to workers health and safety and ensure respect for labour rights during operation	Operation	• The Workers' Health and Safety Management System will be extended to the operation phase and adapted to address relevant aspects, including the following measures: • Development of a Human Resources Policy which will outline worker rights to be included in all contracts including restrictions on working hours in line with	RNT HSE Manager	Verify Worker Health and Safety Management System is extended to operation phase.	Worker Health and Safety Management System and Human Resources Policy developed and approved prior to the operations.	IFC Performance Standard 2 provides requirements on working conditions of workers. In particular, the Project is required to provide accommodation,

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		applicable ILO standards, compensation including consideration of overtime, holidays etc. • Identification and provision of appropriate PPE, training and monitoring, as well as ongoing safety checks and safety audits. • Prohibiting the use of alcohol or 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 or the environment. • Ensuring that training on health and safety measures is provided to all construction and operation workers prior to starting to work on the Project. • RNT will undertake compliance monitoring of labour rights. Key Performance Indicators will be developed around worker rights, discrimination and management, workforce grievance mechanism and monitoring of outcomes. • Implementing a Workers Grievance Mechanism for the Project workforce. • Establishing a procedure for the recording and analysis of lessons learned and implementation of additional actions to avoid or minimize occupational health and safety risks. • 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. • Put in place measures to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation.		Verify Human Resources Policy is developed as part of the Worker Health and Safety Management System. Compliance monitoring v Records of incidents observed when situation deviates from normal. Keep a record on training sessions and attendance on health and safety measures Monitoring and auditing all contractors and subcontractors to ensure compliance with national standards and Project specific standards. Record of lessons learned to minimize occupational health and safety risks. Verify Waste Management Plan developed prior to operations commencing.	Waste Management Plan developed and approved prior to the operations. Monitoring of compliance of labour rights. Training should be provided to construction workers before operations and as new workers join as part of induction.	transportation, and basic services including water, sanitation, and medical care for the workers working on that project.
Measures to mitigate potential impacts on community health and safety during the operation phase in relation to maintenance activities and line operation.	Operation	• As part of the Project's Stakeholder Engagement Plan, the start date for electricity transmission and safety implication will be announced locally using public announcement systems. • Permanent warning plates (danger sign boards) and anti-climbing devices on all faces of the lattice towers. • Ensure that an *Emergency Preparedness and Response Plan (EPRP)* is developed. • The *Community Grievance Mechanism* established during the construction phase will be maintained during the operation phase so stakeholders can report specific concerns. • As part of the *Community Health and Safety Management Plan*, undertake a community education programme on transmission lines safety. • Residents and land right holder will be trained on safety issues and actions to be taken; for example, where a pole is located close to residential areas or schools and recreational areas.	RNT NHID	Verify that Warning/Danger signs are erected and are easily identifiable and understandable. Verify the existence of the EPRP. Keep a record on training sessions on transmission line safety, and safety issues.	Continuously throughout construction activities. The EPRP should be verified at the beginning of the operation phase. Training sessions should be given continuously according to the advance in the electric line construction.	IFC Performance Standard 4 requires the Project to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.
Cultural Heritage						
Prevention of damage and destruction to materials of heritage significance	Construction	• Develop a *Chance Finding Procedure* for dissemination to the construction teams prior to construction commences, this should including the following points: • All work must stop immediately if any human remains and or other archaeological and historical material are uncovered.	NHID Project Manager with HSE Manager	Visual inspection on daily basis	Continuously throughout the construction activities	Internal reporting

Project Aspect/ Management Objective	Project Phase/s	Specific actions	Responsible for ensuring implementation	Means for verification that commitment has been met	Timing and Frequency (routine, how often, continuous or in emergency situations only)	Reporting requirements and applicable standards
		• Findings must be reported to the nearest museum/archaeologist or local Government authorities so that a systematic and professional investigation can be undertaken. • Training should be provided to workers on the identification of potential relevant artifacts and the concurrent procedures to be taken once a finding is identified.				
Unplanned Events						
Minimise the risk of unplanned events and their impacts on soil and surface water resources	Construction and operation	• The Project will develop a detailed Oil Spill Response Plan (OSRP) with includes community sensitization/ notifications when required. The Project will maintain spill clean-up and response capability adequate for addressing spills for 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. • Refueling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, treated by incineration or removed by a local contractor. Drip trays must be used when refueling and servicing vehicles or equipment, where it is not on a hard standing surface. • Hazardous material storage will be on hard standing and impermeable surface and the bulk storage facility will be bonded. The Project will restrict storage and handling of hazardous materials and fuels to bonded areas of sufficient capacity to contain a release. • Additional measures are set in the water and soil sections.	NHID HSE Manager	Oils Spill Response Plan Document Records of incidents as they occur	Review of incident as and when they occur Regular maintenance of equipment	Internal reporting

11 IMPACT SUMMARY

11.1 INTRODUCTION

This ESIA has been conducted to evaluate the impacts associated with the proposed Project by NHID. The impact assessment has been conducted in accordance with international best practice (such as the IFC PS) and national legislative requirements.

11.2 IMPACTS REQUIRING DETAILED ASSESSMENT

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 11.1* 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 ***minor*** significance, with the implementation of mitigation measures specified.

Table 11.1 Impact Assessment Outcomes

Environmental / Social Variable	Project Activities/Impacts	Phase	Predicted Significance	
			Before Mitigation	With Mitigation
Soils	Loss of soil resources due to erosion	Construction	Minor	Negligible to Minor
Water Resources	Availability and Quality of Water Resources	Construction	Minor	Negligible to Minor
Air Quality	Road Traffic Exhaust Emissions	Construction	Negligible	Negligible
	Dust and PM_{10} from unpaved roads during construction activities	Construction	Major	Negligible
Noise and Vibration	Noise from construction activities affecting nearby dwellings	Construction	Negligible - Minor	Negligible
Flora and Vegetation	Disturbance to vegetation and habitat loss and fragmentation as a result of the ROW or degradation to environment and habitat	Construction	Moderate	Minor
	Disturbance to vegetation and potential grow of invasive species as result of the maintenance works	Operation	Moderate	Negligible

Environmental / Social Variable	Project Activities/Impacts	Phase	Predicted Significance	
			Before Mitigation	With Mitigation
Fauna	Disturbance to avifauna species and degradation to environment during construction	Construction	Minor	Negligible
	Increase in bird mortality due to bird strikes during operation	Operation	Minor	Minor
Visual Amenity	Deterioration of visual amenity	Construction	Minor	Negligible
	Deterioration of visual amenity	Operation	Minor	Minor
Economy And Employment	Local employment opportunities, capacity building and economic development	Construction	Moderate	Positive
	Long term local employment opportunities	Operation	Moderate	Positive
Land and Livelihoods	Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land	Construction	Moderate	Minor
	Physical displacement of Project-Affected People during construction	Construction	Major	Minor
	Temporary loss of access to forest products from site clearing during construction	Construction	Minor	Negligible
	Permanent loss of livelihoods and household income due to permanent land take and restrictions.	Operation	Moderate	Minor
	Changes in land and property value	Operation	Minor	Negligible
Community Health and Safety	Community Safety (Road Accidents, Site Trespass, Demining)	Construction	Moderate	Minor
	Environmental Health (Noise and Air)	Construction	Moderate	Minor
	Interaction with Project Workforce	Construction	Moderate	Minor
	EMF Health effects	Operation	Minor	Minor
Worker's Health and Safety and Workers' Rights	Effects on worker health and safety and labour rights	Construction	Moderate	Minor
	Effects on worker health and safety and labour rights	Operation	Moderate	Minor
	Disruption to traffic and transportation	Construction	Moderate	Minor

Environmental / Social Variable	Project Activities/Impacts	Phase	Predicted Significance	
			Before Mitigation	With Mitigation
Access to Infrastructure and Services	Improvement of the local road networks	Operation	Moderate	Positive
Cultural Heritage	Damage of grave sites considered important by the local communities	Construction	Negligible	Negligible
Unplanned Events - Unplanned Spillages	Reduction in local soil quality	Construction and operation	Moderate	Minor
	Reduction in surface water	Construction and operation	Moderate	Minor
Unplanned Events - Community Health and Safety	Risk during stringing activities	Construction	Moderate	Minor
	Effects from unplanned spillages	Construction and Operation	Moderate	Minor
	Effects from fire and/or explosion due to dielectric oil release	Operation	Moderate	Minor
	Exposure to UXOs	Construction	Major	Positive
	Effects from transmission line snapping and transmission tower/pylon collapse	Operation	Major	Minor

12 CONCLUSION

NHID has been awarded a contract by the Ministry of Energy and Water of Angola (*Ministerio da Energia e Aguas* - MINEA) to complement and reinforce existing transmission lines as well as other transmission lines that are currently being built within the 800 m Laúca-Luanda transmission line corridor. NHID is working in collaboration with *Gabinete de Aproveitamento do Médio Kwanza* (GAMEK), the representative of MINEA. GAMEK is responsible for the management of the acquisition of land rights and the provision of compensation to affected people.

Under the Angolan environmental regulations high voltage transmission lines are an undertaking for which an Environmental Impact Assessment (EIA) is mandatory. In 2014, MINEA started the process to develop an Environmental and Social Impact Assessment (ESIA) report to comply with Angolan requirements. MINEA developed the ESIA of these transmission lines using EDP as subcontractor (2014 ESIA), and the ESIA was presented to MINAMB for approval.

NHID commissioned ERM to carry out the update of the existing 2014 ESIA in order to address changes to the proposed design. This updated ESIA has been developed by ERM to meet the International Finance Corporation (IFC) Performance Standards (PS), in addition to complying with the requirement to present an Annex to the 2014 ESIA the Angolan EIA requirements to MINAMB for approval.

The ESIA identified and assessed a number of potential environmental and social impacts.

The assessment demonstrated that, with the implementation of the committed mitigation measures during construction and operation, all of impacts are of negligible to minor in significance.

Positive impacts are expected in the social context, mainly in terms of local employment opportunities, capacity building and economic development (construction), long term local employment opportunities (operation), improvement of the local road networks (operation) and reduction in exposure to UXOs (construction).

A Resettlement and Compensation Action Plan (RCAP) had been developed as a parallel process to the ESIA, and outlines the measures that NHID have taken, and will continue to take, to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by the Project.

A Stakeholder Engagement Plan (SEP) has been developed, which describes how the Project shall engage external stakeholders during construction and operation, and how stakeholder engagement activities will be incorporated into the company's overall management system. Stakeholder engagement undertaken during this process included 19 project disclosure meetings with municipality and commune officials, and commune administrators and Sobas, as well as community members. Overall 97 people were involved in this process, amongst which 24% were women and 76% were men.

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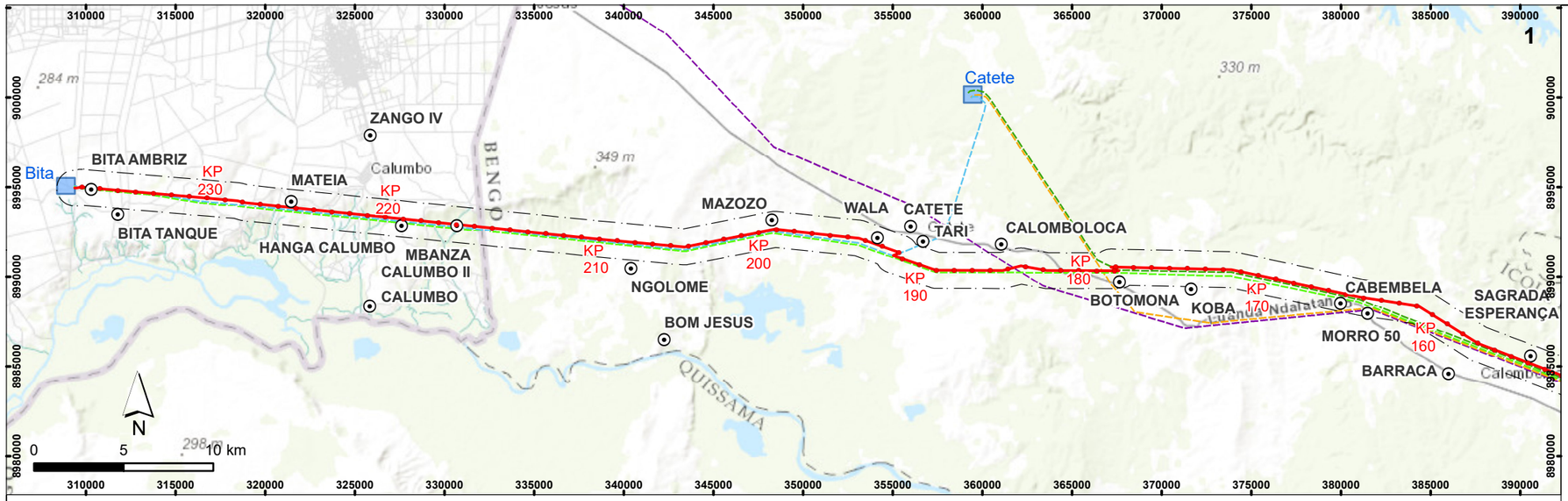
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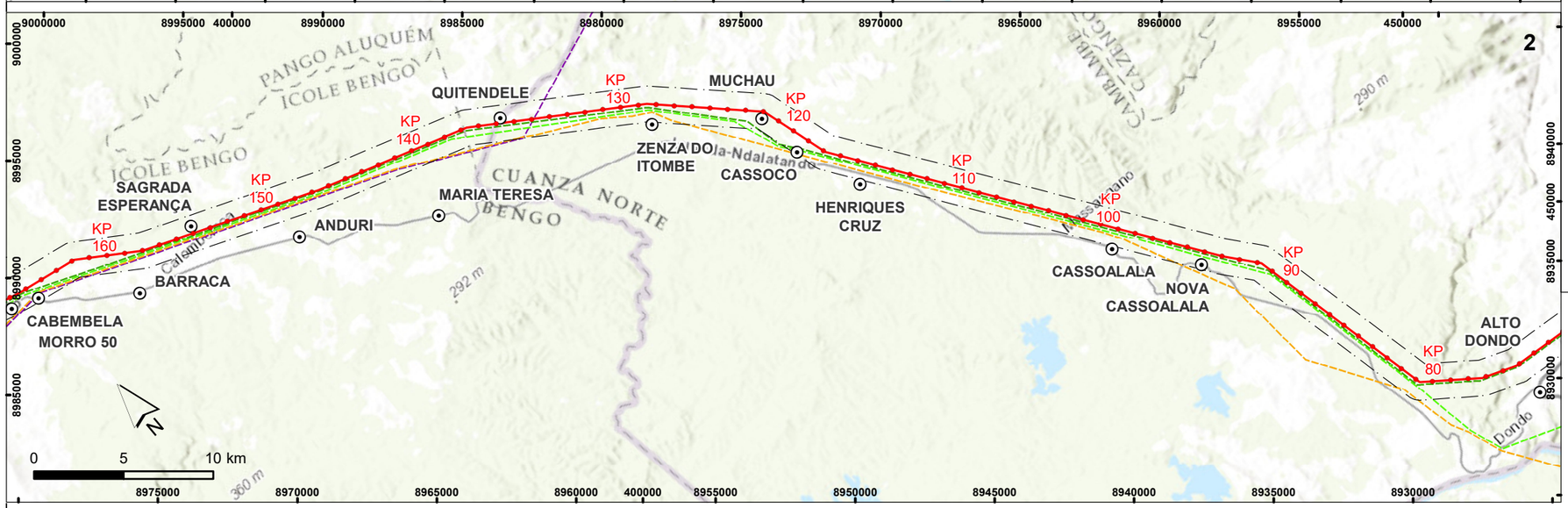
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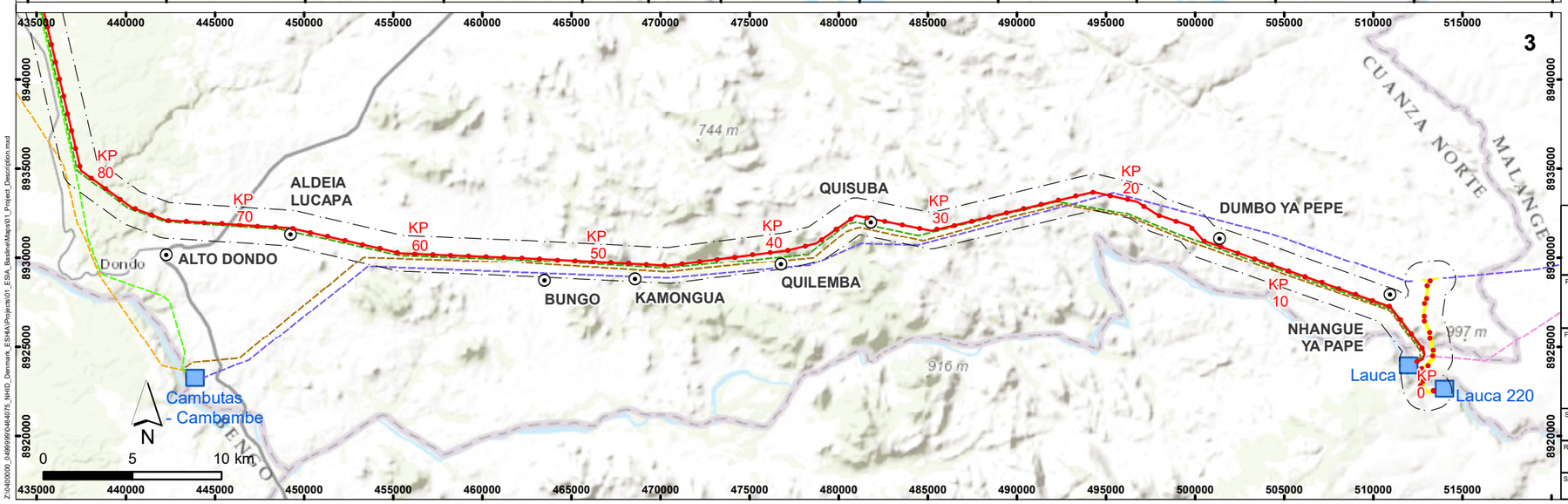
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Annex A

Maps



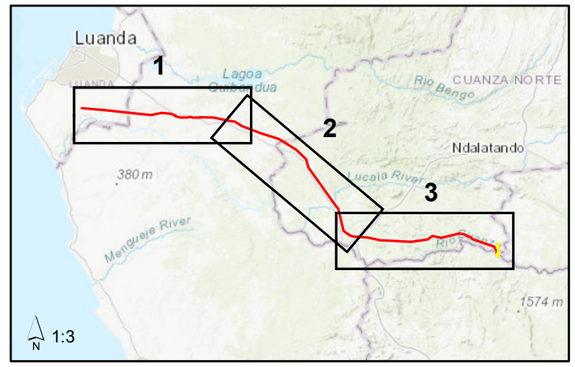




LEGEND

- KILOMETRE POST
- TRANSMISSION LINE 220KV
- TRANSMISSION LINE 400KV
- 2KM CORRIDOR
- CAMBAMBE - CATETE
- CAMBUTAS - BITA
- CAMBUTAS - CAPANDA
- CATETE - BITA
- LAUCA - CAMBUTAS
- LAUCA - CAPANDA
- LAUCA - CATETE
- LUCALA - VIANA
- EXISTING SUBSTATION
- COMMUNITY

Coordinate System: WGS 1984 UTM Zone 33S
Proiezione: Transverse Mercator
Datum: WGS 1984



Environmental Resources Management

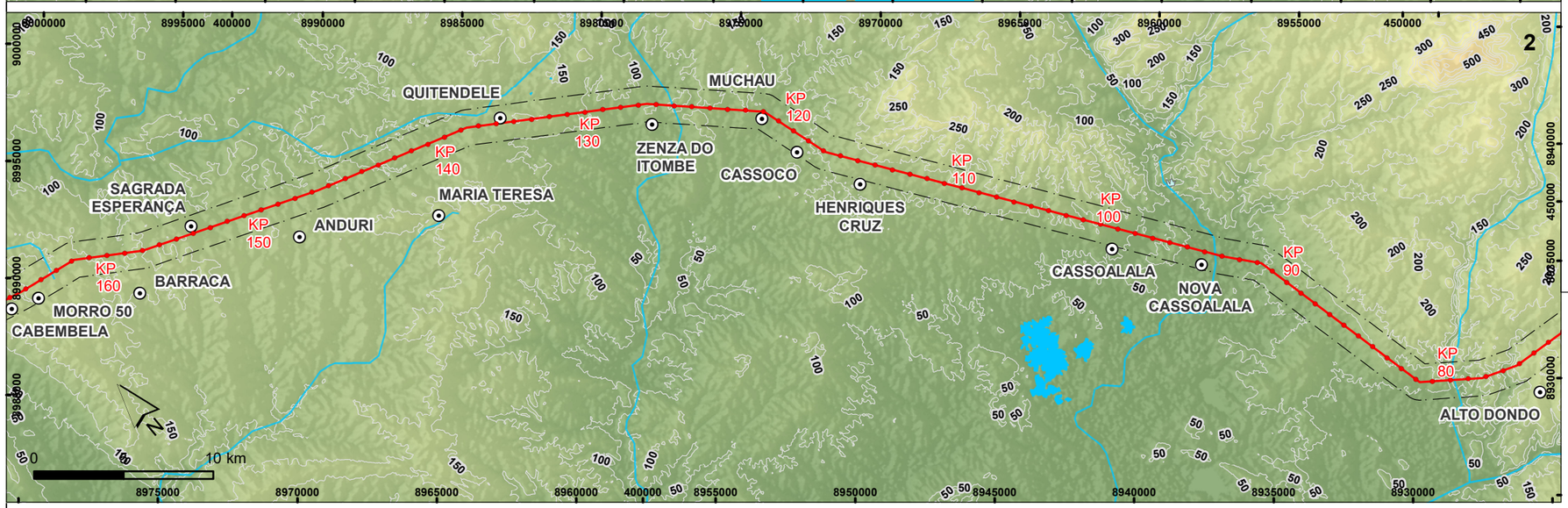
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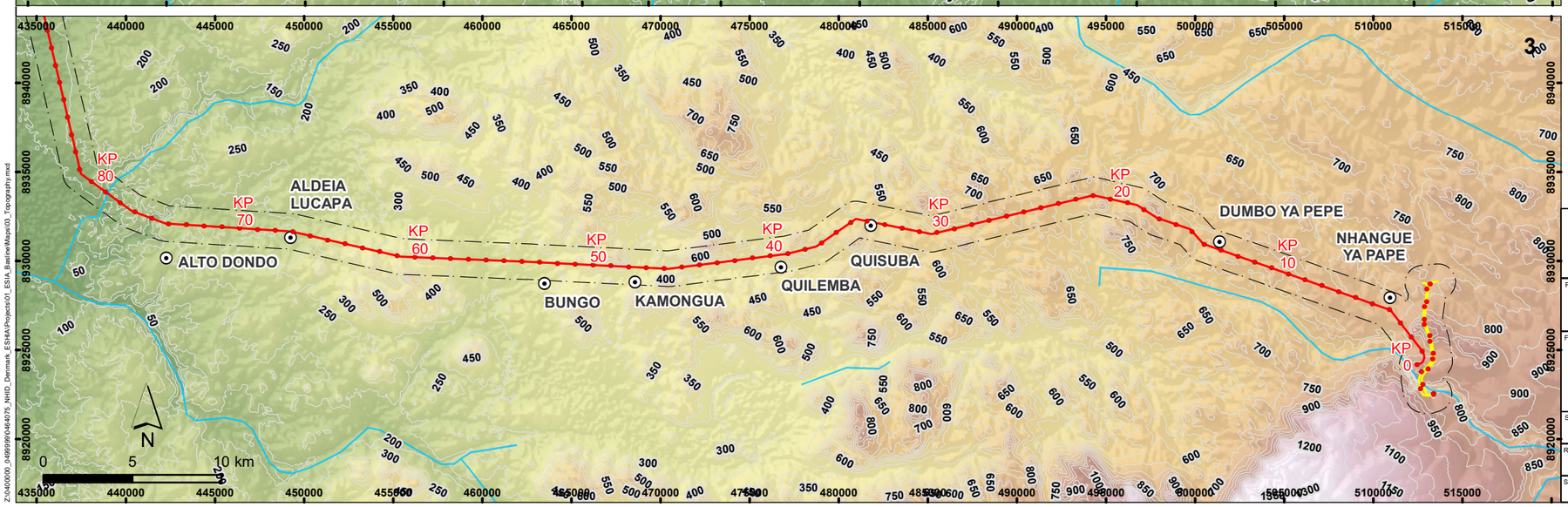
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECTION: WGS 1984 UTM Zone 33S







LEGEND

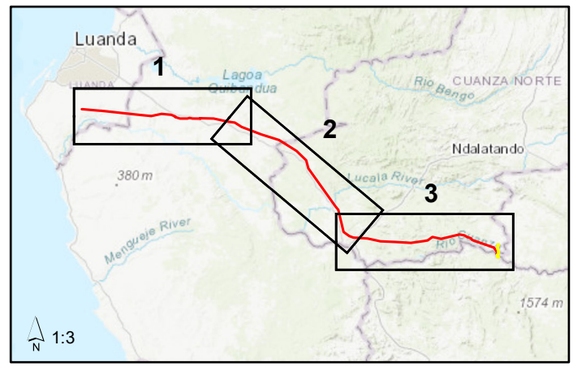
- KILOMETRE POST
- TRANSMISSION LINE 220KV
- TRANSMISSION LINE 400KV
- 2KM CORRIDOR
- COMMUNITY
- RIVER AND WATER BODY

TOPOGRAPHY (meters)

- 1600
- 1000
- 500
- 0

50m CONTOURLINE

Coordinate System: WGS 1984 UTM Zone 33S
Proiezione: Transverse Mercator
Datum: WGS 1984



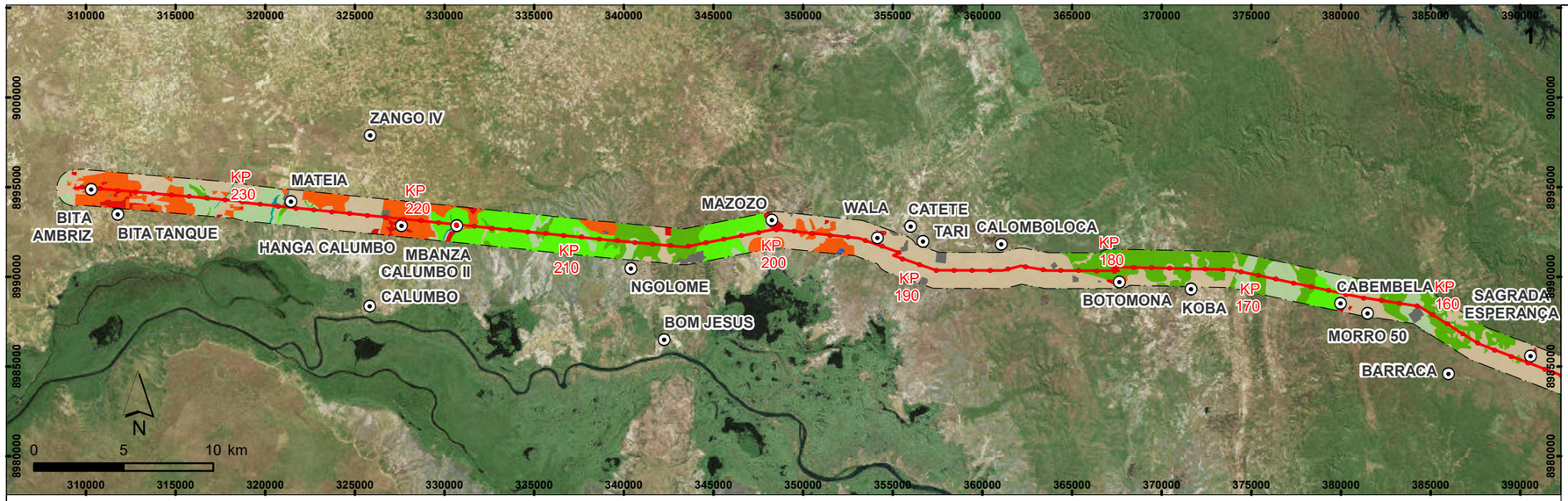
Environmental Resources Management

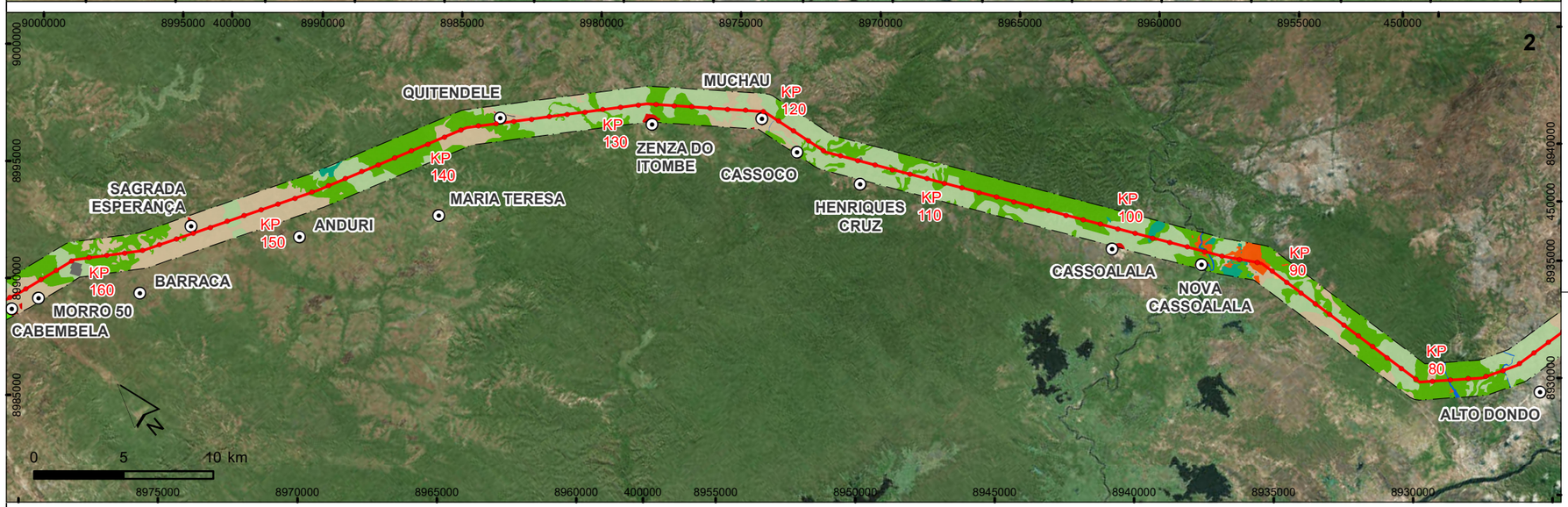
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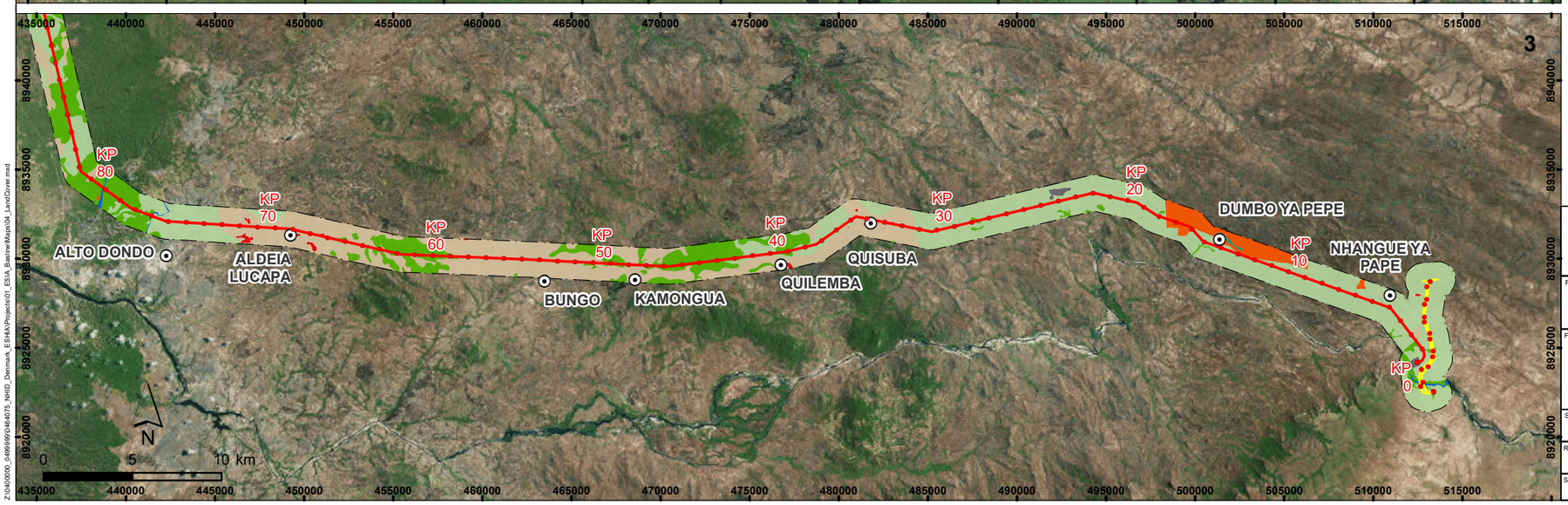
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECTION: WGS 1984 UTM Zone 33S







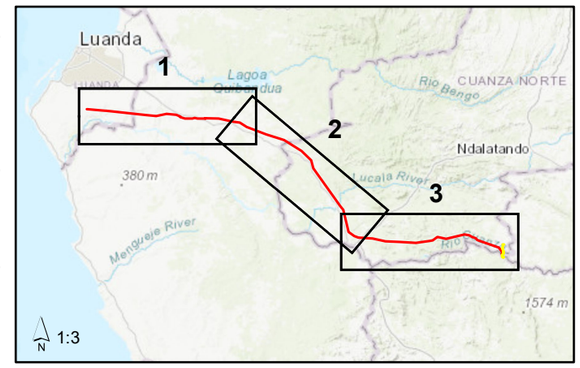
LEGEND

- KILOMETRE POST
- TRANSMISSION LINE 220KV
- TRANSMISSION LINE 400KV
- 2KM CORRIDOR
- COMMUNITY

LAND COVER CLASSES

- MOSAIC AGRICULTURE
- MOSAIC VEGETATION
- FOREST
- WETLAND
- BARELAND
- SAVANNAH
- SAVANNAH WITH AGRICULTURAL PATCHES
- INDUSTRIAL AREAS
- RESIDENTIAL AREAS
- WATER

Coordinate System: WGS 1984 UTM Zone 33S
Proiezione: Transverse Mercator
Datum: WGS 1984



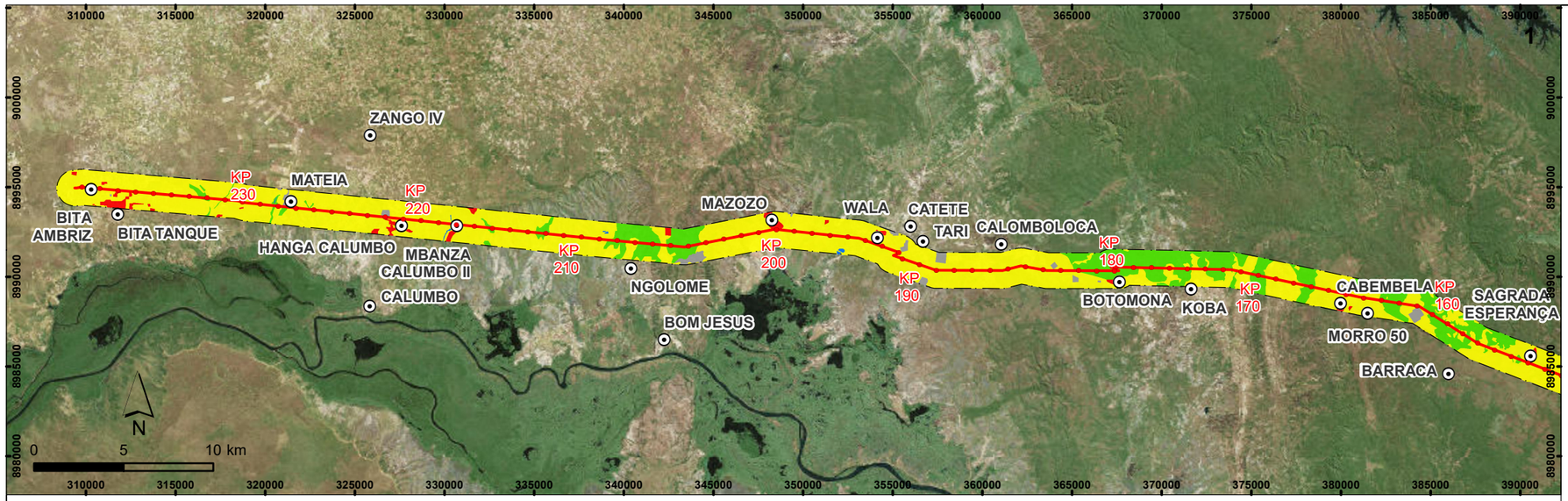
Environmental Resources Management

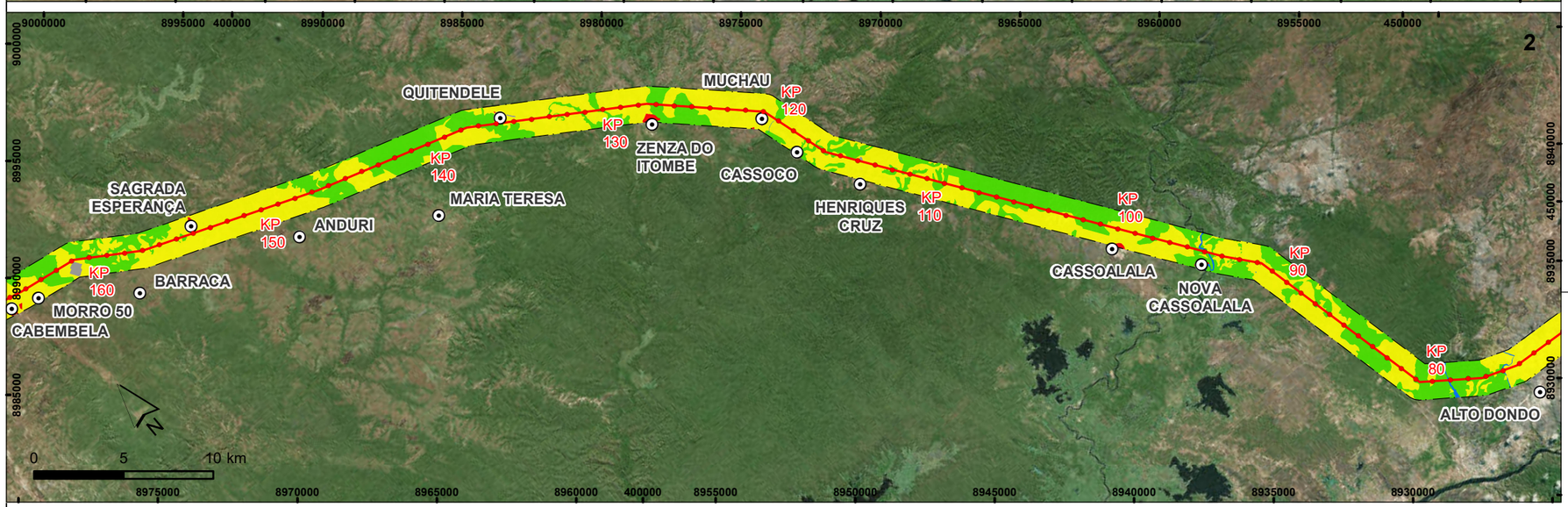
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Revision: 00	Date: gen 2019		
Size: A3	Layout: -	Drawn by: MAR	PjM: RF
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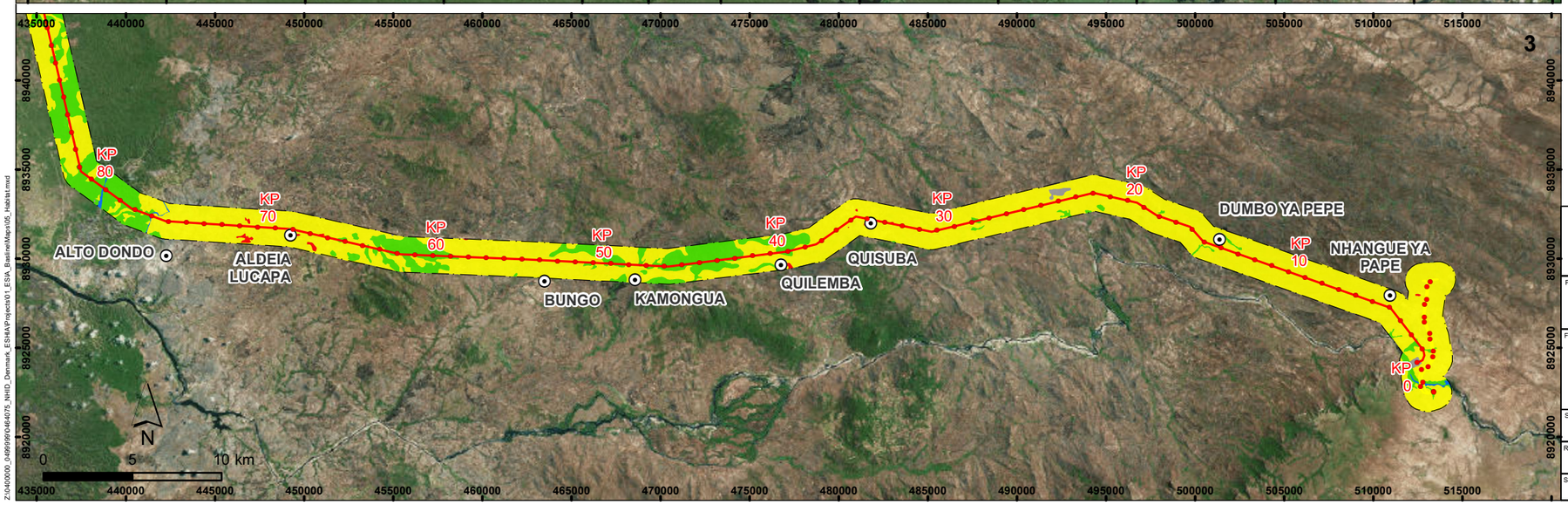
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECTION: WGS 1984 UTM Zone 33S







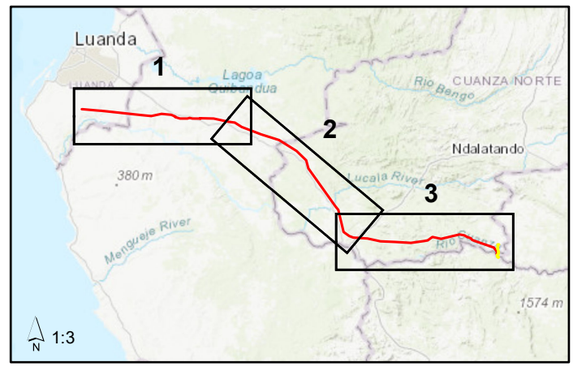
LEGEND

- KILOMETRE POST
- TRANSMISSION LINE 220KV
- TRANSMISSION LINE 400KV
- 2KM CORRIDOR
- COMMUNITY

HABITAT CLASSES

- NATURAL HABITAT
- MODIFIED HABITAT
- WATER
- RESIDENTIAL AREAS
- INDUSTRIAL AREAS

Coordinate System: WGS 1984 UTM Zone 33S
Proiezione: Transverse Mercator
Datum: WGS 1984



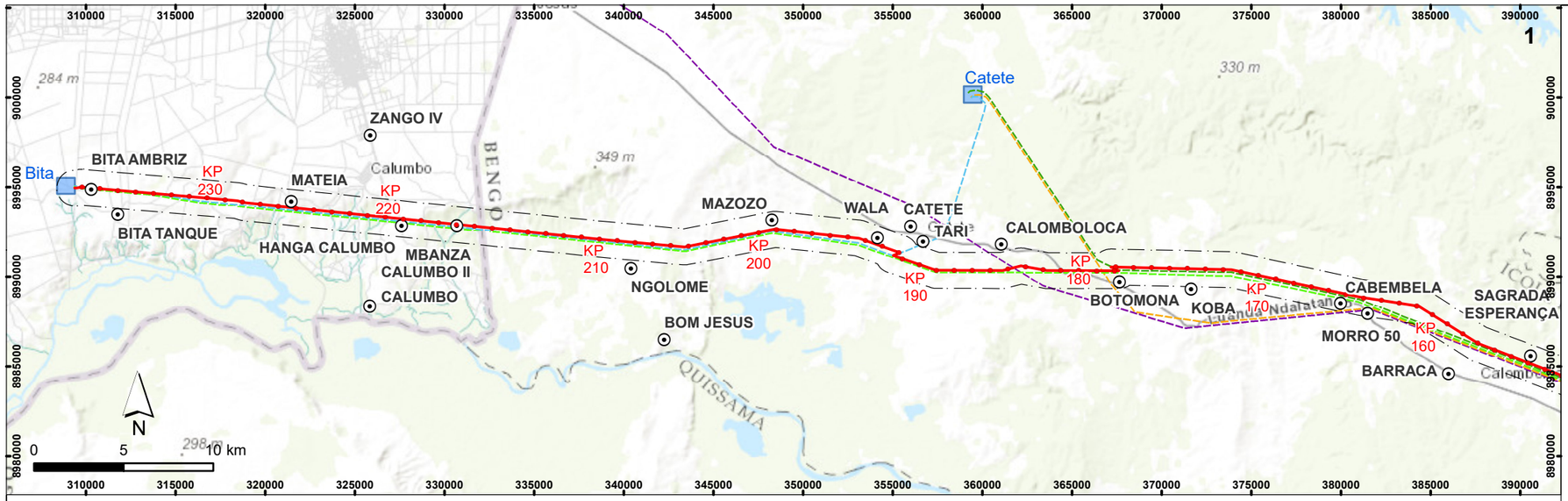
Environmental Resources Management

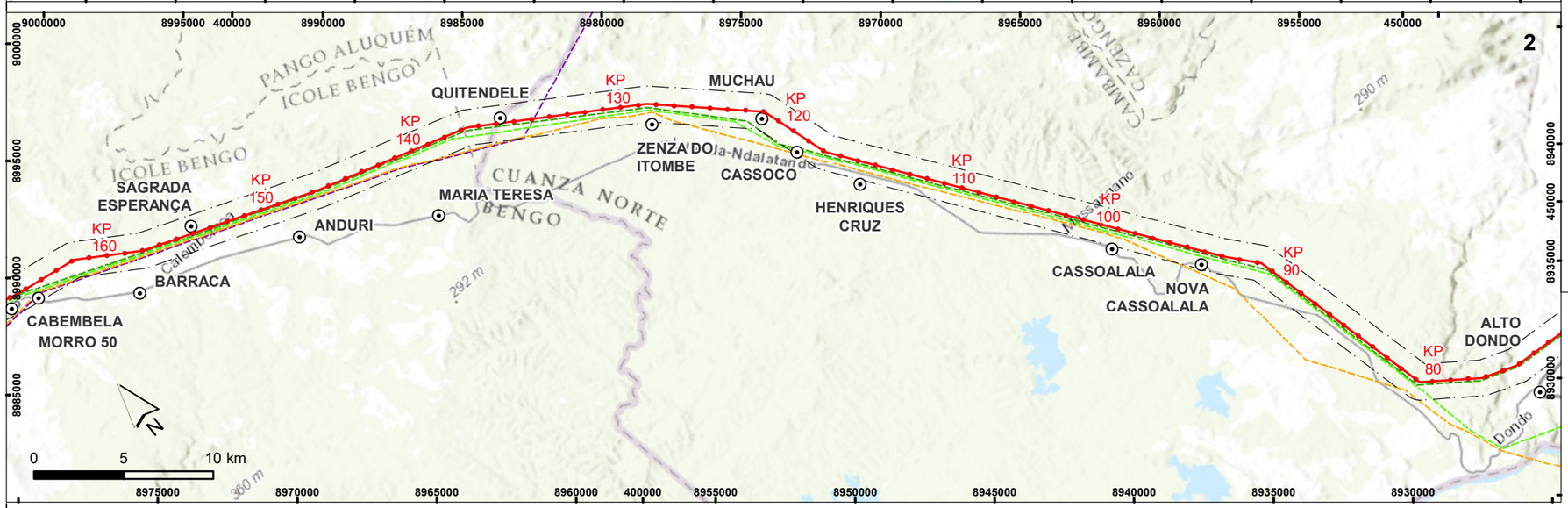
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Client: NHID	
Revision: 00	Date: gen 2019
Size: A3	Layout: -
Drawn by: MAR	PjM: RF
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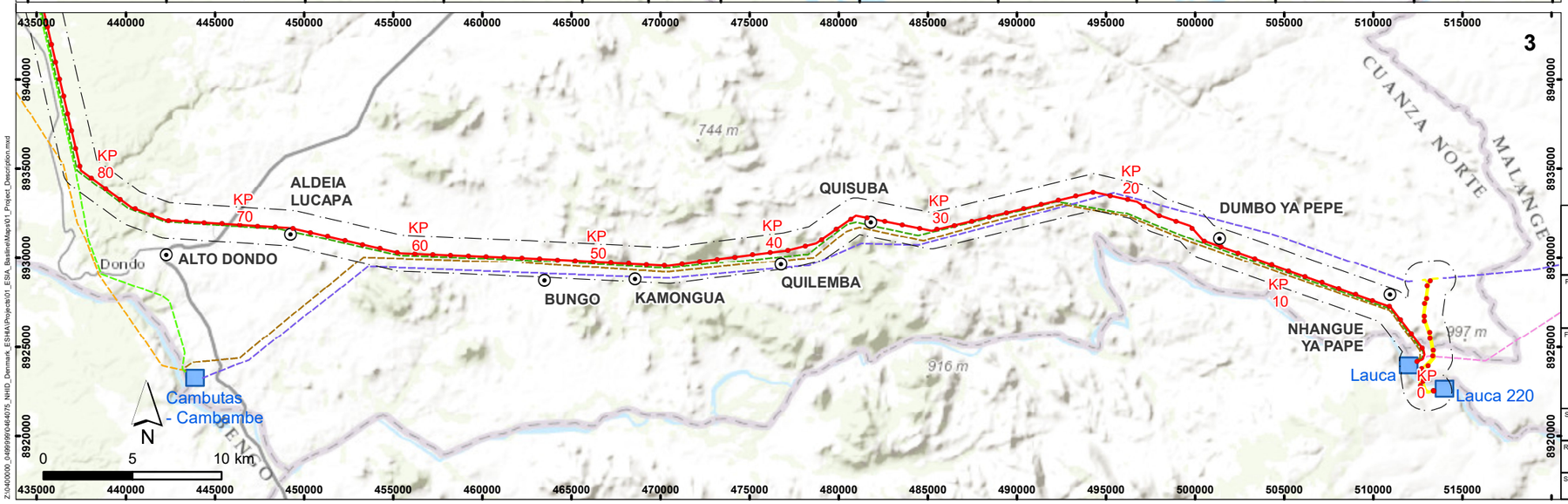
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECTION: WGS 1984 UTM Zone 33S



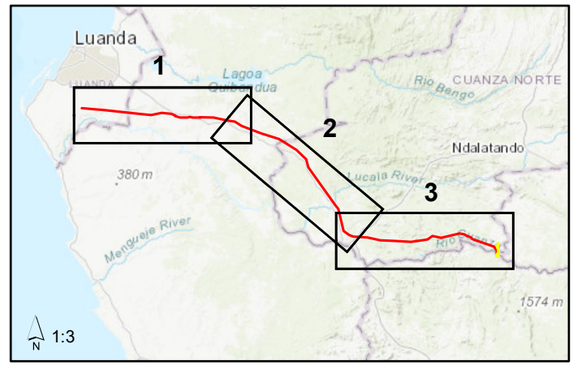




LEGEND

- KILOMETRE POST
- TRANSMISSION LINE 220KV
- TRANSMISSION LINE 400KV
- 2KM CORRIDOR
- CAMBAMBE - CATETE
- CAMBUTAS - BITA
- CAMBUTAS - CAPANDA
- CATETE - BITA
- LAUCA - CAMBUTAS
- LAUCA - CAPANDA
- LAUCA - CATETE
- LUCALA - VIANA
- EXISTING SUBSTATION
- COMMUNITY

Coordinate System: WGS 1984 UTM Zone 33S
Proiezione: Transverse Mercator
Datum: WGS 1984



Environmental Resources Management

Project	Laúca-Bita Transmission Line Project *Angola*
Figure: 01	Project Description Map
Scale: 1:300	Project Number: 0464075
Revision: 00	Date: gen 2019
Client: NHID	
Size: A3	Layout: -
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECTION: WGS 1984 UTM Zone 33S

Annex B1

Project Modifications (NHID, 2018)

NHID

November 2018

Sistema de Transporte Associado com o Desenvolvimento Hidrolétrico de Laúca
LT 400 kV Laúca-Bita
Line Route Modification



Laúca-Bita 400 kV Transmission Line Route Modification Report

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1. Introduction

This report describes the proposed modifications for the Right of Way (ROW) of the 400 kV single circuit overhead transmission line Laúca - Bita.

It includes all diversions resulting from the interference with existing and contracted lines that will be constructed in the short term, interference with existing villages, swamp areas, and coordination requirements with parallel lines.

2. Proposed Line Modifications

2.1. Modification 1 - Entrance to CH Laúca

In order to avoid crossings between the 400 kV lines at CH Laúca, the Laúca -Bita line should be connected to the existing 400 kV Module No. 2 (currently equipped and connected to Capanda Elevadora).

Consequently, the Laúca -Capanda line will be diverted between MV0 and MV2 and will be connected to Module No. 1 (currently unequipped space). Module 1 will be constructed by NHID (whereas the existing Module 2 which will have been freed will be used by NHID to connect its line to it).

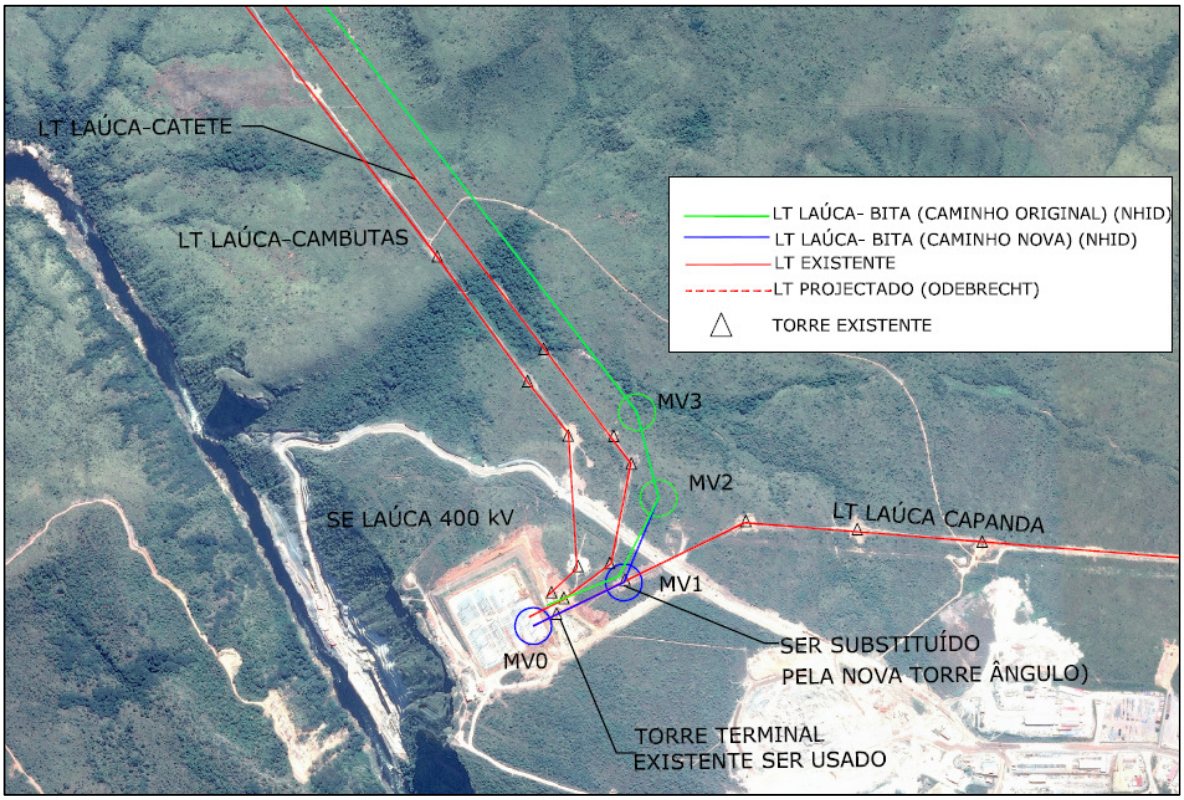


Figure 1: Modification 1 - Entrance to CH Laúca

2.2. Modification 2 – Interference with the Existing 400 kV Laúca - Catete Line and 220 kV Cambambe - Capanda Line

The original route of the 400 kV line Laúca -Bita is modified between Vertices MV5 and MV10 for the following reasons:

- Intersection and overlapping with the existing 400 kV Laúca –Catete line between Vertices MV5 and MV9 (noting that the latter had already been displaced slightly to the north, to avoid the future basin of the Caculo Cabaça dam)
- Intersection with the existing 220 kV Cambambe - Capanda line between Vertices MV5 and MV6 Consequently, Laúca-Bita 400 kV line route should be modified to avoid this interference.
- Getting the 400 kV Laúca – Catete and Laúca -Bita lines Vertices MV9 and MV10 closer together, thereby optimizing on the combined Right of Way, easing future maintenance to the Operator's personnel, and allowing for usage of the same access roads to the new constructed line

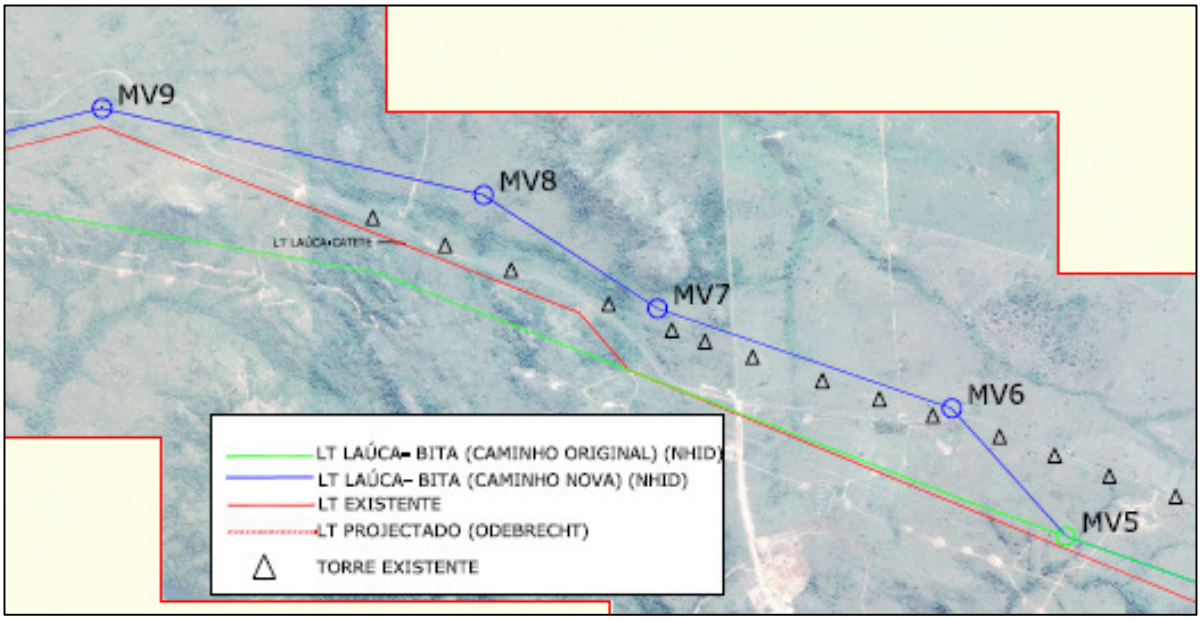


Figure 2a: Modification 2 – Interference with existing 400 kV Line Laúca - Catete and 220 kV Line Cambambe-Capanda

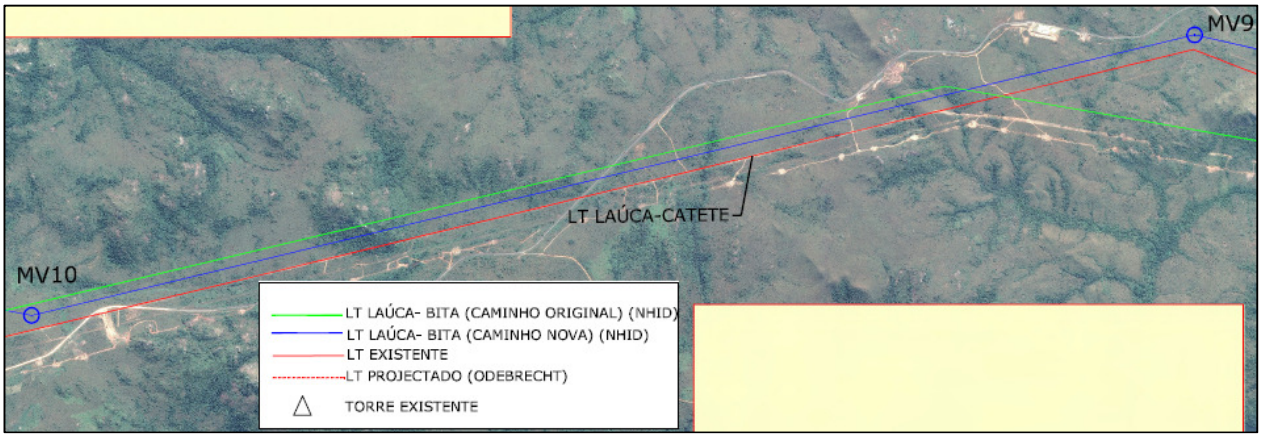


Figure 2b: Modification 2 – Interference with Existing 400 kV Line Laúca - Catete and 220 kV Line Cambambe-Capanda

2.3. Modification 3 – Interference with Quisuba Village

The route of the line Laúca - Bita is modified further west between MV10 and MV11 to avoid passing through Quisuba village and its residences.

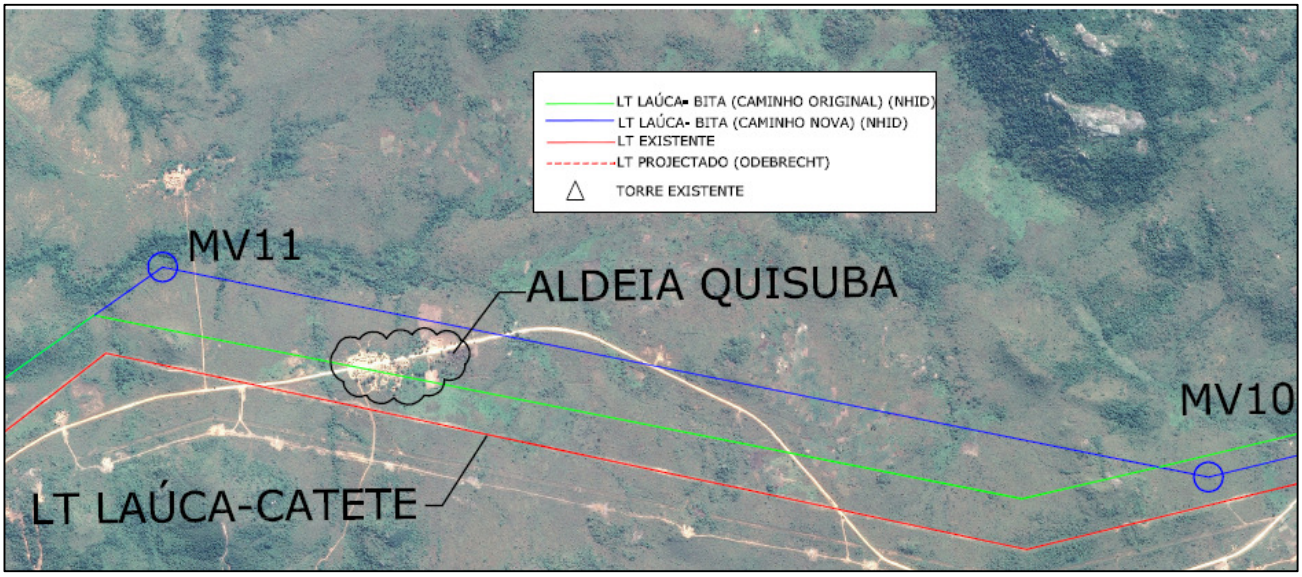


Figure 3: Modification 3 – Interference with Quisuba Village

2.4. Modification 4 – Conveying the 400 kV Laúca -Bita Line Closer to the Existing Route of the Existing 400 kV Laúca –Catete Line

Laúca -Bita line route is modified between MV17 and MV20 to become closer to its paralleled existing Laúca -Catete line, considering that this will optimize on the corridor width, thereby freeing more space to the side, and it will make maintenance inspections in the future easier for the Operator, who will become able to monitor two lines visually more easily. Finally, it will also make Laúca -Bita line in some places closer to some existing access roads.

For this line section, the distance between the existing Laúca -Catete and Laúca -Bita lines is reduced from an average of 700m to 100 m.

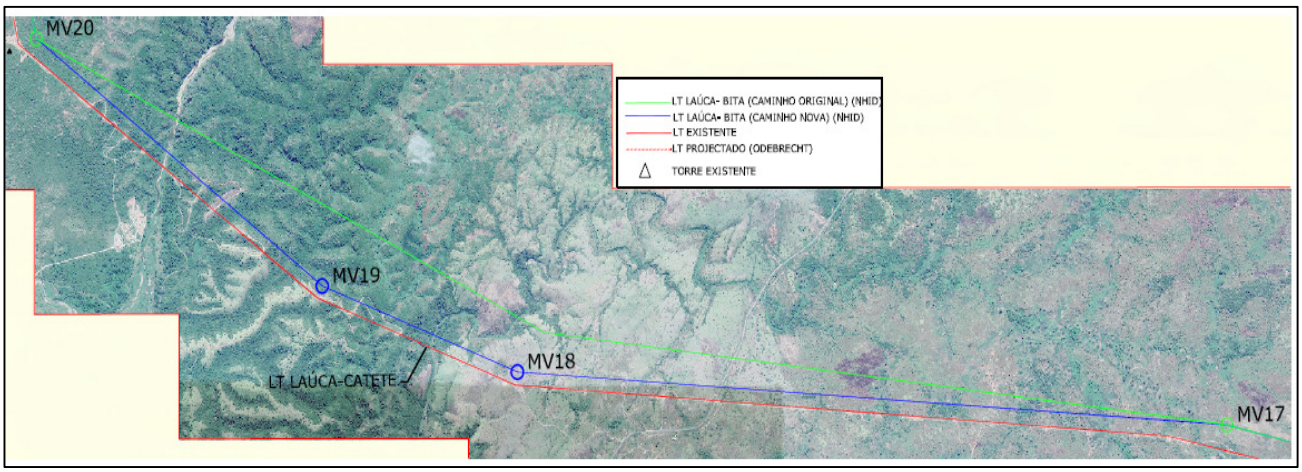


Figure 4: Modification 4 – Conveying the 400 kV Line Laúca -Bita Closer to Existing Route of the Existing 400 kV Line Laúca -Catete

2.5. Modification 5 – Avoiding Wetland Area

Laúca - Bita line route is also modified between MV21 and MV23 to avoid the swamp area near Cassolala. The updated line route will pass parallel to the exiting 400 kV Laúca –Catete line.

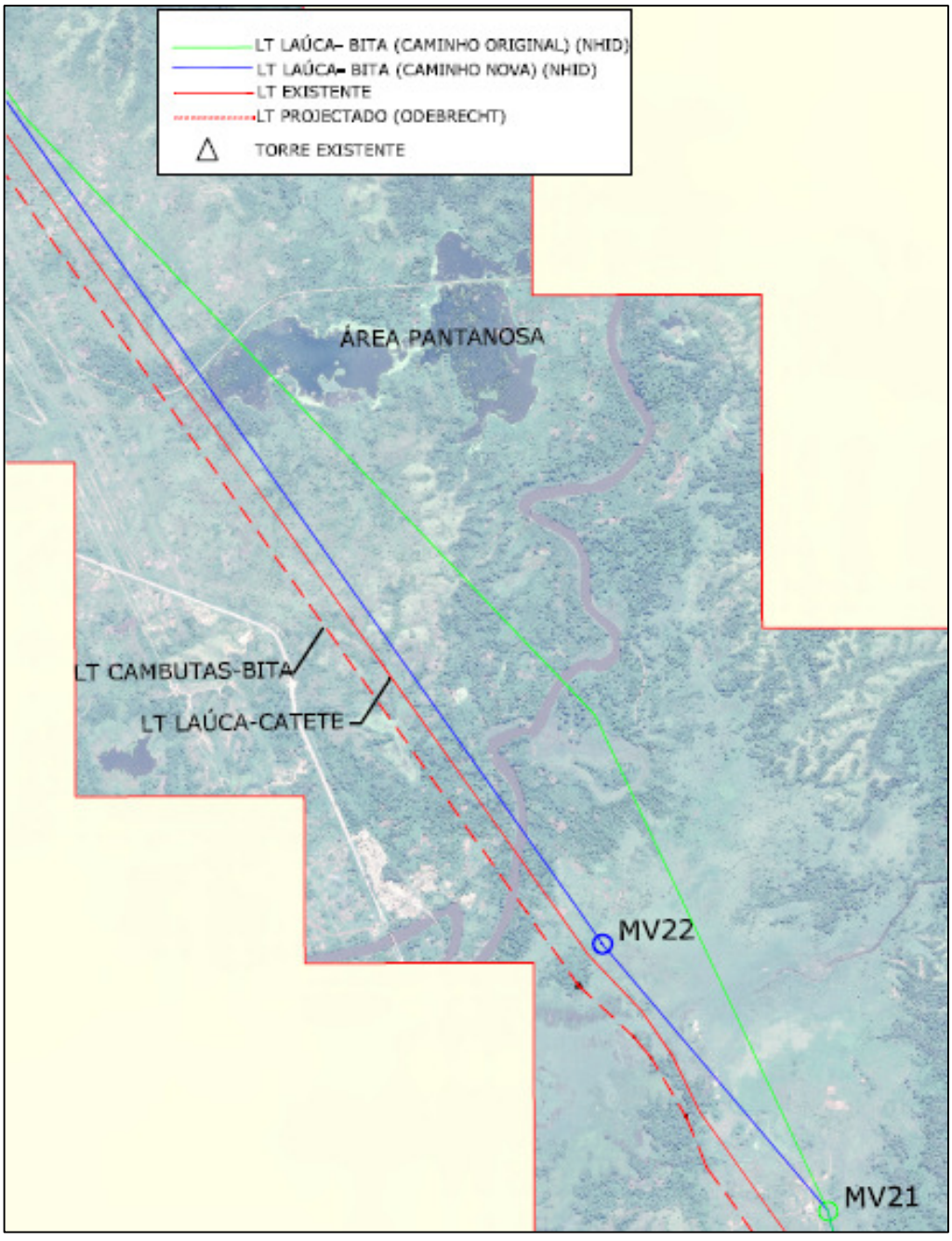


Figure 5: Modification 5 – Avoiding Wetland Area

2.6. Modification 6 – Interference with Muchau Village

The route of the 400 kV Laúca - Bita line is modified between MV23 and MV25 to avoid passing through Muchau village and avoid interference with the houses.

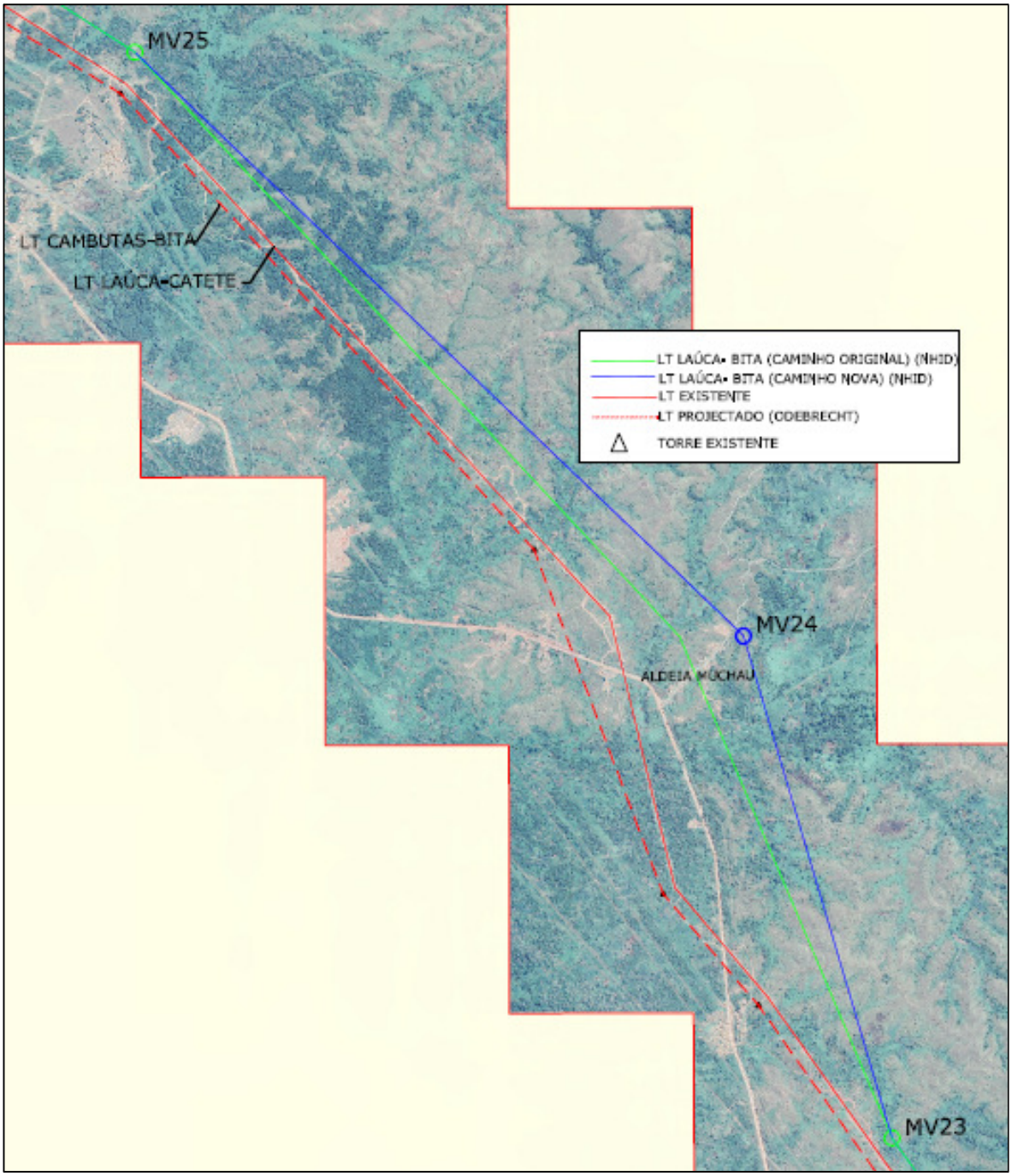


Figure 6: Modification 6 – Interference with Muchau Village

2.7. Modification 7 – Conveying the 400 kV Laúca –Bita Line Closer to Existing Route of the 400 kV Laúca –Catete Line

Laúca -Bita line is modified between MV26 and MV28 to be closer to its paralleled existing Laúca -Catete line, for the same reasons mentioned in Section 2.4 above.

For this line section, the distance between the existing Laúca -Catete line and Laúca -Bita lines is reduced from an average of 350m to 100 m.

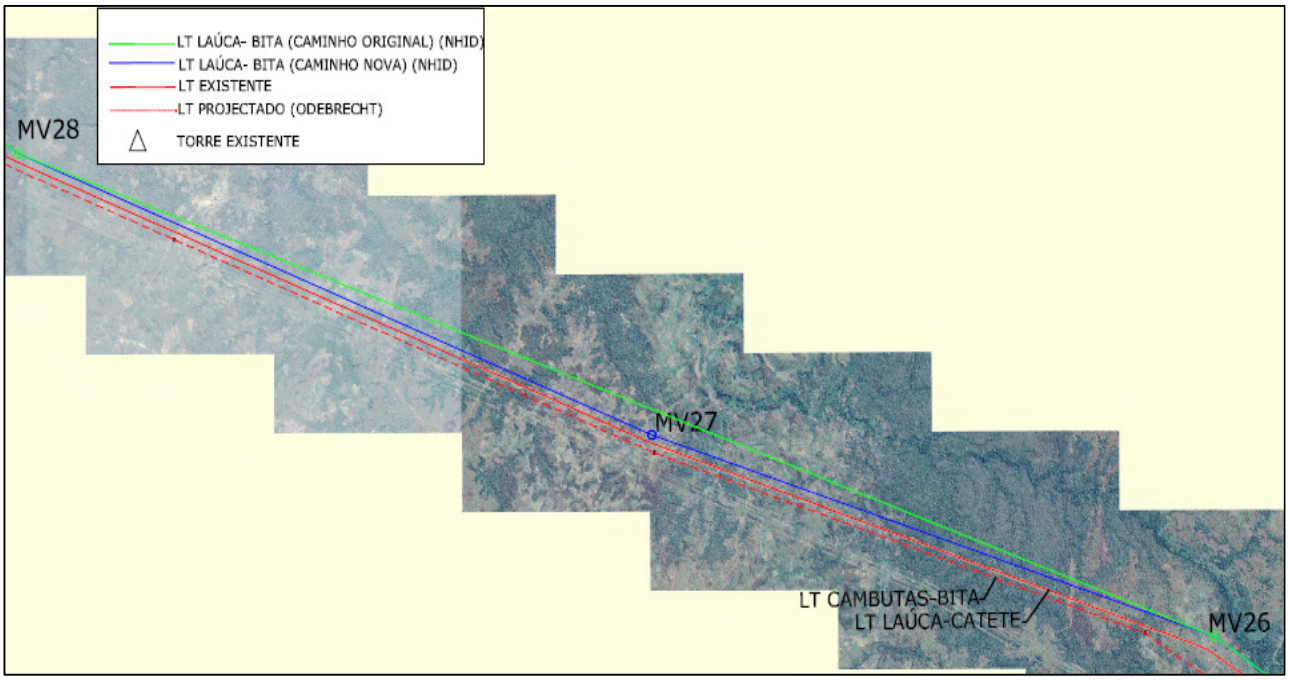


Figure 7: Modification 7 – Conveying the 400 kV Line Laúca -Bita Closer to Existing Route of the 400 kV Line Laúca -Catete

2.8. Modification 8 – Swapping with the Existing 400 kV Laúca -Catete Line

Laúca -Bita line is modified between MV31 and MV33 in order to avoid crossing with Laúca -Catete existing 400 kV line.

Laúca -Bita line will be connected to the existing Laúca -Catete line at Vertex MV32 and continue towards Catete Substation (using the already installed towers and lines, by Messrs. GAMEK/Odebrecht). In addition, Laúca -Bita line will connect to Laúca -Catete line at Vertex MV33 and continue towards Bita Substation.

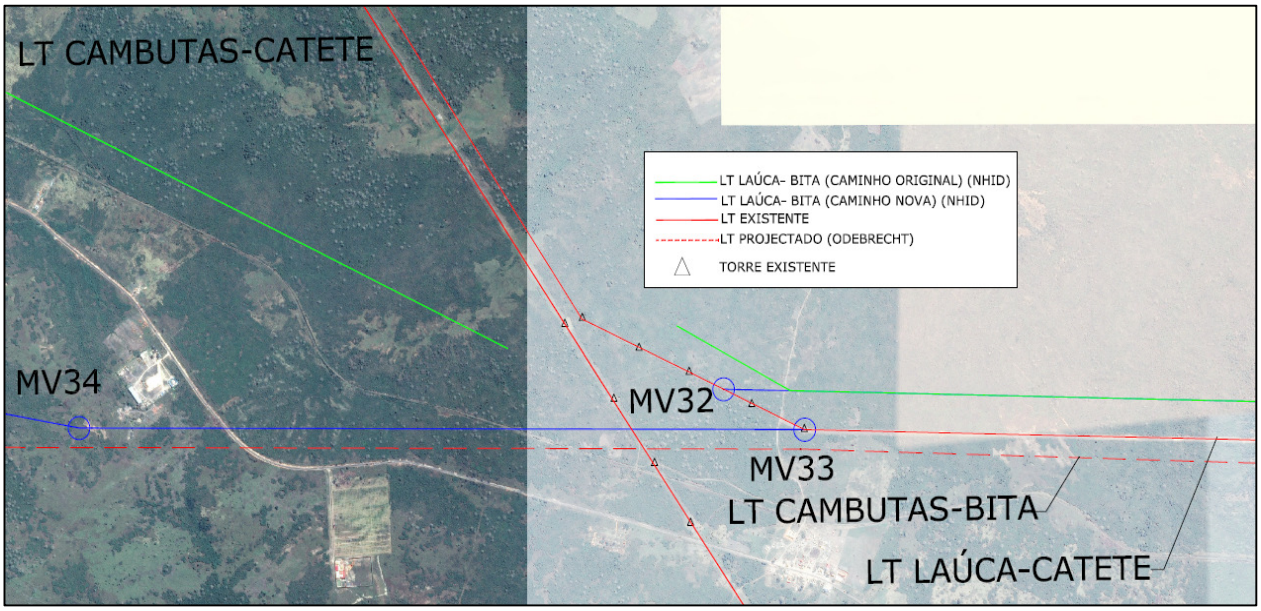


Figure 8: Modification 8 – Swapping with the Existing Laúca –Catete 400 kV line

2.9. Modification 9 – Conveying the 400 kV Laúca –Bita Line Closer to Existing Route of the 400 kV Cambutas-Bita Line

Laúca -Bita line is modified between MV33 and MV38 towards the south to become closer to the contracted, and soon to be constructed by Messrs. GAMEK/Odebrecht, Cambutas-Bita line. This will also result in the facilitation of the connection to Laúca -Catete and Catete-Bita lines and avoid passage over private and fenced lands.

Also, it should be noted that the Laúca -Bita line will in this part inevitably cross over one 400 kV and three 220 kV existing lines between MV35 and MV36, which are:

- 400 kV Lucala- Viana
- 220 kV Catete-Camama
- 220 kV Catete-Viana
- 220 kV Cambambe-Viana

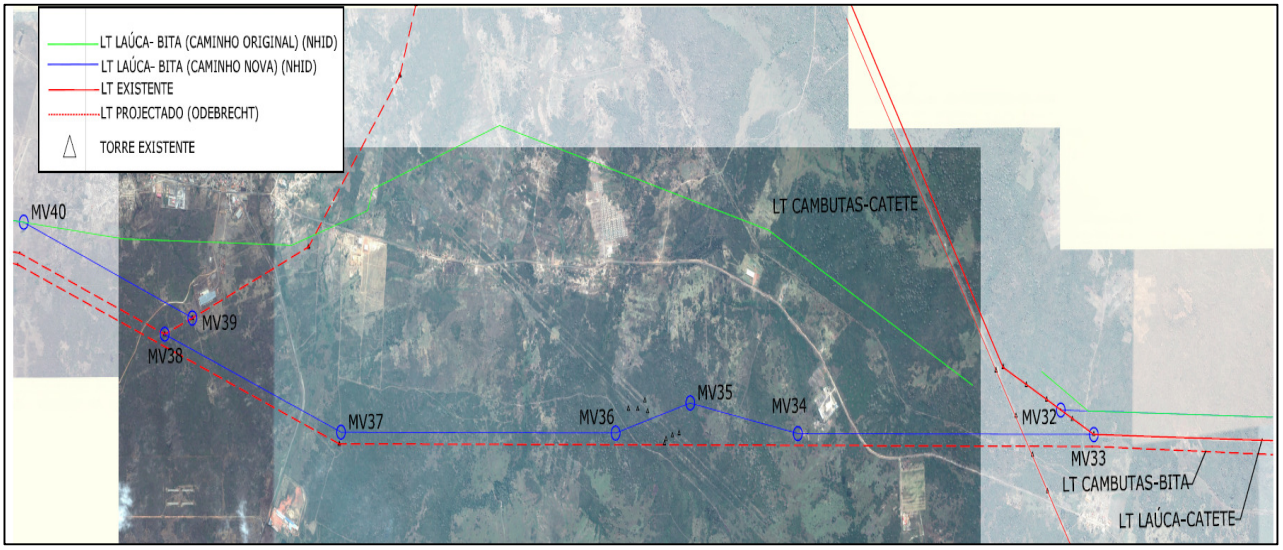


Figure 9: Modification 9 – Section Between the Swapping with Existing 400 kV line Laúca -Catete and Under Construction 400 kV Catete-Bita Lines

2.10. Modification 10 – Swapping with Planned Catete-Bita Line

Laúca -Bita line is modified between MV38 and MV40 in order to avoid crossing with Catete-Bita 400 kV planned line.

Laúca -Bita line will connect to the planned Catete-Bita line at Vertex MV39 and continue towards Catete Substation (through the towers and conductors that will be or will have been installed by Messrs. GAMEK/Odebrecht). In addition, Laúca -Bita line will be connected to the soon to be constructed Catete-Bita line at Vertex MV38 and continue towards Bita Substation.

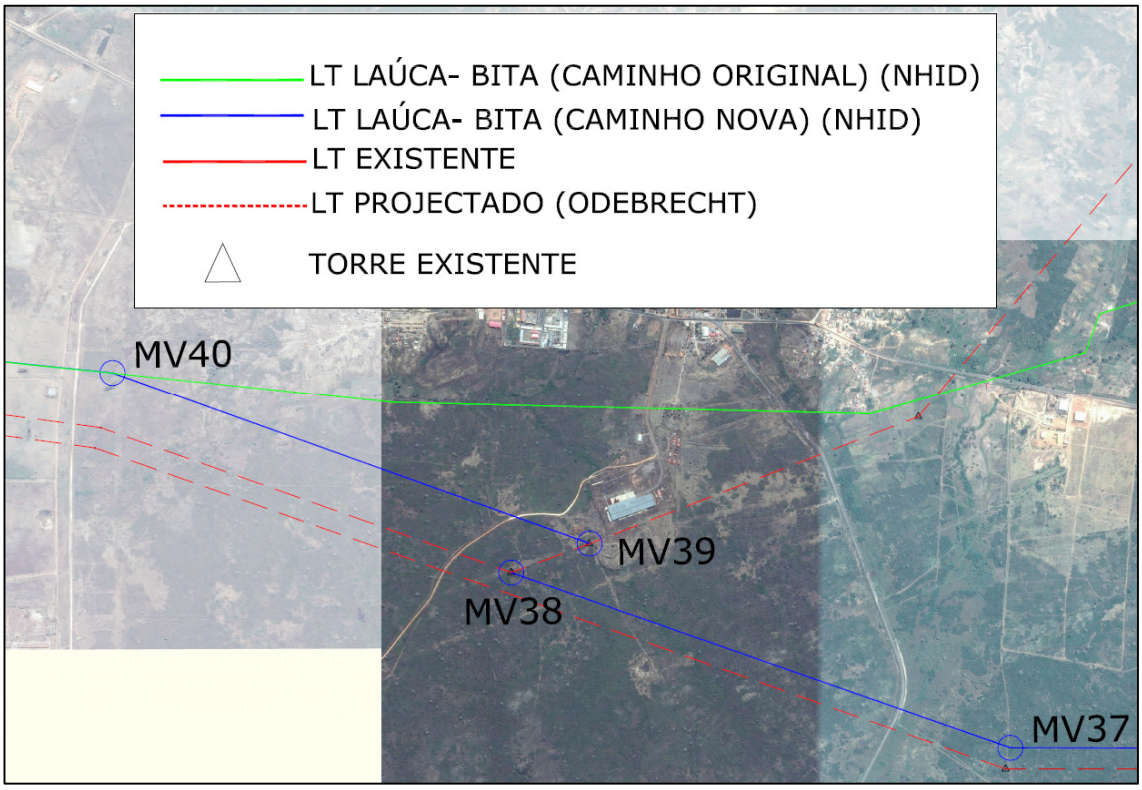


Figure 10: Modification 10 – Swapping with Planned Catete-Bita 400 kV line

2.11. Modification 11 – Crossing with Existing Lines Near Cement Factory

Laúca -Bita line is modified between MV41 and MV43 in order to ensure proper crossing over the span of the existing conductors rather than crossing directly above the existing 220 kV and 60 kV towers themselves. The lines in question are:

- 220 kV Catete – Ramiros
- 60 kV Catete – Bom Jesus
- 60 kV Catete – Cement Factory

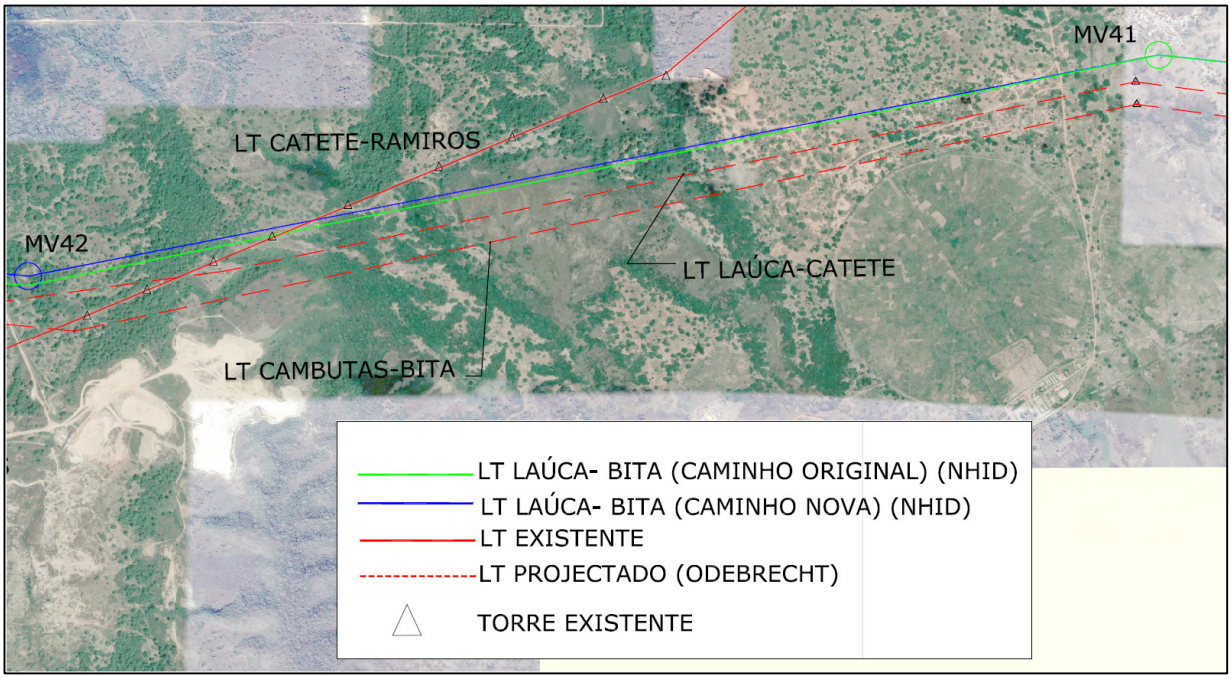


Figure 11A: Modification 11 – Crossing with Existing Lines Near Cement Factory

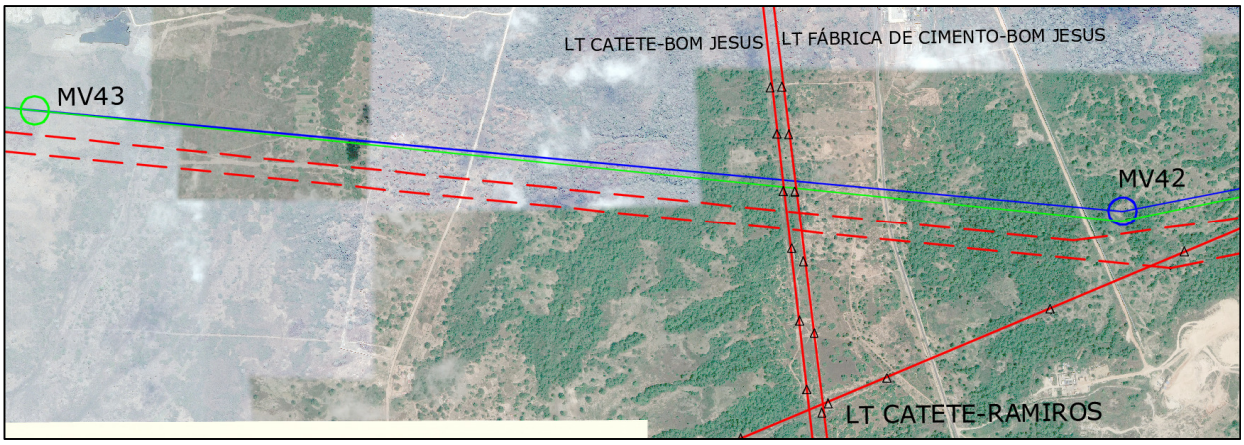


Figure 11B: Modification 11 – Crossing with Existing Lines Near Cement Factory

2.12. Obstacle – Interference with Private Land

Laúca -Bita line is crossing over the southwest corner of private land between MV43 and MV44. This crossing needs coordination with Messrs. GAMEK/Odebrecht, and the respective landowners, noting that not only Laúca – Bita but also the planned Catete-Bita and Cambutas-Bita will also require a similar and minor route adjustment. In case the landowner accepts this minor interference, then the routes of all three lines may stay as is.

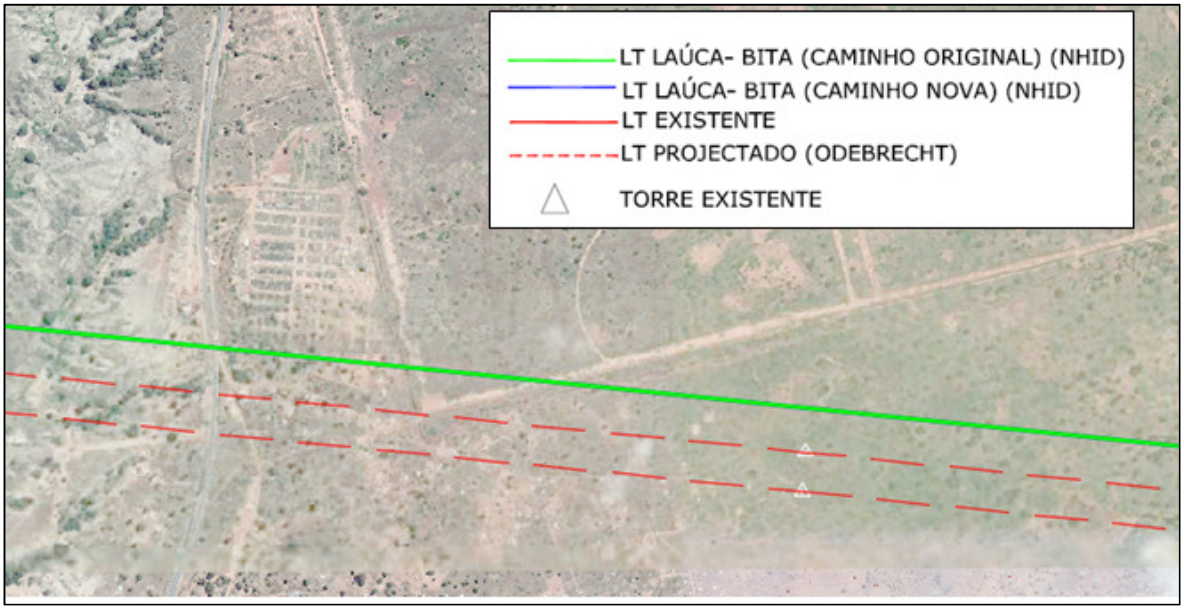


Figure 12: Interference with Private Land

2.13. Modification 12 – Entrance to the Planned Bita Substation

Laúca -Bita line is modified between MV44 and MV47 in order to enter to the 400 kV Module L7 at Bita Substation and avoid crossing with the planned 400 kV lines.

The entrance to the planned Bita substation at MV47 should be in due time coordinated with the contractor of SE Bita, Messrs. GAMEK/Odebrecht, and the other two 400 kV lines as the latter should follow a similar arrangement and make a slight oblique shift for his two lines towards the south at the entrance of Bita substation to enter Modules L5 and L6. With this ultimate arrangement, the two extreme Modules No. L4 and L8 will remain free, thereby allowing for future unobstructed connections to the north and south respectively, should a future need arise.

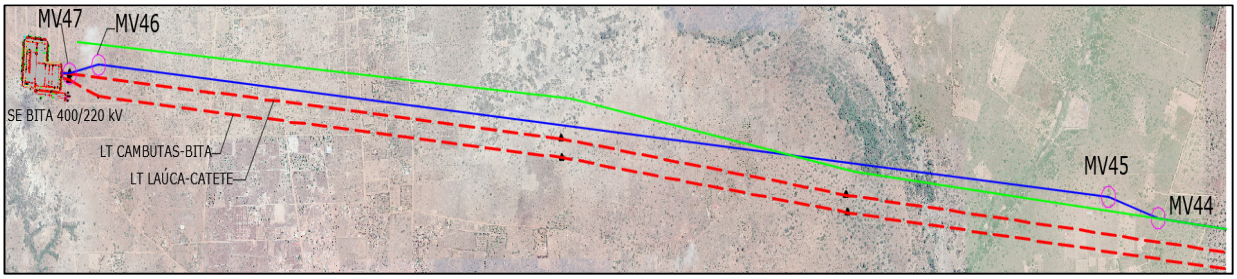


Figure 13a: Modification 12 – Entrance to SE BITA

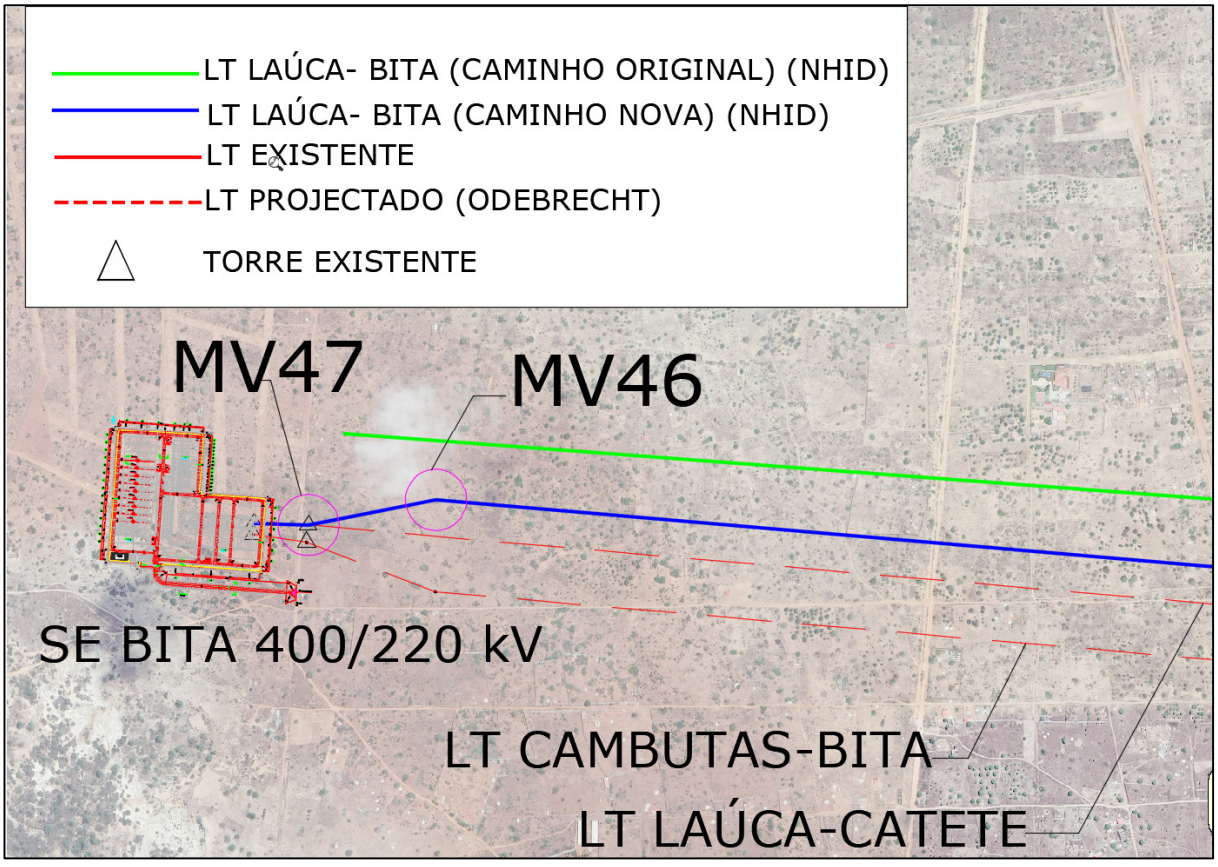


Figure 13b: Modification 12 – Entrance to the Planned Bita Substation

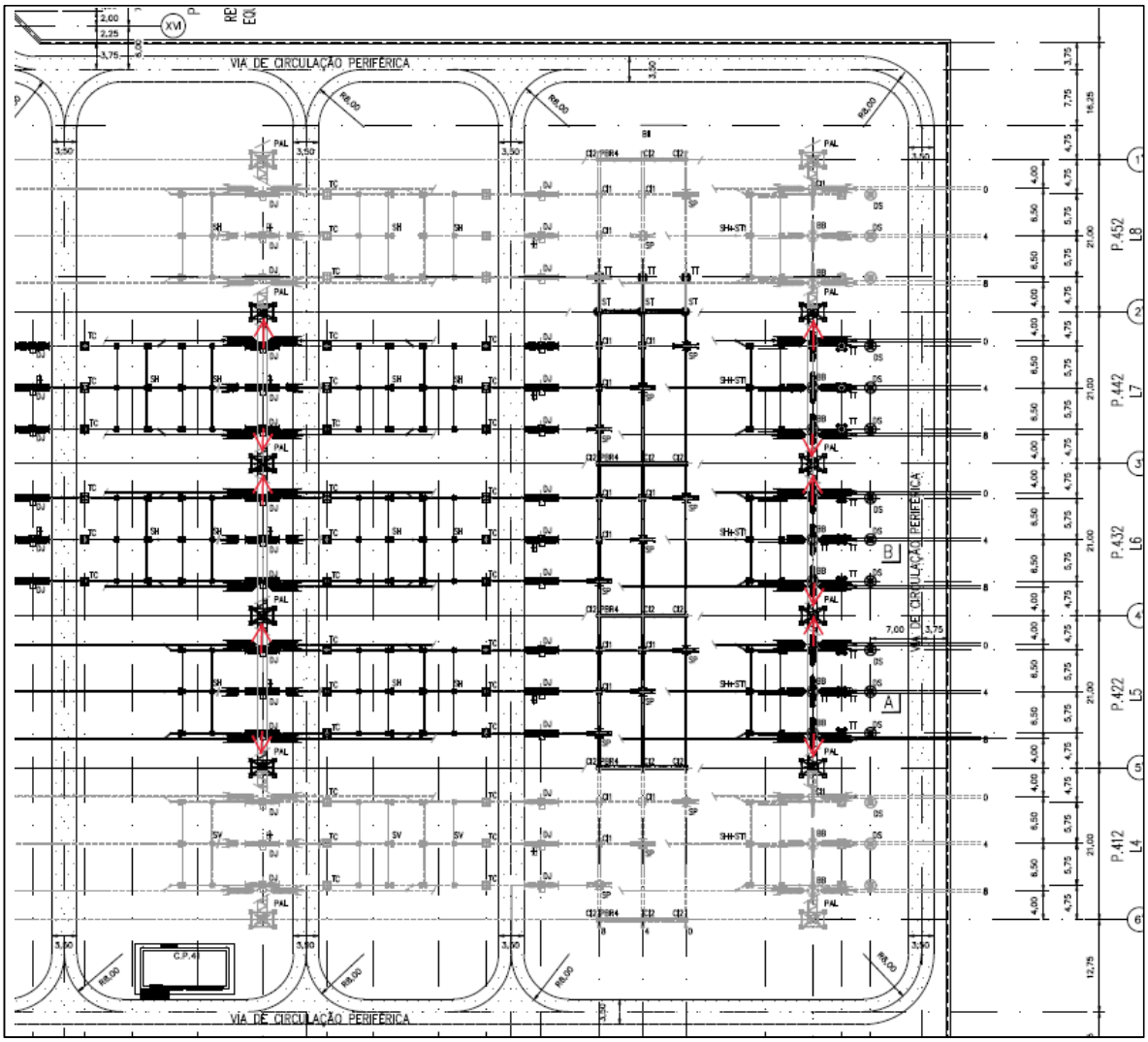


Figure 13c: Modification 12 –Planned Bita Substation 400 kV Switchyard Layout

Annex B2

Electric Field Strength, Magnetic Field Strength and Magnetic Flux Density Calculations

Linha simples a 400 kV e feixe duplo
Cálculo do Campo Eléctrico - Tensão máxima de serviço
(CIGRÉ , Working Group 36.01 (Interference and Fields))

Circuito a				
Condutor	**Diâmetro [m]**			
Sorbus	3,34E-02			
		Uc =	400,00	kV
C. Guarda	**Diâmetro [m]**	Us =	230,94	kV
19No9Awg	1,45E-02			

Corrente por fase

I = 1000 A

Tensão máxima de serviço

Uc = 420,00 kV

Us = 242,49 kV

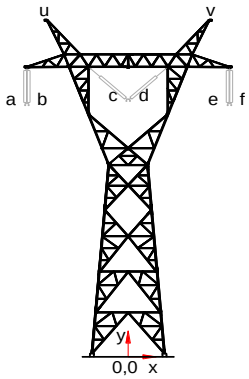
Distância ao solo miníma absoluta = 13 m

Vão médio = 450 m

$f_{85ºC}$ = 14,42 m

$f_{85ºC}$ = 15,45 m

Δf = 1,03 m



Duplex

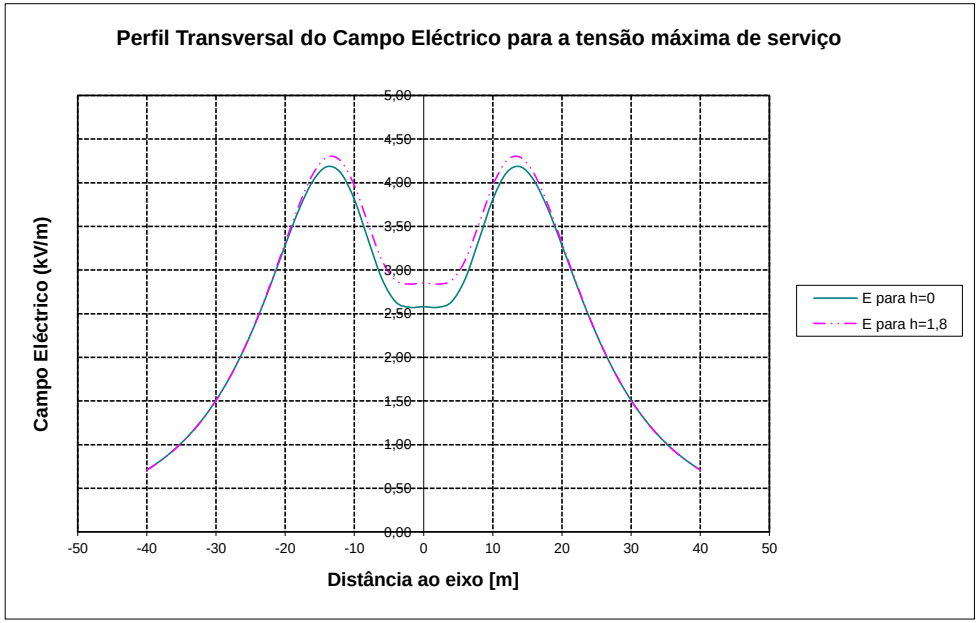
Condutores Circ a: X

Geometria dos Condutores [m]

			x	$y_{cabo\ ao\ solo}$	$y_{miníma}$
Circ a	**Condutor a**	8	-11,70	14,03	13,00
	Condutor b	8	-11,30	14,03	13,00
	Condutor c	0	-0,20	14,03	13,00
	Condutor d	0	0,20	14,03	13,00
	Condutor e	4	11,30	14,03	13,00
	Condutor f	4	11,70	14,03	13,00
cg u		-1	-9,30	28,21	27,33
cg v		-1	9,30	28,21	27,33

h - Distância ao solo

xN	E tensão nominal	
	h [m] = 0	h [m] = 1,8
-40	0,709	0,708
-38	0,817	0,816
-36	0,946	0,944
-34	1,100	1,098
-32	1,286	1,284
-30	1,508	1,507
-28	1,774	1,773
-26	2,087	2,089
-24	2,450	2,457
-22	2,856	2,871
-20	3,285	3,314
-18	3,695	3,746
-16	4,021	4,100
-14	4,184	4,292
-12	4,115	4,251
-10	3,808	3,967
-8	3,344	3,528
-6	2,896	3,110
-4	2,633	2,878
-2	2,573	2,839
0	2,580	2,853
2	2,573	2,839
4	2,633	2,878
6	2,896	3,110
8	3,344	3,528
10	3,808	3,967
12	4,115	4,251
14	4,184	4,292
16	4,021	4,100
18	3,695	3,746
20	3,285	3,314
22	2,856	2,871
24	2,450	2,457
26	2,087	2,089
28	1,774	1,773
30	1,508	1,507
32	1,286	1,284
34	1,100	1,098
36	0,946	0,944
38	0,817	0,816
40	0,709	0,708



(*) Para um módulo de corrente de 1000 A por fase.

Linha simples a 400 kV e feixe duplo

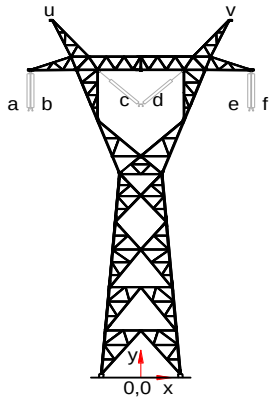
(CIGRÉ , Working Group 36.01 (Interference and Fields))

Indução magnética

Duplex

Condutores Circ a: X

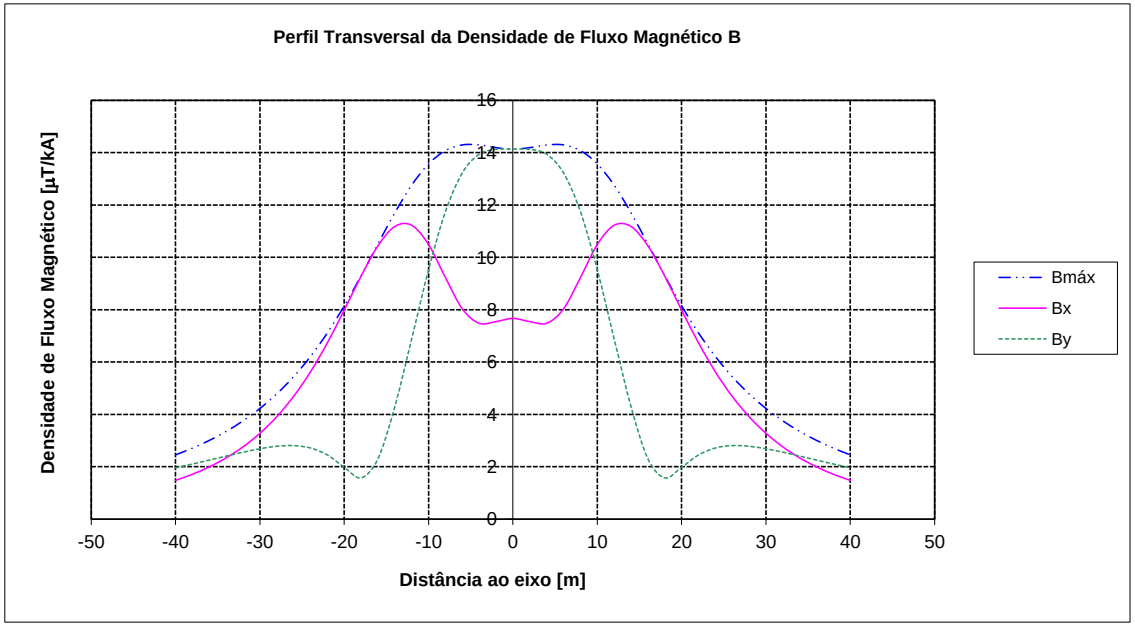
Corrente por fase (1) no Circuito a : **1000 A**



Geometria dos Cabos [m]

			x	$y_{cabo\ ao\ solo}$	$y_{miníma}$
Circ a	Condutor a	8	-11,70	14,03	13,00
	Condutor b	8	-11,30	14,03	13,00
	Condutor c	0	-0,20	14,03	13,00
	Condutor d	0	0,20	14,03	13,00
	Condutor e	4	11,30	14,03	13,00
	Condutor f	4	11,70	14,03	13,00
cg u		-1	-9,30	28,21	27,33
cg v		-1	9,30	28,21	27,33

xN	h = 1,8 m		
	Bmáx	Bx	By
-40	2,455	1,479	1,962
-38	2,711	1,713	2,105
-36	3,007	1,996	2,255
-34	3,351	2,340	2,408
-32	3,754	2,761	2,556
-30	4,227	3,278	2,688
-28	4,784	3,912	2,782
-26	5,441	4,688	2,808
-24	6,214	5,627	2,717
-22	7,115	6,735	2,451
-20	8,148	7,985	1,980
-18	9,296	9,283	1,575
-16	10,511	10,442	2,305
-14	11,704	11,181	4,301
-12	12,759	11,227	6,888
-10	13,569	10,489	9,533
-8	14,078	9,227	11,748
-6	14,297	8,032	13,227
-4	14,294	7,482	13,940
-2	14,192	7,546	14,127
0	14,133	7,669	14,133
2	14,192	7,546	14,127
4	14,294	7,482	13,940
6	14,297	8,032	13,227
8	14,078	9,227	11,748
10	13,569	10,489	9,533
12	12,759	11,227	6,888
14	11,704	11,181	4,301
16	10,511	10,442	2,305
18	9,296	9,283	1,575
20	8,148	7,985	1,980
22	7,115	6,735	2,451
24	6,214	5,627	2,717
26	5,441	4,688	2,808
28	4,784	3,912	2,782
30	4,227	3,278	2,688
32	3,754	2,761	2,556
34	3,351	2,340	2,408
36	3,007	1,996	2,255
38	2,711	1,713	2,105
40	2,455	1,479	1,962



(1) **Para um módulo de corrente de 1000 A por fase.**

Linha simples a 220 kV e feixe simples
Cálculo do Campo Eléctrico - Tensão nominal
(CIGRÉ , Working Group 36.01 (Interference and Fields))

Circuito a		Circuito a		
Condutor	**Diâmetro [m]**	**Tensão nominal**		
Yew	2,84E-02			
		Uc =	220,00	kV
C. Guarda	**Diâmetro [m]**	Us =	127,02	kV
19No9Awg	1,45E-02			
		Corrente por fase (1)		
		I =	1000	A
		Tensão máxima de serviço		
		Uc =	245,00	kV
		Us =	141,45	kV

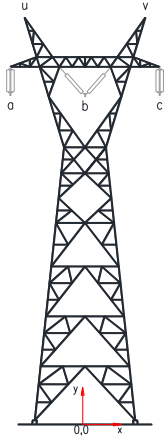
Distância ao solo miníma absoluta = 12 m

Vão médio = 450 m

$f_{65ºC}$ = 13,76 m

$f_{85ºC}$ = 14,83 m

Δf = 1,07 m



Simples

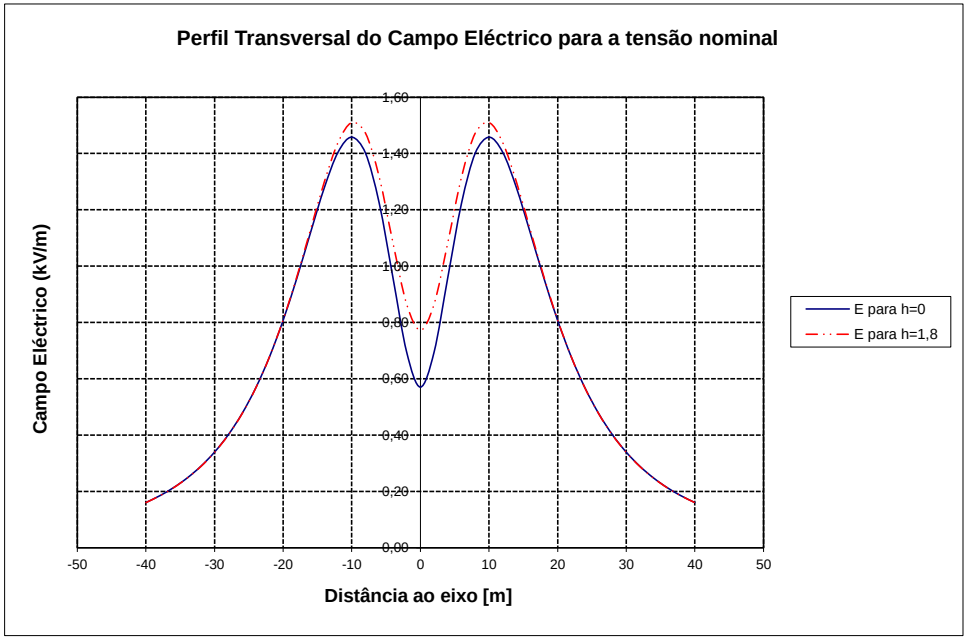
Condutores Circ a: X

Geometria dos Condutores [m]

		x	$y_{cabo\ ao\ solo}$	$y_{miníma}$
Circ a	**Condutor a**	8	-7,10	13,07	12,00
	Condutor b	0	0,00	13,07	12,00
	Condutor c	4	7,10	13,07	12,00
cg u		-1	-5,75	25,14	24,23
cg v		-1	5,75	25,14	24,23

h - Distância ao solo

xN	E tensão nominal	
	h [m] = 0	**h [m] = 1,8**
-40	0,16	0,16
-38	0,19	0,18
-36	0,21	0,21
-34	0,25	0,25
-32	0,29	0,29
-30	0,34	0,34
-28	0,40	0,40
-26	0,48	0,48
-24	0,57	0,57
-22	0,68	0,68
-20	0,81	0,81
-18	0,96	0,96
-16	1,12	1,13
-14	1,28	1,30
-12	1,40	1,44
-10	1,46	1,51
-8	1,40	1,47
-6	1,22	1,32
-4	0,96	1,08
-2	0,70	0,87
0	0,57	0,77
2	0,70	0,87
4	0,96	1,08
6	1,22	1,32
8	1,40	1,47
10	1,46	1,51
12	1,40	1,44
14	1,28	1,30
16	1,12	1,13
18	0,96	0,96
20	0,81	0,81
22	0,68	0,68
24	0,57	0,57
26	0,48	0,48
28	0,40	0,40
30	0,34	0,34
32	0,29	0,29
34	0,25	0,25
36	0,21	0,21
38	0,19	0,18
40	0,16	0,16



(*) Para um modulo de corrente de 1000 A por fase.

Linha simples a 220 kV e feixe simples
Cálculo do Campo Eléctrico - Tensão máxima de serviço
(CIGRÉ , Working Group 36.01 (Interference and Fields))

Circuito a			Circuito a	
Condutor	**Diâmetro [m]**		**Tensão nominal**	
Yew	2,84E-02			
		Uc =	220,00	kV
C. Guarda	**Diâmetro [m]**	Us =	127,02	kV
19No9Awg	1,45E-02			
			Corrente por fase (*)	
		I =	1000	A
			Tensão máxima de serviço	
		Uc =	245,00	kV
		Us =	141,45	kV

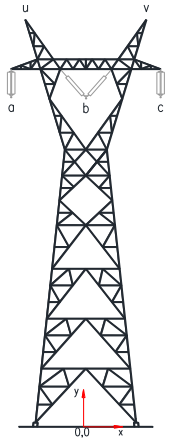
Distância ao solo miníma absoluta = 12 m

Vão médio = 450 m

$f_{85ºC}$ = 13,76 m

$f_{85ºC}$ = 14,83 m

Δf = 1,07 m



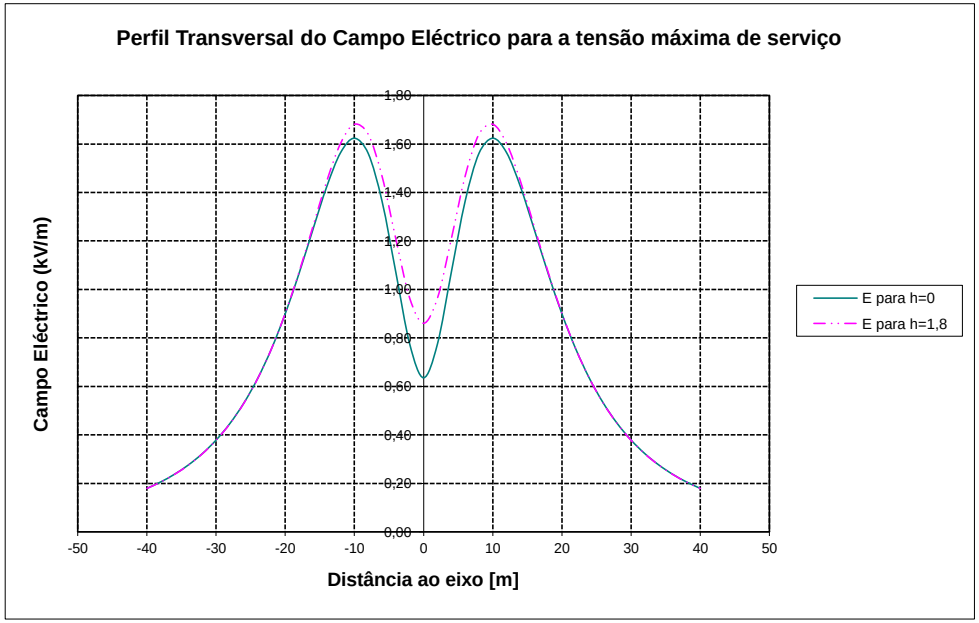
Condutores Circ a: Simples X

Geometria dos Condutores [m]

		x	$y_{cabo\ ao\ solo}$	$y_{miníma}$
Circ a	**Condutor a**	8	-7,10	13,07	12,00
	Condutor b	0	0,00	13,07	12,00
	Condutor c	4	7,10	13,07	12,00
	cg u	-1	-5,75	25,14	24,23
	cg v	-1	5,75	25,14	24,23

h - Distância ao solo

xN	E tensão nominal	
	h [m] = 0	h [m] = 1,8
-40	0,18	0,18
-38	0,21	0,21
-36	0,24	0,24
-34	0,28	0,28
-32	0,32	0,32
-30	0,38	0,38
-28	0,45	0,45
-26	0,53	0,53
-24	0,63	0,63
-22	0,75	0,75
-20	0,90	0,90
-18	1,07	1,07
-16	1,25	1,26
-14	1,42	1,45
-12	1,56	1,60
-10	1,62	1,68
-8	1,56	1,64
-6	1,36	1,47
-4	1,07	1,21
-2	0,77	0,96
0	0,64	0,86
2	0,77	0,96
4	1,07	1,21
6	1,36	1,47
8	1,56	1,64
10	1,62	1,68
12	1,56	1,60
14	1,42	1,45
16	1,25	1,26
18	1,07	1,07
20	0,90	0,90
22	0,75	0,75
24	0,63	0,63
26	0,53	0,53
28	0,45	0,45
30	0,38	0,38
32	0,32	0,32
34	0,28	0,28
36	0,24	0,24
38	0,21	0,21
40	0,18	0,18



(*) Para um módulo de corrente de 1000 A por fase.

Linha simples a 220 kV e feixe simples

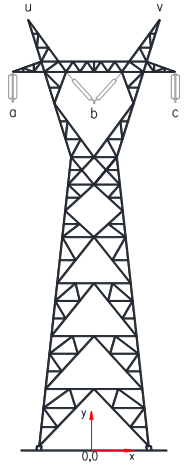
(CIGRÉ , Working Group 36.01 (Interference and Fields))

Indução magnética

Simples

Condutores Circ a: X

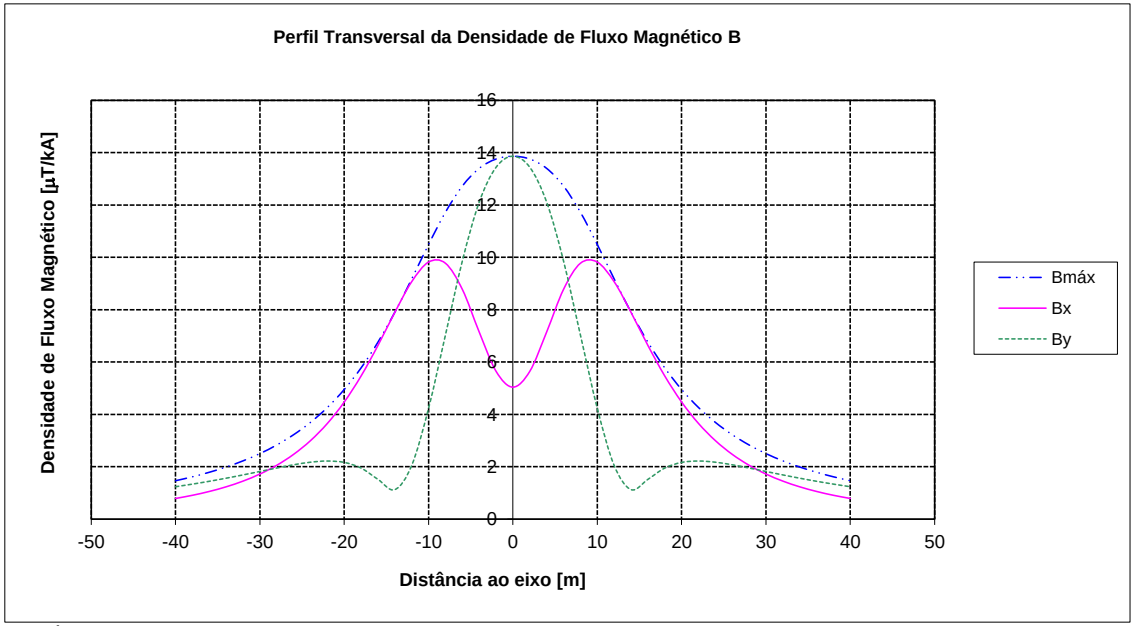
Corrente por fase (1) no Circuito a : **1000 A**



Geometria dos Cabos [m]

		x	$y_{cabo\ ao\ solo}$	$y_{miníma}$
Circ a	**Condutor a**	8	-7,10	13,07	12,00
	Condutor b	0	0,00	13,07	12,00
	Condutor c	4	7,10	13,07	12,00
cg u		-1	-5,75	25,14	24,23
cg v		-1	5,75	25,14	24,23

xN	h = 1,8 m		
	Bmáx	Bx	By
-40	1,467	0,789	1,237
-38	1,616	0,910	1,337
-36	1,789	1,057	1,445
-34	1,990	1,235	1,563
-32	2,226	1,453	1,689
-30	2,503	1,722	1,820
-28	2,832	2,056	1,952
-26	3,225	2,475	2,076
-24	3,696	2,999	2,174
-22	4,265	3,655	2,219
-20	4,951	4,472	2,166
-18	5,778	5,469	1,951
-16	6,762	6,637	1,519
-14	7,905	7,901	1,127
-12	9,176	9,071	2,052
-10	10,494	9,820	4,237
-8	11,725	9,775	7,034
-6	12,723	8,778	9,859
-4	13,399	7,150	12,109
-2	13,757	5,647	13,442
0	13,862	5,042	13,862
2	13,757	5,647	13,442
4	13,399	7,150	12,109
6	12,723	8,778	9,859
8	11,725	9,775	7,034
10	10,494	9,820	4,237
12	9,176	9,071	2,052
14	7,905	7,901	1,127
16	6,762	6,637	1,519
18	5,778	5,469	1,951
20	4,951	4,472	2,166
22	4,265	3,655	2,219
24	3,696	2,999	2,174
26	3,225	2,475	2,076
28	2,832	2,056	1,952
30	2,503	1,722	1,820
32	2,226	1,453	1,689
34	1,990	1,235	1,563
36	1,789	1,057	1,445
38	1,616	0,910	1,337
40	1,467	0,789	1,237



(1) **Para um módulo de corrente de 1000 A por fase.**

PORTUGUESE	**ENGLISH**
➢ Feixe duplo	➢ Double conductor per phase
➢ C. Guarda	➢ Guard cable
➢ Tensão nominal	➢ Nominal tension
➢ Corrente por fase	➢ Electrical current per phase
➢ Tensão máxima de serviço	➢ Maximum service voltage
➢ Distância ao solo miníma absoluta	➢ Mínimum ground distance
➢ Cabo ao solo	➢ Ground cable distance
➢ Campo eléctrico	➢ Electric field
➢ Distância ao eixo	➢ Distance to the axis of the TL.
➢ Perfil Transversal do Campo Eléctrico para a tensão nominal	➢ Cross profile of the Electric Field for nominal tension
➢ Para um módulo de corrente de 1000 A por fase.	➢ For a current module of 1000 A per phase.
➢ Densidade de Fluxo Magnético	➢ Magnetic Density Flux
➢ Perfil Transversal da Densidade de Fluxo Magnético	➢ Cross profile of Magnetic Density Flux

Annex B3

Construction Schedules

TL 400 kV LAUCA - BITA

EXECUTIVE SCHEDULLE - BASIC PROJECT 12 MONTHS

Date: 14/06/2016

Physical Advance

| | | Units | Quant. | Begin | End | | Month | Month 1 | | | | Month 2 | | | | Month 3 | | | | Month 4 | | | | Month 5 | | | | Month 6 | | | | Month 7 | | | | Month 8 | | | | Month 9 | | | | Month 10 | | | | Month 11 | | | | Month 12 | | | | Month 13 | | | | Month 14 | | | | Month 15 | | | | Pending Quantity |
|---|---|---

TL 400 kV LAUCA - BITA

EXECUTIVE SCHEDULLE - BASIC PROJECT 18 MONTHS

Date: 14.08.2018

| | Physical Advance | Units | Quant. | Begin | End | | Month 1 | | | | Month 2 | | | | Month 3 | | | | Month 4 | | | | Month 5 | | | | Month 6 | | | | Month 7 | | | | Month 8 | | | | Month 9 | | | | Month 10 | | | | Month 11 | | | | Month 12 | | | | Month 13 | | | | Month 14 | | | | Month 15 | | | | Month 16 | | | | Month 17 | | | | Month 18 | | | | Month 19 | | | | Month 20 | | | | Month 21 | | | | Pending Quantity |
|---|---|---

Annex C

Flora and Fauna Lists

C.1 Flora

***Key**: IUCN Categories: CR – Critically Endangered (Criticamente ameaçado); NT – Near threatened (Quase Ameaçado); V – Vulnerable (Vulnerável); EN – Endangered (Ameaçado); DD – Data Deficient (Dados Insuficientes)*
** Cultivated species (Planta cultivada).*
*** Invasive species (Planta invasora).*
**** Threatened species (Planta ameaçada).*
n.a. not assessed

Family	Species	Segment			Status	
		I	II	III	IUCN	Angola
	Spondias mombim	x	x		n.a.	
ANACARDIACEAE	*Anacardium occidentale* *	x	x	x	n.a.	
	Mangifera indica *	x	x	x	DD	
	Ozoroa paniculosa	x	x		n.a.	
ANNONACEAE	*Annona senegalensis*	x			n.a.	
APIACEAE	*Steganotaenia araliaceae*	x	x		n.a.	
	Carissa edulis		x	x	n.a.	
	Diplorrynchus condilocarpon ***	x	x		n.a.	VU
APOCYNACEAE	*Landolphia owariensis*	x			n.a.	
	Pergularia daemia		x	x	n.a.	
	Sarcostema viminale			x	n.a.	
ARALIACEAE	*Cussonia angolensis*	x			n.a.	
ARECACEAE	*Elaeis guineense* *	x	x	x	n.a.	
	Hyphaene guineense ***		x	x	n.a.	VU
ASPHODELACEAE	*Aloe* sp.	x			n.a.	
ASTERACEAE	*Tithonia diversifolia* **	x	x		n.a.	
	Vernonia amigdalina	x	x		n.a.	
ASTERACEAE	*Chromolaena odorata* **	x	x	x	n.a.	
BIGNONIACEAE	*Spathodea campanulata*	x	x		LC	
BOMBACACEAE	*Adansonia digitata* ***	x	x	x	n.a.	VU
	Ceiba pentandra ***	x	x	x	LC	VU
BORAGINACEAE	*Cordia caffra*			x	n.a.	
CACTACEAE	*Opuntia ficus-indica***			x	DD	
	Boscia urens		x	x	n.a.	
CAPPARACEAE	*Capparis* sp.			x	n.a.	
	Maerua angolensis		x	x	n.a.	
CARICACEAE	*Carica papaya* *	x	x	x	n.a.	
CELASTRACEAE	*Gymnosporia senegalensis*	x	x		n.a.	
COCHLOSPERMACEAE	*Cochlospermum angolense* ***	x	x		n.a.	EN
	Combretum celastroides	x	x	x	n.a.	
COMBRETACEAE	*Combretum zeyheri* ***	x			n.a.	LR
	Pteleopsis anisoptera ***	x	x		n.a.	VU
	Terminalia sericea ***	x			n.a.	VU
COMMIPHORACEAE	*Commiphora africana*		x	x	n.a.	
CUCURBITACEAE	*Momordia charantia*		x	x	n.a.	
EBENACEAE	*Diospyros mespiliformis* ***	x	x		n.a.	LR
	Alchornia cordifolia	x	x		n.a.	
	Bridelia micrantha	x			LC	
EUPHORBIACEAE	*Euphorbia conspicua*	x	x	x	n.a.	
	Hymenocardia acida ***	x	x		n.a.	LR
	Manihot utilissima *	x	x	x	n.a.	

Family	Species	Segment			Status	
	Pseudolachnostylis maprounifolia	x	x		n.a.	
	Abrus precatorius	x			n.a.	
	Acacia sieberiana ***	x	x		n.a.	LR
	Acacia welwitschii		x	x	n.a.	
	Albizia glaberrima ***	x	x		n.a.	VU
	Acacia nigrescens		x	x	n.a.	
	Afzelia quanzensis ***	x			n.a.	VU
	Albizia versicolor ***	x	x	x	n.a.	VU
	Dichrostachis cinerea	x	x	x	n.a.	
FABACEAE	*Erythrina abyssinica*	x			n.a.	VU
	Erytrophleum africanum	x			n.a.	VU
	Entada abyssinica	x	x		n.a.	
	Milletia versicolor	x	x		n.a.	
	Mucuna pruriens	x	x		n.a.	
	Phaseolus vulgaris *	x	x	x	n.a.	
	Piliostigma thonningii	x	x		n.a.	
	Pterocarpus angolensis ***	x			LC	VU
	Tamarindus indica *		x	x	LC	
LAMIACEAE	*Oslundia opositifolia*		x	x	n.a.	
	Ficus glumosa	x	x		n.a.	
MORACEAE	*Ficus gnaphalocarpa*	x			n.a.	
	Ficus sycomorus	x	x		n.a.	
	Ficus thonningii ***	x	x		n.a.	LR
OLACACEAE	*Ximenia americana*		x	x	n.a.	
	Andropogon gayanus	x	x	x	n.a.	
	Anthephora cristata		x	x	n.a.	
	Aristida stipitata		x	x	n.a.	
	Cynodon dactylon	x	x	x	n.a.	
	Dichanthium papillosum		x	x	n.a.	
	Digitaria milangiana		x	x	n.a.	
	Digitaria monodactila	x	x	x	n.a.	
	Eragrostis fascicularis	x	x	x	n.a.	
POACEAE	*Eragrostis superba*		x	x	n.a.	
	Heteropogon contortus		x	x	n.a.	
	Hyparrhenia cymbaria	x	x		n.a.	
	Hyparrhenia rufa	x	x	x	n.a.	
	Melinis repens	x	x		n.a.	
	Panucum maximum	x	x	x	n.a.	
	Schmidictia pappophoroides		x	x	n.a.	
	Setaria welwitschii	x	x		n.a.	
	Zea mays *	x	x	x	n.a.	
RUBIACEAE	*Crossopteryx febrifuga*	x	x		n.a.	
	Psydrax virgata		x	x	n.a.	
SALVADORACEAE	*Salvadora persica*		x	x	n.a.	
SAPINDACEAE	*Cardiospermum grandiflora* **	x	x		n.a.	
STERCULIACEAE	*Sterculia quinqueloba* ***	x	x		n.a.	VU
	Sterculia setigera	x	x	x	n.a.	
STRYCHNACEAE	*Strychnos cocculoides* ***	x	x		n.a.	LR
	Strychnos innocua	x	x	x	n.a.	
TYLIACEAE	*Grewia* flava	x	x	x	n.a.	
VELLOZIACEAE	*Xerophyta capilares*	x			n.a.	
VERBENACEAE	*Vitex madiensis*	x			n.a.	
VITACEAE	*Cissus quadrangularis* ***		x	x	n.a.	LR
	Cyphostemma sp.		x		n.a.	

C.2 Fauna

BIRDS

***Key**: IUCN Categories: CR – Critically Endangered (Criticamente ameaçado); NT – Near threatened (Quase Ameaçado); V – Vulnerable (Vulnerável); EN – Endangered (Ameaçado); * Least Concerm (Pouco Preocupante). Additional Status: EA – Endemic to Angola.*

Birds

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
1	Garça-boieira	Cattle Egret	*Bubulcus ibis*	*
2	Garça-branca	Little Egret	*Egretta garzetta*	*
3	Garça-real	Grey Heron	*Ardea cinerea*	*
4	Cabeça-de-martelo	Hamerkop	*Scopus umbretta*	*
5	Ibis-sagrado	African Sacred Ibis	*Threshkiornis aethiopicus*	*
6	Cegonha-episcopal	Woolly-necked Stork	*Ciconia microscelis*	*
7	Marabu	Marabou Stork	*Leptoptilos crumeniferus*	*
8	Peneireiro-cinzento	Black-shouldered Kite	*Elanus caeruleus*	*
9	Milhafre-de-bico-amarelo	Yellow-billed Kite	*Milvus aegyptius*	*
10	Águia-pesqueira africana	African Fish-Eagle	*Haliaetus vocifer*	*
11	Abutre-de-capuz	Hooded Vulture	*Necrosyrtes monachus*	CR
12	Bemba	Palm-nut Vulture	*Gypohierax angolensis*	*
13	Águia-bailarina	Bateleur	*Terathopius ecaudatus*	NT
14	Açor Africano	African Goshawk	*Accipiter tachiro*	*
15	Búteo-de-pescoço-vermelho	Red-necked Buzzard	*Buteo auguralis*	*
16	Búteo-da-estepe	Steppe Buzzard	*Buteo vulpinus*	*
17	Águia-cobreira-castanha	Brown Snake-Eagle	*Circaetus cinereus*	*
18	Serpentário-pequeno	Gymnogene	*Polyboroides typus*	*
19	Falcão-cinzento	Grey Kestrel	*Falco ardosiaceus*	*
20	Capota-comum	Helmeted Guineafowl	*Numida meleagris*	*
21	Perdiz-de-gola-vermelha	Red-necked Francolin	*Pternistes afer*	*
22	Perdiz-de-estrias-cinzentas	Grey-striped Francolin	*Pternistes griseostriatus*	*; EA
23	Toirão-comum	Kurrichane Button-Quail	*Turnix sylvatica*	*
24	Alcarvão-do-cabo	Spotted Thicknee	*Burhinus capensis*	*
25	Asa-de-bronze	Bronze-winged Courser	*Cursorius chalcopterus*	*
26	Rola-de-coleira	Cape Turtle Dove	*Streptopelia capicola*	*
27	Rola-negra	Red-eyed Dove	*Streptopelia semitorquata*	*
28	Rola-das-palmeiras	Laughing Dove	*Spilopelia senegalensis*	*
29	Rola-esmeraldina	Emerald-spotted Dove	*Turtur chalcospilos*	*
30	Rolinha-do-cabo	Namaqua Dove	*Oena capensis*	*
31	Pombo-verde	Green Pigeon	*Treron calvus*	*
32	Papagaio-de-Ruppel	Ruppell's Parrot	*Poicephalus rueppelli*	*
33	Quele	Grey Go-away Bird	*Corythaixoides concolor*	*
34	Andua-de-crista-vermelha	Red-crested Turaco	*Tauraco erythrolophus*	*; EA
35	Cuco-de-Diderick	Diderick Cuckoo	*Chrysococcyx caprius*	*
36	Cuco-de-Klaas	Klaas Cuckoo	*Chrysococcyx klaas*	*
37	Cuco-jacobino	Jacobin Cuckoo	*Oxylophus jacobinus*	*

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
38	Cucal-de-luanda	White-browed Coucal	*Centropus superciliosus*	*
39	Cucal-do-Senegal	Senegal Coucal	*Centropus senegalensis*	*
40	Corujão-malhado	Spotted Eagle-Owl	*Bubo africanus*	*
41	Mochinho-malhado	Pearl-spotted Owlet	*Glaucidium perlatum*	*
42	Noitibó-de-welwitsch	Square-tailed Nightjar	*Caprimulgus fossii*	*
43	Guincho-comum	Common Black swift	*Apus apus*	*
44	Guincho-das-palmeiras	African Palm Swift	*Cypsiurus parvus*	*
45	Guincho-pequeno	Little Swift	*Apus affinis*	*
46	Rabo-de-junco-de-rabadilha-vermelha	Red-backed Mousebird	*Colius castanotus*	*; EA
47	Rabo-de-junco-de-mascarilha-vermelha	Red-faced Mousebird	*Urocolius indicus*	*
48	Poupa-Africana	African Hoopoe	*Upupa africana*	*
49	Zombeteiro-de-bico-vermelho	Green Wood-Hoopoe	*Phoeniculus purpureus*	*
50	Pica-peixe-riscado	Striped Kingfisher	*Halcyon chelicuti*	*
51	Pica-peixe-malhado	Pied Kingfisher	*Ceryle rudis*	*
52	Abelharuco-pequeno	Little Bee-eater	*Merops pusillus*	*
53	Abelharuco-de-Madagáscar	Madagascar Bee-eater	*Merops superciliosus*	*
54	Abelharuco-oliváceo	Blue-cheecked Bee-eater	*Merops persicus*	*
55	Rolieiro-de-peito-lilás	Lilac-breasted Roller	*Coracias caudata*	*
56	Rolieiro-de-testa-branca	Purple Roller	*Coracias naevius*	*
57	Rolieiro-de-bico-amarelo	Broad-billed Roller	*Eurystomus glaucurus*	*
58	Calau-terrestre	Southern Ground-Hornbill	*Bucorvus leadbeateri*	V
59	Calau-trombeteiro	Trumpeter Hornbill	*Bycanistes bucinator*	
60	Calau-de-bico-amarelo	Yellow-billed Hornbill	*Tockus leucomelas*	*
61	Calau-coroado	Crowned Hornbill	*Tockus alboterminatus*	*
62	Barbacinhas-de-fronte-amarela	Yellow-fronted Tinkerbird	*Pogoniulus chrysoconus*	*
63	Barbaças-de-fronte-vermelha	Acacia Pied Barbet	*Tricholaema leucomelas*	*
64	Barbaças-de-peito-preto	Black-collared Barbet	*Lybius torquatus*	*
65	Pássaro-do-mel-Comum	Greater Honeyguide	*Indicator indicator*	*
66	Pica-pau-de-cauda-dourada	Golden-tailed Woodpecker	*Campethera abingoni*	*
67	Pica-pau-cardinal	Cardinal Woodpecker	*Dendropicus fusfescens*	*
68	Cotovia-de-crista	Rufous-naped Lark	*Mirafra cf africana*	*
69	Cotovia-de-castanholas	Flapped Lark	*Mirafra rufocinnamomea*	*
70	Andorinha-preta	Black Saw-wing	*Psalidoprocne pristoptera*	*
71	Andorinha-de-papo-estriado	Lesser-striped Swallow	*Hirundo abyssinica*	*
72	Andorinha-de-Angola	Angolan Swallow	*Hirundo angolensis*	*
73	Andorinha-de-monteiro	Mosque Swallow	*Hirundo senegalensis*	*
74	Andorinha-cauda-de-arame	Wire-tailed Swallow	*Hirundo smithii*	*
75	Andorinha-das-rochas	Rock Martin	*Hirundo fuligula*	*
76	Alvéola-preta-e-branca	African Pied Wagtail	*Motacilla aguimp*	*
77	Ave-das-queimadas	Fork-tailed Drongo	*Dricurus adsimilis*	*
78	Papa-figos-de-cabeça-preta	Eastern Black-headed Oriole	*Oriolus larvatus*	*
79	Corvo-de-peito-branco	Pied Crow	*Corvus albus*	*

#	Portuguese Name	English Name	Scientific Name	IUCN Status
80	Chiricuata-amarela	Yellow-bellied Greenbul	*Chlorocichla flaviventris*	*
81	Brimblau	Black-capped Bulbul	*Pycnonotus tricolor*	*
82	Rouxinol-de-heuglin	White-browed Robin-Chat	*Cossypha heuglini*	*
83	Rouxinol-da-manhã	Rufous-tailed Palm-Thrush	*Cichladusa ruficauda*	*
84	Rouxinol-da-floresta	Forest Scrub-Robin	*Cercotrichas leucostricta*	*
85	Rouxinol-de-peito-estriado	White-browed Scrub-Robin	*Cercotrichas leucophrys*	*
86	Cartaxo	Stone Chat	*Saxicola torquata*	*
87	Chasco-familiar	Familiar Chat	*Cercomela familiaris*	*
88	Chasco negro	Sooty Chat	*Myrmerocichla nigra*	*
89	Boita-de-asa-curta	Short-winged Cisticola	*Cisticola cf brachypterus*	*
90	Boita-da-Huíla	Rattling Cisticola	*Cisticola chiniana*	*
91	Boita-chilreadora	Bubbling Cisticola	*Cisticola bulliens*	*
92	Prinia-de-flancos-ferrugíneos	Tawny-flanked Prinia	*Prinia subflava*	*
93	Apalis-de-peito-amarelo	Yellow-breasted Apalis	*Apalis flavida*	*
94	Carriça-de-Ansorge	Long-billed Crombec	*Sylvietta rufescens*	*
95	Carriça-verde	Green Crombec	*Sylvietta virens*	*
96	Papa-moscas-malhado	Spotted Flycatcher	*Muscicapa striata*	*
97	Papa-moscas-do-paraíso	African Paradise Flycatcher	*Tersiphone viridis*	*
98	Chapim-preto-de-asa-branca	White-winged Black Tit	*Parus leucomelas*	*
99	Olho-de-carúncula-amarelo	Yellow-bellied Wattle-eye	*Dyaphorophia blisseti*	*
100	Batis-comum	Chinspot Batis	*Batis molitor*	*
101	Batis-de-Angola	Angola Batis	*Batis minulla*	*
102	Picanço-cinzento	Lesser Grey Shrike	*Lanius minor*	*
103	Picanço-fiscal	Fiscal Shrike	*Lanius collaris*	*
104	Picanço-de-almofadinha	Black-backed Puffback	*Dryoscopus cubla*	*
105	Tchagra-de-coroa-preta	Black-crowned Tchagra	*Tchagra senegalus*	*
106	Tchagra-de-cabeça-castanha	Brown-crowned Tchagra	*Tchagra australis*	*
107	Picanço-ferrugíneo	Swamp Boubou	*Laniarius bicolor*	*
108	Picanço-de-Perrin	Perrin's Bush-Shrike	*Malaconotus viridis*	*
109	Picanço-de-peito-alaranjado	Orange-breasted Bush-Shrike	*Malaconotus sulfureopectus*	*
110	Nicator-de-garganta-amarela	Yellow-throated Nicator	*Nicator vireo*	*
111	Altacador-branco	White Helmetshrike	*Prionops plumatus*	*
112	Beija-flor-de-peito-escarlate	Scarlet-chested Sunbird	*Chalcomitra senegalensis*	*
113	Beija-flor-cúpreo	Copper Sunbird	*Cinnyris cuprea*	*
114	Beija-flor-de-faixa-púrpura	Purple-banded Sunbird	*Cinnyris bifasciata*	*
115	Olho-branco-amarelo	Yellow White-eye	*Zoosterops senegalensis*	*
116	Estorninho-metálico-de-ombro-violeta	Cape Glossy Starling	*Lamprotornis nitens*	*
117	Estorninho-de-carúncula	Wattled Starling	*Creatophora cinerea*	*
118	Pardal-de-cabeça-cinzenta	Grey-headed Sparrow	*Passer griseus*	*
119	Pardal-do-telhado	House Sparrow	*Passer domesticus*	*
120	Tecelão-de-fronte-branca	Thick-billed Weaver	*Amblyospiza albifrons*	*
121	Tecelão-de-bico-fino	Slender-billed Weaver	*Ploceus pelzeni*	*
122	Tecelão-de-nuca-preta	Black-necked Weaver	*Ploceus nigricollis*	*

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
123	Tecelão-de-lunetas	Spectacled Weaver	*Ploceus ocularis*	*
124	Tecelão-dourado	Holub's Golden Weaver	*Ploceus xanthops*	*
125	Cardeal-tecelão-vermelho	Black-winged Red Bishop	*Euplectes hordeaceus*	*
126	Tecelão-de-Cabanis	Lesser-masked Weaver	*Ploceus intermedius*	*
127	Tecelão-das-povoações	Village Weaver	*Ploceus cucullatus*	*
128	Tecelão-de-dorso-preto	Dark-backed Weaver	*Ploceus bicolor*	*
129	Cardeal-tecelão-amarelo	Yellow Bishop	*Euplectes capensis*	*
130	Viúva-de-asa-branca	White-winged Widowbird	*Euplectes albonatus*	*
131	Viúva-de-dorso-amarelo	Yellow-mantled Widowbird	*Euplectes macrourus*	*
132	Viúva-de-coleira-vermelha	Red-collared Widowbird	*Euplectes ardens*	*
133	Quelea-de-bico-vermelho	Red-billed Quelea	*Quelea quelea*	*
134	Macarachão-de-asa-verde	Melba Finch	*Pytilia melba*	*
135	Macarachão-de-asa-laranja	Orange-winged Pytilia	*Pytilia afra*	*
136	Peito-de-fogo-de-Lândana	Pale-billed Firefinch	*Lagonosticta cf landanae*	*
137	Peito-celeste	Blue Waxbill	*Uraeginthus angolensis*	*
138	Bico-de-lacre-comum	Common Waxbill	*Estrilda astrild*	*
139	Bico-de-lacre-de-face-laranja	Orange-cheeked Waxbill	*Estrilda melpoda*	*
140	Bico-de-lacre-de-peito-laranja	Orange-breasted Waxbill	*Sporaeginthus subflavus*	*
141	Guarda-marinha	Bronze Mannikin	*Spermestes cucullatus*	*
142	Viuvinha-malhada	Pin-tailed Whydah	*Vidua macroura*	*
143	Viuvinha-do-paraíso	Paradise-Whydah	*Vidua paradisaea*	*
144	Viuvinha-real	Broad-tailed Paradise-Whydah	*Vidua obtusa*	*
145	Bico-de-prata	Dusky Indigobird	*Vidua cf funerea*	*
146	Bigodinho	Yellow-fronted-canary	*Serinus mozambicus*	*
147	Escrevedeira-das-pedras	Rock Bunting	*Emberiza tahapisi*	*
148	Escrevedeira-de-peito-dourado	Golden-breasted Bunting	*Emberiza flaviventris*	*

REPTILES

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
1	Cágado-de-Bell	Bell's Hinged Tortoise	*Kinixys belliana*	*
2	Sengue	Water Monitor Lizard	*Varanus niloticus*	*
3	Lagartixa-variável	Angolan Variable Skink	*Trachylepis albopunctata*	*
4	Lagarto-de-faixa-preta	Black-lined Lizard	*Gerrhosaurus nigrolineatus*	*
5	Agama-de-Schaack	Schaack's Agama	*Agama schaacki*	*
6	Agama-do-Mucoso	Mucoso's Agama	*Agama mucosoensis*	*
7	Osga-das-casas-comum	Tropical House Gecko	*Hemidactylus mabouia*	*
8	Cobra-do-capim-comum	Mozambique Grass Snake	*Psammophis mossambicus*	*
9	Víbora-de-aríete	Puff Adder	*Bitis arietans*	*

AMPHIBIANS

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
1	Sapo-de-costas-achatadas	Flat-backed Toad	*Sclerophrys pusilla*	*

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
2	Rã-dos-charcos-do-Natal	Natal Puddle Frog	*Phrynobatrachus natalensis*	*
3	Rela-de-Angola	Angolan Reed Frog	*Hyperolius parallelus*	*
4	Rela-de-focinho-afiado	Long Reed Frog	*Hyperolius nasutus*	*
5	Rã-foguete-bicuda	Sharp-nosed Grass Frog	*Ptychadena oxyrhynchus*	*
6	Rã-touro-coroada	Crowned Bullfrog	*Hoplobatrachus occipitalis*	*

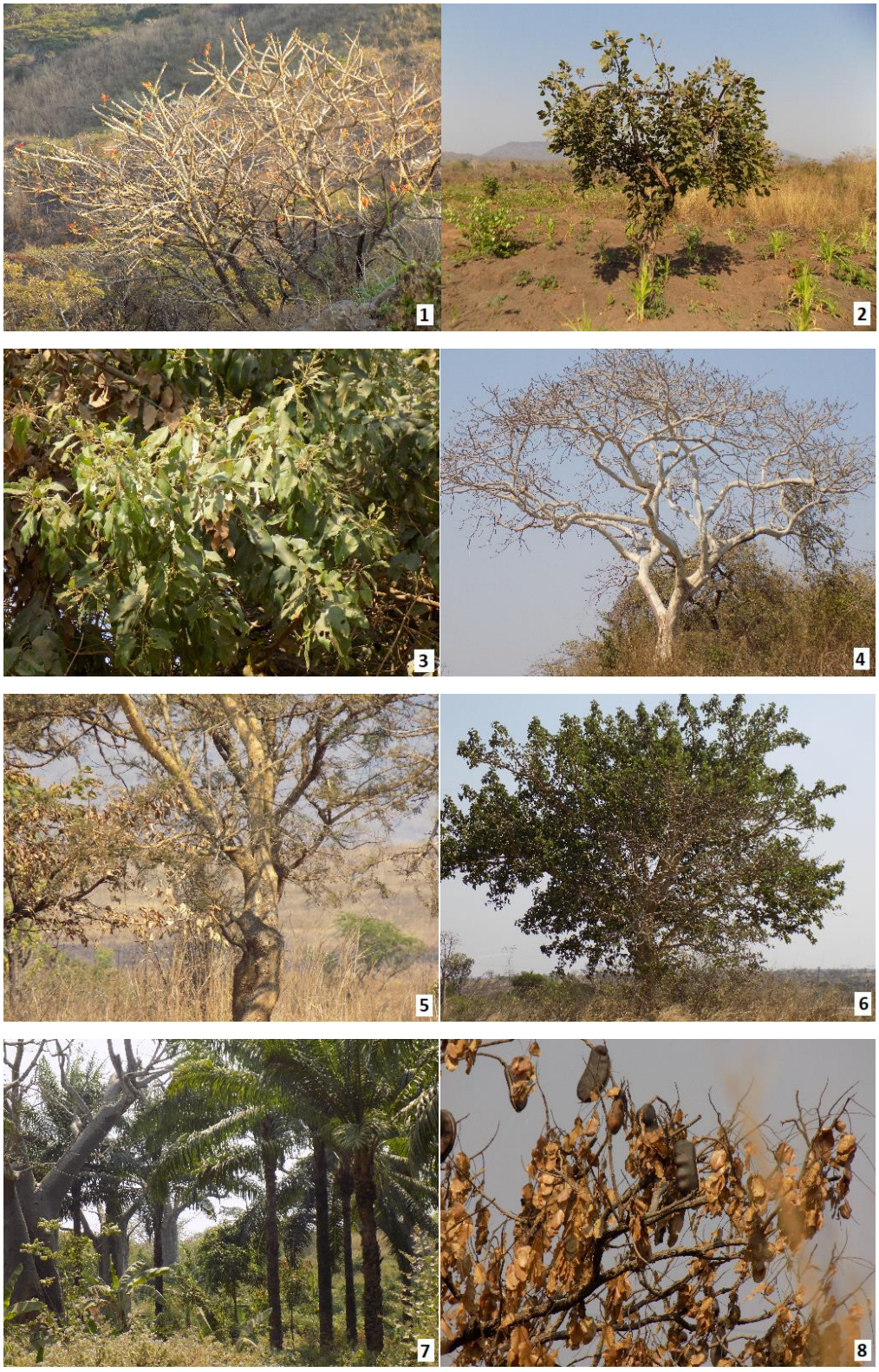
MAMMALS

#	*Portuguese Name*	*English Name*	*Scientific Name*	*IUCN Status*
1	Macaco-de-cara-preta	Malbrouck Monkey	*Cercopithecus cynosurus*	*
2	Macaco-azul	Blue Monkey	*Cercopithecus mitis*	*
3	Paca	Common Cane Rat	*Tryosomys swinderianus*	*
4	Esquilo-do-Congo	Congo Rope Squirrel	*Funisciurus congicus*	*
5	Lebre-da-savana	Scrub Hare	*Lepus victoriae*	*
6	Golungo	Common Bushbuck	*Tragelaphus scriptus*	*
7	Bambi	Grey Duiker	*Sylvicapra grimmia*	*
8	Seixa	Blue Duiker	*Philatomba monticola*	*

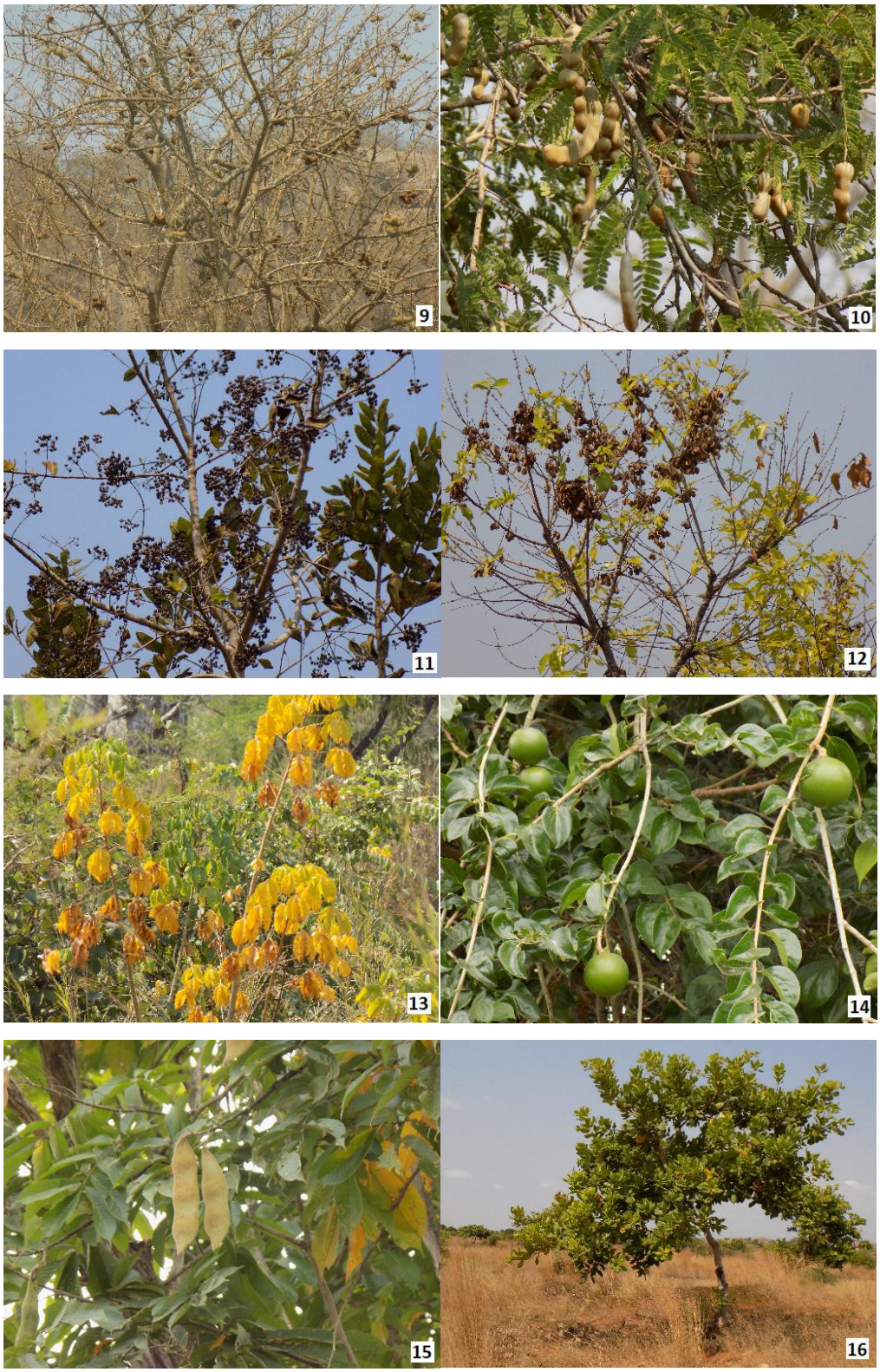
Annex D

Photolog

1- Erythrina abyssinica; 2- Vitex madiensis; 3- Ozoroa paniculosa; 4- Sterculia quinqueloba; 5- Senegalia sieberiana; 6- Ficus sycomorus; 7- Elaeis guineense; 8- Afzelia quanzensis; 9- Sterculia setigera; 10- Tamarindus indica; 11- Crossopterix febrifuga; 12- Combretum celastroides; 13- Cochlospermum angolense; 14- Strychnos innocua; 15- Milletia versicolor;16- Anacardium occidentale; 17- Euphorbia tirucalli; 18- Albizia versicolor; 19- Carissa edulis; 20- Ximenia americana; 21 - Chromolaena odorata (alien and invasive).



Source: ERM and Holisticos, 2018



Source: ERM and Holisticos, 2018





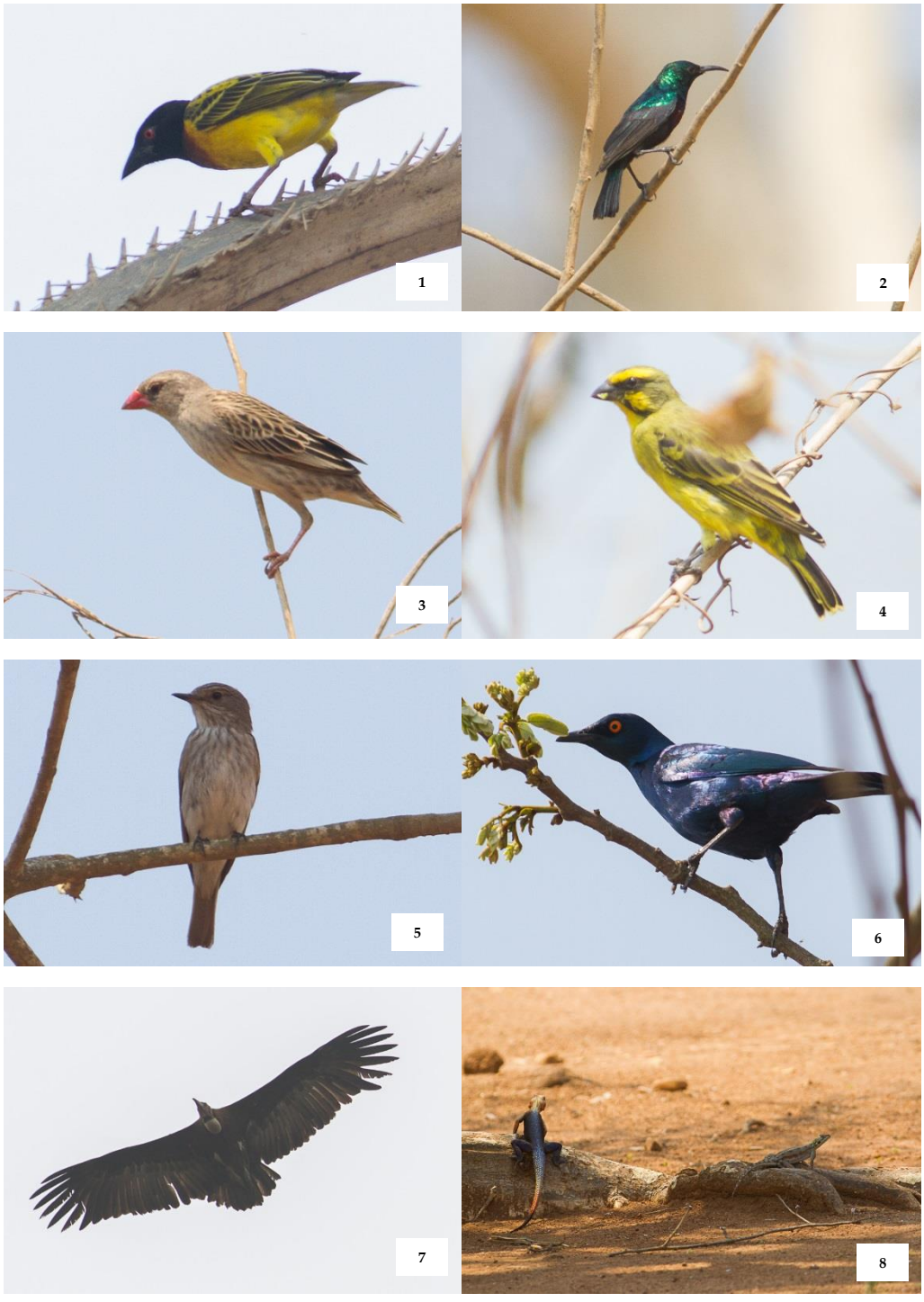






Source: ERM and Holisticos, 2018

1- Village weaver (*Ploceus cucullatus); 2*- Purple-banded sunbird *(Cinnyris bifasciata); 3*- Red-billed quelea (*Quelea quelea*); 4- Yellow-fronted canary (*Serinus mozambicus*); 5- Spotted flycatcher (*Muscicapa striata*); 6- Cape starling (*Lamprotornis nitens*); 7- Hooded vulture (*Necrosyrtes monachus*); 8- Schack's Rock Agama (*Agama schacki*).



Source: ERM and Holisticos, 2018

Annex E

NHID's Safety, Health, Environment and Quality Policy

NHID

Environmental, Health, Safety and Security Policy

20th DECEMBER 2018

Environmental, Health, Safety and Security Policy

New Horizons in Infrastructure of Denmark (NHID) seeks to provide a safe environment for all our stakeholders with a sound and financially responsible business. We apply good practices that support us in our environmental, health, safety and security (EHSS) performance. EHSS performance represents a core value and we always comply with current norms, requirements, rules and legislation, regardless of where in the world we operate.

Compliance

NHID is committed to comply with relevant EHSS laws and regulations applicable to our operations.

NHID will comply with the institutional and legislative framework deemed relevant for the successful implementation of all EHSS components of the Projects. This applies to the laws in the country where the projects are developed and, where no legal framework exist, internationally recognised standards and best practices (eg, International Finance Corporation Performance Standards on Environmental and Social Sustainability and the applicable World Bank Group Environmental, Health and Safety (EHS) Guidelines).

Supply Chain and Contractors Management will be also aligned with IFC performance requirements, including provisions for contractor verification and monitoring of suppliers throughout the supply chain.

Our EHSS staff, led by the Global Operations and Integrated Supply Chain Manager, is responsible for the planning, implementation, compliance and review of the company's EHSS performance. Executive and senior level managers are responsible and held accountable for implementing this Policy, and site level managers and supervisors are responsible for EHSS performance in their areas of responsibility and are expected to demonstrate behavior that is consistent with a Company's EHSS standards. As well, our employees are responsible for integrating sound EHSS practices into their everyday activities.

Respect for the Environment and Life

We always promote a culture of respect for the environmental, social responsibility, health, safety, security and respect for people whilst developing awareness of risks and promoting adoption of responsible behaviours by all our workers and business partners.

Monitoring

We want to measure and report our EHSS performance in a way that is understandable, meaningful and reflecting our impacts in order to strive for continuous improvement. We strive to implement continuous improvement in our environmental performance as well as ensuring that the EHSS Policy remains relevant and appropriate.

Mitigation of our Footprint

We are committed that we will identify, assess and mitigate our EHSS risks in accordance with its impacts that we identify. We also seek to protect the environment, respecting biodiversity, minimising environmental impact through efficient use of resources, mitigation of our carbon footprint, and management of waste and hazardous materials.

Accountability

If required, we will take responsibility and undertake immediate action to mitigate EHSS hazards and remediate accidents when these are identified and reported.

Capacity and Development

NHID will train and develop the leadership and staff providing them with information and instructions on our Policies, Procedures and Practices in order to improve health and safety issues on an ongoing basis to secure the implementation of this policy and our EHSS Management System.

Safety and Security of our stakeholders

We look after our employees with the appropriate equipment and facilities to allow them 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 our workers and partners.

All NHID employees, contractors and clients are required to acknowledge, be aware of and adopt our environmental and social work practices and comply with all EHSS policies and procedures as well as our Code of Conduct, reporting safety hazards, unsafe work practices, unacceptable conditions, environmental and social issues. We respect the safety and security of the Project Affected Persons. We are all responsible for environment, health, safety and security.

NHID is committed to continuously communicate our EHHS Policy to all our personnel as well as relevant stakeholders through an effective, inclusive and non-discretionary communication process.

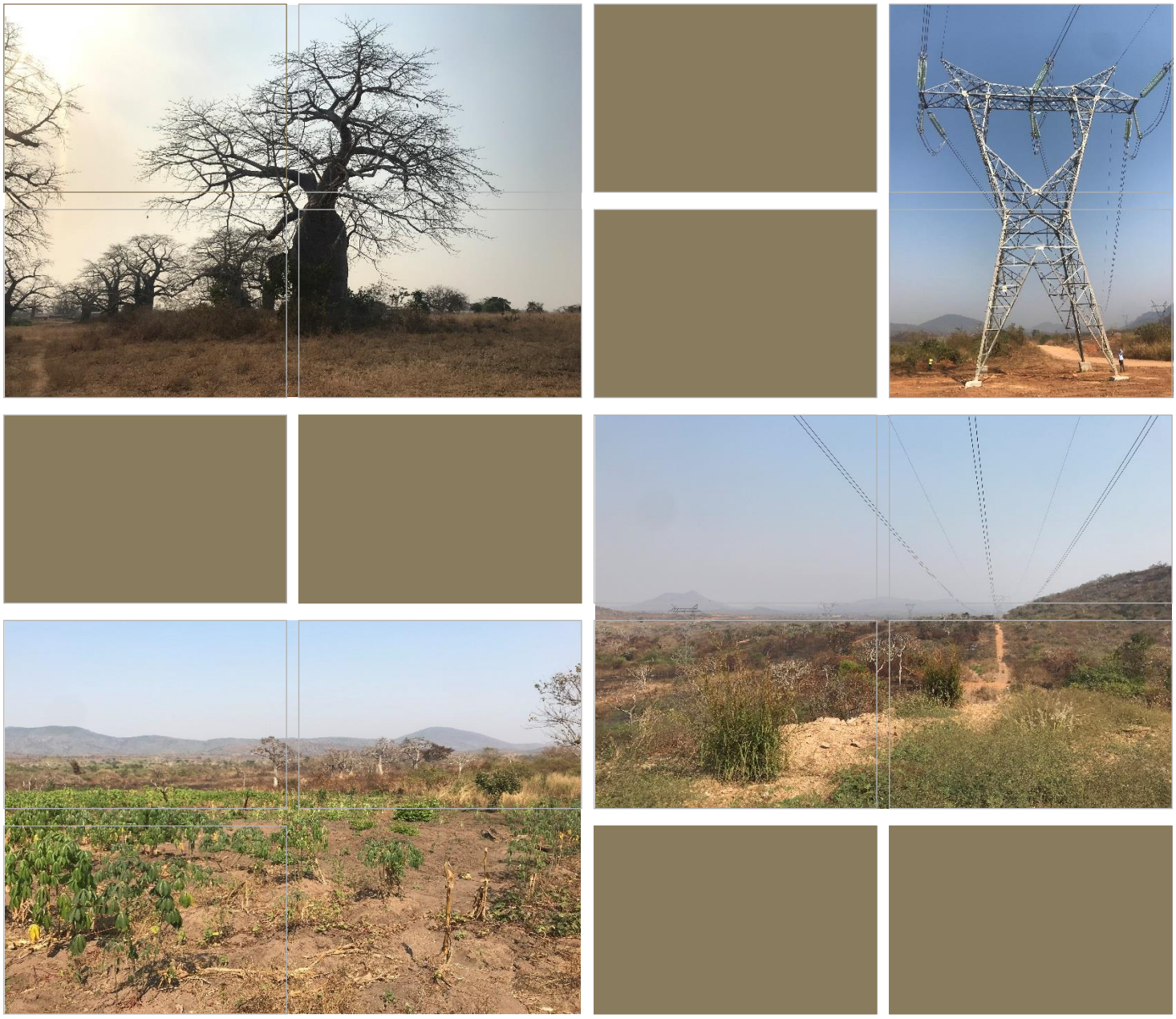
The principle elements of this policy are based on the common values, vision, and mission of the NHID's three shareholders: Dominion Instalaciones y Montajes S.A.U., Energy Saving Engineering, SL and Per Aarsleff West Africa, A/S.



Francisco Riomegro Lorenzo
Supervisory Board Member

Annex F

Stakeholder Engagement



NHID

Laúca-Bita Transmission Line, Angola

Stakeholder Engagement Plan

Final v4.0
March 2019

www.erm.com

The business of sustainability

ERM

NHID

Laúca-Bita Transmission Line, Angola: *Stakeholder Engagement Plan*

Final v4.0
March 2019

For and on behalf of
Environmental Resources Management

Approved by: Alastair Scott



Signed:

Position: Partner

Date: 05 March 2019

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ACRONYMS AND ABBREVIATIONS

AoI	Area of Influence
BID	Background Information Document
CIA	Cumulative Impact Assessment
DAEA	Department of Agriculture and Agrarian Economy
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ERM	Environmental Resource Management
GAMEK	Office of Utilization of the Middle Kwanza
I&APs	Interested and Affected Parties
IFC	International Finance Corporation
Km	Kilometer
Kv	Kilovolt
LRP	Livelihood Restoration Plans
MADR	Ministry of Agriculture and Rural
MW	Mega Watt
MINAMB	Ministry of Environment or Angola
MINARS	Ministry Social Assistance and Inclusion of Angola
MINEA	Ministry of Energy and Water of Angola
NHID	New Horizons in Infrastructure of Denmark
RAP	Resettlement Action Plans
RCAP	Resettlement Compensation Action Plan
RNT	National Electricity Transmission Network Company

1 INTRODUCTION

1.1 BACKGROUNDS

New Horizons of Infrastructure of Denmark, hereafter referred to as 'NHID' or the 'Company' has developed this Stakeholder Engagement Plan (SEP) for the Láuca-Bita Transmission Line (the 'Project') located in Angola.

The Project involves the construction, commissioning, and operation of an overhead electricity transmission line that addresses the need to transport the electricity generated in the hydroelectric plant in Laúca (with a production planned capacity of 2,067 MW), to a new electricity substation to be built in Bita, near the Luanda metropolitan consumer area. It will complement and reinforce existing transmission lines as well as other transmission lines that are currently being built within the same 800 m Laúca-Luanda transmission line corridor. Together, the transmission lines will provide sufficient capacity to evacuate all the expected energy generated by the Laúca hydropower plant.

NHID has been awarded a contract by the Ministry of Energy and Water of Angola (*Ministerio da Energia e Aguas* - MINEA) for the design, construction and commissioning of the Project. NHID is working in collaboration with *Gabinete de Aproveitamento do Médio Kwanza* (GAMEK). GAMEK is the representative of the *Ministério da Energia e Águas* (MINEA), the owner of the Project. Once constructed, the Project will be handed over to *Rede Nacional de Transporte de Electricidade* (RNT) dependent on MINEA who will be responsible of the operations. GAMEK will be responsible with support from NHID for managing stakeholder engagement relations including grievance management during pre-construction and construction phases. RNT will be responsible for delivering operational responsibilities related to environmental and social management including stakeholder engagement and grievance management.

In 2014, an Environmental and Social Impact Assessment (ESIA) was conducted to comply with Angolan requirements (referred to in this report as the '2014 ESIA'). NHID has commissioned ERM to update the 2014 ESIA in order to address changes to the Project design and address environmental and social requirements of international financial institutions ERM was also commissioned to develop this SEP.

1.2 PROJECT DESCRIPTION

1.2.1 Location

The Project routing is presented in *Figure 1.1* below. As shown, the Project includes two distinct transmission lines:

- The first is a 238km long 400 kV overhead transmission line that will connect the 400 KV substation of the Laúca hydroelectric power station to a new substation to be built close to Luanda.
- The second part is a 7.5km long 220 kV overhead transmission line (with two parallel lines) that will connect the 220 KV substation of the Laúca hydroelectric power station to the existing transmission line that connects the Capanda hydroelectric power station with the Cambambe hydroelectric power station.

1.2.2 Area of Influence

In terms of the ESIA, the Area of Influence for the social impact assessment incorporates all the settlements totally or partially within a 500 m corridor (250 m either side of the centreline) running the entire length of the transmission line from the municipality of Cambambe in Cuanza Norte Province to Belas in Luanda Province). This 500 m width was defined as it is considered that most impacts, including land-based impacts, will occur within this corridor as most surveyed settlements are located close to the lands they cultivate. It should be noted that in some cases some settlements may be located further away from the 500 m corridor and still have cultivated land within this corridor.

Affected settlements located outside the 500 m corridor, if any, will be identified during the household survey at a later stage as part of the implementation of the Resettlement and Compensation Action Plan (RCAP).

1.2.3 Development Phases and Schedule

The transmission line and substation schedule includes the following phases:

- *Planning and executive design phase*: This includes line route selection through discussions with MINEA to establish bend points for all routes which will be surveyed by the surveyor and on site measurements to accurately determine the route and substation layout. The current schedule has assumed up to 12 months are needed for the complete detailed design stage, development of route and profile design and structure and foundation design. Subsequent to the detailed design, procurement, shipping, clearing and transportation activities will take place to bring the equipment and infrastructure to site. Pre-construction activities will include a topographic survey using LIDAR. This phase will also involve completion of the Resettlement and Compensation Action Plan (RCAP) and corresponding Annexes.

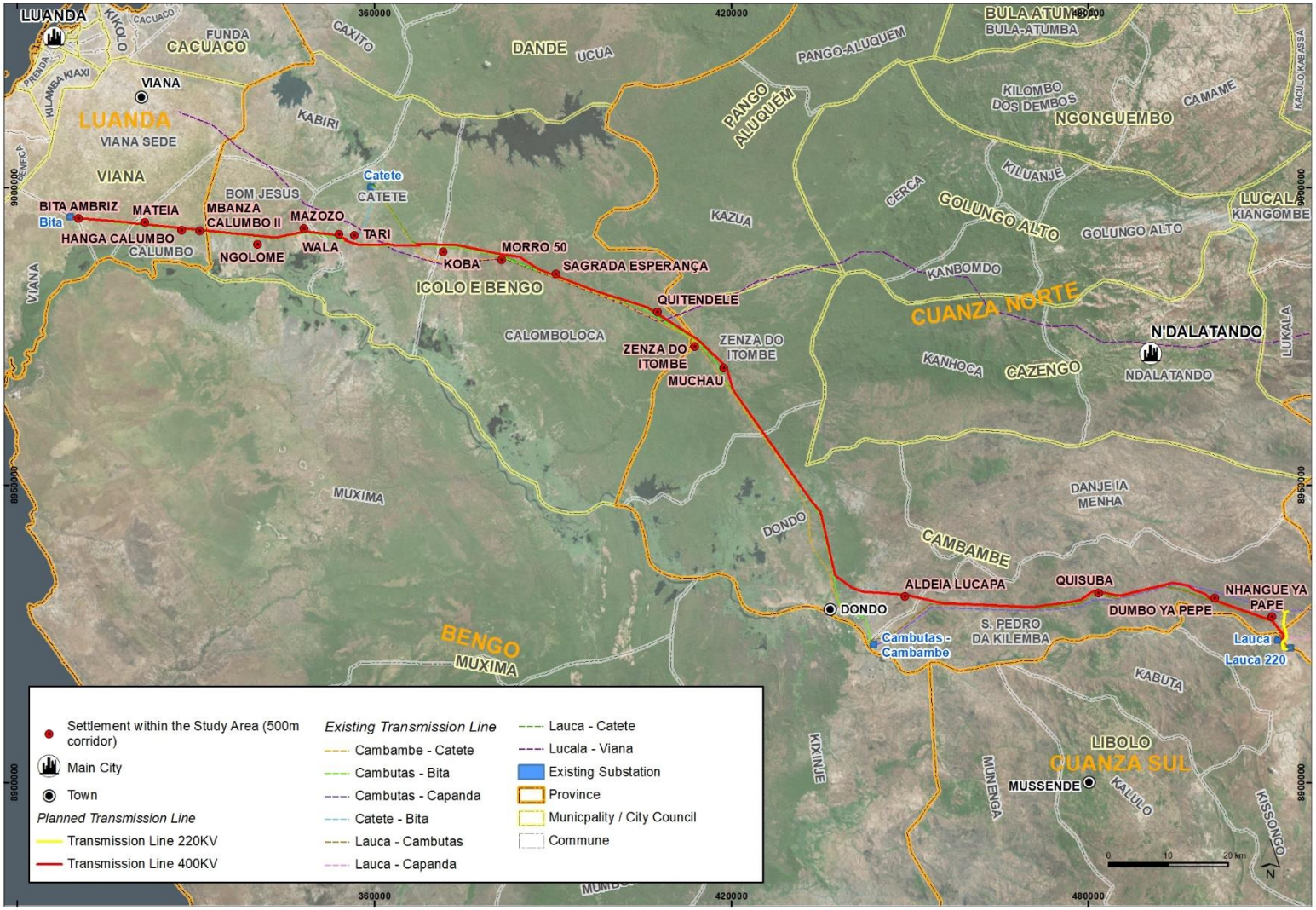
- *Construction phase*: The construction of the transmission line will involve surveying, establishing the site, bush clearing and access road establishment, foundation construction and structure installation, and energising. This phase is expected to take between 12 to 18 months to complete. Due to the fact that NHID is considering creating three independent constructions teams (different subcontractors), this timeframe

is expected to be completed over 12 months (01 July 2019 to 30 June 2020). If only two contractors will be used, the construction period is expected to extend to 18 months.

- *Operational phase:* Once commissioned, the transmission line will be transferred by MINEA to RNT for operation. This phase includes operational activities associated with the management, maintenance and control of the 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 transmission lines is 50 years.

Figure 1.1 Project Location



Source: ERM 2018

1.3 STAKEHOLDER ENGAGEMENT

1.3.1 Principles

NHID understands that effective stakeholder engagement and public consultation is a cornerstone of successful Project development, and is committed to free, prior, and informed engagement with stakeholders throughout the Project lifecycle.

The key principles guiding NHID's approach to stakeholder engagement on this Project are as follows:

- To be open and transparent with stakeholders.
- To be accountable and willing to accept responsibility as a corporate citizen and to account for impacts associated with the Project activities.
- To have a relationship with stakeholders that is based on trust and a mutual commitment to acting in good faith.
- To respect stakeholders' interests, opinions and aspirations.
- To work collaboratively and cooperatively with stakeholders to find solutions that meet common interests.
- To be responsive and to coherently respond in good time to stakeholders.
- To be pro-active and to act in anticipation of the need for information or potential issues.
- To engage with stakeholders such that they feel they are treated fairly and their issues and concerns are afforded fair consideration.
- To communicate in a manner that is culturally appropriate and understandable to the affected persons.
- To be inclusive and accessible to stakeholders so that they feel able to participate; to receive and understand information; and to be heard.

1.3.2 Objectives of the SEP

The main objectives underpinning the development and implementation of the SEP for the Project are outlined in *Table 1.1* below.

Table 1.1 Objectives of the Stakeholder Engagement Plan

Objective	Rationale
Identify relevant stakeholders for this Project.	Identify and categorise individuals or organisations that may be affected by the Project or have an effect on how the Project is implemented, noting that this is an ongoing process which many change throughout the life of the Project.

Objective	Rationale
Distribute accurate Project information in an open and transparent manner.	Ensure that stakeholders, particularly those directly affected by the proposed Project, have all relevant information available to them to enable them to make informed comments and plan for the future. This helps reduce levels of uncertainty and anxiety. Information should allow affected parties to develop an understanding of potential impacts, risks and benefits and an open and transparent approach is central to achieving this aim.
Form partnerships to promote constructive interaction between all parties.	Develop relationships of trust between the Project and stakeholders to contribute to proactive interactions and avoid where possible, unnecessary conflicts based on rumour and misinformation. Identifying structures and processes to deal with conflicts and grievances allows the Project a better understanding of stakeholder concerns and expectations thereby providing opportunities to increase the Project's value to local stakeholders.
Record and address public concerns, issues and suggestions.	Document stakeholder issues, concerns and comments to allow the rationale for Project decisions to be traced and understood. Records also assist during review and audits of the Project, in identifying thematic issues, which may need a more holistic response, and during follow up engagements with the affected people. This approach also addresses potential concerns that stakeholder engagement is a token gesture by the developer that meets requirements but that it is not taken seriously in Project planning.
Manage stakeholders' expectations.	Expectations, both positive and negative, may not be aligned with the realities of the Project. Ensuring that expectations are kept at realistic levels (e.g. around job opportunities; provision of local infrastructure; social development; and disruption) limits disappointments and frustrations of directly affected parties at later stages of Project implementation, and therefore mitigates the potential for conflict with stakeholders.
Fulfil national and international requirements for consultation.	Ensuring compliance can avoid potential Project delays based on procedural issues rather than substantive ones, and save the company from any additional costs from fines.

1.3.3 Plan Structure

This SEP describes how the Project will engage stakeholders during construction and operations and how stakeholder engagement activities will be incorporated into the Project's overall management system. The SEP focuses on construction and operation; engagement plans for decommissioning will be developed closer to the Project's end of life.

The document is structured as follows:

- *Section 2* describes the regulatory, lender, company, and/or other requirements for consultation and disclosure;
- *Section 3* presents a summary of the previous stakeholder engagement.
- *Section 4* presents an identification and characterisation of stakeholders in order to determine appropriate ways of engagement;

- *Section 5* presents the stakeholder engagement program describing the approach and timetable for sharing information and consulting with stakeholders.
- *Section 6* outlines the resources and responsibilities for implementing stakeholder engagement activities.
- *Section 7* describes the community grievance mechanism.
- *Section 8* describes the monitoring and reporting requirements.

This document is supported by the following annexes:

- *Annex A: Stakeholder Engagement Log*
- *Annex B: List of Stakeholders*
- *Annex C: Sample Grievance Registration Form and Log*
- *Annex D: Sample Stakeholder Engagement Register*
- *Annex E: Project Disclosure Presentation*

2 REGULATIONS AND REQUIREMENTS

2.1 PROJECT REQUIREMENTS

The Project will undertake engagement in alignment with the following which are introduced below:

- NHID company policies;
- Applicable environmental and social legislation of the Republic of Angola; and
- *International Finance Corporation Performance Standards on Environmental and Social Sustainability (2012)* (the 'IFC Performance Standards').

2.1.1 NHID Company Policies

The guiding values of the activities performed by NHID are the following:

- Internal and external client orientation and service-based approach.
- Respect for people, their capacity for initiative, creativity and innovation, participation and teamwork.
- Ability to achieve objectives and added value.
- Positive attitude to change and continuous improvement.
- Responsibility and integrity of people in their commitment towards a job well done.
- Respect for the environment, working to minimise any impact.
- Transparency, publically disclosing all the relevant data from our activities.

In addition to these basic values, the Supervisory Board of the Company has adopted an Internal Code of Professional Conduct. Pertinent rules within the NHID Internal Code of Professional conduct, applicable to the Project, are summarised below.

Regulatory Compliance: Behaviour According to Law and Ethics

NHID rejects any kind of unlawful and/or criminal practice, stating that such practices are completely prohibited, without exception or limits, within the organisation.

For this reason, all the people who affiliated to NHID must: (i) perform their functions within the organization, not only in strict compliance with

applicable legislation, but also avoiding any bad practice that is not ethically acceptable under strict criteria of honesty and moral integrity; and (ii) act in a clear and transparent manner, ensuring that none of their actions may be liable to be interpreted as deceitful.

Relation with Interest Groups Policy

- *Shareholder relations*. NHID undertakes to provide appropriate information to all the shareholders in a transparent, complete, truthful and accurate manner, and to establish dynamic tools to communicate with them. The actions of the people who are part of NHID will be focused on the protection and maximization of value of shareholders' investments, achieving a reasonable return for those investments.

- *Relations with suppliers, contractors and business partners*. The selection process for suppliers, contractors and business partners of NHID must be conducted with impartiality and objectivity, for which its employees must apply criteria of quality and cost in these processes, avoiding any conflict of interest or favouritism in their selection.

- *NHID will require its suppliers to sign the "Supplier Social Responsibility Commitment*". Likewise, the company will promote the performance of any audits that may be necessary to identify and correct deficiencies or weaknesses in the internal control systems of suppliers, contractors and business partners.

- *Relations with governments and authorities*. NHID declares its political neutrality, and states that it does not finance, directly or indirectly, either in Denmark or abroad, any political parties or their representatives or candidates. Employees who wish to participate in activities of a public or political nature must do so exclusively on their own account and outside office hours.

- *Respect for Human Rights.* NHID, in addition to complying with the applicable legislation in all the territories in which it operates, is committed to respecting internationally recognised human rights, including the rights set forth in the International Bill of Human Rights and the principles relating to the rights established in the Declaration of the International Labour Organisation. In addition, NHID complies with the ten principles of the Global Compact.

- *Respect for the environment.* The respect for and protection of the environment are fundamental values that NHID adheres to, at all times meeting the environmental legislation in each of the countries in which it is established, and undertakes to conduct its activities so that any environmental impacts are minimised.

- All persons that are part of the Company shall respect the environment, making rational use of natural resources, and putting all the control

mechanisms at their disposal to minimise the environmental impact derived from the different processes of the activities

2.2 *ANGOLAN REGULATIONS*

Regulatory requirements for stakeholder engagement in Angola are stated in the Decree 51/04 on Environmental Impact Assessment. This decree describes the ESIA process and associated requirements for the project developer. As documented in the updated ESIA report (*Section 2*), this process was undertaken throughout the current ESIA process. Additionally, as prescribed in Article 10 of the Decree 51/04, projects must be subject to a public consultation programme organised by the Ministry of Environment.(1)

The environmental licence for construction of the Laúca-Bita transmission line is expected to be received by GAMEK in January 2018. No additional public consultation is expected to be required by MinAmb.

2.3 *IFC PERFORMANCE STANDARDS*

The IFC Performance Standards are considered a benchmark for good practice for environmental and social risk management in private sector developments. The IFC Performance Standards require that clients engage affected communities through disclosure of information, consultation, and informed participation, in a manner commensurate with the risks to and impacts of the Project on the affected communities.

The *IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts* includes specific guidance on conducting stakeholder engagement both during the planning phase and through the project lifecycle. The key requirements for consultation and disclosure through the life of the Project are as follows.

- *Stakeholder Analysis and Engagement Planning*: Stakeholder engagement is an on-going process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and on-going reporting to affected stakeholders.

- *Disclosure of Relevant Project Information*: Provide affected stakeholders with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such stakeholders and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism.

(1) It could not be confirmed if this process was followed during the Environmental licensing process that occurred in 2014 and 2016. However, the fact that no records of any engagement have been found is an indication that most likely no official engagement took place.

- *Consultation:* Consultation will be in line with the degree of impact of the Project and should: i) begin early and continue through project, ii) be based on prior disclosure of relevant and easily accessible information on the project, iii) focus engagement on those who are directly affected, iv) be free of outside interference and external manipulation, v) enable meaningful participation, vi) be documented.

- *Informed Consultation and Participation***:** For projects with potentially significant adverse impacts on affected stakeholders, conduct an informed consultation and participation process. It should involve deep exchange of views and information, and an organized and iterative consultation, leading to the project incorporating into their decision-making process the views of the affected stakeholders on matters that affect them directly, such as the proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues. The process should be documented, in particular the measures taken to avoid or minimize risks to and adverse impacts on the affected stakeholders. The stakeholders should be informed about how their concerns have been considered.

- *External Communications***:** Implement and maintain a procedure for external communications that includes methods to (i) receive and register external communications from the public; (ii) screen and assess the issues raised and determine how to address them; (iii) provide, track, and document responses, if any; and (iv) adjust the management program, as appropriate. In addition, clients are encouraged to make publicly available periodic reports on their environmental and social sustainability.

- *Grievance Mechanism for Affected Stakeholders:* Establish a grievance mechanism to receive and facilitate resolution of affected stakeholders' concerns and grievances about the client's environmental and social performance.

- *On-going Reporting to Affected Stakeholders:* Provide periodic reports to the affected stakeholders that describe progress with implementation of the project Action Plans on issues that involve on-going risk to or impacts on affected stakeholders and on issues that the consultation process or grievance mechanism have identified as a concern to those stakeholders. The Performance Standards require that after completion of an environmental assessment the consultation and disclosure must continue throughout the life cycle (construction and operation phase) of the project.

The IFC Performance Standards have additional stakeholder engagement and consultation requirements to manage specific impacts as described in the following*:*

- IFC Performance Standard 2: Labour and Working Conditions;

- IFC Performance Standard 4: Community Health, Safety and Security;

- IFC Performance Standard 5: Land Acquisition and Involuntary Resettlement;

- IFC Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management; and

- IFC Performance Standard 8: Cultural Heritage.

The consultation requirements of these other Performance Standards are summarised in *Table 2.1*.

Table 2.1 Other Relevant IFC Performance Standards

Standard	Key Components
PS2: Labour and Working Conditions	Recognises that the pursuit of economic growth through employment creation and income generation should be balanced with the protection of basic rights for workers. Acknowledges that constructive worker-management relationship and safe and healthy working conditions may enhance the efficiency and productivity of operations. As such, requires engagement between projects and their workers including mechanisms for workers to report grievances. (1)
PS 4: Community Health, Safety & Security	Recognizes that project activities, equipment and infrastructure bring benefits to communities including employment, services and opportunities for economic development. However, the project can also increase the potential for community exposure to risks from development. Where project activities pose risks of adverse impacts on the health, safety and security of affected communities the developer is required to make available relevant information (including the details of an Action Plan), in an appropriate form, to affected parties and government authorities so that they can fully understand the nature and extent of the risks.
PS 5: Land Acquisition and Involuntary Resettlement	Recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Where the Project will affect host communities, it will consult with and facilitate the informed participation of affected persons and communities in decision making process related to resettlement. Consultation will continue during the implementation, monitoring and evaluation of compensation payment and resettlement activities.

(1) Worker engagement measures including worker grievance mechanism are not considered in the SEP. A series of worker specific management plans are being prepared as part of the Project social and environmental management system, namely a Worker's Management and Recruitment Plan and Worker's Grievance Mechanism.

Standard	Key Components
PS 6: Biodiversity Conservation and Sustainable Natural Resource Management	Recognises that protecting and conserving biodiversity in all its forms is fundamental to sustainable development. Where the project has potential impacts on legally protected or critical habitats consultation with relevant authorities, specialists and communities must be undertaken. However, no such areas will be affected by the Project.
PS 7: Indigenous People	Recognises that indigenous peoples (IPs) may be particularly vulnerable to the adverse impacts associated with project development, including risk of impoverishment and loss of identity, culture, and natural resource-based livelihoods. There are no indigenous people affected by the Project.
PS8: Cultural Heritage	Recognises the importance of cultural heritage for current and future generations and is consistent with the convention concerning the protection of the world's cultural and natural heritage. Where sites of cultural heritage are potentially impacted (i.e. graveyards) by the project the developer will consult with local communities as well as relevant national authorities responsible for the maintenance of such sites. No cultural heritage is expected to be impacted by the Project.

3 SUMMARY OF PREVIOUS STAKEHOLDER ENGAGEMENTS

3.1 ENGAGEMENT ACTIVITIES

3.1.1 Engagement during Previous ESIAs

The Laúca-Bita Transmission Line Project was initiated in 2014 by MINEA and an ESIA was submitted by GAMEK to, and approved by MinAmb in the same year. Following a design change in the Project in 2016, a new EIA was produced and submitted to MinAmb to reflect this change.

Following another project design change, NHID commissioned ERM to produce another ESIA to update the previous EIA. Project design evolution are presented in detail in the ESIA *Section 2 Project Description.*

Records presented in 2014 and 2016 EIAs indicate that no public consultation events were organised by MinAmb. If any consultation events took place, records are not available.

3.1.2 Engagement during the ESIA Update

Stakeholder engagement was undertaken as part of the Project disclosure and social baseline data collection for the current ESIA. This consisted of meetings with municipality and commune officials, and commune administrators and *Sobas.* Some community meetings were also held.

Overall 19 project disclosure meetings were held between the 10th July and 3rd of August 2018 involving 97 people amongst which 24% were women and 76% were men.

To facilitate disclosure of project information a presentation was developed in Portuguese. This presentation was delivered to stakeholders during meetings. A copy of the presentation is presented in *Annex E*.

Social baseline data collection activities were undertaken in parallel with the engagement activities and this involved forms of engagement as well. These activities encompassed 33 formal and informal meetings in 24 locations with 164 members of settlements in the Project area with including potential landowners and users of the land for the right-of-way. Thirty percent (30%) of those engaged with were women. In addition, five Focus Group Discussions (FGD) with women were organised to ensure their voices and concerns would be documented and accounted for in the ESIA assessment.

Table 3.1 presents a summary of the stakeholder consultation carried out between the 10th of July and 3rd of August 2018. A detailed descriptions of these activities is provided as *Annex A*.

Table 3.1 Stakeholder Consultation during ESIA Update

Date	Location (venue/village)	Participants s	Activity Description	Purpose
10 July 2018	Pungo Andongo Commune Administration	• Commune Administrator (Maria Teresa Oleca) • Adjunct Administrator (Famoroso Inácio) • Chief of staff (Jacinto Oleque)	Official disclosure and consultation meeting with Pungo Adongo Commune Administration	• Project disclosure • Understand land rights procedure • Understand procedures for resettlement and compensation
12 July 2018	Cambambe Municipal Administration	• Representatives of Cambembe Municipal Administration (Fiscalization Unit)	Key Informant Interview with representatives of Cambambe Municipal Administration	• Informal data collection
13 July 2018	Cambambe Municipal Administration	Municipal Administrator (Adão Malongo)	Official disclosure and consultation meeting with Cambambe Municipal Administration	• Inform municipal authority about the Project and survey
13 July 2018	Zenza do Itombe Commune Administration	• Commune Administrator of Zenza do Itombe (Fátima de Almeida) • Soba (Adão Pedro) • Chief of Police (Paulo Estevão)	Official disclosure and consultation meeting with Zenza do Itombe Commune Administration	• Project disclosure and data collection for village profile
16 July 2018	Icolo e Bengo Municipal Administration	• Municipal Administrator (Noivito Agostinho Pedro) • Technical Administrator (Elisabeth Rafael) • Municipal Director for Water and Energy (Gildo Gabriel)	Official disclosure and consultation meeting with Icolo e Bengo Municipal Administration	• Inform municipal authorities about the Project and survey

Date	Location (venue/village)	Participants s	Activity Description	Purpose
19 July 2018	Icolo e Bengo Municipal Administration	• Technical Representative of Municipal Administration – Department of Water and Energy (Nsingi André) • Commune Administrator of Bom Jesus (José Alberto) • Commune Administrator of Catete (Domingos de Azeudo) • Commune Administrator of Cassoneca (Jordão Filipe Amado)	Official disclosure and consultation meeting with Icolo e Bengo Municipal Administration	• Project disclosure and consultation with municipal and commune administrators
20 July 2018	• GAMEK	• GAMEK representatives: • General Director-Fernando Barros Gonga • Deputy Director- Euclides de Brito • Infrastructure Director-Arlindo Manuel Carlos • Environmental Department - Rafael Neto • Project Director- Fernando Quileba • Environmental Department - Sónia Silva	Meeting to inform about survey progress and discuss technical aspects	• Inform on social survey progress, understand and confirm technical, resettlement and compensation aspects.
25 July 2018	Zango Commune Administration	• Technical Representative (Rui Pitra)	Official disclosure and consultation meeting with Zango Commune Administration	• Inform municipal authority about the Project and survey
03 August 2018	Belas Municipal Administration	• Municipal Administrator (Mateus António da Costa) • Adjunct Municipal Administrator (Antónia Ferreira) • Administrator for Water and Energy (Arnaldo Simões)	Official disclosure and consultation meeting with Belas Municipal Administration	• Inform municipal authority about the Project and survey

Date	Location (venue/village)	Participants s	Activity Description	Purpose
10 July 2018	Nhangue Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Soba (Fonseca António Correia) • Other members of the community (elderly, male and female farmers)	Community Meeting and consultation at Nhangue Ya Pepe settlement	• Project disclosure • Socioeconomic baseline data collection for village profile
11 July 2018	Quisuba (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Community coordinator (André Domingos) • Local residents Note: Soba (André Cristovão) was not present at time of visit	Community Meeting and consultation at Quissuba settlement	• Project disclosure and data collection for village profile
11 July 2018	Aldeia Lucapa (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Soba (n/a) Local residents	Community Meeting and consultation at Aldeia Lucapa settlement	• Project disclosure and data collection for village profile
13 July 2018	Muchau (Zenza do Itombe commune, Cambambe munincipality)	• Soba (n/a) • Local residents (male farmers)	Community Meeting and consultation at Muchau settlement	• Project disclosure and data collection for village profile
14 July 2018	Sagrada Esperança (Cassoneca Commune, Icolo e Bengo municipality)	• Soba (Felizardo Jorge) • Local residents (elderly men, women)	Community Meeting and consultation at Sagrada Esperança settlement	• Project disclosure and data collection for village profile
16 July 2018	Mazozo (Catete Commune, Icolo e Bengo municipality)	• Soba (Araújo Cafala) • Local residents (representatives from Farmer's association)	Community Meeting and consultation at Mazozo settlement	• Project disclosure and data collection for village profile
21 July 2018	Bita Ambriz (Quenguela commune, Belas municipality)	• Community Coordinator (n/a) • Local residents (men, women and children)	Community meeting, consultation and Focus Group Discussion with community members in Bita Ambriz settlement	• Inform about the project and collect information about local residents
10 July 2018	Nhangue Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Women	Focus Group Discussion with Women in Nhangue ya Pepe settlement	• Socioeconomic data collection

Date	Location (venue/village)	Participants s	Activity Description	Purpose
11 July 2018	Dumbo Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Community coordinator (Adão André Mateus) • Local residents Note: Soba (Aíres Paulo) was not present at time of visit	Key Informant Interview with community representatives at Dumbo Ya Pepe settlement	• Project disclosure • Socioeconomic baseline data collection for village profile
11 July 2018	Dumbo Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Women	Focus Group Discussion with Women in Dumbo Ya Pepe settlement	• Data collection
11 July 2018	Quisuba (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Women • Youth	Focus Group Discussion with Women and Youth in Quissuba settlement	• Data collection
11 July 2018	Hombo (Sao Pedro Quilemba Commune, Cambambe Municipality)	• Local residents	Informal discussion with community members at Hombo during ground-truthing activity	• Ground-truthing to verify farming close to Transmission Line
13 July 2018	Cambambe (Cambambe municipality)	• Representatives of the Fiscalization Unit at Cambambe Municipality	Informal discussion with community representatives at Cambambe during ground-truthing activity	• Check site to confirm land use
14 July 2018	Quitendele (Zenza do Itombe commune, Cambambe munincipality)	• Local residents	Key Informant Interview with community representatives at Quitendele settlement	• Collect information regarding land use in the area
14 July 2018	Sagrada Esperança (Cassoneca Commune, Icolo e Bengo municipality)	• Elderly woman	Key Informant Interview with community representatives at Sagrada Esperança settlement	• Data collection on women issues
17 July 2018	Hanga Calumbo (Calumbo commune, Viana municipality)	• Local residents (female trader, men)	Key Informant Interview with local residents at Hanga Calumbo settlement	• Village profile and informal data collection

Date	Location (venue/village)	Participants s	Activity Description	Purpose
17 July 2018	Hanga Calumbo (Calumbo commune, Viana municipality)	• Community Coordinator (Quim Sebastião) Local resident	Key Informant Interview with community representatives at Hanga Calumbo settlement	• Project disclosure and data collection for village profile
17 July 2018	Mbanza Calombo II (Calumbo commune, Viana municipality)	• Community Coordinator (n/a) • Local residents (farmers)	Key Informant Interview with community representatives at Mbanza Calumbo II settlement	• Project disclosure and data collection for village profile
18 July 2018	Morro 50 (Cabembeia Commune, Icolo e Bengo Muncipality)	• Women • Men • Youth	Focus Group Discussion with community members in Morro 50 settlement	• Village profile and informal data collection
18 July 2018	Morro 50 (Cabembeia Commune, Icolo e Bengo Muncipality)	• Community Coordinator (n/a) • Local resident (translator)	Key Informant Interview with community representative at Morro 50 settlement	• Project disclosure and data collection for village profile
18 July 2018	Koba (Calamboloca Commune, Icolo e Bengo municipality)	• Businessman • Local resident	Key Informant Interview with local businessman and resident at Koba settlement	• Inquire about land close to point 36 and community experience with past TL projects
18 July 2018	Tari (Catete Commune, Icolo e Bengo municipality)	• Interim Coordinator (Manuel Agostinho) • Community Secretary (Augusto Joaquim) • Representative of community coordination office	Key Informant Interview with community representatives at Tari settlement	• Project disclosure and data collection for village profile
19 July 2018	Wala (Catete Commune, Icolo e Bengo municipality)	• Community representative (Fernando José) • Secretary (Miguel Bernardo) • Local residents	Key Informant Interview with community representatives at Wala settlement	• Project disclosure and data collection for village profile

Date	Location (venue/village)	Participants s	Activity Description	Purpose
19 July 2018	Wala (Catete Commune, Icolo e Bengo municipality)	• Women	Focus Group Discussion with Women in Wala settlement	• Data collection on issues faced by women
20 July 2018	Mateia (Kikuxi commune, Viana municipality)	• Community Representative (Paulo Sebastião)	Key Informant Interview with community representatives at Mateia settlement	• Inform about the project and collect information about local residents
20 July 2018	Mateia (Kikuxi commune, Viana municipality)	• Women	Focus Group Discussion with Women in Mateia settlement	• Collect information from talking to local residents
21 July 2018	Bita Ambriz (Quenguela commune, Belas municipality)	• Female farmer	Key Informant Interview with local farmer at Bita Ambriz settlement	• Collect data on land use and ownership
21 July 2018	4 de Fevereiro (Quinguele Commune, Belas municipality)	• Local residents	Key Informant Interview with local residents at 4 de Fevereiro settlement	• Understand expansion pattern and where families come from
23 July 2018	Ngolome (Bom Jesus commune, Icolo e Bengo municipality)	• Community Coordinator (n/a)	Key Informant Interview with community representatives at Ngolome settlement	• Inform about the project and collect information about local residents

3.2 KEY STAKEHOLDER ISSUES

During the meetings outlined in *Table 3.1,* stakeholders raised a number of concerns associated with the Project. *Table 3.2* presents a summary of the key issues raised in the different municipalities. The issues expressed by the different stakeholder have been considered in the impact assessment presented in the ESIA and accounted for in the development of the RCAP. It is also assumed that these outcomes will inform the Project planning and development of engagement activities.

Table 3.2 Key Stakeholder Issues

Location	Main issues and concerns raised
Cambambe Municipality	• Participants noted that they do not have access to electricity even though the transmission line passes through their lands. • Participants raised the fact previous transmission line projects did not compensate them appropriately for their loss of lands. • Participants insisted compensation must be paid prior to the transmission line construction. • Participants highlighted the high unemployment in the Project area. • Participants highlighted the lack of basic social infrastructures such as access to water and electricity, health and school infrastructures as well as transportation network in the Project area. • Participants highlighted the lack of transparency and fairness of the compensation process.
Cacuso Municipality	• Participants stressed the importance of informing communities about the Project and the related risks and of understanding impacts to livelihoods. • On other transmission line projects, local communities stated that they did not benefit from improvements in access to energy. Communities do not understand why some communities have electricity and others do not. • The importance of transparency and honesty was stressed when dealing with communities including regarding compensation and benefits.
Icolo e Bengo Municipality	• Participants raised the issue that the previous transmission line project did not compensate affected stakeholders appropriately. They would like to get transparent information on the compensation process. • Participants raised their concerns over health and safety risks associated with the Project. • Participants mentioned the importance of continuing stakeholder engagement and to keep them informed of the Project evolution, especially locations. This was particularly important for those preparing their land for the rainy season. • Participants highlighted the lack of social infrastructures such as access to water and electricity, and lack of school and health facilities. • Participants highlighted the high unemployment levels in the Project area. • Participants shared expectations that the Project will give them access to electricity. • Participants asked for more information on the grievance mechanism process especially in case of failure from the Project to compensate for the loss of land.
Belas Municipality	• It is expected that once the Project design, stakeholder engagement plan, and resettlement plan are defined, the company needs to inform the municipality so that the families affected can be registered by the administration.
Viana Municipality	• Participants mentioned the lack of compensation associated with the previous transmission line construction. • Participants asked questions about health and safety, and are concerned about how the transmission line could affect the health of local residents.

Location	Main issues and concerns raised
	• Issues raised by participants included: unemployment, lack of access to water, lack of access to electricity, high number of malaria cases.

Annex A provides further detail on specific feedback provided in each of the meetings organised during the ESIA field survey.

4 PROJECT STAKEHOLDERS

4.1 STAKEHOLDER IDENTIFICATION

Stakeholders are organisations and individuals who may be directly or indirectly (positively or negatively) affected by the Project or who may have an effect on how the Project is implemented. Stakeholder can be categorised as follows:

- *Primary Stakeholders:* Those directly affected by the Project such as individuals with rights of ownership or use of land required by the Project and nearby neighbours to the parcel of land, including members of the public and various institutions (eg schools, churches).

- *Secondary Stakeholders:* Those indirectly affected by the Project but who will influence the Project implementation. These include the responsible agencies, government ministries, municipal and communal authorities and traditional leaders (*sobas*).

Stakeholder identification began at Project inception and planning, and has continued through the various stages of the project development. Stakeholders identified to date are listed in *Table 4.1* including a description of their connection to the Project. This information is provided in order to consider the appropriate ways of providing information and consulting with the various groups.

Stakeholder identification is an ongoing activity that will need to be continued as the Project progresses.

Table 4.1 Stakeholder Category List

Stakeholder Category	Stakeholder Group	Stakeholders
National Government National government are 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.	• Key Ministries • National Regulatory bodies • Government Agencies and Institutes	*National Regulatory Bodies* • Ministry of Environment "*Ministério do Ambiente*" (MinAmb) • Ministry of Energy and Water "*Ministério da Energia e Águas*" (MinEA) Key *Ministries and Ministry Departments* • Ministry of Agriculture and Forestry *"Ministério da Agricultura e Florestas"* • Agriculture Land Management Office *"Gabinete de Gestão de Terras"* (Ministry of Agriculture and Forestry) • National Agriculture Directorate "*Direcção Nacional da Agricultura"*(Ministry of Agriculture and Forestry) • Agriculture Development Institute *"Instituto de Desenvolvimento Agrário"* (Ministry of Agriculture and Forestry) *National Implementing Body* • GAMEK – *Gabinete de Aproveitamento do Médio Kwanza* • RNT EP – *Rede Nacional de Transporte de Electricidade, Empresa Pública* (Ministry of Energy and Water)
Regional and Local Government 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. In addition, the municipalities along the transmission line will be impacted by the Project and will need to be kept informed of progress and plans in their area, to consider	• Provincial authorities • Municipal authorities • Commune authorities	*Provincial governments* • Luanda Province • Cuanza-Norte Province *Municipal administration* • Belas • Viana • Icolo e Bengo • Cambambe *Commune administration* • Quenguela • Calumbo • Distrito Urbano do Zango (Urban District) • Distrito Urbano do Kikuxi (Urban District) • Bom Jesus • Catete

Stakeholder Category	Stakeholder Group	Stakeholders
the Project activities in their policy-making, regulatory and other duties and activities.		• Calomboloca • Zenza do Itombe • Dondo • São Pedro da Quilemba • Cassoneca
Parastatals Parastatals may have land or other assets which could be affected by the Project. RNT is the owner of the transmission line and electricity network that the Project will connect to. RNT is responsible for all the Very High Voltage Transmission assets.	• Government funded private enterprises in charge of managing specific activities.	• GAMEK (Gabinete de Aproveitamento do Médio Kwanza (Ministry of Energy and Water) • RNT (*Rede Nacional de Transporte de Electricidade*) National Network of Energy Transmission
Traditional and Community Level Authorities Local community leaders acting as representatives of their local community. These are the key leadership figures at local level. They are locally appointed amongst the most respected community members. Sobas are traditional village leaders. Their role is to support local communities and liaise with government authorities. Meetings with traditional authorities will follow local practices and should be held prior to any wider communication in local communities in order to respect the political and social structures.	• Community level local administration representatives. • Traditional authorities at community level.	Traditional and community level authorities of the settlements and neighbourhoods ("*bairros*") included in the Study Area (500 buffer) or that have land within the Study Area (see below): • Community coordinator (and secretary coordinator) in peri-urban areas • Sobas (village chiefs) and secretary soba • Village elders and councillors of affected settlements.

Stakeholder Category	Stakeholder Group	Stakeholders
Communities or Settlements Households and communities that may be directly or indirectly affected by the proposed Project and its activities. This includes people living on land affected by the Project, through direct land take or by social and environmental impacts, and other people who visit or use land or resources that may be affected. Primary stakeholders include landowners and land users. These communities need to be engaged around Project impacts (construction and operations). Land affected households will need to be informed about land acquisition and restrictions to land, to participate in the finalization of agreements around compensation and livelihood restoration and take active ownership of the resulting implementation of these measures.	• Project affected communities along the 500 m buffer including: o Landowners and users; o Community members who use access roads to access nearby natural resources o Social / public infrastructure and services.	*Villages (included in the Study Area (500 m buffer) or that have land in the buffer)*: • Directly and indirectly affected community members • Land Affected Households: • Households losing access to land • Households losing access to livelihood resources • Households with houses at risk of displacement
Vulnerable Persons/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.	Vulnerable groups within the Study Area	Vulnerable people within the communities of the Study Area (listed above), specifically: • very poor households that rely mostly on farming for food; • women and female-headed households including single mothers and widows – these households typically rely on farming since other activities such as harvesting of múcua, hunting/fishing, and informal jobs (“*biscatos”)* are usually performed by men; • unemployed youth – high unemployment rate in the study area; • elderly and orphans; • disabled persons; • in-migrants (these include migrants from other communities and ethnic groups in search of employment opportunities, farmland, education and intermarriage). It can be more difficult for migrants to find land available.

Stakeholder Category	Stakeholder Group	Stakeholders
Civil Society 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. Such organisations may also have useful data and insight and may potentially become partners to the Project in areas of common interest such as the implementation of community investment as applicable.	• Community-Based Organisations (CBOs) • Community or Other Associations • Research and Academic Institutions	• Rede Terra (non-governmental organization working towards supporting communities to have access to land and has conducted studies that include land tenure information). • Rede Ambiental Maiombe (a forum for consultation of environmental NGOs, proclaimed on 31 January 2001, which is presented as a continuation of the quality of life, as well as a recovery and recovery of ecosystems). • Fundação Kissama (a non-governmental organization founded in 1996 with the aim of promoting the protection of Angolan flora and fauna). • ADRA – Acção para o Desenvolvimento Rural e Ambiente (an Angolan NGO committed to building a democratic and sustainable development, socially, economically and environmentally just, and with the process of national reconciliation and peace for Angola). • Juventude Ecológica Angolana (JEA) (a non-governmental organization dedicated to environmental awareness and education). • Other organisations
Non-Governmental Organizations (NGOs) 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 bilateral organisations.	• International • National • Local	• Local NGOs and NGOs located in the Study Area: o Red Cross operating in Cambambe municipality • International NGOs and Pressure Groups: Human Rights Watch, World Vision, IUCN, OXFAM, CARE, WWF, GTZ, Eldoret - SOS Children's Villages International are all present in Angola. • Development Workshop (DW) Is ONGs that has been working in Angola since 1981 at the national government's request to assist in developing policies and programs for human settlements and self-help housing. • ADPP (Ajuda de Desenvolvimento de Povo para Povo) - ADPP is an Angolan Non-Governmental Organization that started its activities in 1986 and has invested in the construction of schools in rural areas as well as supporting agricultural projects implemented by women.
Other interest groups Local and Municipal level media will typically have a higher level of influence over the Project and may be leveraged to influence local stakeholders' perceptions of the Project.	• Media • Law enforcement	• Local radio stations part of *Rádio Nacional de Angola* • Provincial media (radio stations). • Angolan local police

Stakeholder Category	Stakeholder Group	Stakeholders
Potential business partners Organisations, businesses and individuals with direct interest in the Project e.g. running businesses or providing services and supplies to the Project.	• Contractors • Suppliers and service providers. • Other businesses operating within the community • Local and international banks • Other	• Municipal / provincial businesses

4.2 STAKEHOLDER ANALYSIS

It is helpful to map stakeholders in order to develop tailored and effective means of engagement that meet their interest in the project and their likely key issues. To support the analysis of stakeholders have been mapped to indicate the following:

- *Influence on the Project:* Influence refers to the power that the stakeholders have in relation to decisions either taken by, or affecting the Project. This power may be in the form of stakeholders that have formal control over the decision-making process or it can be informal in the sense of protesting against, blocking or allowing Project operations to continue.

- *Interest:* Interests refers to the connection between the stakeholders and the Project, for example they may or have something to either gain or lose because of Project implementation. Understanding stakeholder level of interest can help clarify the motivations of different stakeholders and the ways in which they might be able to influence the Project.

Figure 4.1 shows the current stakeholder map. It is noted that the positions of stakeholders may change over time as the Project progresses and that the stakeholder map should be reviewed and updated as appropriate. In addition, any new stakeholders identified should be added into the map.

Figure 4.1 Stakeholder Mapping



Source: ERM 2018

5 STAKEHOLDER ENGAGEMENT PROGRAMME

5.1 OVERVIEW

The stakeholder engagement programme is designed to cover all phases of the Project. However, NHID will hand over the Project to *Rede Nacional de Transporte de Electricidade* (RNT) once the construction and commissioning of the transmission lines is completed. NHID will have no responsibilities during the operation phase. In this regard, all engagement activities during the operation will be implemented and managed by RNT.

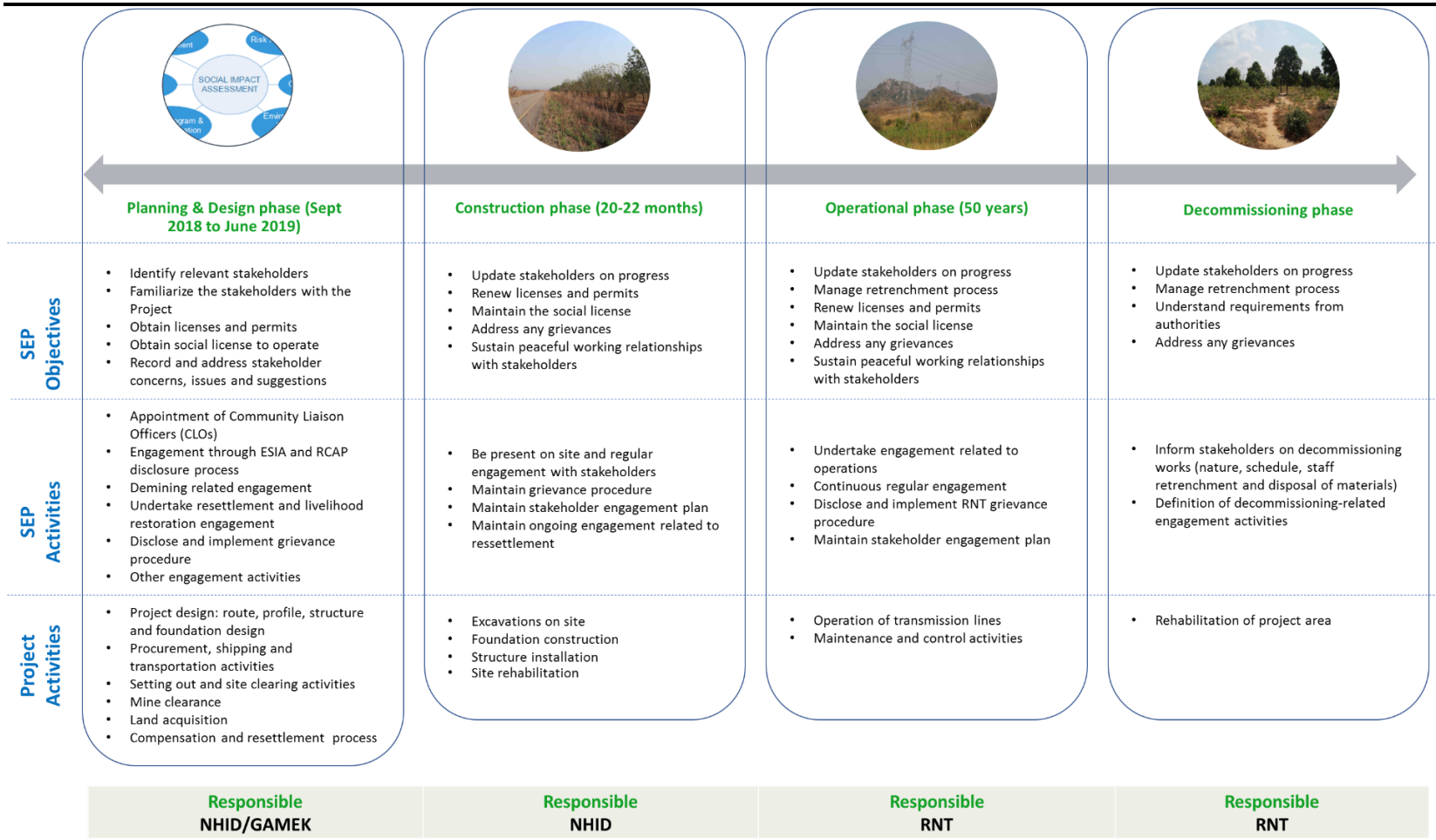
The general objectives of stakeholder engagement under this SEP are as outlined in *Figure 5.1* below.

Specific planning and engagement activities will be necessary at each Project phase, however some activities will be ongoing throughout the entire Project cycle and therefore common to the different phases. Common activities 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 (see *Section* ***Error! Reference source not found.***)
- Regular Project Monitoring reports (in particular during Construction and Operations).

The following sections detail the planned engagements at each Project phase.

Figure 5.1 Stakeholder Engagement Objectives and Activities for Each Project Phase



Source: ERM 2018

5.2 PROJECT PHASES

5.2.1 Pre-Construction

Community Liaison

The Project will appoint a team of E&S / Project Community Liaison Managers to oversee community and stakeholder engagement activities including land acquisition and compensation related engagement. The E&S / Project Community Liaison Managers will be neutral individuals, recruited from the community who speak the dominant local languages, Portuguese and Quimbundo, and do not to have a vested interest in a particular outcome. The E&S / Project Community Liaison Managers will be responsible for interfacing between the stakeholders and the Project.

The E&S / Project Community Liaison Managers will need to be acquainted with the stakeholders and stakeholder process as outlined in this SEP, including a clear understanding of the Project schedule and engagement milestones in order to inform stakeholders appropriately about the development of the Project. E&S / Project Community Liaison Managers will, under the guidance of the Land Acquisition and Compensation Coordinator, engage with land affected households in order to provide information on the process ahead.

Engagement during ESIA Update and RCAP

Disclosure of the ESIA and Resettlement and Compensation Action Plan (RCAP) will involve engaging with national, provincial and local stakeholders.

The ESIA disclosure process requires consultation with affected communities and interested stakeholders to ensure their views and concerns are taken into consideration in the development of the final ESIA document. It is also a requirement to ensure they are informed in a timely manner of the Project activities and timeline.

The ESIA team will disclose the ESIA in a way that is culturally and technically adapted to each group of stakeholders. It will particularly present the project activities and it associated impacts in non-technical language to local communities to ensure they are fully understood. Stakeholder comments will feed into the ESIA which will be adapted should it be necessary.

Along with the ESIA results, the RCAP will be presented to stakeholders with a focus on landowners and land users affected by resettlement. The purpose of the RCAP disclosure is to inform stakeholders potentially affected by involuntary resettlement, either physical or economical, of the resettlement process the Project is planning to implement, consult their views on the RCAP and collect their feedback to adapt the RCAP as needed. The RCAP disclosure

needs to begin to build the necessary basis for informed participation of people potentially affected by resettlement.

Considering the potential sensitivity of resettlement activities, disclosure of the RCAP will be a key element of early pre-construction stakeholder engagement activities. Clear communication with affected stakeholders will be paramount for the acceptance of the RCAP and support the Project to obtain a social licence to operate.

Engagement during Demining

Prior to any construction work being carried out, the Project will demine a 60m wide corridor around the OTHL path to remove all land mine still present in the area. Considering the potential health and safety risk associated with this activity, specific engagement activities will be undertaken in the project are to inform stakeholders of the location and timing of the demining activities, present the method to be used by the demining contractor and consult stakeholders on area where land mines are potentially present.

Engagement during Resettlement and Livelihood Restoration Planning

The resettlement and livelihood restoration activities will involve significant engagement with affected people along the transmission line corridor including announcement of cut-off date, census of population affected by resettlement activities, asset inventories and household surveys. These activities will be presented to affected stakeholders through specific engagement activities which will be detailed in the RCAP and will include:

- Resettlement and livelihood restoration options disclosure;
- Report disclosure;
- Ongoing information sharing the implementation ; and
- Implementation monitoring.

The resettlement and livelihood restoration activities will be carried out sequentially in line with the construction schedule. It is likely that several plans will be developed for each construction sequence.

Grievance Mechanism

The grievance mechanism presented in detail in *Section 6* will be disclosed to the affected communities during the ESIA and RCAP disclosure to ensure that it is available for use by stakeholders in advance of on the ground Project works.

During construction, the grievance mechanism will be implemented and managed by NHID. Once construction is completed, NHID will hand over the responsibility of implementing the grievance mechanism to RNT.

Other Engagement Activities

Other engagement activities during the pre-construction phase may include communication to stakeholders about upcoming feasibility surveys and liaison with suppliers and contractors.

5.2.2 Construction Phase Engagement

Maintain Stakeholder Engagement Plan

The Stakeholder Engagement Plan is a living document. It will be regularly updated with the results of stakeholder engagement activities carried out by the Project team. The engagement activities program will be adapted to the project evolution and will reflect any significant change in the project design or execution. It will in particular be updated as the Project transitions into construction and again as the Project transitions into operation.

Site Presence and Regular Engagement with Stakeholders

Stakeholder engagement will take place regularly to inform stakeholders on the advancement of the Project works. Specific information activities will be carried out in advance of any work taking place in a given location.

Stakeholders will be informed of the nature of the work, the number of workers on site and the duration of works. Regular updates will be provided to stakeholders to inform them on the evolution of the project work and of any significant change to the project planning.

During project works, the Project team will maintain open a communication channel with stakeholders to allow them to share any relevant feedback about the ongoing works and raise any concerns.

Ongoing Engagement Related to Resettlement

Continued information sharing is important to ensure acceptance of the resettlement process, to manage expectations and also to allay any tensions between households receiving differential benefits. Presenting consistent project information and messages to all stakeholders will support a greater understanding of the resettlement livelihood restoration process, and reduce the chance of misinformation. In this regard, land-affected households will be regularly engaged during project implementation including addressing grievances and managing incidences with agriculture reestablishment. This will be the responsibility of the Land Acquisition and Compensation team with oversight from the Municipal Commission (see *Section 8*).

Maintain Grievance Procedure

The grievance mechanism will be maintained during the construction phase. It will be regularly reviewed to ensure it is appropriately capturing and closing

out community grievances and is fit for purpose. The grievance mechanism will be implemented and managed by NHID through its Social and Environmental Manager and the E&S / Project Community Liaison Managers deployed in each area.

5.2.3 Operations Phase Engagement

At the end of the construction phase, when the transmission line commissioning is completed, the responsibility for operating and maintaining the transmission line will be transferred to RNT. GAMEK/NHID will have no role during the operational phase. However, it is expected that before transition starts GAMEK/NHID will deliver capacity building/training of RTN. This section presents the expected engagement activities that will be undertaken by RTN.

Engagement Related to Transition to Operations

When transitioning to operations, NHID will hand over all implementation responsibilities to RTN. Before the transition is completed, NHID and RTN will inform all stakeholders of the change of responsibilities during specific engagement activities. The information shared with stakeholders will include mechanisms for communicating with RTN, including raising grievances, and the process by which RTN will engage with local communities in case of necessary maintenance works.

Continuous Regular Engagement

Following the transition period RTN will engage regularly with key stakeholders on the Project performance.

Prior to undertaking land clearance on access roads and maintenance work on the TL, RTN will engage with stakeholder potentially affected by the works to inform them on the nature of the works, the schedule and their duration.

Implement and Disclose RNT Grievance Mechanism

During the operation phase, the responsibility for managing grievances will be with RTN. It is expected that the grievance mechanism structure and its management will change between the construction and operation phase. These changes will be presented to affected stakeholders to ensure a smooth transition between the two phases and that grievances are managed appropriately by RTN.

Maintain Stakeholder Engagement Plan

In the operation phase, RTN will be responsible for managing the stakeholder relations and engagement.

During the operation phase, the engagement activities program will be adapted to the project evolution and will reflect any significant change in the

project design or execution. It will also adapt to the evolution of stakeholders in the Project area and communication methods available to the Project. RNT will submit the SEP for the operations phase 2 months prior to commissioning.

5.2.4 Decommissioning Phase Engagement

As the decommissioning phase is currently planned for 2071, the level of uncertainty around the implementation of decommissioning activities does not allow for stakeholder engagement planning. This will rather be determined prior to the end of the operation phase.

Information shared with stakeholder will cover the following subjects:

- Nature and schedule of decommissioning works;
- Removal and disposal of materials; and
- Remediation of tower areas.

5.3 DETAILED ENGAGEMENT PLAN

5.3.1 Pre-Construction and Construction Engagement

The detailed information about the SEP is entailed in *Table 5.1* below. The table details actions to be managed by NHID for engaging stakeholders during pre-construction and construction phase in order to meet the Project objectives, address their issues and concerns, as well as implement mitigation and enhancement measures across the Project's management systems.

5.3.2 Operations Engagement

RNT will define the stakeholder engagement program at least two months prior to the transmission line commissioning. Stakeholder engagement activities during the operation phase will include:

- Regular update to key ministries, provincial and local authorities on the TL performance and maintenance requirements; and

- Notification of local communities two weeks prior to any land clearance or maintenance works taking place in their vicinity, unless emergency works are required, in which case notification will be made as early as possible.

Table 5.1 Stakeholder Engagement Programme for Pre-Construction and Construction Phases

Activity	Stakeholders	Purpose	Timeframe	Responsible
Pre-construction				
ESIA and RCAP disclosure to national and local authorities (1)	Key ministries, national regulatory bodies, government agencies and institutes, provincial, municipal and communal authorities.	• Present ESIA and RCAP results. • Consult stakeholders on their views on the key impacts and mitigation measures • Present the land acquisition and compensation process, compensation and livelihood restoration actions and associated timeline. • Confirm submission of required documentation with regards to land concession and resettlement process.	March 2019	NHID (HSES manager and Land Acquisition and Compensation Manager)
ESIA and RCAP disclosure to affected communities	*Sobas* and community members including land affected households and individuals.	• Provide information on the Project to the whole community • Consult stakeholders on their views on key impacts and mitigation measures • Socialise the grievance mechanism • Present the land acquisition and compensation process, compensation and livelihood restoration actions and associated timeline • Validate entitlement matrix presented in RCAP. *Note: Further detail on resettlement related stakeholder engagement activities are detailed in the RCAP.*	April 2019	NHID (HSES manager and Land Acquisition and Compensation Manager).
Information on demining activities and schedule	Sobas and community members	Inform stakeholder on the demining process, the associated risks and the mitigation measures planned by the project to manage safety risk.	2 weeks prior to start of demining activities in each area	NHID (HSES Manager and E&S / Project Community Liaison Managers) Demining sub-contractor
Engagement with the Municipal Commissions (*Comissão Municipal) regarding RCAP*	Municipal/Communal representatives	• Establishment of Municipal Commission for land acquisition and compensation. • Identify affected households through Sobas • Establish and communicate cut-off date.	One month prior to planned RAPs/LRPs social survey	NHID (Land Acquisition and Compensation

(1) The proposed ESIA/RCAP disclosure does not preclude the need for additional Public Consultation should this be required by MinAmb as part of the Environmental licensing process. Any additional requirements will be communicated in writing by MinAmb to NHID.

Activity	Stakeholders	Purpose	Timeframe	Responsible
	Sobas and community members affected by resettlement			Team) and HSES Manager
Information provision regarding identification of affected people and RAP/LRP social surveys	Sobas and community members affected by resettlement	• Present the content, purpose and activities related to the RAP/LRP census, land and asset valuation and socioeconomic survey. • Communicate cut-off date. *Note: Further detail on landowners and land users will be presented in the RCAP Annexe. Please refer to the RCAP document where the process for development of these Annexes is presented in detail.*	2 weeks prior to RAP/LRP social survey in each area *Note: RAP/LRP will be carried out sequentially in line with construction schedule and demining.*	NHID (Land Acquisition and Compensation Manager and HSES Manager).
RCAP follow up meetings	Municipal/Communal representatives Sobas and community members affected by resettlement.	• Hold follow up meetings as required to agree RCAP measures particularly: i) valuation process; ii) support for households that are physically displaced (assisted self-build); iii) support for accessing new land and restoring land based livelihoods.	February-June 2019	NHID (Land Acquisition and Compensation Team and E&S / Project Community Liaison Managers)
Establishment and management of the Grievance Mechanism	Sobas and community members affected by the Project and more specifically by the resettlement.	• Record and manage grievances during pre-construction including resettlement related grievances.	March 2019 (Management of Grievances – Ongoing)	NHID (E&S / Project Community Liaison Managers) and *Sobas*
Construction				
RAP/LRP implementation engagement	Municipal/Communal representatives Sobas and community members affected by resettlement.	• Engagement related to monitoring and evaluation of RAP/LRP implementation. • Manage grievances.	Ongoing	NHID (Land Acquisition and Compensation Team and E&S / Project Community Liaison Managers)
Work site establishment	Sobas and community members	• 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	2 weeks prior to work site establishment.	NHID (E&S / Project Community

Activity	Stakeholders	Purpose	Timeframe	Responsible
		and the mitigation measures planned to control those risks.		Liaison Managers and HSES manager)
Ongoing information on construction progress	Sobas and community members	• Inform stakeholders of construction work progress and schedule. • Give feedback on grievances received and associated resolution.	Monthly	NHID E&S / Project Community Liaison Managers
Grievance management	Sobas and community members	• Record and manage grievances during construction including resettlement related grievances.	Ongoing	NHID E&S / Project Community Liaison Managers
Work site dismantlement	Sobas and community members	• Inform local communities of the end of works and work site remediation measures. • Inform local staff of retrenchment conditions.	2 weeks prior to work site dismantlement.	NHID E&S / Project Community Liaison Managers

5.4 ENGAGEMENT TOOLS

To achieve a consistent and effective stakeholder engagement programme implementation, the tools outlined in *Table 5.2* below will be key in all phases of the Project.

The contents and messages shall be reviewed and approved by the Project prior to dissemination.

Table 5.2 Stakeholder Engagement Tools

Tool	Description
BID	A Background Information Document (BID) will be developed in Portuguese and Quimbundo and distributed in the pre-construction phase during ESIA disclosure engagements. The BID will provide a description of the proposed Project, the Project schedule the engagement programme and schedule, contact details for the E&S /Project Community Liaison Manager and information on the grievance mechanism. As the Project progresses, this document will be reviewed and updated as often as necessary to ensure accuracy of information at any given time.
RAP and LRP flyers	Flyers presenting the key stages of the RAP/LRP process will be prepared in Portuguese and Quimbundo and distributed in the pre-construction phase during engagements. They will provide a description of the key stages of the process, the associated schedule, contact details of the land acquisition and compensation team and information on the grievance mechanism. As the process progresses, different flyers will be developed providing updated information on the progress of the RAP / LRP implementation.
Notice Board	Notice boards will be erected at the entrance to the Project work sites and at other agreed locations in each settlement, accessible to the communities, and updated on a regular basis. The notice board will serve as an information dissemination tool. For example the Project will be able to display contact details, construction updates, heavy traffic movement information, and recruitment updates. Project information should be available in Portuguese and Quimbundo. Wherever possible, maps or visual aids will be used to increase accessibility of the notices.
Radio Broadcast	The use of local radio for communication to stakeholders shall be explored. Local radio broadcasts could be used to provide updates and information related to the Project.
Reporting to Stakeholders	NHID and GAMEK will provide project updates to different stakeholder groups at agreed timelines.
Q&A	NHID and GAMEK will develop a Q&A that should help providing consistent responses during regular community and stakeholder engagement. The Q&A is a key tool in helping manage community expectations (i.e. provision of electricity, employment).
Stakeholder Engagement Register	The Community Liaison Team Manager (CLT Manager) /E&S / Project Community Liaison Managers will maintain a stakeholder engagement register to plan and track engagements related to the different ESMS Management Plans.
Stakeholder Grievance Log	The CLT Manager will maintain a stakeholder grievance log to record and track grievances as well as resolution status. The register of complaints will be kept and communicated on a monthly basis as part of the ongoing efforts to share information with local stakeholders during the pre-construction and construction phase and also to promote transparency.

6 COMMUNITY GRIEVANCE MECHANISM

6.1 DEFINITIONS AND GOOD PRACTICE

The IFC's Good Practice Guide to addressing grievances from Project-affected communities describes a grievance as: (1)

'…a concern or complaint raised by an individual or a group within communities affected by company operations. Both concerns and complaints can result from either real or perceived impacts of a company's operations, and may be filed in the same manner and handled with the same procedure.'

It describes a Project-level grievance mechanism for affected communities as:

'…a process for receiving, evaluating, and addressing project-related grievances from affected communities at the level of the company, or project.'

The community grievance mechanism should be broadly and regularly publicised, especially during the pre-construction and construction phase to ensure that comments, questions and grievances are appropriately channelled and registered.

6.2 PURPOSE

The community grievance mechanism enables any stakeholder to make a complaint or a suggestion about the way the Project is being implemented. Grievances may take the form of specific complaints for damages/injury, concerns about routine Project activities, or perceived incidents or impacts.

The purpose of the community grievance mechanism procedure is to implement a formalised process (identification, tracking and redress) to manage complaints/grievances from communities and other local stakeholders in a systematic and transparent manner that could potentially arise from the Project.

6.3 SCOPE

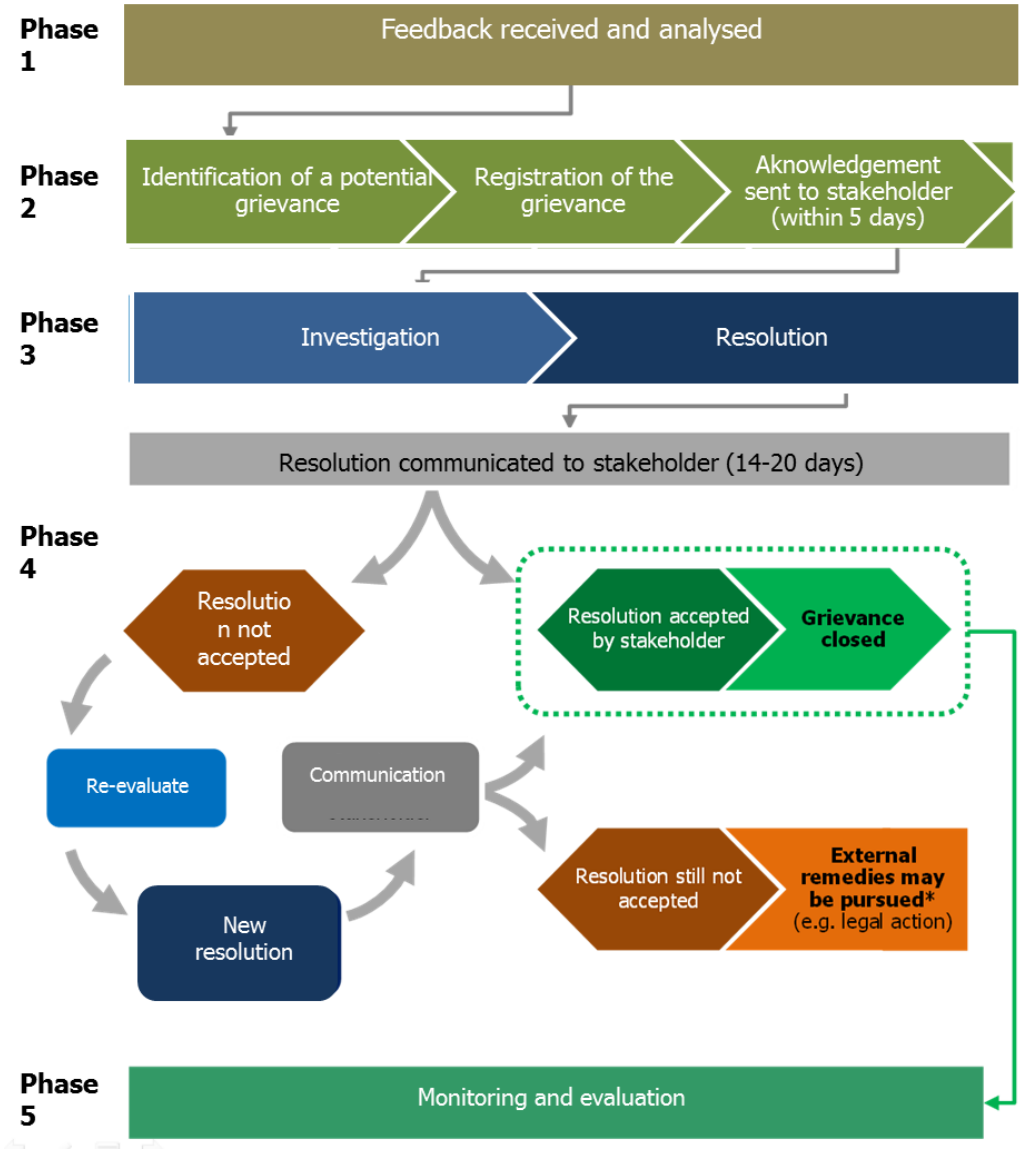
This grievance procedure will be implemented by NHID and covers the pre-construction and construction phase. Following the Project commissioning, RNT will have the responsibility to implement a grievance mechanism during the operational phase. The present grievance mechanism covers the land acquisition and compensation processes presented in the RCAP.

(1) Good Practice Note: Addressing Grievances from Project-Affected Communities (IFC 2009)

6.4 PROCEDURE

The grievance procedure in *Figure 6.1* below has been developed to ensure an effective and timely response to community complaints and maintain good community and stakeholder relations.

Figure 6.1 Grievance Mechanism during Pre-Construction and Construction Phase



Source: ERM 2018

6.4.1 *Step 1: Grievance Receipt and Registration*

Stakeholders will be offered different ways of submitting a grievance including submitting a grievance via the *soba,* in person to Project staff, by phone, by post, on the Project website or at a dedicated letterbox at project

work sites. These grievances may be in written form or verbal complaints and shall be treated with equal respect.

The filing of grievances shall be made easy for communities with various levels of literacy and shall be accessible and culturally appropriate.

All grievances or complaints submitted by stakeholder received will be channelled to the team of NHID E&S / Project Community Liaison Managers who will be responsible for logging the grievance. Where the E&S / Project Community Liaison Manager is able to resolve the grievance, they will proceed to do so. It is envisaged that many grievances will be able to be resolved quickly between the E&S / Project Community Liaison Manager, the complainant and the local construction teams. Other, in particular resettlement and compensation ones will require engagement with GAMEK Resettlement and Compensation Coordinator (see below for further details).

All received grievances, even those rapidly resolved, shall be logged in a centralised database that can be accessed by the Community Liaison Team (CLT) Manager on the day of receipt. The log will include details of the complaint (unless anonymous) and details of the grievance. All resettlement and compensation related grievances will be also communicated to the GAMEK Resettlement and Compensation Coordinator.

NHID shall acknowledge receipt of the complaint within a standardised time period (ideally at reception) or within 12 hours and explain to the complainant the process including timelines of the remaining steps in the procedure.

6.4.2 Step 2: Screening and Prioritisation

All grievances will need to undergo some degree of screening and prioritisation. The CLT manager will be responsible for managing the grievance resolution process. The CLT manager will determine the nature of the investigation considering the type of grievance and the potential social risk attached to it. This may require the CLT to review of records of previous similar incidents or occurrences, any available evidence, supporting documents or statements.

During this step, the CLT manager shall establish the nature of the grievance to determine the measures needed for review and investigation of unresolved grievances. Depending on the circumstances of the complaint, various NHID units or departments may need to get involved, including the NHID Grievance Manager, GAMEK Resettlement & Compensation Coordinator to be supported, if required, by the NHID LAC Manager.

6.4.3 Step 3: Grievance Investigation

As necessary, the CLT manager will organise telephone or face-to-face meetings to investigate the complainant's allegations, verify the validity and

gravity of the grievance. If necessary, if the grievance relates to a given site or location, the community liaison team will organise a site inspection.

The CLT manager will work with other responsible members of the Project team to investigate the grievance and identify corrective or preventive measures to properly address the grievance.

The resolution of a grievance may require additional information to clarify the situation and/or improve communication between the stakeholder and NHID, or to implement mitigation or reparation measures caused by financial or in-kind compensation, but also to introduce mitigation measures to prevent the recurrence of the problem.

6.4.4 Step 4: Resolution and Feedback to Complainant(s)

Once grievance investigations are completed, the CLT Manager shall draft a formal communication to the complainant, advising of findings and the outcome. The CLT Manager will communicate the response, stipulate mutual commitments, and ask for the complainants' agreement. If the complainant is not satisfied with the resolution, or the outcome of the agreed corrective actions the response should be reviewed and if appropriate amended in light of any discussions or negotiations.

If the complainant is still no satisfied, they should be free to take their grievances to a dispute resolution mechanism outside of the company grievance mechanism. Proposed resolution actions may be of the following types:

- *Unilateral*: NHID addresses the source of the problem directly (e.g. reducing noise or dust).

- *Bilateral:* NHID convenes a meeting with the complainant, and appropriate management levels (according to the complaint category) to reach a resolution through discussion or negotiation. As during the evaluation process, NHID are committed to considering all the evidence and meeting with all the relevant parties, in an effort to give complainants every opportunity to present their views.

Third party: Informally or through mediation. (1)

(1) In case of land related grievances the law provides for three avenues as follows: (a) Community justice: traditional dispute settlement addressing disputes over community land. Settlement in accordance with local customs of the communities. If the dispute is not resolved through this mechanism, it is then reverted to mediation or conciliation in the courts; (b) Tribunals: resolution through mediation or conciliation, where mediation involves the intervention of a third party mediating the resolution process and proposing recommendations and solutions, while conciliation involves a negotiation process with assistance of a third party responsible for helping the conflicting parties reach an agreement; and (c) Arbitration tribunal: arbitrators acting as judges help resolve the conflict. Usually composed of three arbitrators representing each side and a third one representing the State.

While collating and communicating the response to the complainant, NHID shall:

- take photos or collect other documentary evidence to form a comprehensive record of the grievance and how it was resolved;
- create a record of resolution internally, with the date and time it took place, and have responsible staff sign off;
- have a meeting with the complainants to get a collective agreement to close out the claim; and
- if the issue was resolved to the satisfaction of the complainants, get a confirmation and file it along with the case documentation.

Grievance resolution should be provided to complainants within 21 days of receipt of the initial grievance.

If the complainant is not satisfied with the resolution, or the outcome of the agreed corrective actions, they should be free to take their grievances to a dispute resolution mechanism outside of the company grievance mechanism.

6.4.5 Step 5: Grievance Close-out and Register Update

Where the stakeholder is satisfied with the responses provided to their grievances, the specific grievances will be concluded by the CLT Manager and the register updated to indicate as much. All correspondences will be filed and the corrective actions clearly updated against the grievances.

NHID will ensure that all grievances raised by all Project stakeholders are treated impartially, respectfully and confidentially.

7 RESOURCES AND RESPONSIBILITIES

7.1 MANAGEMENT FUNCTIONS

During the preconstruction and construction phase, NHID Health, Safety, Environment and Social (HSES) Manager will be responsible for the management and implementation of the SEP.

The HSES Manager will be supported by the Community Liaison Team (CLT) which will effectively be in charge of all relations with stakeholders. The CLT will be made of several E&S / Project Community Liaison Managers . The CLT will be headed by a CLT Manager. The number of E&S / Project Community Liaison Managers will be determined by the number of works sites and the distance between them.
The specific responsibilities associated with each role are presented in *Table 7.1.*

Table 7.1 SEP Roles and Responsibilities

Role	Responsibility / Accountability
Health, Safety, Environment and Social Manager (HSES Manager) *NHID*	• Ensure proper implementation and follow up of the SEP. • Ensure that Project's employees are informed and trained on the SEP. • Ensure NHID HSES team reports on time and with the expected and agreed points. • Provide resources to ensure that interests of stakeholders are represented and taken into consideration during preconstruction and construction.
Social and Environmental Manager *GAMEK*	• Oversee operations (strategic, business and financial) of resettlement and compensation activities; • Review and authorise scope changes (in consultation with the RRC) and ensure variations are justified; • Assists in securing necessary resources and approvals; and • Provides oversight as required to ensure that the LRPs/RAPs meets their overall objectives.
Community Liaison Team (CLT) Manager *NHID*	• Plan the stakeholder engagement activities and ensure they are appropriately implemented by the E&S / Project Community Liaison Managers deployed along the TL route. • Manage the grievance mechanism and grievance resolution process. • Report to HSES manager and NHID management on the stakeholder engagement activities.
E&S / Project Community Liaison Managers *NHID*	• Lead SEP activities and coordinate the results and actions to be taken with the HSES team in each of the areas along the TL route. • Lead day-to-day implementation of the SEP and Community Grievance Mechanism, including proactively maintaining regular contact with affected communities through regular community visits to monitor opinions and provide updates on Project activities, and ensuring communication with vulnerable groups. Specific efforts will be made to ensure participation of and disclosure to illiterate individuals, individuals with hearing or vision disabilities, individuals with limited mobility and the elderly who may not be able to get to venues of meetings. • Manage land acquisition and compensation related engagement. • Produce stakeholder engagement monitoring reports and submit to Community Liaison Team Manager. • Supervise/monitor and coordinate activities with subcontractors to ensure they comply with the SEP.
Land Acquisition and Compensation (LAC) Manager *NHID*	• Interface with GAMEK Resettlement & Compensation Coordinator; • Supervise and work closely with the field teams and E&S/CL Managers; • Ensure robust monitoring reporting and identify corrective action; • Promoting the participation of all stakeholders and information sharing.
Resettlement and Compensation Coordinator *GAMEK*	• Interference with NHID LAC Manager. • Plan and oversight stakeholder engagement activities related to the resettlement process and ensure they are appropriately implemented by the E&S / Project Community Liaison Managers. • Actively review resettlement and compensation grievances;
Subcontracted employees	• Comply with requirements stated under this document. • Provide assistance if needed to ensure compliance with this plan. • Perform assigned tasks towards meeting SEP objectives. • Communicate concerns, questions or views to their supervisor or the E&S / Project Community Liaison Manager compliance or implementation of the SEP.

Role	Responsibility / Accountability
	• Provide data related to SEP performance/monitoring as required.

8 MONITORING, EVALUATION, AND REPORTING

8.1 OVERVIEW

In order to record activities, and assess the effectiveness of this SEP and associated community dialogue activities, NHID will implement a data management and monitoring process as outlined below.

In addition, this section includes mechanisms for reporting to external stakeholders as an integral step in building relationships with stakeholders and promoting understanding between NHID and its publics.

8.2 DATA MANAGEMENT

Stakeholder engagement activities will be documented and retained in order to track and refer to records when required and ensure delivery of commitments made to stakeholders. The following stakeholder community dialogue records and documentation will be used and maintained by NHID during pre-construction and construction phase:

- *Stakeholder list:* On-going updates to the list, including key contacts and contact details (telephone number, email address) as additional stakeholders are identified.

- *Stakeholder engagement log*: Used to store, analyse and report on stakeholder dialogue activities. It will be populated with details on information presented, audience questions, NHID responses and actions, and meeting evaluation results, when appropriate. The database will also be used to track frequency of meetings over the life of the project (see also *Section 5.4*).

- *Commitments register*: Used to keep track of the commitments made to various stakeholders.

- *Meeting minute template:* Used to collect meeting minutes to be filed within the stakeholder database.

- *Grievance log:* Used to record all grievances received, management actions and whether it has satisfactorily been closed out (see also *Section 5.4*).

- *Media monitoring* of press and radio stories relevant to the project and unconventional related issues and activities.

Records will be reviewed on a quarterly basis to ensure that information is being recorded accurately and information maintained.

Commitments and actions recorded during community interaction activities will also be regularly reviewed to ensure they are taken forward.

8.3 INTERNAL REPORTING

The following internal reports will be developed:

- *Red Flag Reports*: Weekly or daily reports for urgent items (e.g., high potential grievances) or incidents of significant nature. These red flag reports will be prepared by the CLT manager and sent to the HSES Manager which will take action and/or escalate if necessary.
- *Quarterly Progress reports*: Internal quarterly progress reports will be prepared by the CLT Manager in collaboration with the CLOs. These reports will summarise:
    - Engagement activities undertaken thus far: stakeholders met, key topics discussed, main concerns and expectations, positioning towards Project activities;
    - Grievance mechanism: participation, main grievances received, progress summary (actions to be taken and status);
    - Social licence risks to the Project;
    - Limitations (e.g. resources, internal alignment); and
    - Priorities for next quarter.

These reports will be discussed at quarterly meetings involving the CLT Manager, the HSES Manager, the Site Manager and the construction contractors. The progress reports will be circulated internally as required. Summaries of these progress reports will be shared and discussed during the quarterly Operation Committee meetings.

8.4 EXTERNAL REPORTING

Once consultation with stakeholders has taken place, stakeholders generally want to know which of their suggestions have been taken on board, what risk or impact mitigation measures will be put in place to address their concerns, and how, for example, projects impacts are being monitored.

It is recommended to keep track of commitments made (commitments tracker) and to communicate progress made against these commitments on a regular basis. For this Project, external reporting will be developed on a monthly base by NHID E&S Manager.

REFERENCE LIST

Good Practice Note: Addressing Grievances from Project-Affected Communities (IFC 2009).

ANNEX A: STAKEHOLDER ENGAGEMENT LOG

Annex A: Stakeholder Engagement Log

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
Municipality and Commune Level Engagement										
1	Official disclosure and consultation meeting with Pungo Adongo Commune Administration	10/7/18	Pungo Andongo Commune Administration	Meeting with officials	• Project disclosure • Understand land rights procedure • Understand procedures for resettlement and compensation	• Commune Administrator (Maria Teresa Oleca) • Adjunct Administrator (Famoroso Inácio) • Chief of staff (Jacinto Oleque)	*Women (W): 1* *Men (M): 2* *Total (T): 3*	• Participants stressed the importance of informing communities about the Project and the related risks and of understanding impacts to livelihoods. • On other transmission line projects, local communities did not benefit from improvements in access to energy. Communities do not understand why some communities have electricity and other do not. • The importance of transparency and honesty was stressed when dealing with communities including regarding compensation and benefits.	• Land allocation and acquisition process: the first step is to inform the soba or traditional authority about the Project who will then identify and inform the land owner. • Clarification that Nhangue Ya Pepe belongs to Sao Pedro da Kilemba, not Pungo Andongo. • Compensation process should always involve the *soba* and the municipal and commune administration. • Sacred sites: participants do not recall any case in which removal / displacement of sacred sites happened. Nonetheless, it was stressed that sacred sites should be avoided at all costs. (*Soba is the best informant of sacred sites locations).*	
2	Key Informant Interview with representatives of Cambambe Municipal Administration	12/07/18	Cambambe Municipal Administration	KII	Informal data collection	• Representatives of Cambembe Municipal Administration (Fiscalization Unit)	*W: 0* *M: 3* *T: 3*	n/a	• Interviewees provided information on compensation process and procedures, affirming the soba and the municipal and commune administrations should always be involved in the process. • Grievance mechanism incorporates different levels, being the soba the first point of contact at community level, then commune or municipal administration. • Land allocation is always discussed with the soba.	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
3	Official disclosure and consultation meeting with Cambambe Municipal Administration	13/07	Cambambe Municipal Administration	Meeting with officials	Inform municipal authority about the Project and survey	• Municipal Administrator (Adão Malongo)	*W: 0* *M: 1* *T: 1*	• Participant raised the point that all transmission lines cross the commune of Sao Pedro da Kilemba, but do not bring energy to local communities in the area. The compensation should be given prior to project construction.	• A commission was created to support the project development in the municipality. The administrator of the commune of Sao Pedro da Kilemba will coordinate the commission and is the main point of contact for the municipality.	
4	Official disclosure and consultation meeting with Zenza do Itombe Commune Administration	13/07	Zenza do Itombe Commune Administration	Meeting with officials, including Soba	Project disclosure and data collection for village profile	• Commune Administrator of Zenza do Itombe (Fátima de Almeida) • Soba (Adão Pedro) • Chief of Police (Paulo Estevão)	*W: 1* *M: 2* *T: 3*	• It was mentioned that previous transmission line projects did not provide compensation to people whose land were cleared. • Local benefits from having another transmission line was also questioned since local communities remain without access to electricity despite being crossed by transmission lines. • Other issues mentioned are: use of drugs by people from outside the community, high unemployment especially among the youth/young adult, and high teenage pregnancy rate. hool years.		
5	Official disclosure and consultation meeting with Icolo e Bengo Municipal Administration	16/07	Icolo e Bengo Municipal Administration	Meeting with officials	Inform municipal authorities about the Project and survey	• Municipal Administrator (Noivito Agostinho Pedro) • Technical Administrator (Elisabeth Rafael) • Municipal Director for Water and Energy (Gildo Gabriel)	*W: 1* *M: 2* *T: 3*		• Official meeting was rescheduled due to unforeseen events • Municipal Administrator requested the technical administrator and director for water and energy to follow up with the engagement team.	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
6	Official disclosure and consultation meeting with Icolo e Bengo Municipal Administration	19/07	Icolo e Bengo Municipal Administration	Meeting with officials	Project disclosure and consultation with municipal and commune administrators	• Technical Representative of Municipal Administration – Department of Water and Energy (Nsingi André) • Commune Administrator of Bom Jesus (José Alberto) • Commune Administrator of Catete (Domingos de Azeudo) • Commune Administrator of Cassoneca (Jordão Filipe Amado)	*W: 0* *M: 5* *T: 5*	• Participants complained that another transmission line project cleared crops without prior warning and did not provide compensation. Participants asked questions about how compensation is defined. • There are concerns about health and safety of people who live next to the transmission line.. • There are expectations that the project will create local jobs. • Participants asked for regular meetings to keep them informed about the project development and requested another meeting once project design is final.	• Participants mentioned that there is low land availability in Icolo e Bengo.	
7	Meeting to inform about survey progress and discuss technical aspects	20/07	GAMEK	Meeting with officials	Inform on social survey progress, understand and confirm technical, resettlement and compensation aspects.	GAMEK representatives: • General Director- Fernando Barros Gonga • Deputy Director- Euclides de Brito • Infrastructure Director- Arlindo Manuel Carlos • Environmental Department -Rafael Neto • Project Director- Fernando Quileba • Environmental Department - Sónia Silva	*W: 1* *M: 5* *T: 6*	n/a	• Points of attention regarding physical displacement were discussed. • GAMEK informed about technical aspects regarding right of way corridor, distance houses should keep from TL, etc.	[no photo record]
8	Official disclosure and consultation meeting with Zango Commune Administration	25/07	Zango Commune Administration	Meeting with officials	Inform municipal authority about the Project and survey	Technical Representative (Rui Pitra)	*W: 0* *M: 1* *T: 1*	• According to interviewee, there are complaints that no compensation was provided by previous transmission line project.	• It was mentioned the need to work together with community coordinators to identify land right holders/owners and inform the people affected. • Local police: should be involved in certain areas (i.e. Bita Ambriz) to avoid violence. (*Note: Potential unrest could be driven by the fact that people in the area have already been resettled from other areas to Zango and any further resettlement might not be well received.)* • Important to note: residents of this area have	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
									a history of previous displacements.	
9	Official disclosure and consultation meeting with Belas Municipal Administration	03/08	Belas Municipal Administration	Meeting with officials	Inform municipal authority about the Project and survey	• Municipal Administrator (Mateus António da Costa) • Adjunct Municipal Administrator (Antónia Ferreira) • Administrator for Water and Energy (Arnaldo Simões)	*W: 1* *M: 2* *T: 3*	• It is expected that once the project design, stakeholder engagement plan, and resettlement plan are defined, the company needs to inform the municipality so the families affected can be registered by the administration.	• Land availability in case of physical displacement: there is land available and allocation needs to be discussed with the municipal administration as well as with the elderly women (mamas) who hold the land rights. Any negotiation about land needs to involve them. • The point of contact is the Municipal Director for Water and Energy.	[no photo record]
Settlement Level Engagement										
10	Community Meeting and consultation at Nhangue Ya Pepe settlement	10/7/18	Nhangue Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	Community Meeting	• Project disclosure • Socioeconomic baseline data collection for village profile	• Soba (Fonseca António Correia) • Other members of the community (elderly, male and female farmers)	*W: 1* *M: 6* *T: 7*	• Participants raised expectations that the project will bring electricity to the community. • Participants also mentioned lack of access to water and electricity, and high unemployment.		[no photo record]
11	Community Meeting and consultation at Quissuba settlement	11/07/18	Quisuba (Sao Pedro Quilemba Commune, Cambambe Municipality)	Community meeting	Project disclosure and data collection for village profile	• Community coordinator (André Domingos) • Local residents *Note: Soba (André Cristovão) was not present at time of visit*	*W: 0* *M: 7* *T: 7*	• Participants affirmed that another transmission line project cleared crops and have not yet provided compensation to the families affected. • It was also mentioned that the local cemetery was affected without prior consultation and consent.		[no photo record]
12	Community Meeting and consultation at Aldeia Lucapa settlement	11/07/18	Aldeia Lucapa (Sao Pedro Quilemba Commune, Cambambe Municipality)	Community meeting	Project disclosure and data collection for village profile	• Soba (n/a) • Local residents	*W: 4* *M: 10* *T: 14*	• No specific issues and concerns related to the project were raised. There is a transmission line close to the community which, according to participants, caused some impacts that were addressed through an agreement between company and community. • Other issues raised (not related to the projects) are lack of access to water,		

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
								electricity, health services and jobs.		
13	Community Meeting and consultation at Muchau settlement	13/07	Muchau (Zenza do Itombe commune, Cambambe munincipality)	Community meeting	Project disclosure and data collection for village profile	• Soba (n/a) • Local residents (male farmers)	*W: 0* *M: 8* *T: 8*	• Participants did not raise issues and concerns related to the transmission line, but highlighted general community issues such as lack of access to water, to electricity, to school and health services. Participants also complained about unemployment.	• The initial project design crosses the community in the middle. *Note: Rerouting has been implemented and village will be entirely avoided.*	
14	Community Meeting and consultation at Sagrada Esperança settlement	14/07	Sagrada Esperança (Cassoneca Commune, Icolo e Bengo municipality)	Community meeting	Project disclosure and data collection for village profile	• Soba (Felizardo Jorge) • Local residents (elderly men, women)	*W: 4* *M: 3* *T: 7*	• Participants affirmed that previous transmission line project did not compensate crop owners. • Other issues raised included lack of access to water and electricity, no transportation in case of health emergencies, lack of teachers in schools, and unemployment.	n/a	
15	Community Meeting and consultation at Mazozo settlement	16/07	Mazozo (Catete Commune, Icolo e Bengo municipality)	Community meeting	Project disclosure and data collection for village profile	• Soba (Araújo Cafala) • Local residents (representatives from Farmer's association)	*W: 0* *M: 4* *T: 4*	n/a	• Participants affirmed that land availability is not an issue and land allocation should always be discussed with the soba. • Farmers in the community are organized in a cooperative.	[no photo record]
16	Community meeting, consultation and Focus Group Discussion with community members in Bita Ambriz settlement	21/07	Bita Ambriz (Quenguela commune, Belas municipality)	Community meeting and FGD	Inform about the project and collect information about local residents	• Community Coordinator (n/a) • Local residents (men, women and children)	*W: 10* *M: 7* *T: 17*	n/a	• Transmission line route falls exactly on top of community coordinator's house/land. • Families have a history of physical displacement.	
Other Data Collection Engagement										
17	Focus Group Discussion with Women in Nhangue ya Pepe settlement	10/7/18	Nhangue Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	FGD	• Socioeconomic data collection	• Women	*W: 5* *M: 0* *T: 5*	• Participants did not raise issues and concerns related to the transmission line, but highlighted general community issues such as unemployment,	• Land allocation is always discussed with the soba.	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
								lack of access to water and electricity, and food shortage.		
18	Key Informant Interview with community representatives at Dumbo Ya Pepe settlement	11/07/18	Dumbo Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	KII	• Project disclosure • Socioeconomic baseline data collection for village profile	• Community coordinator (Adão André Mateus) • Local residents *Note: Soba (Aíres Paulo) was not present at time of visit*	*W: 0* *M: 3* *T: 3*	• Participants did not raise issues and concerns related to the transmission line, but highlighted general community issues such as unemployment, and difficulties with farming and fishing.	• Land allocation is always discussed with the soba.	
19	Focus Group Discussion with Women in Dumbo Ya Pepe settlement	11/07/18	Dumbo Ya Pepe (Sao Pedro Quilemba Commune, Cambambe Municipality)	FGD	Data collection	• Women	*W: 3* *M: 0* *T: 3*	• Participants did not raise issues and concerns related to the transmission line, but highlighted general community issues such as lack of access to electricity, education facilities, health services and clean water. Concerns about high unemployment were also mentioned.	n/a	
20	Focus Group Discussion with Women and Youth in Quissuba settlement	11/07/18	Quisuba (Sao Pedro Quilemba Commune, Cambambe Municipality)	FGD	Data collection	• Women • Youth	*W: 4* *M: 5* *T: 9*	• Participants raised expectations that the project will bring electricity to the community and create local jobs • There are concern about fairness in compensation (regarding amount paid) and further clarification on compensation procedures is much appreciated.	n/a	
21	Informal discussion with community members at Hombo during ground-truthing activity	11/07/18	Hombo (Sao Pedro Quilemba Commune, Cambambe Municipality)	KII	Ground-truthing to verify farming close to Transmission Line	• Local residents	*W: 2* *M: 1* *T: 3*	lack of transportation to larger settlements was raised as an issue by community members	n/a	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
22	Informal discussion with community representatives at Cambambe during ground-truthing activity	13/07	Cambambe (Cambambe municipality)	KII	Check site to confirm land use	• Representatives of the Fiscalization Unit at Cambambe Municipality	*W: 0* *M: 3* *T: 3*	n/a	• Area is intended for residential buildings. There is a foundation for what seems to be a house, but no walls were built.	
23	Key Informant Interview with community representatives at Quitendele settlement	14/07	Quitendele (Zenza do Itombe commune, Cambambe munincipality)	KII	Collect information regarding land use in the area	• Local residents	*W: 1* *M: 1* *T: 2*	n/a	• There are residents in the area since 2003. • The crops cultivated close to existing transmission line tower is owned by someone who lives in Luanda.	
24	Key Informant Interview with community representatives at Sagrada Esperança settlement	14/07	Sagrada Esperança (Cassoneca Commune, Icolo e Bengo municipality)	KII	Data collection on women issues	• Elderly woman	*W: 1* *M: 0* *T: 1*		• Agriculture is managed by both men and women, but financial resources are usually managed by men.	
25	Key Informant Interview with local residents at Hanga Calumbo settlement	17/07	Hanga Calumbo (Calumbo commune, Viana municipality)	KII	Village profile and informal data collection	• Local residents (female trader, men)	*W: 1* *M: 5* *T: 6*	n/a	• Areas used for agriculture are located towards the valley (direction of Mbanza Calumbo II) and mostly owned by elderly women who live in urban centres. Free land for farming is only available at Quissama. • Area is under expansion, with various houses under construction.	[no photo record]
26	Key Informant Interview with community representatives at Hanga Calumbo settlement	17/07	Hanga Calumbo (Calumbo commune, Viana municipality)	KII	Project disclosure and data collection for village profile	• Community Coordinator (Quim Sebastião) • Local resident	*W: 0* *M: 2* *T: 2*	n/a	• Community coordinator did not want to provide additional information. • Area of peri-urban expansion, plenty of new houses being built.	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
27	Key Informant Interview with community representatives at Mbanza Calumbo II settlement	17/07	Mbanza Calombo II (Calumbo commune, Viana municipality)	KII	Project disclosure and data collection for village profile	• Community Coordinator (n/a) • Local residents (farmers)	*W: 0* *M: 4* *T: 4*	• Participants asked questions about health and safety, and are concerned about how the transmission line could affect the health of local residents.	• Important to note that residents of this area have a history of previous displacements. They have been in Mbanza Calumbo II for the past 12 years.	
28	Focus Group Discussion with community members in Morro 50 settlement	18/07	Morro 50 (Cabembeia Commune, Icolo e Bengo Muncipality)	FGD	Village profile and informal data collection	• Women • Men • Youth	*W: 7* *M: 5* *T: 12*	• Participants raised expectations that the project will provide access to electricity to the communities close to the transmission line. • Other issues were raised such as unemployment, and lack of access to water and electricity.	n/a	
29	Key Informant Interview with community representative at Morro 50 settlement	18/07	Morro 50 (Cabembeia Commune, Icolo e Bengo Muncipality)	KII	Project disclosure and data collection for village profile	• Community Coordinator (n/a) • Local resident (translator)	*W: 0* *M: 2* *T: 2*	• Interviewees do not object the project but stress the need to engage with the land owner and compensate accordingly.	• Community is far from projected TL, but there might be farming land crossed by the project. Talk to community coordinator to identify owners.	
30	Key Informant Interview with local businessman and resident at Koba settlement	18/07	Koba (Calamboloca Commune, Icolo e Bengo municipality)	KII	Inquire about land close to point 36 and community experience with past TL projects	• Businessman • Local resident	*W: 0* *M: 2* *T: 2*	• It was mentioned that previous transmission line project did not compensate for crops destroyed.	• There is a poultry farm on the right side of the valley (looking at projected line from Koba), the owner lives in the community.	[no photo record]
31	Key Informant Interview with community representatives at Tari settlement	18/07	Tari (Catete Commune, Icolo e Bengo municipality)	KII	Project disclosure and data collection for village profile	• Interim Coordinator (Manuel Agostinho) • Community Secretary (Augusto Joaquim) • Representative of community coordination office	*W: 0* *M: 3* *T: 3*	• Participants mentioned the importance of keeping residents informed about the project and project location, especially those who are preparing the land for the rainy season. There are expectations that the project will create local jobs.	• The point of contact with local communities is the soba or the community coordinator.	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
32	Key Informant Interview with community representatives at Wala settlement	19/07	Wala (Catete Commune, Icolo e Bengo municipality)	KII	Project disclosure and data collection for village profile	• Community representative (Fernando José) • Secretary (Miguel Bernardo) • Local residents	*W: 0* *M: 4* *T: 4*	• Other issues raised included the need for better access to water. • Participants also wanted to understand the grievance mechanism in place in case the parties to not follow thru with the agreement (compensation).	n/a	[no photo record]
33	Focus Group Discussion with Women in Wala settlement	19/07	Wala (Catete Commune, Icolo e Bengo municipality)	FGD	Data collection on issues faced by women	• Women	*W: 0* *M: 8* *T: 8*	• Participants are concerned about compensation and stressed that this is an important issue and needs to be provided. • Other issues raised included unemployment and lack of job opportunities.	n/a	
34	Key Informant Interview with community representatives at Mateia settlement	20/07	Mateia (Kikuxi commune, Viana municipality)	KII	Inform about the project and collect information about local residents	• Community Representative (Paulo Sebastião)	*W: 0* *M: 1* *T: 1*	n/a	• Participant was supportive of the project.	[no photo record]
35	Focus Group Discussion with Women in Mateia settlement	20/07	Mateia (Kikuxi commune, Viana municipality)	FGD	Collect information from talking to local residents	• Women	*W: 3* *M: 5* *T: 8*	• Issues raised by participants included: unemployment, lack of access to water, lack of access to electricity, high number of malaria cases.	• According to the women, farming is not a common activity throughout the community, contradicting what was informed by the community representative.	[no photo record]
36	Key Informant Interview with local farmer at Bita Ambriz settlement	21/07	Bita Ambriz (Quenguela commune, Belas municipality)	KII	Collect data on land use and ownership	• Female farmer	*W: 1* *M: 0* *T: 1*	n/a	• Elderly women are the best informants on land ownership in the area.	[no photo record]
37	Key Informant Interview with local residents at 4 de Fevereiro settlement	21/07	4 de Fevereiro (Quinguele Commune, Belas municipality)	KII	Understand expansion pattern and where families come from	• Local residents	*W: 1* *M:1* *T: 2*	n/a	• Area of recent peri-urban expansion with families moving in from urban centres.	[no photo record]

ID	Activity Description	Date	Location (venue/village)	Activity type	Purpose	Participants s	-Number of Attendees	Main issues and concerns raised	Observations and relevant information collected	Photo
38	Key Informant Interview with community representatives at Ngolome settlement	23/07	Ngolome (Bom Jesus commune, Icolo e Bengo municipality)	KII	Inform about the project and collect information about local residents	• Community Coordinator (n/a)	*W: 0* *M: 2* *T: 2*	• Participants are aware of transmission line projects in the area and are supportive of such projects.		

ANNEX B: LIST OF STAKEHOLDERS

Annex B: List of Stakeholders

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
National Government	• Key Ministries • National Regulatory bodies • Government Agencies and Institutes	National government are 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 Regulatory Bodies* • Ministry of Environment "*Ministério do Ambiente*" (MinAmb) • Ministry of Energy and Water "*Ministério da Energia e Águas*" (MinEA) Key *Ministries and Ministry Departments* • Ministry of Agriculture and Forestry *"Ministério da Agricultura e Florestas"* • Agriculture Land Management Office *"Gabinete de Gestão de Terras"* (Ministry of Agriculture and Forestry) • National Agriculture Directorate "*Direcção Nacional da Agricultura"*(Ministry of Agriculture and Forestry) • Agriculture Development Institute *"Instituto de Desenvolvimento Agrário"* (Ministry of Agriculture and Forestry) *National Implementing Body* • GAMEK – *Gabinete de Aproveitamento do Médio Kwanza* • RNT EP – *Rede Nacional de Transporte de Electricidade, Empresa Pública* (Ministry of Energy and Water)
Regional and Local Government	• Provincial authorities • Municipal authorities • Commune authorities	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. In addition, the municipalities along the transmission line will be impacted by the Project and will need to be kept informed of progress and plans in their area, to consider the Project activities in their policy-making, regulatory and other duties and activities	*Provincial governments* • Governor of the Luanda Province • Governor of Cuanza-Norte Province *Municipal administration* • Municipal administrator of Belas • Municipal administrator of Viana • Municipal administrator of Icolo e Bengo • Municipal administrator of Cambambe *Commune administration* • Commune administrator of Quenguela • Commune administrator of Calumbo • Distrito Urbano do Zango (Urban District) • Distrito Urbano do Kikuxi (Urban District) • Commune administrator of Bom Jesus

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
			• Commune administrator of Catete • Commune administrator of Calomboloca • Commune administrator of Zenza do Itombe • Commune administrator of Dondo • Commune administrator of São Pedro da Quilemba • Commune administrator of Cassoneca
Parastatals	• Government funded private enterprises in charge of managing specific activities.	Parastatals may have land or other assets which could be affected by the Project. RNT is the owner of the transmission line and electricity network that the Project will connect to. RNT is responsible for all the Very High Voltage Transmission assets.	• GAMEK (Gabinete de Aproveitamento do Médio Kwanza (Ministry of Energy and Water) • RNT (*Rede Nacional de Transporte de Electricidade*) National Network of Energy Transmission
Traditional and Community Level Authorities	• Community level local administration representatives. • Traditional authorities at community level	Local community leaders acting as representatives of their local community. These are the key leadership figures at local level. They are locally appointed amongst the most respected community members. Sobas are traditional village leaders. Their role is to support local communities and liaise with government authorities. Meetings with traditional authorities will follow local practices and should be held prior to any wider communication in local communities in order to respect the political and social structures.	Traditional and community level authorities of the settlements and neighbourhoods ("*bairros*") included in the AoI (500 buffer) or that have land within the AoI (see below): • Community coordinator (and secretary coordinator) in peri-urban areas • Sobas (village chiefs) and secretary soba • Village elders and councillors of affected settlements.
Communities or Settlements	• Project affected communities along the 500 m buffer including: • Landowners and users; • Community members who use access roads to access nearby natural resources • Social / public infrastructure and services.	Households and communities that may be directly or indirectly affected by the proposed Project and its activities. This includes people living on land affected by the Project, through direct land take or by social and environmental impacts, and other people who visit or use land or resources that may be affected. Primary stakeholders include landowners and land users.	*Villages (included in the AoI (500 m buffer) or that have land in the buffer)*: Directly and indirectly affected community members from: • Bita Ambriz • 4 de Fevereiro • Mbanza Calumbo II (Settlement 17) • Hanga (settlement 16) • Mateia (settlement 11) • Ngolome (settlement 20) • Mazozo • Tare (settlement 29)

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
		These communities need to be engaged around Project impacts (construction and operations). Land affected households will need to be informed about land acquisition and restrictions to land, to participate in the finalization of agreements around compensation and livelihood restoration and take active ownership of the resulting implementation of these measures.	• Uala (settlement 26) • Koba (settlement 37) • Botomona • Morro 50 (settlement 40) • Sagrada Esperança (settlement 43) • Quitendele (settlement 47) • Zenza do Itombe • Muchau (settlement 49) • Cassoalala • Nova Cassoalala • Aldeia Lucapa • Quissuba (settlement 71) • Dumbo Ya Pepe • Nhangue Ya Pepe *Affected Community Members and Infrastructures* • Households losing access to land • Households losing access to livelihood resources • Households with houses at risk of displacement
Vulnerable Persons/Groups	Vulnerable groups within the study area:	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.	Vulnerable people within the communities of the Study Area (listed above), sspecifically: • very poor households that rely mostly on farming for food; • women and female-headed households including single mothers and widows – these households typically rely on farming since other activities such as harvesting of múcua, hunting/fishing, and informal jobs (“*biscatos”*) are usually performed by men; • unemployed youth – high unemployment rate in the study area; • elderly and orphans; • disabled persons; • in-migrants (these include migrants from other communities and ethnic groups in search of employment opportunities, farmland, education and intermarriage). It can be more difficult for migrants to find land available.
Civil Society	• Community-Based Organisations (CBOs)	Organisations with direct interest in the Project, and its social and environmental aspects and that are able	• Rede Terra (non-governmental organization working towards supporting communities to have access to land and has conducted studies that include land tenure information).

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
	• Community or Other Associations • Research and Academic Institutions	to influence the Project directly or through public opinion. Such organisations may also have useful data and insight and may potentially become partners to the Project in areas of common interest such as the implementation of community investment as applicable.	• Rede Ambiental Maiombe (is a forum for consultation of environmental NGOs, proclaimed on 31 January 2001, which is presented as a continuation of the quality of life, as well as a recovery and recovery of ecosystems). • Fundação Kissama is a non-governmental organization founded in 1996 with the aim of promoting the protection of Angolan flora and fauna. • ADRA – Acção para o Desenvolvimento Rural e Ambiente *(ADRA is an Angolan Non-Governmental Organization committed to building a democratic and sustainable development, socially, economically and environmentally just, and with the process of national reconciliation and peace for Angola.)*. • Juventude Ecológica Angolana (JEA) – JEA is a non-governmental organization dedicated to environmental awareness and education. • Other organisations
Non-Governmental Organizations (NGOs)	• International • National • Local	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 bilateral organisations.	• Local NGOs and NGOs located in the Study Area: o Red Cross operating in Cambambe municipality • International NGOs and Pressure Groups: Human Rights Watch, World Vision, IUCN, OXFAM, CARE, WWF, GTZ, Eldoret - SOS Children's Villages International are all present in Angola. • Development Workshop (DW) Is ONGs that has been working in Angola since 1981 at the national government's request to assist in developing policies and programs for human settlements and self-help housing. • ADPP (Ajuda de Desenvolvimento de Povo para Povo) - ADPP is an Angolan Non-Governmental Organization that started its activities in 1986 and has invested in the construction of schools in rural areas as well as supporting agricultural projects implemented by women.
Other interest groups:	• Media • Law enforcement	Local and Municipal level media will typically have a higher level of influence over the Project and may be leveraged to influence local stakeholders' perceptions of the Project.	• Local radio stations part of *Rádio Nacional de Angola* • Provincial media (radio stations). • Angolan local police
*Potential **business** partners*	• Contractors • Suppliers and service providers.	Organisations, businesses and individuals with direct interest in the Project e.g. running businesses or providing services and supplies to the Project.	• Municipal / provincial businesses

Stakeholder Category	Stakeholder Group	Connection to the Project	Stakeholders
	• Other businesses operating within the community • Local and international banks • Other		

ANNEX C: SAMPLE GRIEVANCE REGISTRATION FORM AND LOG

Annex C.1: Grievance Registration Form

PUBLIC GRIEVANCE FORM

Reference No (for NHID/GAMEK internal purpose):

Full Name: Note: you can remain anonymous if you prefer or request not to disclose your identity to the third parties without your consent	First name _____ Last name _____ ❏ I wish to raise my grievance anonymously ❏ I request not to disclose my identity without my consent
Contact Information Please mark how you wish to be contacted (mail, telephone, e-mail).	❏ By Post: Please provide mailing address: _____ _____ _____ ❏ By Telephone: _____ ❏ By E-mail _____
Preferred Language for communication	❏ Portuguese ❏ English ❏ Other, please specify

Description of Grievance:

What would you like to see happen to resolve the grievance issue?

IF Grievance is related to a specific event/Incident;
Date of Incident

❏ One time incident/grievance (date _____)
❏ Happened more than once (how many times? _____)
❏ On-going (currently experiencing problem)

Signature: _____ Date: _____

Annex C.2: Sample Grievance Register Log

No.	Grievance #	Date Received	Access point	Received by	Name of Complainant	Gender	Community/ Village of Origin	Brief Complaint/Grievance Description	Category
1	13-005-AP	23-ene-13	Municipality	XXXX	YYYY		Village A	Chicken got killed by company vehicle	

Acknowledgement date	Rapid Response by	Associated Dpt/ Contractor/Third Party	Complaint Owner	Proposed Resolution/Feedback to Complainant	Preliminary Resolution Date	Satisfied with Process (yes/no)?	If no, why not?	Conclusive Resolution Date	Satisfied with Outcome (yes/no)?	If no, why not?	Closure Date
24-Jan-13	XXX	Exploration	XXXX	Provide compensation to complainant							

ANNEX D: EXAMPLE STAKEHOLDER ENGAGEMENT REGISTER

Annex D: Template Stakeholder Engagement Register

Management Plan	Description of Commitment	Section (Reference)	Engagement Action	Specific engagement activities	Engagement Type (*Meeting, workshop, Key informant interview, focus*	Engagement Objective *(information disclosure, consultation,*	Stakeholder *(county government, local leadership, local communities,*	Implementation Schedule and Milestones (First 6 months)																				Post 6 months	Monitoring			
								February				March				April				May				June				July					Status	Synergies with other plans	Deliverables	Monitoring KPI
								W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4					

ANNEX E: PROJECT DISCLOSURE PRESENTATION



Projecto da Linha de Transmissão de Láuca-Bita em Angola – Actualização do *EIAS e Consulta Pública*

Angola, Julho 2018

NHID

Agenda

- Apresentação e actualização do Projecto Laúca-Bita EIAS
- O projecto
- Questões do Projecto do âmbito ambiental, socioeconómicas e património cultural
- Processo de Direitos de Terras e Compensação
- Plano para Consulta de Partes Interessadas Próximos Passos
- Discussão

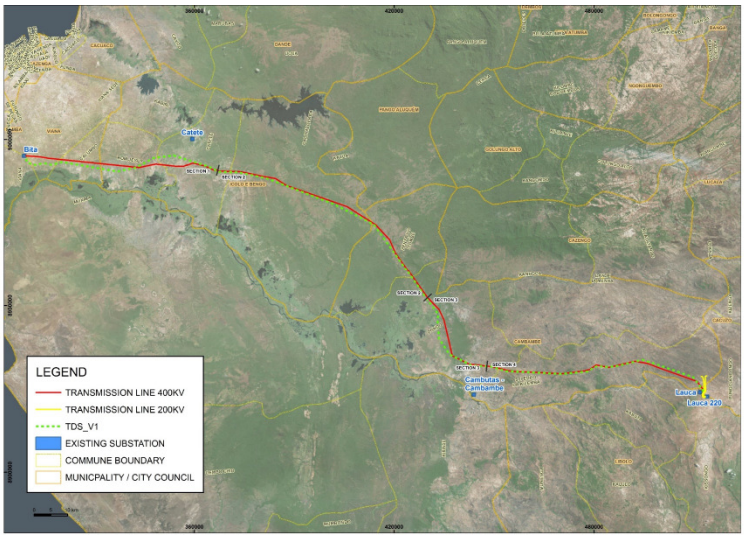
1. Apresentação e actualização do Projecto Laúca-Bita EIAS

Principais Componentes da Linha de Transmissão de Láuca-Bita

- A empresa **New Horizons of Infrastructure of Denmark (NHID)** está a desenvolver um Projecto de Construção de Linha de Transmissão de Electricidade entre a Barragem Hidroeléctrica de Laúca na província de Malanje até a subestação na zona do Bita Tanque no município de Belas, província de Luanda.
- O projecto endereça a necessidade de transportar a electricidade gerada na planta hidroelétrica de Lauca, com uma capacidade de produção de 2,550 MW, para a área de consumo localizada na parte costeira do pais, especificamente na área metropolitana de Luanda. Este projecto inclui duas partes distintas e complementares :
  - Uma linha aérea de transporte de electricidade de 400 kV da Barragem Hidroeléctrica de Laúca até a futura subestação na zona do Bita Tanque em Luanda,
  - Duas linhas de aéreas de transporte de electricidade de 220 kV de 7,5 km para ligar a Subestação da Barragem de Laúca com a linha de transporte da Barragem Hidroeléctrica de Capanda até à Subestação Cambutas em Cambambe.



Via da LT de Láuca-Bita



As linhas de transmissão de electricidade passarão pelas seguintes localidades:

- Em Malanje: Cacuso (aldeias Nhangue Ya Pape e Dumbo);
- No Cuanza-Norte: nas comunas do Zenza do Itombe e Dondo no município de Cambambe (Dondo, Zenza do Itombe e as aldeias Cassoalala, Lucapa e Bungo);
- Em Luanda: Icolo e Bengo (Bom Jesus, Mazozo, Catete e Botomona), Viana (Calumbo e Zango IV) e Belas (Bita Tanque).

Parceiros do Projecto

- O projecto é promovido pela empresa New Horizons of Infrastructure of Denmark (NHID) em parcerias com o Gabinete de Aproveitamento do Médio Kwanza (GAMEK) em representação do Ministério de Energia e Aguas (MINEA).
- A NHID contractou a DOMINION como companhia provedora de Serviços de Escritório de Gerenciamento de Projectos (PMO).

REPÚBLICA DE ANGOLA
MINISTÉRIO DA ENERGIA E ÁGUAS

GAMEK
GABINETE DE APROVEITAMENTO DO MÉDIO KWANZA

+

NHID

DOMINION

Compromisso com Padrões Internacionais

- A NHID adere requisitos de desempenho do International Finance Corporation (IFC)
- A NHID conta com um rigoroso Código de Conduta
- A NHID age de forma ética e com responsabilidade social.
- A NHID mantem um discurso aberto com a sociedade e ira consultar e cooperar com todos as partes interessantes de forma a alancar um solução aceitável para todos os envolvidos,

→

- O Projecto ira aderir a:
  - Toda a legislação ambiental e social aplicável da Republica de Angola.
  - Padrões do Grupo do Banco Mundial (WBG)
  - Padrões de Desempenho do IFC (2012) (com foco para o PS5- Reassentamento Involuntário)
  - Linhas Gerais para Ambiente, Saúde e Segurança do IFC/Banco Mundial (IFC, 2012).

2. Actualização do Processo de Impacto Ambiental

Processo de Impacto Ambiental

- Em conformidade com o Decreto sobre Avaliação de Impacte Ambiental (Decreto n.º 51/04 de 23 de Julho) e demais legislação ambiental em vigor, o projecto foi sujeito à uma Avaliação de Impacte Ambiental que culminou com a entrega do Estudo de Impacte Ambiental e Social (EIAS) as autoridades competentes em 2015.
- Havendo necessidade de se actualizar o Estudo de Impacte Ambiental e Social (EIAS) devido às alterações no projecto (traçado da linha de transmissão e localização da subestação do Bita) e a necessidade do aprofundamento de aspectos ambientais e sociais.
- NHID contratou as empresas **Holísticos** – Serviços, Estudos & Consultoria e **Environmental Resources Management** (ERM), com a finalidade de:
  - Actualizar o EIAS do Projecto através da realização de levantamentos ambientais e sociais assim como encontros de auscultação pública com as autoridades locais e demais partes afectadas e interessadas pelo projecto.
  - Desenvolver a estrutura do Plano de Ação de Reassentamento e Compensação, que define a estrutura do processo de concessão de terras e compensação.

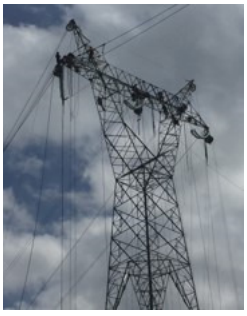
Actividades de Trabalho de Campo

Ambiental	*Equipa: 2 ecologistas* *Duração:* 8 dias (9-16 Julho 2018) *Actividades:* • Medição de Ruido em pontos selecionados • Evidencia fotográficas ao longo da linha de transmissão • Levantamento físico de dados adquiridos : habitats, flora, fauna e serviços de ecossistemas
Socioeconómica & Consulta de Partes Interessadas	*Equipa: 3 especialistas sociais* *Duração:* 8 dias (9-25 Julho 2018) *Actividades:* • Disseminação de informação do projecto e consulta publica (autoridades a nível nacional, municipal/local e comunidades) em cada comunidade no corredor de 500 m • Verificação das comunidades no corredor de 500 m da linha • Grupos focais e entrevistas com grupos de relevância
Património Cultural	*Equipa: 1 arqueólogo* *Duração:* 8 dias (9-16 Julho 2018) *Actividades* Levantamento físico de património cultural sensível ao longo da linha

3. O Projecto

Principais Estruturas do Projecto

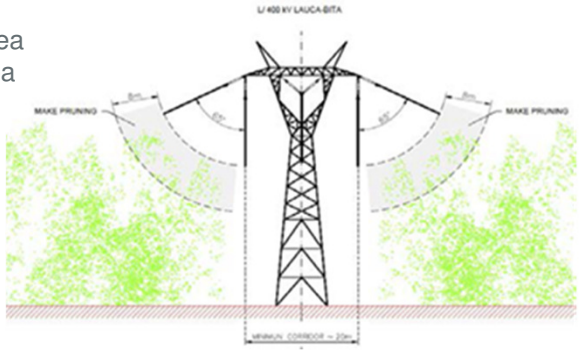
- Até 600 **torres serão erguidas** ao decorrer da linha de transmissão (236 km). As torres terão comprimento entre 25-50 m.
- **Acampamentos para Trabalhadores** com capacidade para 200 pessoas serão construídos pela NHID para uso dos contractados nos seguintes locais:
  - A barragem existente de Laúca;
  - Próximo do Dondo (local exato a ser definido)
  - Próximo a Maria Teresa (local exato a ser definido)
- **Estradas de acesso**: é esperado que se utilize as estradas de acesso já existentes, com exceção de um ou outro acesso necessário.
- **Mão de Obra**: será necessário um largo número de trabalhadores (aproximadamente 600 pessoas) durante a fase de construção (período de 18 meses) maioritariamente angolanos.





Requisitos de Terra (Outras Restrições)

- Durante a fase de **construção** (18 meses):
  - Desminagem dentro do corredor de 60 m.
  - Torres serão construídas dentro de uma área de trabalho de máximo 60mx60m. Esta área de trabalho terá segurança durante o período de construção de 18 meses.
- Durante a fase de **operação** (40 anos):
  - Um corredor de 45m será mantido sem vegetação para assegurar a operação (desmatamento e limpeza); e
  - Um corredor de 5 m para acesso por debaixo da linha será limpo para manutenção.



Método de Construção

- **Pré-construção incluirá um levantamento** LIDAR que ajudará na determinação da localização exacta /tipo /peso das tores a serem usadas ao longo da linha (Dez 2018).
- **Construção** irá proceder ao longo de três secções da linha em paralelo, com diferentes contractadas para cada secção. (Inicio no 3 Trimestre de 2018 sobre um período de construção de 18 meses). A construção terá três fases :
  - Fundações;
  - Levantamento das Torres; e
  - Instalação de cabos e condutores.



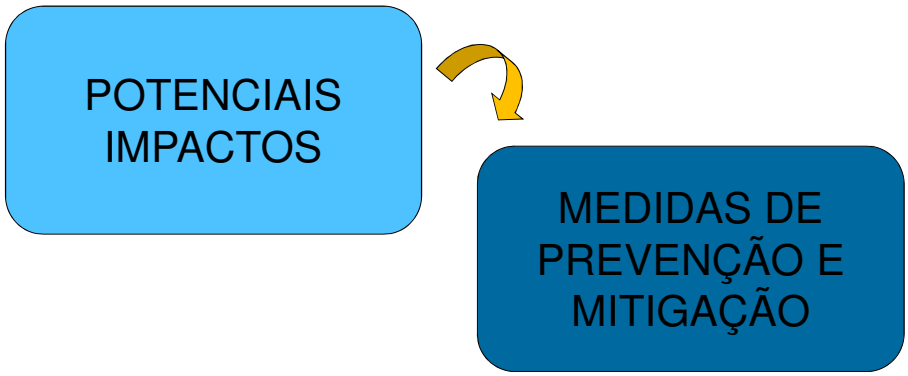




4. Questões do Projecto do âmbito ambiental, socioeconómicas e património cultural

Potenciais Impactos e Medidas de Mitigação

- Nos seguintes slides:



Os seguintes aspectos serão estudados e quantificados ao decorrer da elaboração do EIAS

Impactos Ambientais e Mitigação

Potenciais Impactos	Mitigação
Biodiversidade, Habitat Natural, Paisagem (construção e operação)	
▪ Temporário : Perda de habitat devido a remoção de vegetação nas áreas de construção (a ser reposta) ▪ Permanente: Perda de habitat devido a remoção de vegetação sobre Via de Acesso (corredor 4 m & impacto na avifauna ▪ Alteração Temporária e Permanente da paisagem	▪ Seleccao da tora para evitar e minimizer atravesars area som valor eologico alto (e.g. florestas) ▪ Reduzir áreas de trabalho onde possível ▪ Restaurar condições de pré-construção ▪ Plano de Acção para a Biodiversidade, incluindo espécies importantes (avifauna) ▪ Plano de Restauração de Vegetação / Paisagem
Qualidade da Água e Habitats Aquáticos (construção)	
▪ Danos a habitats aquáticos interceptados pelo traçado da linha. ▪ Derrames de petróleo acidentais / derrames de produtos químicos ▪ Águas residuais dos acampamentos de trabalhadores	▪ Minimizar o número de interseções do rio ▪ Monitoramento da qualidade da água ▪ Restabelecer a vegetação tal como em pré-construção ▪ Plano de Reposta a Derrames de Petróleo e produtos químicos e equipamentos ▪ Formação de trabalhadores
Ruído, Emissões Atmosféricas, Trânsito (construção)	
▪ Ruído, Vibrações e Emissões Atmosféricas ligadas às operações de construção e transporte.	▪ Limitar horas de trabalho perto de receptores sensíveis ▪ Medidas de mitigação em equipamentos ruidosos ▪ Minimizar o impacto na perturbação do trânsito através do Plano de Gestão de Trânsito

Socioeconomicos Impactos Ambientais e Mitigacao

Potenciais Impactos	Mitigacao
Benefícios socioeconômicos (construção e operação)	
▪ Aumento das receitas do governo (taxas, permissões) ▪ Criação de emprego direto / indireto ▪ Aquisição local de materiais ▪ Atualização de estradas	▪ Estratégia de compras para garantir a maximização do emprego e aquisição local (sujeito a disponibilidade, qualidade e custo) ▪ Facilitar o acesso das comunidades locais às estradas e outras novas infraestruturas
Uso da terra, propriedade, pessoas (construção)	
▪ Deslocamento do uso da terra existente em faixas de trabalho de 45 m, áreas de construção de torres e estradas de acesso. ▪ Deslocamento permanente devido ao estabelecimento de 4 m de direito de passagem de toda a vegetação	▪ Plano de Acção de Reassentamento: compensação para incluir a perda de meios de subsistência (por exemplo, perda de rendimento do cultivo) ▪ Planos de restauração de terras ▪ Nenhuma plantação anual de árvores ou árvores pode ser replantada no total 4 m direito de passagem. Restrições no corredor de 45 m.
Uso da terra, propriedade, pessoas (Operação)	
▪ Servidão no caminho do canal ▪ Terrenos adquiridos para torres (10x10m) e estradas novas ou ampliadas ▪ Faixa de 4 m para ficar livre de vegetação, culturas e estruturas	▪ Plano de Ação de Reassentamento / Restauração de Meios de Subsistência ▪ Planos de restauração de terras
Presenca de Mao de Obra	
▪ Construção de acampamentos de trabalhadores ▪ Potencial perturbação e incômodo com a comunidade e os costumes e normas locais ▪ Maior transmissão de doenças transmissíveis	▪ Desenvolver um código de conduta dos trabalhadores e monitorar sua implementação pelos trabalhadores ▪ Engajar agentes de ligação da comunidade para monitorar a satisfação da comunidade relacionada ao projeto ▪ Desenvolver um Plano de Engajamento de Partes Interessadas ▪ Desenvolver um Plano Comunitário de Saúde e Segurança

Impactos Culturais e de Mitigacao

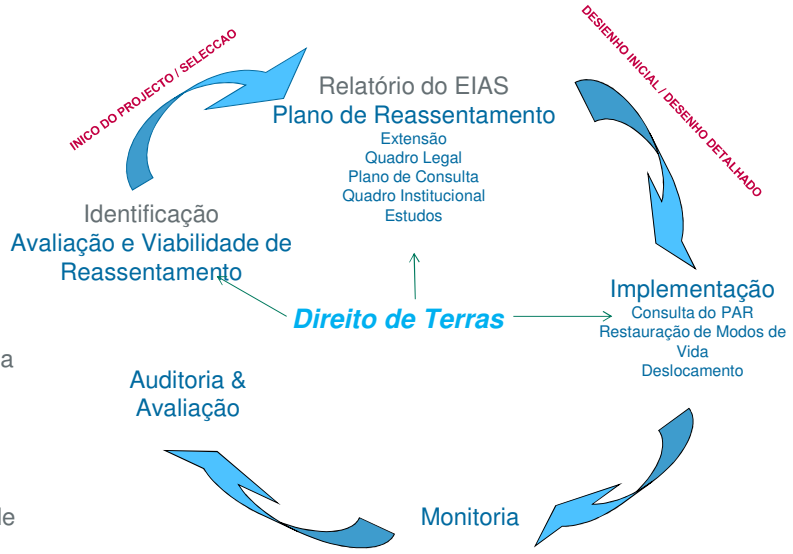
Potenciais Impactos	Mitigacao
Patrimonio Cultural (construção)	
▪ Atividades de construção perturbadoras no solo na área de construção	▪ Pesquisa de reconhecimento detalhada ▪ Monitoramento arqueológico e procedimento de "chance de encontrar" ▪ Prevenção de determinados sites e prováveis ou técnicas de construção de baixo impacto onde o reencaminhamento não é viável

5. Processo de Direitos de Terras e Compensação

Requisitos Internacionais do Processo de Reassentamento

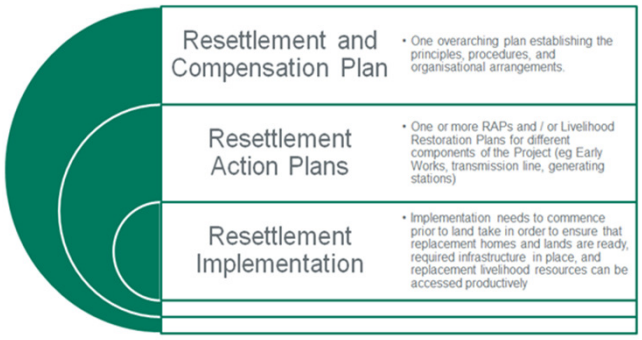
De acordo com o **IFC PS 5,** A NHDI:

- Totalmente responsável pelo processo de reassentamento processo;
- Devera estar directamente envolvido;
- Complementar Actividades Governamentais;
- Atingir resultados em concordância com os Padrões de Desempenho em conjunto com o GAMEK;
- Directamente envolvido na implementação e monitorização – (aproximadamente um processo de 3 anos).



Metodologia Proposta pela NHID

- A fim de satisfazer as exigências dos credores, a NHID desenvolverá um Plano de Ação de Reassentamento e Compensação (Framework) para o projeto Laúca-Bita, que fornece a estrutura para o processo de aquisição e reassentamento de terras.



*A Resettlement Policy Framework is required for projects with **subprojects or multiple components** that cannot be identified before project approval. This instrument may also be appropriate where there are valid reasons for delaying the implementation of the resettlement, provided that the implementing party provides an appropriate and concrete commitment for its future implementation. The policy framework should be consistent with the principles and objectives of OD 4.30."*

6. Plano para Consulta de Partes Interessadas Próximos Passos

Fases de Consulta Publica

Fase	Objectivo	Estado
Fase (1) EIAS (2014)	O envolvimento das partes interessadas durante a ESIA de 2014 foi limitado às autoridades provinciais.	*Completo*
Fase (2) Actualizacao do EIAS (2018)	O engajamento das partes interessadas durante a fase de atualização da ESIA terá dois objetivos: manter os relacionamentos desenvolvidos durante as etapas anteriores; e garantir que todas as questões das partes interessadas tenham sido identificadas e consideradas pelo Projeto. A NHID revisitará as autoridades nacionais e regionais e se envolverá com as comunidades afetadas ao longo da rota da linha de transmissão. Todas as partes interessadas receberão uma atualização do projeto e uma oportunidade de comentar, expressar quaisquer preocupações e discutir questões.	A decorrer
Fase (3) Consulta Publica do EIAS	As partes interessadas receberão o relatório preliminar atualizado da ESIA no final do processo de AIAS e serão convidados a comentar o documento. As informações sobre os impactos do projeto serão apresentadas juntamente com as medidas de mitigação destinadas a minimizá-las ou aprimorá-las.	*Planeado*
Execucao do Projecto (construccao, operatcao decomissionamento)	O NHID / GAMEK continuará a se envolver com as partes interessadas durante todo o ciclo de vida do projeto. A metodologia para isso será desenvolvida e finalizada usando as informações compiladas durante o processo de AIAS.	*Planeado*

Comentários Públicos e Mecanismo de Sugestões

- Um objetivo importante da consulta sobre a actualização do EIAS será permitir às partes interessadas fornecer feedback ao Projecto.
- A NHID gostaria de convidar a todas as partes interessadas envolvidas no processo de consulta, incluindo comunidades locais e publico em geral, a submeter os seus comentários e sugestão sobre o projecto.
- Já esta disponível um formulário para a entrega de comentários e sugestões em Português e Inglês.



Obrigado

NHID







Annex G

Noise Equipment Calibration Certificate

sanas
Calibration Laboratory
148
1302

M AND N ACOUSTIC SERVICES (Pty) Ltd
Co. Reg. No: 2012/123238/07 VAT NO: 4300255876 BEE Status: Level 4
P.O. Box 61713, Pierre van Ryneveld, 0045
No. 15, Mustang Avenue
Pierre van Ryneveld, 0045
Tel: 012 689-2007 (076 920 3070) • Fax: 086 211 4690
E-mail: admin@mnacoustics.co.za
Website: www.mnacoustics.co.za

CERTIFICATE OF CONFORMANCE

CERTIFICATE NUMBER	2017-AS-2215
ORGANISATION	ERM SOUTHERN AFRICA (PTY) LTD
ORGANISATION ADDRESS	POSTNET SUITE 90, PRIVATE BAG X12, TOKAI, 7966
CALIBRATION OF	INTEGRATING SOUND LEVEL METER complete with ½" MICROPHONE
MANUFACTURERS	RION
MODEL NUMBERS	NL-52, NH-25 and UC-59
SERIAL NUMBERS	00810334, 10328 and 02888
DATE OF CALIBRATION	22 NOVEMBER 2017
RECOMMENDED DUE DATE	NOVEMBER 2018
PAGE NUMBER	PAGE 1 OF 4

This certificate is issued in accordance with the conditions of approval granted by the South African National Accreditation System (SANAS). This Certificate may not be reproduced without the written approval of SANAS and M and N Acoustic Services.

Calibrations performed by this laboratory are in terms of standards, the accuracies of which are traceable to national measuring standards as maintained by NMISA.

The measurement results recorded in this certificate were correct at the time of calibration. The subsequent accuracy will depend on factors such as care, handling, frequency of use and the amount of different users. It is recommended that re-calibration should be performed at an interval, which will ensure that the instrument remains within the desired limits and/or manufacturer's specifications.

The South African National Accreditation System (SANAS) is member of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). This arrangement allows for mutual recognition of technical test and calibration data by member accreditation bodies worldwide. For more information on the arrangement please consult www.ilac.org

Calibrated by:	Authorized/Checked by:	Date of Issue:
W.S. SIBANYONI (CALIBRATION TECHNICIAN)	M. NAUDÉ (SANAS TECHNICAL SIGNATORY)	23 NOVEMBER 2017

Conditions under Which M and N Acoustic Services (Pty) Ltd Will Perform Work

In this document, reference to a service or services will include: calibration, measurement, analysis or conformance work performed by M and N Acoustics on behalf of the Applicant.

1. Services are carried out at the discretion of M and N Acoustic Services, which reserves the right to decline any application for performance or services when deemed to be outside the scope of services of this Company.
2. Through acceptance of the original quotation, the Applicant agrees to the quoted fee and the conditions stated herein. In cases where M and N Acoustic Services has not published the amount of the fee, M and N Acoustic Services will in good faith give estimates of the time and cost of the service based upon its previous experience.
3. Payment is strictly COD, or 30 days from the date of invoice, or as mutually agreed in writing between the Applicant and M and N Acoustic Services before the service commenced. M and N Acoustic Services retains the right to ask for a deposit for services.
4. All instruments, items of equipment, etc. sent by the Applicant for performance of services shall be delivered and collected at the Applicant's own cost and risk.
5. M and N Acoustic Services cannot guarantee to complete the work within the estimated time and cost but will consult the Applicant of it becomes apparent that either estimate will be exceeded.
6. If a service is not completed because of defects or deficiencies in the item submitted by the applicant, an appropriate reduction in the fee may be allowed depending on the amount of work already performed. The normal practice will be to charge the fee in full.
7. The Applicant hereby consents that the legal liability of M an N Acoustic Services with regard to any damage whatsoever or a mistake made by M and N Acoustic Services in services performed for the Applicant will be limited to the original quoted fee.
8. Regarding certificates and reports:
    - A certificate or report will be furnished to the Applicant on completion of the service.
    - Additional certified copies of certificates, or re-issued certificates will be subjected to an additional fee, as determined on a case by case basis.
    - The values in the issued certificates are correct at the time of calibration. Subsequently the accuracy will depend on such factors as the care exercised in handling and use of the instrument and the frequency of use.
    - Re-calibration should be performed after a period which has been chosen to ensure that the instrument's accuracy remains within the desired limits.

1. PROCEDURE

The Integrating Sound Level Meter was calibrated according to procedure 1002/P/003 and to the IEC 60651 and IEC 60804 specifications as well as the manufacturer's specifications.

The ½" Microphone was calibrated according to procedure 1002/P/002 as well as the manufacturer's specifications.

2. MEASURING EQUIPMENT

JFW	50BR-022	50 Ohm Step Attenuator	4610290708
Agilent	33522A	Function Generator	MY 50005443
Greysinger	80 CL	Data Logger	02304030/1/2
Agilent	34461A	Digital Multimeter	MY 53224004
Agilent	34461A	Digital Multimeter	MY 53205694
G.R.A.S	42 AA	Piston Phone	18259
B&K	2829	4-Ch Microphone Power Supply	2329283
G.R.A.S	26 AJ	½" Pre-Amplifier	188476
G.R.A.S	40 AQ	½" Microphone	160816
B&K	4226	Multi-Functional Calibrator	2912645
Greysinger	80 CL	Data Logger	02304030/1/2
Gems	3500B0001A01B000	Pressure Sensor	1606-0204475

Calibrations performed by this laboratory are in terms of standards, the accuracies of which are traceable to national measuring standards as maintained by NMISA

Calibrated by:	*Authorized/Checked by:*
W.S. SIBANYONI *(CALIBRATION TECHNICIAN)*	*M. NAUDÉ* *(SANAS TECHNICAL SIGNATORY)*

3. RESULTS

3.1 The following parameters of the Integrating Sound Level Meter were calibrated:

Parameter	Specification	Uncertainty of Measurement in dB
Input Sensitivity	Manufacturer's specification	± 0,23
Amplitude Linearity (at 31,5 Hz, 1 kHz and 8 kHz from 30,0 dB to 120,0 dB)	IEC 60651: section 6.3 & 6.4	± 0,27
Weighting Network A (31,5 to 20 000) Hz	IEC 60651: section 6.1 & 6.2	± 0,27
Weighting Network C (31,5 to 20 000) Hz	IEC 60651: section 6.1 & 6.2	± 0,27
Linear (31,5 to 20 000) Hz	Manufacturer's Specification	± 0,27
Detector network (Fast, Slow and Impulse)	IEC 60651: section 7.1, 7.2 & 7.3	± 0,27
Integrating (Time Averaging)	IEC 60804: section 9.3.2 & 9.3.3	± 0,27
Integrating (Pulse Range)	IEC 60804: section 9.3.4	± 0,33
Impulse Integrating (AI-weighted)	IEC 60804: annex B	± 0,27
Peak Level	Manufacturer's specification	± 0,27
Max. /Min. Level	Manufacturer's specification	± 0,27
SEL	Manufacturer's specification	± 0,27
AC Output Level	Manufacturer's Specification	± 0,24
DC Output Level	Manufacturer's Specification	± 0,23

Conclusion: The Integrating Sound Level Meter complied with the above-specified clauses of the IEC 60651 and IEC 60804 specifications, **Type 1**.

3.2 The following parameters of the ½" Microphone were calibrated:

Output Sensitivity at 250 Hz at 94,0 dB
Frequency Response (31,5 to 16 000) Hz

The following parameters of the ½" Microphone were calibrated Electro Acoustically:

Frequency Response (31,5 to 16 000) Hz

Conclusion: The parameters measured for the ½" Microphone, complied with the manufacturer's specification.

Calibrated by:	*Authorized/Checked by:*
W.S. SIBANYONI (CALIBRATION TECHNICIAN)	*M. NAUDÉ (SANAS TECHNICAL SIGNATORY)*

4. REMARKS

4.1 The reported expanded uncertainties of measurements are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95,45 %, the uncertainties of measurements have been estimated in accordance with the principles defined in the GUM (Guide to Uncertainty of Measurement) ISO, Geneva, 1993

4.2 The environmental conditions were: Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) % RH

4.3 Calibration labels bearing cal date, due date (if requested), certificate number and serial number have been affixed to the instrument.

4.4 The uncertainties of the measurements were taken into account when the above statements of compliance to the relevant specifications are made.

4.5 The **total** uncertainty of measurements was estimated as follows:

Integrating Sound Level Meter: ± 1,0 dB
½" Microphones: ± 0,3 dB

----------SECTION 4.5 THE END OF CERTIFICATE----------

Calibrated by:	Authorized/Checked by:
W.S. SIBANYONI (CALIBRATION TECHNICIAN)	M. NAUDÉ (SANAS TECHNICAL SIGNATORY)

Annex H

Lauca-Kilamba Environmental Licencing Process Documentation

GAMEK

PARECER VINCULATIVO SOBRE O ESTUDO DE IMPACTE AMBIENTAL DOS PROJECTOS DE TRANSPORTE E SUBESTAÇÃO ASSOCIADOS AO APROVEITAMENTO HIDROELÉCTRICO DE LAÚCA

A República de Angola encontra-se num amplo processo de recuperação de sua infraestrutura para a sustentação do seu desenvolvimento económico, social e ambiental. Neste contexto ressalta-se a necessidade de incremento de produção de energia eléctrica com um factor básico para o suporte desse desenvolvimento.

Porém para atinjirmos estes objectivos, foi contratada a empresa brasileira ODEBRECHT para a construção do A. H. de Laúca localizado no km 307,5 do rio Kwanza, cerca de 47 km a jusante do A. H. de Cambambe próximo a localidade de Nhangue ya Pepe.

O Estudo de Impacte Ambiental (EIA) objecto deste parecer, foi elaborado em 2015 pela empresa EDETA – Estudos e Desenvolvimento de Tecnologias Ambientais Lda, credenciada pelo Ministério do Ambiente com certificado de Registo Ambiental n° 042 e, submetido ao GAMEK em Maio de 2015 para obtenção de uma Licença Ambiental de Instalação.

Após leitura e análise dos Relatórios do EIA para o transporte e subestação nos mostramos de acordo com o seu conteúdo e forma de abordagem de todos os temas. Além disso, o EIA encontra-se de acordo com a legislação nacional e internacionais no qual inclui um Resumo Não Técnico, Relatório de Estudos de Impacte Ambiental e Relatório de Impacte Social.

Por outro lado, o EIA apresenta medidas de mitigação para a redução/minimização/atenuação dos impactes negativos causados durante a fase de construção bem como define um Plano de Monitorização Ambiental, que vai assegurar a aplicação das boas práticas de gestão ambiental para o correcto desenvolvimento das várias fases do projecto e melhoria da qualidade de vida.

ATENTAMENTE,

FERNANDO BARROS C. GONGA

DIRECTOR GERAL

GABINETE DO APROVEITAMENTO HIDROELÉCTRICO DO MÉDIO KWANZA – GAMEK, EM LUANDA, 07 DE JULHO DE 2015.-

REPÚBLICA DE ANGOLA

MINISTÉRIO DA ENERGIA E ÁGUAS

GABINETE DO MINISTRO

À
SUA EXCELÊNCIA
MINISTRA DO AMBIENTE
Drª.MARIA DE FÁTIMA JARDIM

L U A N D A

REFª.1135/GAB.MINEA/2015

ASSUNTO: **Estudo de Impacte Ambiental dos Projectos do Sistema de Transporte e Subestações Associadas ao Aproveitamento Hidroeléctrico de LAÚCA**.

Excelência;

Atendendo ao facto de estarem reunidas todas as condições técnicas e legais para obtenção das respectivas licenças, serve o presente para formalizar à entrega do Estudo de Impacte Ambiental dos Projectos do Sistema de Transporte e Subestações Associadas ao Aproveitamento Hidroeléctrico de LAÚCA e respectiva documentação de suporte que se anexa, para apreciação da Direcção Nacional de Prevenção e Avaliação de Impacte Ambiental do vosso Ministério:

- **Parecer Vinculativo sobre o Estudo de Impacte Ambiental dos Projectos de Transporte e Subestação Associados ao Aproveitamento Hidroeléctrico de Laúca;**

- **CD Subestação de Transporte de Malange de 220/110KV**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

- **CD Transporte de Kilamba 400/220/60**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

- **CD Muito Alta Tensão Waco Kungo-Belém do Dango a 400KV**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

MINISTÉRIO DA ENERGIA E ÁGUAS

- **CD Linha de Muito Alta Tensão Laúca-Waco Kungo, a 40 KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Laúca – Capanda, a 400 KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Laúca – Cambutas, a 400 KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Laúca-Kilamba, a 400 KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Laúca-Catete, a 400KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Catete – Kilamba, a 400KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Kilamba-Camama, a 220 KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

- **CD Linha de Muito Alta Tensão Capanda-Malange, a 220 KV**
  - ✓ Estudo de Impacte Ambiental
  - ✓ Resumo Não Técnico
  - ✓ Estudo de Impacte Social

MINISTÉRIO DA ENERGIA E ÁGUAS

- **CD Linha de Muito Alta Tensão Cambutas-Kilamba. 400KV**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

- **CD Ampliação da Subestação de Transporte de Waco Kungo 400/220/60**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

- **CD Ampliação da Subestação de Transporte de Belém do Dango 400/220/60**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

- **CD Linha de Muito Alta Tensão Belém do Dango – Lubango, a 400KV**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

- **CD Subestação de Transporte do Lubango 400/220/60KV**
  - ✓ **Estudo de Impacte Ambiental**
  - ✓ **Resumo Não Técnico**
  - ✓ **Estudo de Impacte Social**

Sem mais de momento, queira Excelência, aceitar os nossos,

Distintos Cumprimentos.

GABINETE DO MINISTRO DA ENERGIA E ÁGUAS, EM LUANDA, AOS 22 DE JULHO DE 2015.

O MINISTRO

JOÃO BAPTISTA BORGES

GAMEK
Rua do Massangano S/N – Bairro Operário
Telefs. {+244 222-445072 /445110}
Cx. Postal 6184
Telex: 3207

À
DIRECÇÃO NACIONAL DE PREVENÇÃO E AVALIACÇÃO DE IMPACTES AMBIENTAIS
ATT: ENGª NELMA SILVA CAETANO

LUANDA

S/Referência	N/Referência	Data
	079/GAMEK-DT/2018	04/12/2018

ASSUNTO: SOLICITAÇÃO DE LICENÇA AMBIENTAL DE INSTALAÇÃO DO PROJECTO DE LINHA DE TRANSPORTE DE MUITO ALTA TENSÃO LAÚCA-BITA DE 400 KV.

Prezada Senhora,

Em Junho 2015 foi submetido à vossa direcção para a emissão de parecer e subsequente processo de licenciamento ambiental (Decreto nº 59/07 de 13 de Julho), os relatórios finais do Estudo de Impacte Ambiental e Social, bem como os respectivos Resumos Não Técnicos dos Projectos do Sistema de Transporte e Subestação Associados ao Aproveitamento Hidroeléctrico de Laúca.

De seguida, o parecer vinculativo elaborado pelo Ministério da Energia e Águas referente ao Estudo de Impacte Ambiental, permitiu garantir à sua autenticidade e a certeza de que foi desenvolvido de acordo com o regime jurídico de Avaliação de Impacte Ambiental (Decreto nº 51/04 de 23 de Julho), de forma a atender as leis vigentes no país e, as recomendações do Ministério do Ambiente.

Na sequência do processo, foi realizado pelos técnicos do DNPAIA/MINAMB a visita de pré-licenciamento, para aferir não só as incidências do traçado da linha de transmissão, mas fundamentalmente a minimização dos potenciais impactes e processos de dinâmica superficial durante a implantação do projecto.

É importante realçar que o EIA apresenta medidas de mitigação e plano de monitorização ambiental que vão de facto assegurar a aplicação das boas práticas de gestão ambiental para o correcto desenvolvimento das várias fases do projecto garantindo a melhoria da qualidade de vida das populações.

O referido projecto está registado no Ministério do Ambiente como Laúca-Kilamba, mas atendendo ao facto de ter havido uma alteração ao nome da subestação e consequentemente ao nome do projecto;

Vimos solicitar a emissão da Licença Ambiental de Instalação com a denominação de Laúca-Bita, para o qual nos comprometemos em cumprir com os demais requisitos exigidos pela legislação vigente. Aproveitamos a ocasião para remeter em anexo documentos comprovativos.

Sem outro assunto de momento, apresentamos os nossos respeitosos cumprimentos.

ATENTAMENTE,

GAMEK

FERNANDO BARROS C. GONGA
DIRECTOR GERAL

GABINETE DE APROVEITAMENTO DO MÉDIO KWANZA,GAMEK,EM LUANDA,04 DE DEZEMBRO DE 2018.

AC/rn

ENTRADA
Nº
DATA 05 / 12 / 18
ASS

Annex I

Roles and Responsibilities

Organizational diagram showing roles and responsibilities within NHID as well as an overview showing roles and responsibilities between Gamek, Dar and NHID.

PROJECT ORGANIZATIONAL DIAGRAM

Ministério da Energia e Águas (MINEA)

GAMEK (Gabinete de Aproveitamento de Medio Kwanza)

LENDERS

PROJECT DIRECTOR

ESIA/ESMP/ESAP

ACCORDING ERM´S SUBCONTRACT AND ADDTTIONALS IN THE CONSTRUCTION PERIOD

NEW HORIZONS IN INFRASTRUCTURE OF DENMARK NHID I/S (NHID)

DAR ANGOLA

NHID - Supervisory Board

PROCUREMENT COMMITTEE

TECHNICAL DIRECTOR

CONTROLLER	
ACCOUNT CONTROL COORDINATOR	OFFICE COORDINATOR
LEGAL SERVICES	HUMAN RESSOURCES COORDINATOR
CONTRACT MANAGER	DOCUMENTATION COORDINATOR
HEALTH AND SAFETY MANAGER	

PROJECT MANAGER
DEMINING COORDINATOR
LOGISTICS COORDINATOR
ROW

SUBCONTRACTORS	SUBCONTRACTORS	SUBCONTRACTORS
		DAMASEC
		DSV

CONSTRUCTION MANAGER - DEPUTY TECHNICAL DIRECTOR		
SUB-STATION COORDINATOR	RESIDENT ENGINEER SECTION 1	SITE ADMINISTRATION
	RESIDENT ENGINEER SECTION 2	
	RESIDENT ENGINEER SECTION 3	
	SITE HEALTH AND SAFETY ENGINEER	

SUBCONTRACTORS	SUBCONTRACTORS
MOTA ENGIL	EIP
	ELECNOR
	DAR
	APROT

ENVIRONMENTAL &SOCIAL MANAGER	
LAND ADQUISITION AND COMPENSATION MANAGER	ENVIRONMENTAL AND SOCIAL TENHNICIAN
ENVIRONMENTAL AND SOCIAL MANAGER SECTION 1	ENVIRONMENTAL AND SOCIAL MANAGER SECTION 2
ENVIRONMENTAL AND SOCIAL MANAGER SECTION 3	COMMUNITY LIASON MANAGER
GRIVANCE OFFICER	DATA MANAGER

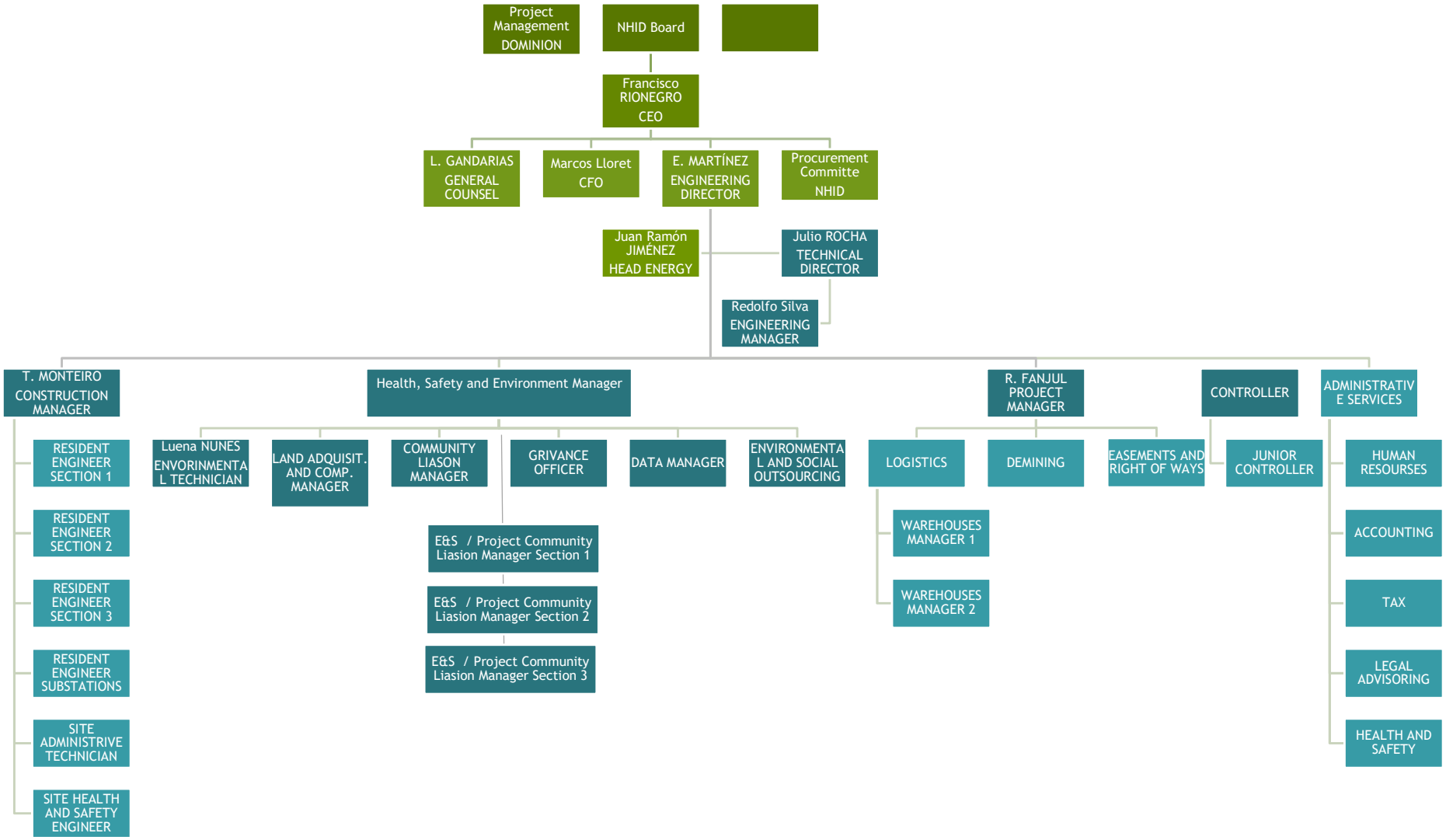
SUBCONTRACTORS
ERM
HOLISTICOS

Task No.	Task	RESPONSIBLE / SUPPORTER	NHID (DIVISION)	NHID SUBCONTRACTOR	NHID	GAMEK	MINAMB	MINADER	MINARS / CNIDAH / CED
1.1	Roles and responsibilities	NHID	NHID > Supervisory Board > Technical Director	ERM	X				
1.2	Environmental and Social Policy	GAMEK/ MINAMB	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM		X	X		
1.3	HR policy	GAMEK/NHID	NHID > Supervisory Board > Technical Director > QUALITY assurance & Occupational HEALTH MANAGER	ERM	X	X			
1.4	Changes of scope / design of project	GAMEK / NHID	NHID > Supervisory Board > Technical Director > Engineering Services Manager	DAR ENGINEERING	X	X			
1.5	Project specific baseline study of socio-economic conditions	NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X				
1.6	Project specific baseline study of biodiversity & ecosystem services	NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X				
1.7	Stakeholder Engagement Plan (SEP)	GAMEK/NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X	X			
1.8	Resettlement and compensation action plan (RCAP)	GAMEK/NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X	X			
1.9	Develop cumulative impact assessment (CIA)	GAMEK/NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X	X			
1.11	Identification of health Risks and Impacts to PAPs	GAMEK/NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X	X			
1.12	Grievance system	GAMEK/NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	HOLISTICOS	X	X			
1.13	Environmental & Social Management Program (ESMP)	NHID / GAMEK	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X	X			
2.1	Explosive Ordnance Clearance	GAMEK/NHID/MINARS / CNIDAH / CED	NHID > Supervisory Board > Technical Director > Engineering Services Manager	DAMASEC	X	X			X
2.2	Procedures for Occupational Health and Safety	NHID	NHID > Supervisory Board > Technical Director > QUALITY assurance & Occupational HEALTH MANAGER		X				
4.1	Health Risks and Impacts to PAPs	NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X				
5.1	Resettlement and compensation	MINADER / GAMEK / NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	NHID	X	X		X	
5.2	Re-alignment of transmission at Quissuba and other villages	NHID / GAMEK	NHID > Supervisory Board > Technical Director > Engineering Services Manager	ENGINEERING CONSULTANT	X	X			
5.3	Additional affected buildings and property	NHID/MINADER / GAMEK	NHID > Supervisory Board > Technical Director > E&S Coordinator	ENGINEERING CONSULTANT	X	X		X	
6.1	Impact in biodiversity & ecosystem services	NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X				
8.1	Chance Find Procedure	GAMEK/NHID	NHID > Supervisory Board > Technical Director > E&S Coordinator	ERM	X	X			

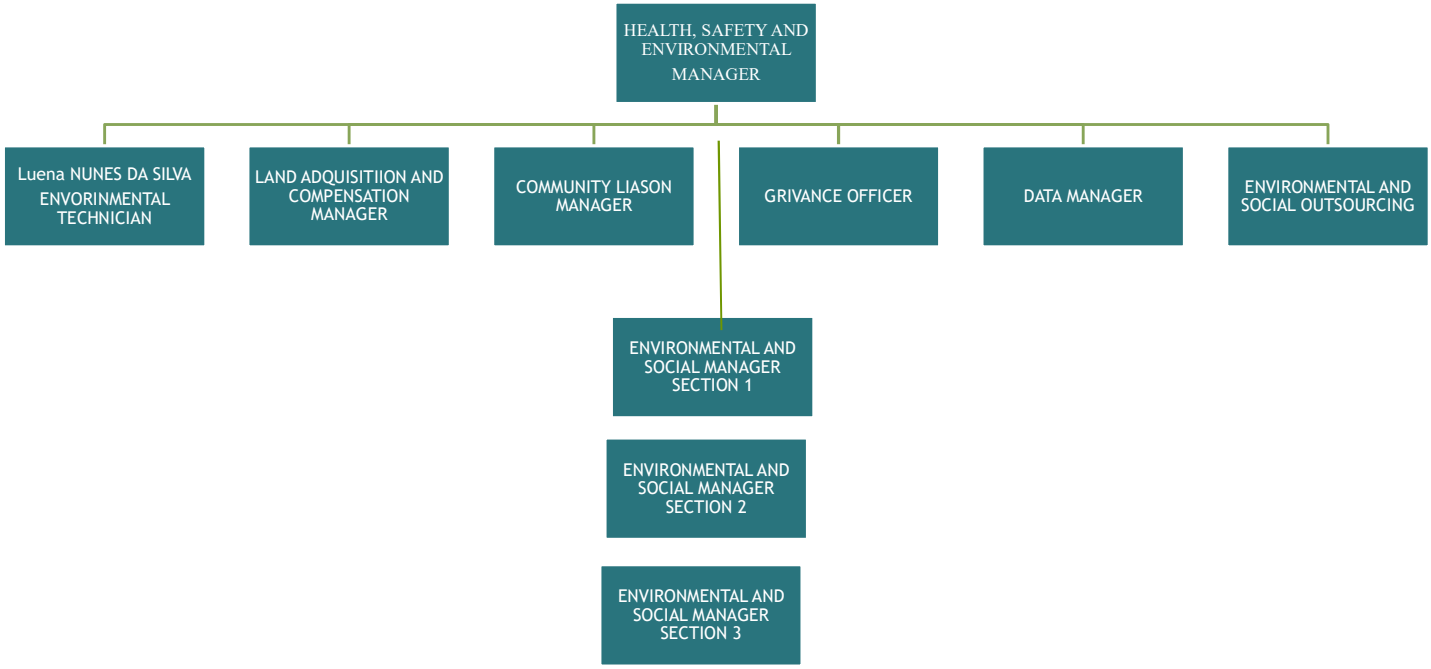
Annex J

NHID Team Structure

NHID Lauca-Bita Project Organization Chart



NHID Lauca-Bita Project Environmental and Social Organization Chart



ERM has over 160 offices across the following countries and territories worldwide.

Argentina
Australia
Belgium
Brazil
Canada
China
Chile
Colombia
France
Germany
Hong
Kong India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
New
Zealand
Norway
Panama
Peru Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South
Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
The Netherlands
United Arab Emirates
United Kingdom
United States of America
Vietnam



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M: +255 767 150 894
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